CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
COMMUNITY DEVELOPMENT

DEVELOPMENT PERMIT APPLICATION

NOTE: Development Permit Application forms must accompany all other Community Development Department land use applications. This form and all documents associated with it are public record once submitted.

To be completed by Applicant

PROPERTY LOCATION

Physical Address: 9399 Rivercourt Way to 4395 Riverside Drive

Legal Description(s) (Subdivision, Survey, Block, Tract, Lot): See Parcel Listing attachment

Parcel Number(s): See Parcel Listing attachment

☐ This property is located in the downtown historic district
☐ This property is located in a mapped hazard area, if so, which _____

LANDOWNER/ LESSEE

Property Owner: Varies (see Parcel Listing attachment) | Contact Person: Nathan Rumsey

Mailing Address: 155 Heritage Way, Juneau, AK 99801 | Phone Number(s): 907-586-0800 x4182

E-mail Address: nate.rumsey@juneau.gov

LANDOWNER/ LESSEE CONSENT

Required for Planning Permits, not needed on Building/ Engineering Permits.

Consent is required of all landowners/ lessees. If submitted with the application, alternative written approval may be sufficient. Written approval must include the property location, landowner/ lessee's printed name, signature, and the applicant's name.

I am (we are) the owner(s)or lessee(s) of the property subject to this application and I (we) consent as follows:
A. This application for a land use or activity review for development on my (our) property is made with my complete understanding and permission.
B. I (we) grant permission for the City and Borough of Juneau officials/employees to inspect my property as needed for purposes of this application.

Local Improvement District
Landowner/Lessee (Printed Name) **Title (e.g.: Landowner, Lessee)**

X _____ _____
Landowner/Lessee (Signature) **Date**

_____
Landowner/Lessee (Printed Name) **Title (e.g.: Landowner, Lessee)**

X _____ _____
Landowner/Lessee (Signature) **Date**

NOTICE: The City and Borough of Juneau staff may need access to the subject property during regular business hours. We will make every effort to contact you in advance, but may need to access the property in your absence and in accordance with the consent above. Also, members of the Planning Commission may visit the property before a scheduled public hearing date.

APPLICANT If same as LANDOWNER, write "SAME"

Applicant (Printed Name): City and Borough of Juneau | Contact Person: Nathan Rumsey

Mailing Address: 155 Heritage Way, Juneau, AK 99801 | Phone Number(s): 907-586-0800 x4182

E-mail Address: nate.rumsey@juneau.gov

X Nate R _____ 6/26/2025
Applicant's Signature **Date of Application**

----------DEPARTMENT USE ONLY BELOW THIS LINE----------

Intake Initials	
FHC	
Case Number: FLE25-001	Date Received: 25/6/26

INCOMPLETE APPLICATIONS WILL NOT BE ACCEPTED

For assistance filling out this form, contact the Permit Center at 586-0770.

Owner	Parcel #	Street Address	Legal Description	Mailing Address Line 1	City	State	Zip
John & Sharon Taber; Judith Taber O'Kelley	5B2101190160	9399 Rivercourt Way	LAKEWOOD I BL A LT 16	9399 Rivercourt Way	Juneau	AK	99801
Scott W Heaton; Traci S Heaton	5B2101200010	9391 Rivercourt Way	LAKEWOOD I BL B LT 1	9391 Rivercourt Way	Juneau	AK	99801
William F Race; Sara M Race	5B2101200100	3339 Meander Way	LAKEWOOD I BL B LT 10	3339 Meander Way	Juneau	AK	99801
Alan & Joann Steininger	5B2101200110	3343 Meander Way	LAKEWOOD I BL B LT 11	3343 Meander Way	Juneau	AK	99801
Lisa Bryant	5B2101200120	3361 Meander Way	LAKEWOOD I BL B LT 12	3361 Meander Way	Juneau	AK	99801
Robert Atadero; Adrienne Atadero	5B2101200130	3377 Meander Way	LAKEWOOD I BL B LT 13	3377 Meander Way	Juneau	AK	99801
Constance Stager	5B2101200150	3401 Meander Way	LAKEWOOD I BL B LT 15	3401 Meander Way	Juneau	AK	99801
Joshua Hamilton; Andrea Hamilton	5B2101200160	3425 Meander Way	LAKEWOOD I BL B LT 16	3425 Meander Way	Juneau	AK	99801
Benjamin Miller	5B2101200030	3311 Meander Way	LAKEWOOD I BL B LT 3	3867 Killewich Dr	Juneau	AK	99801
Dee Pearson; Robert Pearson	5B2101200080	3331 Meander Way; 3333 Meander Way	LAKEWOOD I BL B LT 8	3333 Meander Way	Juneau	AK	99801
Bjorn Karl & Stefanie Wolter	5B2101200090	3335 Meander Way	LAKEWOOD I BL B LT 9	3335 Meander Way	Juneau	AK	99801
Dennis Mathers; Kimberly Mathers	5B2101210010	3429 Meander Way	LAKEWOOD II BL B LT 17A	3429 Meander Way	Juneau	AK	99801
Nicolaas Wilhelmus Bus; Susan Miller Bus	5B2101210020	3433 Meander Way	LAKEWOOD II BL B LT 18A	3433 Meander Way	Juneau	AK	99801
Mark Buness; Rhonda Buness	5B2101210030	3437 Meander Way	LAKEWOOD II BL B LT 19	3437 Meander Way	Juneau	AK	99801
Jordan Ashley Mcnatt; Chase Robert Mcnatt	5B2101210040	3441 Meander Way	LAKEWOOD III BL B LT 20	3441 Meander Way	Juneau	AK	99801
Norman E Staton; Donna M Staton	5B2101210050	3445 Meander Way	LAKEWOOD III BL B LT 21	3445 Meander Way	Juneau	AK	99801
Howard R Jaeger; Roberta J Jaeger	5B2101210060	3451 Meander Way	LAKEWOOD III BL B LT 22	3451 Meander Way	Juneau	AK	99801
Jessica Wright; Andre Khmelev	5B2101210070	3455 Meander Way	LAKEWOOD III BL B LT 23	3455 Meander Way	Juneau	AK	99801
Jeffrey M Rud; Lori L Rud	5B2101210080	3459 Meander Way	LAKEWOOD III BL B LT 24	3459 Meander Way	Juneau	AK	99801
Kamal Lindoff; Danielle Lindoff	5B2101210100	3467 Meander Way	LAKEWOOD III BL B LT 26	3467 Meander Way	Juneau	AK	99801
Melissa Brown; Locke O Brown	5B2101210110	3471 Meander Way	LAKEWOOD III BL B LT 27	3471 Meander Way	Juneau	AK	99801
Samuel E Hatch	5B2101210120	3475 Meander Way	LAKEWOOD III BL B LT 28	3475 Meander Way	Juneau	AK	99801
Sean Smack; Ashley Smack	5B2101210130	3479 Meander Way	LAKEWOOD III BL B LT 29	3479 Meander Way	Juneau	AK	99801
Jeffrey Garmon; Nicolle Garmon	5B2101210140	3483 Meander Way	LAKEWOOD III BL B LT 30	3483 Meander Way	Juneau	AK	99801
Kevin Tillotson; Gabriella Tillotson	5B2101210180	3499 Meander Way	LAKEWOOD III BL B LT 34	3499 Meander Way	Juneau	AK	99801
Scott J Griffith; Sarah L Griffith	5B2101220010	3503 Meander Way	LAKEWOOD III BL C LT 1	3503 Meander Way	Juneau	AK	99801
Elizabeth Barr Cayce	5B2601000030	9419 Long Run Dr	LENGTHY ACRES BL 3 LT E TR W	9419 Long Run Dr.	Juneau	AK	99801
Bonnie Chaney; Gregory Chaney	5B2601000042	9418 Long Run Dr.	LENGTHY ACRES BL 4 LT A2	715 Sixth Street	Juneau	AK	99801
Jeffry L Lind; Ann M Lind	5B2501460014	4299 Marion Dr	LINDS OASIS LT 2	4299 Marion Dr	Juneau	AK	99801
John Bishop; Anita Bishop	5B2501450010	4229 Marion Dr	QUAYS EDGE LT 1	4229 Marion Dr	Juneau	AK	99801
Joan A Brown	5B2501450100	4265 Marion Dr	QUAYS EDGE LT 10	4265 Marion Dr	Juneau	AK	99801
Jacob Olmstead; Cailey Neary	5B2501450110	4269 Marion Dr	QUAYS EDGE LT 11	4269 Marion Dr	Juneau	AK	99801
George Carpenter; Darlene Carpenter	5B2501450120	4273 Marion Dr	QUAYS EDGE LT 12	4273 Marion Dr	Juneau	AK	99801
Gary Leder; Juli Leder	5B2501450020	4233 Marion Dr	QUAYS EDGE LT 2	4233 Marion Dr	Juneau	AK	99801
David Athearn; Cynthia Athearn	5B2501450030	4237 Marion Dr	QUAYS EDGE LT 3	4237 Marion Dr	Juneau	AK	99801
William J Palmer	5B2501450060	4249 Marion Dr	QUAYS EDGE LT 6	4249 Marion Dr	Juneau	AK	99801
Peter Bangs; Cara Rodgveller	5B2501450080	4257 Marion Dr	QUAYS EDGE LT 8	4257 Marion Dr	Juneau	AK	99801
David & Colleen Mckenna	5B2501450090	4261 Marion Dr	QUAYS EDGE LT 9	4261 Marion Dr	Juneau	AK	99801
Darrin Crapo; Lindsay Crapo	5B2601010020	9347 Betty Ct	SMITH PARK IV BL 6 LT 5	9347 Betty Ct	Juneau	AK	99801
William Diebels Jr & Audrey Diebels	5B2601010030	9342 Betty Ct	SMITH PARK IV BL 6 LT 6	9342 Betty Ct	Juneau	AK	99801
Lawrence J Sullivan	5B2501100051	9336 Betty Ct	SMITH PARK IV BL 6 LT 8A	9336 Betty Ct	Juneau	AK	99801
Anselm Staack; Carol Staack	5B2501100060	9330 Betty Ct	SMITH PARK IV BL 6 LT 9	9330 Betty Ct	Juneau	AK	99801
Drew and Michelle Norman	5B2501160040	3819 Killewich Dr	SMITH PARK IV BL 7 LT 4A1	3819 Killewich Dr	Juneau	AK	99801
James L Wright	5B2501160050	3823 Killewich Dr	SMITH PARK IV BL 7 LT 4B1	3823 Killewich Dr	Juneau	AK	99801
Charity Lynn Platt	5B2501160061	3827 Killewich Dr	SMITH PARK IV BL 7 LT 5A1	3827 Killewich Dr	Juneau	AK	99801
Christopher Gianotti; Joan Gianotti	5B2501160071	3831 Killewich Dr	SMITH PARK IV BL 7 LT 6A1	3831 Killewich Dr	Juneau	AK	99801

Laureen Dicarlo; Paul Dicarlo	5B2501430050	3871 Killewich Dr	SMITH PARK VI BL A LT 10	3871 Killewich Dr	Juneau	AK	99801
Brian Nielsen; Kaili Nielsen	5B2501430040	3875 Killewich Dr	SMITH PARK VI BL A LT 11	3875 Killewich Dr	Juneau	AK	99801
Donna M Schultz	5B2501430030	3879 Killewich Dr	SMITH PARK VI BL A LT 12	3879 Killewich Dr	Juneau	AK	99801
Jane R Huckstorf; David L Cline	5B2501430020	3883 Killewich Dr	SMITH PARK VI BL A LT 13	3883 Killewich Dr	Juneau	AK	99801
Scott Gende; Amy Reifenstein	5B2501430120	3843 Killewich Dr	SMITH PARK VI BL A LT 3	3843 Killewich Dr	Juneau	AK	99801
Michael Tibbles; Kristy Tibbles	5B2501430100	3851 Killewich Dr	SMITH PARK VI BL A LT 5	3851 Killewich Dr	Juneau	AK	99801
Gretchen Pence; William Pence	5B2501430080	3859 Killewich Dr	SMITH PARK VI BL A LT 7	3859 Killewich Dr	Juneau	AK	99801
Eric S Holst; Sandra K Holst	5B2501430070	3863 Killewich Dr	SMITH PARK VI BL A LT 8	3863 Killewich Dr	Juneau	AK	99801
Christie Bentz	5B2501430060	3867 Killewich Dr; 3867 Killewich Dr Unit B	SMITH PARK VI BL A LT 9	3867 Killewich Dr	Juneau	AK	99801
Stephen Ball; Heather Ball	5B2501100071	3785 Killewich Dr	SMITH PARK VII LT 1	3785 Killewich Dr	Juneau	AK	99801
Mark Ryder; Amanda Ryder	5B2501100093	3807 Killewich Dr	SMITH PARK VII LT 3	3807 Killewich Dr	Juneau	AK	99801
Rodney A Wilson	5B2501440030	4211 Riverside Dr; 4215 Riverside Dr	TIM LT 1	4215 Riverside Dr	Juneau	AK	99801
Brian Dallas; Sara Dallas	5B2501440020	4101 Riverside Dr; 4103 Riverside Dr	TIM LT 2	4101 Riverside Dr	Juneau	AK	99801
Gregory & Anita Thomas	5B2501460012	4293 Marion Dr	VAN VLEITS LANDING LT 1	4293 Marion Dr	Juneau	AK	99801
John & Suzanne Schoenmann	5B2101210160	3491 Meander Way	LAKEWOOD III BL B LT 32	PO Box 20222	Juneau	AK	99802
Morgan Cruz Erisman; Vladimir Cruz	5B2101200140	3379 Meander Way	LAKEWOOD I BL B LT 14	PO Box 35351	Juneau	AK	99803
Timothy K Smith; Carrie E Smith	5B2501160032	3815 Killewich Dr	SMITH PARK IV BL 7 LT 3A1	PO Box 33924	Juneau	AK	99803
Jonathan K Gunstrom; Brooke S Gunstrom	5B2501430130	3839 Killewich Dr	SMITH PARK VI BL A LT 2	PO Box 34221	Juneau	AK	99803
Frank F Mesdag; Mimi D Mesdag	5B2501430110	3847 Killewich Dr; 3849 Killewich Dr	SMITH PARK VI BL A LT 4	PO Box 32497	Juneau	AK	99803
Richard N Janelle; Kim M Janelle	5B2501430090	3855 Killewich Dr	SMITH PARK VI BL A LT 6	PO Box 34562	Juneau	AK	99803
Stephen M Bower; Patricia J Bower	5B2601000043	9416 Long Run Dr	LENGTHY ACRES BL 4 LT A1A	PO Box 210525	Auke Bay	AK	99821
Killehuck LLC	5B2501160021	3811 Killewich Dr	SMITH PARK IV BL 7 LT 2A	108 Huckleberry Cir	Ketchikan	AK	99901
Daniel C Wayne; Kathleen A Wayne	5B2501100080	3795 Killewich Dr	SMITH PARK IV BL 6 LT 11	3795 Killewich Dr	Juneau	AK	99801-8817
Garrett &Florentina Schoenberger	5B2101200070	3327 Meander Way	LAKEWOOD I BL B LT 7	3327 Meander Way	Juneau	AK	99801-9602
John H Cooper; Alyson H Cooper	5B2101210170	3495 Meander Way	LAKEWOOD III BL B LT 33	3495 Meander Way	Juneau	AK	99801-9626
John G Schoenmann	5B2101210150	3487 Meander Way	LAKEWOOD III BL B LT 31	PO Box 020222	Juneau	AK	99802-0222
Russell and Thyes Shaub Living Trust	5B2101210090	3463 Meander Way	LAKEWOOD III BL B LT 25	PO Box 32517	Juneau	AK	99803-2517
Donald R Nowlin	5B2501450040	4241 Marion Dr	QUAYS EDGE LT 4	PO Box 33614	Juneau	AK	99803-3614
Carefree LLC	5B2501450050	4245 Marion Dr	QUAYS EDGE LT 5	PO Box 33614	Juneau	AK	99803-3614
Mike J Erickson; Bonnie Erickson	5B2501430140	3835 Killewich Dr	SMITH PARK VI BL A LT 1	PO Box 34363	Juneau	AK	99803-4363
James Stedman & Lori Steadman	5B2501450070	4253 Marion Dr	QUAYS EDGE LT 7	PO Box 34421	Juneau	AK	99803-4421
Brian J Goettler; Kimberly D Goettler	5B2101200060	3323 Meander Way	3323 Meander Way	3323 Meander Way	Juneau	AK	99801
Harvey E Hergett; Pamela K Hergett	5B2101200050	3319 Meander Way	3319 Meander Way	3319 Meander Way	Juneau	AK	99801-9602
Christine R Shaw; Adam J Shaw	5B2101200040	3315 Meander Way	11422 Olympia Dr	11422 Olympia Dr	Houston	TX	77077
Loretta Bessie Neal	5B2101200020	9387 Rivercourt Way	PO Box 032537	PO Box 32537	Juneau	AK	99803

CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
COMMUNITY DEVELOPMENT

FLOOD ZONE EXCEPTION APPLICATION

See reverse side for more information regarding the permitting process and the materials required for a complete application.

NOTE: Must be accompanied by a DEVELOPMENT PERMIT APPLICATION form.

To be completed by Applicant

PROJECT SUMMARY

The project includes installation of HESCO flood barriers and associated bank revetment to protect the Mendenhall Valley from future, likely GLOF flooding. This project covers the east bank of the Mendenhall River from 9399 Rivercourt Way upstream to 4395 Riverside Drive.

Base Flood Elevation: Varies

Flood Insurance Rate Map Panel #: Multiple

Elevation of Lowest Floor of all Structures Including Basement: N/A

Elevation to which the Structure has been Floodproofed: N/A

ALL REQUIRED MATERIALS ATTACHED

- [x] **Complete application per CBJ 49.70.410**
- [x] **Narrative including:**
  - [ ] Exceptional hardship if not granted
  - [ ] Elevation at lowest floor
  - [ ] Elevation structure(s) have been floodproofed
  - [ ] Certification that floodproofing meets generally accepted standards
  - [x] Extent to which any watercourse will be altered or relocated
  - [ ] Plan for maintenance of altered or relocated watercourse
  - [ ] If the base flood elevation will change as a result of the proposed activity, and why
  - [x] Why a flood zone exception is needed
  - [x] How the proposed exception will effect life and property in the event of a flood
  - [ ] How susceptible the proposed facility is to flooding
  - [x] How the proposed facility/use serves the public
  - [x] If the facility/use requires a waterfront location
  - [ ] Availability of alternative locations
  - [ ] Compatibility of proposed use with surrounding existing and proposed uses
  - [ ] Relationship of proposed use to the Comprehensive Plan and Flood Management programs
  - [ ] Expected heights, velocity, duration, rate of rise, and sediment transport
  - [x] Other applicable information as outlined in CBJ 49.70.410(b)
- [x] **Plans** (details on page 2)

----------DEPARTMENT USE ONLY BELOW THIS LINE----------

FLOOD ZONE EXCEPTION FEES	Fees	Check No.	Receipt	Date
Application Fees	$ 400.00			
Admin. of Guarantee	$			
Adjustment	$			
Total Fee	$			

This form and all documents associated with it are public record once submitted.

INCOMPLETE APPLICATIONS WILL NOT BE ACCEPTED

For assistance filling out this form, contact the Permit Center at 586-0770.

Case Number	Date Received
	25/6/26

Flood Zone Exception Application Instructions

Flood zone exceptions are outlined in CBJ 49.70.410

Each application for a Flood Zone Exception is reviewed by the Board of Adjustment at a public hearing. The permit procedure is intended to provide the Board the flexibility necessary to make decisions tailored to individual applications. The Board may stipulate conditions to mitigate external adverse impacts from the proposed use. If it is determined that these impacts cannot be satisfactorily overcome, the permit shall be denied.

Pre-Application Conference: Prior to submitting this application the applicant will meet with City & Borough of Juneau staff to discuss the proposed development, the permit procedure and to determine the application fees. To schedule a pre-application conference, please contact the Permit Center at 586-0770 or via e-mail at Permits@juneau.org.

Application: An application for a Flood Zone Exception will not be accepted by the Community Development Department until it is determined to be complete. The items needed for a complete application are:

1. **Forms:** Completed Flood Zone Exception and Development Permit Application forms.
2. **Fees:** The fee is $400.00. Any development, work or use done without a permit issued will be subject to double fees. All fees are subject to change.
3. **Project Narrative:** A detailed narrative describing the project according to the criteria under CBJ 49.70.410 Exceptions.
4. **Plans:**
   A. Site plan showing the dimensions of the parcel, existing and proposed structures, mean lower low water line, topographical contours shown at **2 foot** intervals, and elevation drawings illustrating the land and structures.
   B. Floorplan.
   C. Profile views.
   D. If applicable:
      A. Certification that the floodproofing methods for any nonresidential structure meet generally accepted floodproofing standards.
      B. Description of the extent to which any watercourse will be altered or relocated as a result of the proposed development.
      C. Description of the plan for maintenance of the altered or relocated portion of the watercourse so that the flood-carrying capacity is not diminished.

Document Format: All materials submitted as part of an application shall be submitted in either of the following formats:

1. Electronic copies in the following formats: .doc, .txt, .xls, .bmp, .pdf, .jpg, .gif, .xlm, .rtf (other formats may be preapproved by the Community Development Department).
2. Paper copies 11" X 17" or smaller (larger paper size may be preapproved by the Community Development Department).

Application Review & Hearing Procedure: Once the application is determined to be complete, the Community Development Department (CDD) will initiate the review and scheduling of the application. This process includes:

Review: As part of the review process the Community Development Department will evaluate the application for consistency with all applicable City & Borough of Juneau codes and adopted plans. Depending on unique characteristics of the permit request, the application may be required to be reviewed by other municipal boards and committees. During this review period, the Community Development Department may also send the application out for a 15-day agency review period. Review comments may require the applicant to provide additional information, clarification, or submit modifications/alterations for the proposed project.

Hearing: All Flood Zone Exceptions must be reviewed by the Board of Adjustment. Once an application has been deemed complete and has been reviewed by all applicable parties the Community Development Department will schedule the application for the next appropriate meeting.

Public Notice Responsibilities: Flood Zone Exception requests shall be given proper public notice, which consists of the following:

Community Development Department: Will give notice of the pending Planning Commission meeting and its agenda in the local newspaper a minimum of 10-days prior to the meeting. Furthermore, the department will mail abutters notices to all property owners within 500-feet of the project site.

FROM THE FLOOD ZONE; IT MAY SEVERELY LIMIT OR PREVENT THE ABILITY TO RECEIVE FEDERALLY-BACKED FLOOD INSURANCE; AND, IF REQUIRED, FLOOD INSURANCE MAY INCREASE WITH THE APPROVAL OF THE REQUEST.

INCOMPLETE APPLICATIONS WILL NOT BE ACCEPTED

City and Borough of Juneau
Engineering & Public Works Department
155 Heritage Way
Juneau, Alaska 99801
Telephone: 586-0800

TO: Jill Lawhorne, CBJ CDD Director

DATE: June 30, 2025

FROM: Nate Rumsey, CBJ EPW Deputy Director

THRU: Denise Koch, CBJ EPW Director

RE: HESCO Barrier Phase 1 Flood Zone Exception Application

The purpose of this letter is to provide narrative information related to documentation and rationale supporting a Flood Zone Exception Application for the City and Borough of Juneau's (CBJ) HESCO Barrier, Phase 1 project.

The sole purpose of the HESCO Barrier Phase 1 project is to reduce community flood risk associated with possible future Suicide Basin glacial lake outburst flood (GLOF) events. It was conceived, developed, and directed to provide near-term, non-permanent flood protection for properties along the Mendenhall River impacted by the 2024 GLOF. Due to timing constraints, not all properties could be protected prior to a likely 2025 GLOF. Hence, CBJ elected to sequence the work, with Phase 1 covering the east bank of the Mendenhall River from 4395 Riverside Drive (northern reach) to 9399 Rivercourt Way (southern reach). This area was selected because it offered protection to the greatest number of properties relative to the length of barrier that could be installed in one construction season.

The project included targeted riverbank revetment stabilization at specific locations within the mapped floodway, and the installation of a 2-mile HESCO flood barrier, generally placed above the riverbank and upland of existing revetments. Additional details about the revetment and barrier installation can be found in the attached *HESCO No-Rise Analysis* document dated June 23, 2025.

There are several factors that set this work apart from traditional development. As mentioned above, the sole purpose of this project is to reduce CBJ community flood risk associated with possible future GLOF events. Through professional engineering analysis, including hydraulic and hydrologic modeling performed for CBJ by Michael Baker, International (MBI), the HESCO Barrier Phase 1 project significantly reduces the likely

impacts to public and private properties from a GLOF similar in size (or even slightly larger) than what was seen in 2024. Additionally, modeling shows that these improvements create no discernable rise to the base flood elevation, and no additional flood risk to properties outside the protected area.

Secondly, the materials and products used for the project were specifically selected to prevent or withstand the movement of water, and specifically recommended by the U.S. Army Corps of Engineers (USACE) Floodfighting Center of Excellence for this application. The materials are inherently floodproof and not susceptible to flooding. Additionally, the revetment materials and HESCO barrier are required to be located adjacent to the floodway to carry out their intended function.

Under ideal circumstances, a project of this nature could be designed, permitted, procured and executed in a traditional manner. However, due to the significantly shortened timeframe to provide near-term flood fighting protection, this project was carried out based on best professional judgment of licensed CBJ engineers in consultation with the U.S. Army Corps of Engineers (hydraulic engineers, floodfighting experts, and contracted technical advisors), and in tandem with the development of a 2D surface water hydraulic and hydrologic model of the Mendenhall River under possible GLOF conditions.

Due to the compressed timeframe to complete this work, and because a standard step backwater analysis was not performed as a part of the no-rise analysis, a flood zone exception is requested. Specifically, exceptions from CBJ

- (1) [CBJ 49.70.400(e)(3)(E)] – Description of the plan for maintenance of the altered portion of the watercourse so that the flood-carrying capacity is not diminished.

- (2) [CBJ 49.70.400(f)(4)] – Control filling, grading, dredging, and other development that may increase flood damage.

- (3) [CBJ 49.70.400(f)(5)] – Prevent or regulate the construction of flood barriers that will unnaturally divert floodwaters or that may increase flood hazards in other areas.

- (4) [CBJ 49.70.400(g)(1)(A)] – Design, modify, and anchor new construction and substantial improvements to prevent flotation, collapse, or lateral movement of the structure(s)

- (5) [CBJ 49.70.400(g)(5)] – Floodplain development permit requirements.

- (6) [CBJ 49.70.400(i)(2)] – Encroachments, including fill, new construction, and other development, except subdivisions, within a floodway are prohibited unless an engineer licensed in the State of Alaska submits a hydrologic and hydraulic analyses to the director indicating that the encroachment would not result in any increase in flood levels during the occurrence of the base flood discharge. The hydrologic and hydraulic analyses must be performed in accordance with standard engineering practice acceptable by the Federal Emergency Management Agency.

Hydrologic modeling files associated with the “No-Rise Analysis” are located in CBJ electronic public folders and are available for review. *HESCO Technical Specifications* and *HESCO Construction Guide for Engineers* are included as attachments 2 and 3 for the Flood Zone Exception Application, respectively, and provide information regarding the floodproofing of the HESCO product as well as the manufacturer’s guidelines for installation.

Installation work was carried out in accordance with manufacturer’s guidelines and modified as necessary based on site considerations, with U.S. Army Corps of Engineers Technical Advisor and manufacturer’s representative guidance for the duration of the project. Maintenance of the modified watercourse will adhere to current CBJ practices for armoring work, and to maintenance and repair procedures outlined in the *HESCO Construction Guide for Engineers* document.

City and Borough of Juneau
Engineering & Public Works Department
155 Heritage Way
Juneau, Alaska 99801
Telephone: 586-0800

TO: Jill Lawhorne, CBJ CDD Director

DATE: June 30, 2025

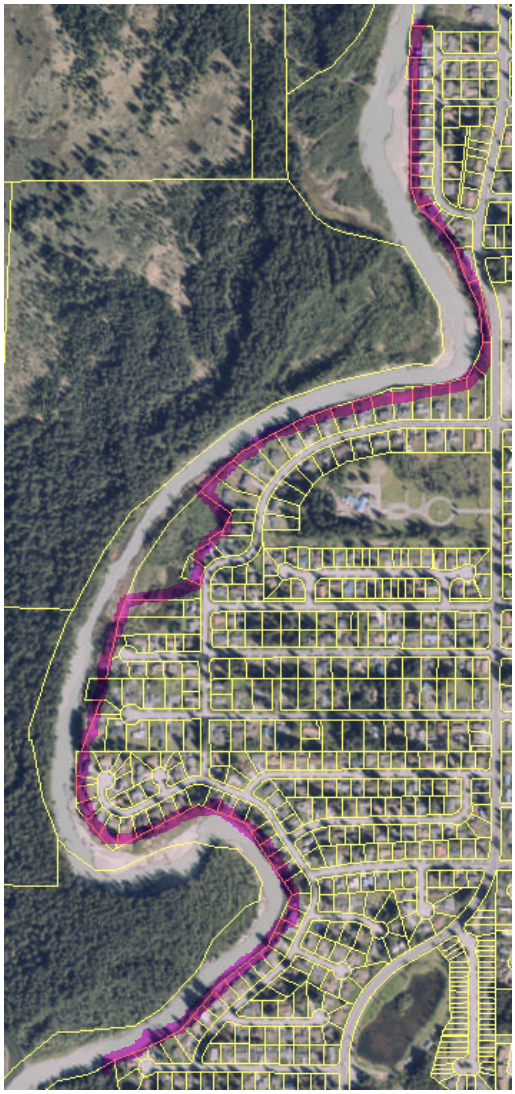
FROM: Nate Rumsey, CBJ EPW Deputy Director

RE: HESCO Barrier Phase 1 Project No-Rise Analysis

The purpose of this memorandum is to demonstrate that the proposed HESCO Barrier Phase 1 Project does not cause a rise in the 100-year flood elevations along the Mendenhall River.

Background: The City and Borough of Juneau (CBJ) authorized the execution of the subject project subsequent to Federal, State, and Local Emergency Declarations stemming from glacial lake outburst flooding (GLOF) which occurred in August, 2024. The project includes installation of HESCO flood barriers and associated bank revetment to protect the Mendenhall Valley from future, likely GLOF flooding. This project covers the east bank of the Mendenhall River from 9399 Rivercourt Way upstream to 4395 Riverside Drive (Figure 1).

Figure 1: Project Location (highlighted)



This section of the Mendenhall River is located in a Federal Emergency Management Agency (FEMA) Special Flood Hazard Area (SFHA) Zone AE, and the improvements include several riprap revetments that are located within the mapped floodway. Additionally, a 2-mile, continuous temporary flood barrier was installed along the east bank of the Mendenhall River from 9399 Rivercourt Way upstream to 4395 Riverside Drive. CBJ contracted with Michael Baker, International (MBI) to perform hydrologic and hydraulic analyses in accordance with standard engineering practice to determine the potential increase in flood levels within the community during the occurrence of the base flood discharge due to this project.

FEMA Information for this Area: The FEMA SFHA information for the project area is provided by the Flood Insurance Study (FIS) for the City and Borough of Juneau and the Flood Insurance Rate Maps (FIRM), numbers 02110C1239E, 02110C1238E, 02110C1526E, and 02110C1527E (Attachments 1 through 4), all dated September 2020. A comparison of SFHA boundaries along the project path to the alignment of the HESCO barrier is shown in Attachment 5.

Through CBJ, MBI developed a two-dimensional surface water model utilizing the latest current Hydrologic Engineering Center's River Analysis System (HEC-RAS, USACE 2024) software (v6.6) incorporating the best available data. The structure and content of the model meets the typical standards of a 2D Base Level Engineering (BLE) Level D model (FEMA 2021) by incorporating hydraulic structures and calibrating historical data but not including channel bathymetry. The selected level of modeling detail was chosen based on the best available data and compressed project schedule.

Description of Proposed Improvements: As this project was directed subsequent to the aforementioned Federal, State, and Local Emergency Declarations, and in anticipation of likely future GLOF flooding in the summer of 2025, traditional design documents were not issued for construction for the proposed work. The work incorporated two primary components:

First, revetments consisting of Class III riprap and shot rock, were stabilized by excavating existing material from the riverbank and replacing in a manner as to not decrease cross-sectional area or flow capacity. This revetment work was carried out at the following locations:

- 3835 - 3851 Killewich Drive (5 parcels)
- 3495 – 3499 Meander Way (4 parcels)
- 9387 Rivercourt Way - 3323 Meander Way (4 parcels)

Attachment 6 shows the revetment locations, typical cross-section comparisons for work at each location, net volumetric increase in floodway capacity due to revetment work, and photographs of bank conditions prior to armorning. The primary purpose of the revetment work is to ensure the integrity of the proposed temporary flood barrier, which is anticipated to remain in place for up to 10 years while a long-term solution is implemented.

Secondly, a continuous, temporary flood barrier was established to prevent floodwater inundation due to future GLOF events. The barrier consists of HESCO Floodline Concertainer™ units which were generally placed above the riverbank and upland of existing revetments.

Baseline for Comparison: The purpose of this analysis is to determine whether, and to what extent, the improvements in the mapped floodway impact flood elevations in the area. In this project area, and since the latest FIRM maps were published, significant bank erosion has occurred in recent years, causing widening of the river's flow channel. This widened channel may have resulted in a drop in flood levels from the published flood elevations. However, our collective analysis did not attempt to quantify changes in the water surface elevation from the original mapped condition. Rather, this analysis focused on understanding impacts to flood elevations compared to existing conditions based on the latest spatial, terrain, map, and hydrology data, which was consolidated through extensive coordination between Federal, State, and local governments. This includes topographic survey and terrain data, and high-resolution imagery collected in October 2024 (after the latest flood event).

Revetment No-Rise Analysis: The revetment activities were determined to cause no rise to the 100-year flood elevations. The rationale for this determination is based on examination of the individual factors that could impact the water surface elevation, each of which are described below.

For this section of the Mendenhall River, the three primary parameters that have the potential to impact the water surface elevation are the cross-sectional area, the Manning's roughness coefficient, and the channel slope. Each of these parameters is discussed below, along with an explanation of how they have been analyzed for this project.

Cross-sectional Area: The most significant model parameter that controls water surface elevation is the channel shape which is represented in a 1D model through channel cross sections. A significant change in channel shape can change the channel's conveyance capacity and potentially impact flood elevations. Generally, reducing the channel's cross sectional area results in a water surface elevation increase, and increasing the channel's cross sectional area results in a water surface elevation decrease.

For the revetment improvements, CBJ Engineering ensured that the armored ground surface closely matched the surveyed ground surface. At each of the parcels where riprap revetments were improved, cross-sections were developed to compare the pre-existing and proposed ground surfaces to ensure that the changes would not result in a reduction in the channel's cross-sectional area and associated conveyance capacity. In each location, the improvements slightly increase the channel's cross-sectional area, which is expected to either maintain or reduce flood elevations. The cross-section comparisons and associated calculations demonstrating net increase in cross-sectional area is provided as Attachment 7.

Manning's Roughness Coefficient "n": The frictional resistance to flow is represented in the FEMA effective HEC RAS 1D model using the Manning's "n" roughness coefficient. Unique roughness values can be assigned for the main channel as well as for each bank. While this parameter does not impact modeling results as much as the channel shape, significant changes to roughness coefficients can result in changes to modeled water surface elevations. Generally, notable increases in Manning's "n" will increase modeled flood elevations and notable decreases in Manning's "n" will decrease modeled flood elevations.

In the project area, the shapes of the pre-existing channel banks were undulating and non-uniform, and the banks were lined with root wads, large voids and other obstructions left by localized bank erosion and sloughing, resulting in obstructed and inefficient water flow along the riverbank. The FEMA effective model discussed above represents the entire existing channel (both the banks and the main channel) with a Manning's "n" value of 0.033. Generally, the roughness of the banks is expected to be higher than the roughness of the main channel, but because the same value is used for both the main channel and the banks, this value is understood to be a composite value representing the average flow resistance for the entire channel.

Under the post-construction conditions, the new riprap revetments are uniform and non-undulating. Providing a uniform, non-undulating surface is expected to reduce the overall channel flow resistance and improve flow efficiency, which would decrease proposed water surface elevations.

The banks were lined with Class III riprap and shot rock. The roughness value of these materials is estimated to range from 0.03 to 0.04 under flood conditions. Understanding that the composite roughness of the entire existing channel is 0.033, the newly installed riprap is not expected to increase the channel roughness or impact the water surface elevation at flood events.

Longitudinal Slope: A channel's longitudinal slope impacts the channel's conveyance capacity. In this case, the channel's longitudinal slope is unchanged by the revetment, and will not impact the water surface elevations.

Surface Water Model Analysis: Through use of the MBI-developed model, an analysis was performed to identify any impact to the 100-year flood elevations due to the placement of HESCO flood barriers using a simulated 1% annual exceedance probabability flood event, both with and without HESCO barriers. This analysis considered potential surface water rise upstream, along, and downstream of the proposed work. No rise was indicated within the resolution provided by the model. See Attachment 8 for MBI's *Mendenhall River Preliminary 2D Surface Water Model Report.* Note that MBI's model was developed directly from existing conditions, and not derived from the FEMA Effective Model. With that, the analysis of the impact of HESCO flood barriers on 100-year flood elevations was not performed specifically to adhere to the traditional FEMA No-Rise Certification model comparison scenarios. See Attachment 9 for more information about BLE models.

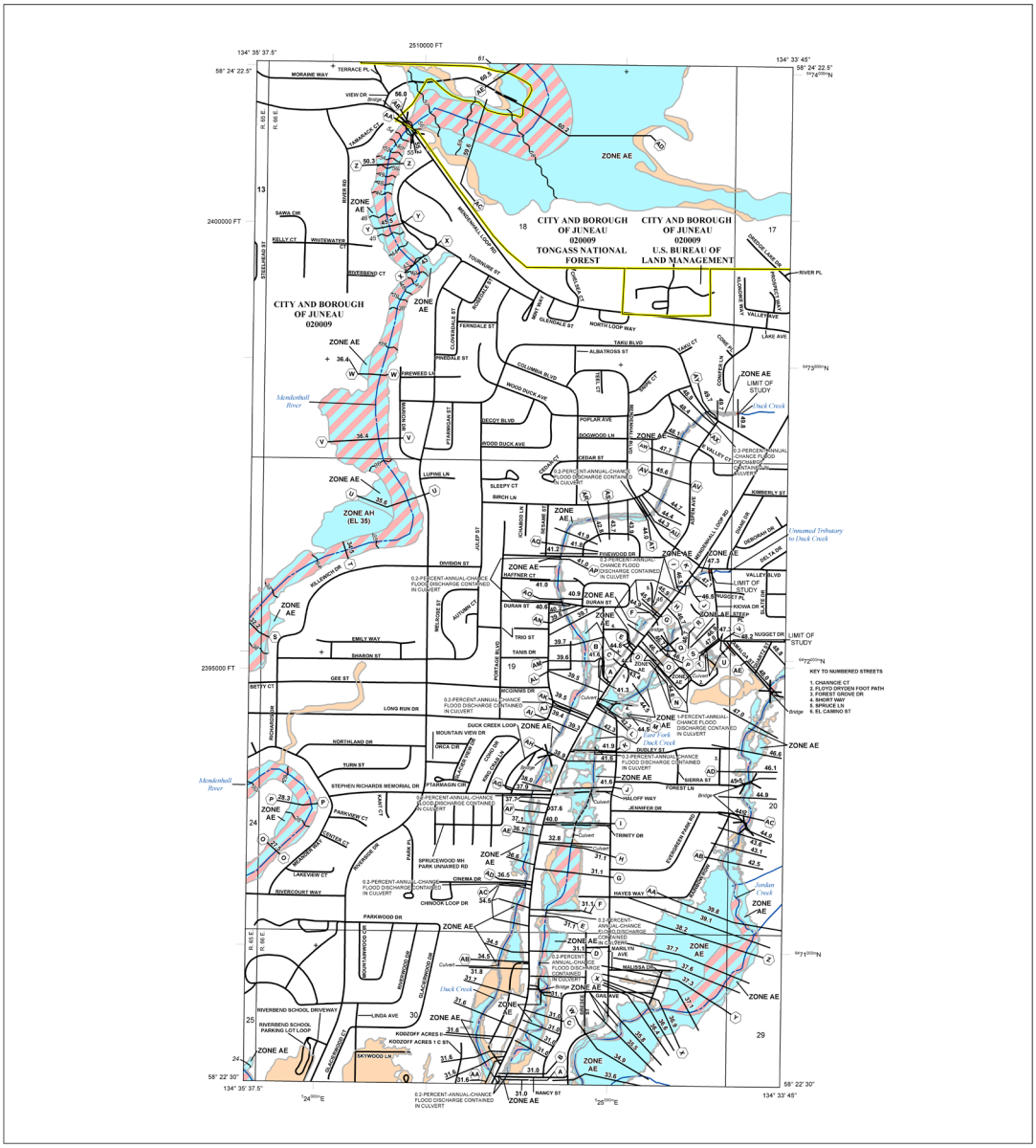
Conclusion: The HESCO Barrier Phase 1 project will not cause a rise in the 100-year water surface elevations of the Mendenhall River. This determination was made through both a careful analysis of key channel parameters that would drive a water level rise, as well as through hydrologic and hydraulic modeling.

If you have any questions regarding this analysis or if you would like to discuss this memorandum, please feel free to contact me at nate.rumsey@juneau.gov or 907.586.0800 x4182.

Attachments:

1. FIRM Panel 02110C1239E (1 page)
2. FIRM Panel 02110C1238E (1 page)
3. FIRM Panel 02110C1526E (1 page)
4. FIRM Panel 02110C1527E (1 page)
5. Comparison of barrier alignment to SFHA (2 pages)
6. Revetment Construction Details (11 pages)
7. Revetment Cross-Section Comparisons by Location (20 pages)
8. Mendenhall River Preliminary 2D Surface Water Model Report (37 pages)
9. FEMA: Frequently Asked Questions about Base Level Engineering (5 pages)

Attachment 1: FIRM Panel 02110C1239E



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR ZONE DESCRIPTIONS AND INDEX MAP

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT HTTP://MSC.FEMA.GOV

- SPECIAL FLOOD HAZARD AREAS
  - Without Base Flood Elevation (BFE) *Zone A, V, A99*
  - With BFE or Depth *Zone AE, AO, AH, VE, AR*
  - Regulatory Floodway
- OTHER AREAS OF FLOOD HAZARD
  - 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
  - Future Conditions 1% Annual Chance Flood Hazard *Zone X*
  - Area with Reduced Flood Risk due to Levee See Notes. *Zone X*
- OTHER AREAS
  - NO SCREEN Areas Determined to be Outside the 0.2% Annual Chance Floodplain *Zone X*
  - Area of Undetermined Flood Hazard *Zone D*
- GENERAL STRUCTURES
  - Channel, Culvert, or Storm Sewer
  - Levee, Dike, or Floodwall
- OTHER FEATURES
  - 18.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation (BFE)
  - Coastal Transect
  - Coastal Transect Baseline
  - Profile Baseline
  - Hydrographic Feature
  - 513 Base Flood Elevation Line (BFE)
  - Limit of Study
  - Jurisdiction Boundary

NOTES TO USERS

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SCALE

Map Projection: State Plane Alaska Zone 1; North American Datum 1983; Western Hemisphere; Vertical Datum: Mean Lower Lowe Water

1 inch = 500 feet 1:6,000

0 500 1,000 2,000 Feet

0 125 250 500 Meters

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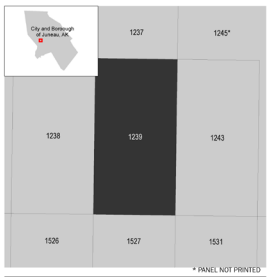


* PANEL NOT PRINTED

FEMA National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP
CITY AND BOROUGH OF JUNEAU, AK
PANEL 1239 OF 2700

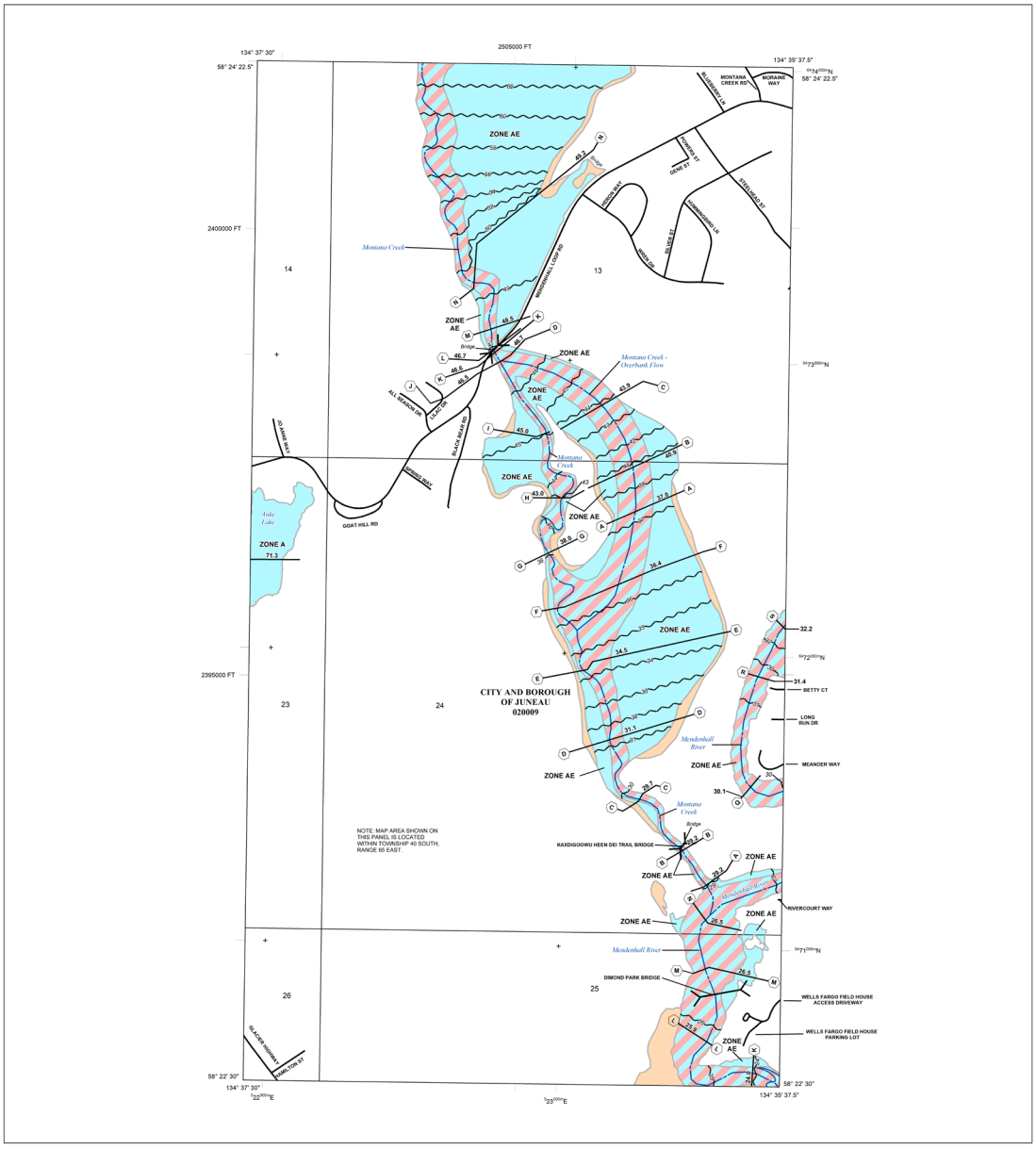
FEMA

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
CITY AND BOROUGH OF JUNEAU	020009	1239	E

VERSION NUMBER 2.3.3.4
MAP NUMBER 02110C1239E
MAP REVISED SEPTEMBER 18, 2020

Attachment 2: FIRM Panel 02110C1238E



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR ZONE DESCRIPTIONS AND INDEX MAP

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SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) Zone A, V, A99
	With BFE or Depth Zone AE, AO, AH, VE, AR
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
	Future Conditions 1% Annual Chance Flood Hazard Zone X
	Area with Reduced Flood Risk due to Levee See Notes. Zone X
OTHER AREAS	NO SCREEN Areas Determined to be Outside the 0.2% Annual Chance Floodplain Zone X
	Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall
	18.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation (BFE)
	Coastal Transect
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
	Base Flood Elevation Line (BFE)
OTHER FEATURES	Limit of Study
	Jurisdiction Boundary

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SCALE

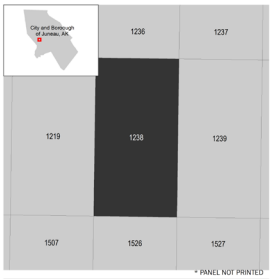
Map Projection:
State Plane Alaska Zone 1; North American Datum 1983;
Western Hemisphere; Vertical Datum: Mean Lower Level Water

1 inch = 500 feet 1:6,000

0 500 1,000 2,000 Feet

0 125 250 500 Meters

PANEL LOCATOR



* PANEL NOT PRINTED

FEMA National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP
CITY AND BOROUGH OF JUNEAU, AK

PANEL 1238 OF 2700

FEMA

Panel Contains:

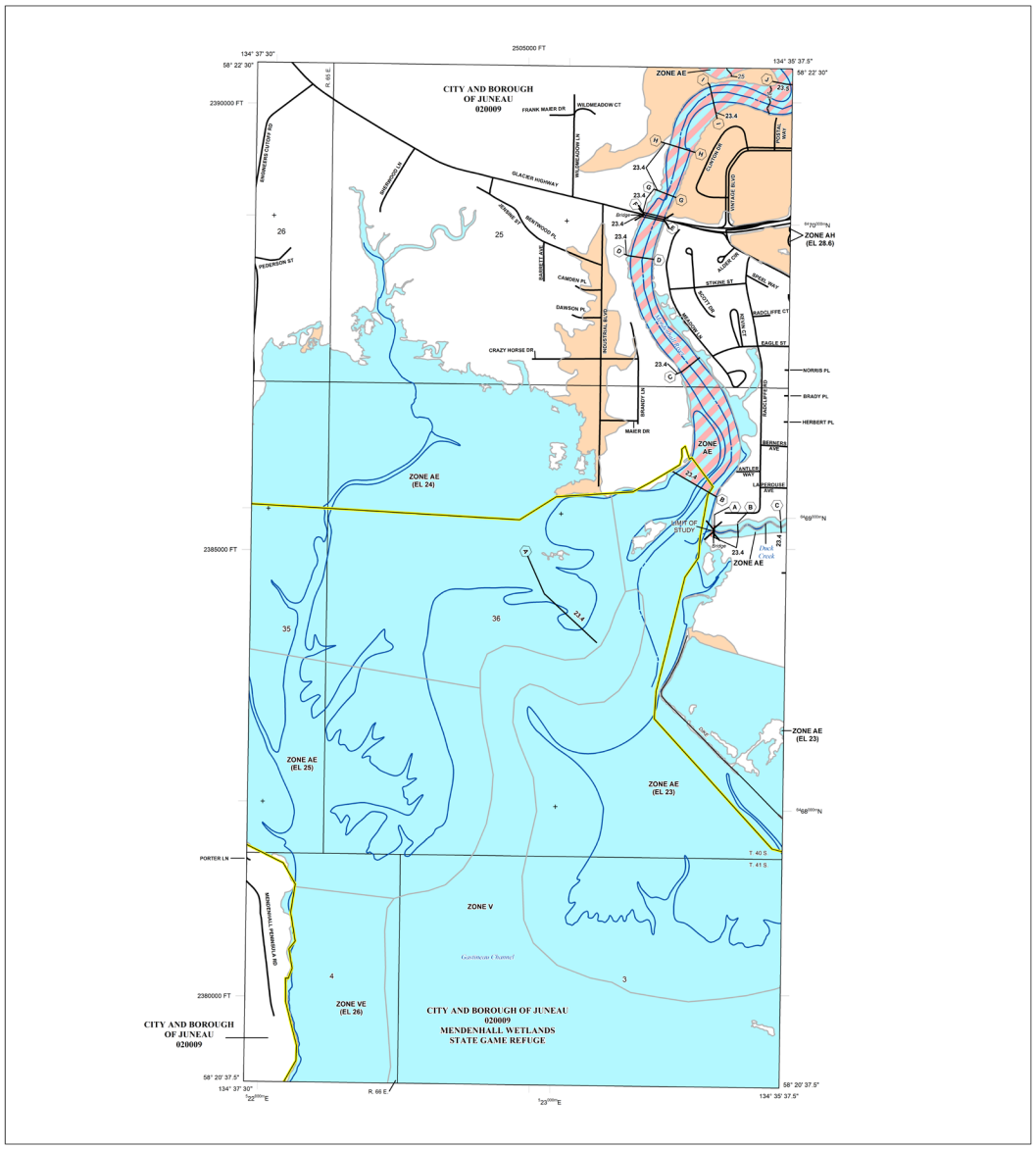
COMMUNITY	NUMBER	PANEL	SUFFIX
CITY AND BOROUGH OF JUNEAU	020009	1238	E

VERSION NUMBER
2.3.3.4

MAP NUMBER
02110C1238E

MAP REVISED
SEPTEMBER 18, 2020

Attachment 3: FIRM Panel 02110C1526E



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR ZONE DESCRIPTIONS AND INDEX MAP

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SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) Zone A, V, A99 With BFE or Depth Zone AE, AO, AH, VE, AR Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X Future Conditions 1% Annual Chance Flood Hazard Zone X Area with Reduced Flood Risk due to Levee See Notes. Zone X
OTHER AREAS	NO SCREEN Areas Determined to be Outside the 0.2% Annual Chance Floodplain Zone X Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer Levee, Dike, or Floodwall
OTHER FEATURES	18.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation (BFE) Coastal Transect Coastal Transect Baseline Profile Baseline Hydrographic Feature Base Flood Elevation Line (BFE) Limit of Study Jurisdiction Boundary

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SCALE

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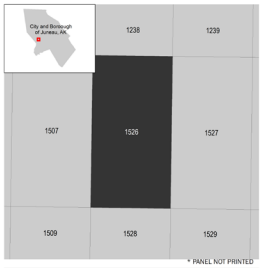
0 500 1,000 2,000 Feet

0 125 250 500 Meters

PANEL LOCATOR



* PANEL NOT PRINTED

FEMA National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP
CITY AND BOROUGH OF JUNEAU, AK

PANEL 1526 OF 2700

FEMA

Panel Contains:

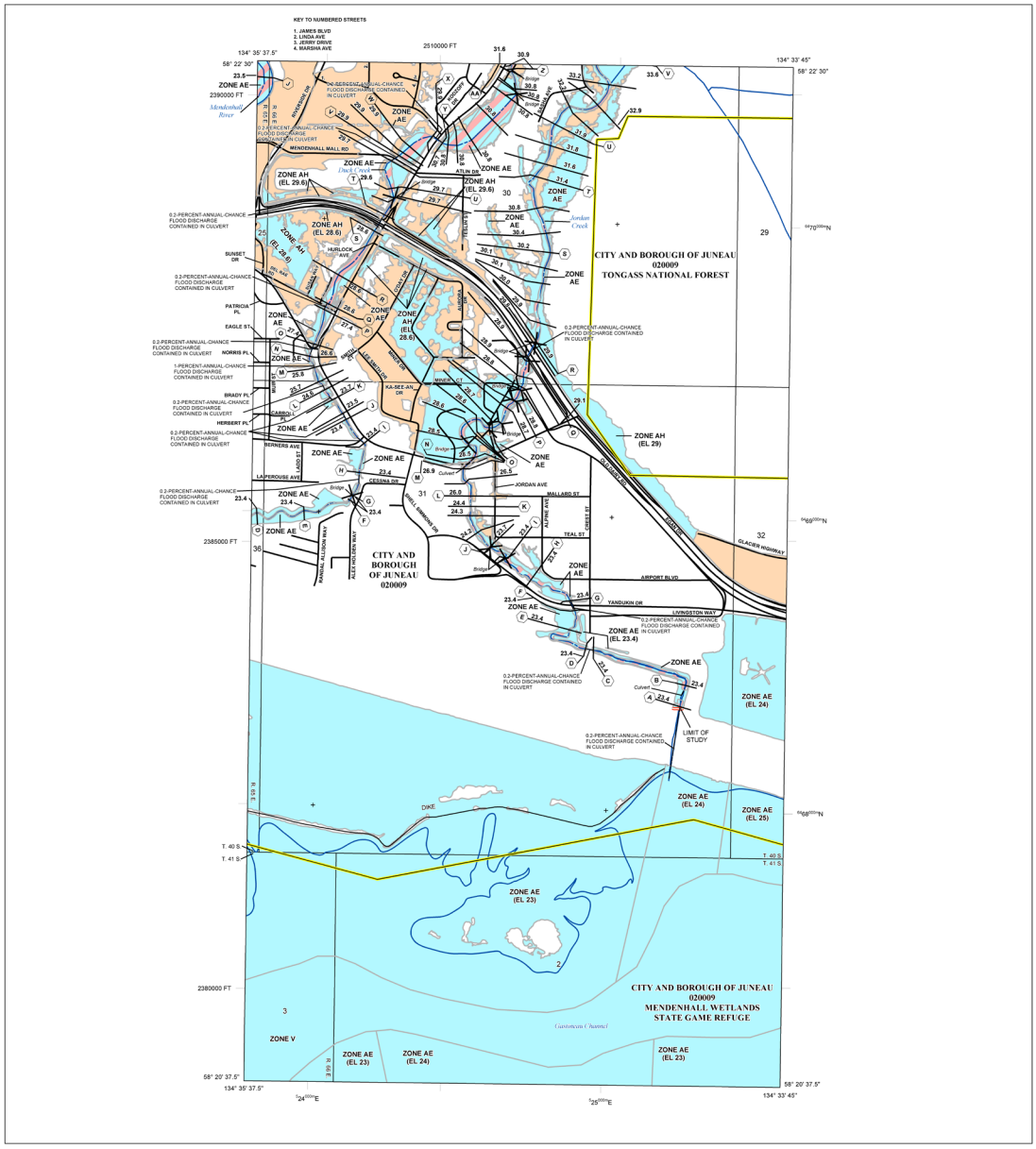
COMMUNITY	NUMBER	PANEL	SUFFIX
CITY AND BOROUGH OF JUNEAU	020009	1526	E

VERSION NUMBER
2.3.3.4

MAP NUMBER
02110C1526E

MAP REVISED
SEPTEMBER 18, 2020

Attachment 4: FIRM Panel 02110C1257E



FLOOD HAZARD INFORMATION

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SCALE

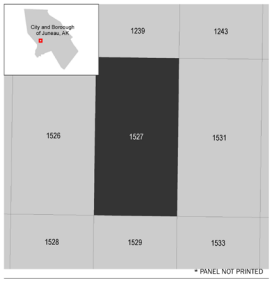
Map Projection:
State Plane Alaska Zone 1; North American Datum 1983;
Western Hemisphere; Vertical Datum: Mean Lower Lower Water

1 inch = 500 feet 1:6,000

0 500 1,000 2,000 Feet

0 125 250 500 Meters

PANEL LOCATOR



* PANEL NOT PRINTED

FEMA National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP
CITY AND BOROUGH OF JUNEAU, AK

PANEL 1527 OF 2700

FEMA

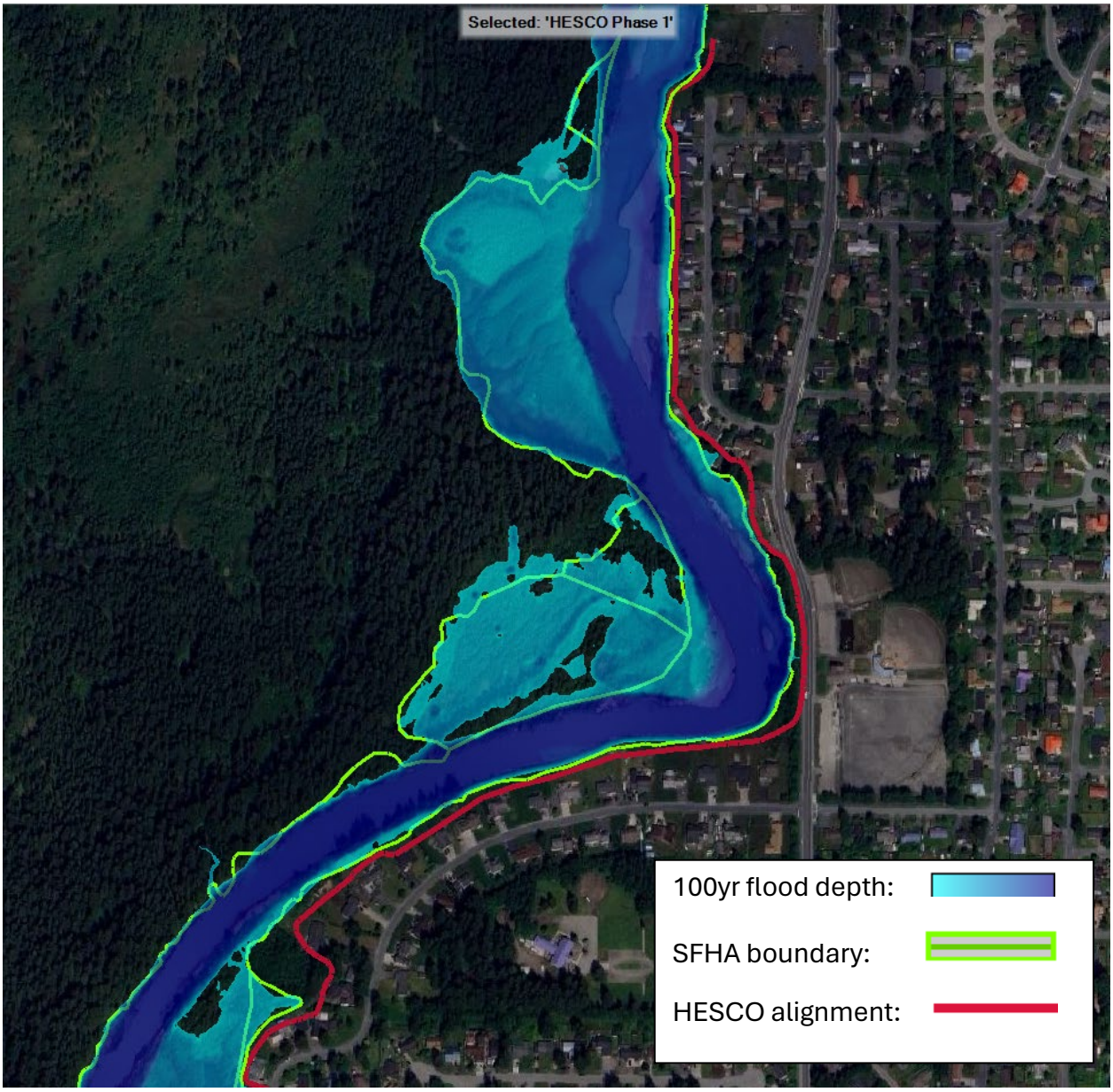
Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
CITY AND BOROUGH OF JUNEAU	020009	1527	E

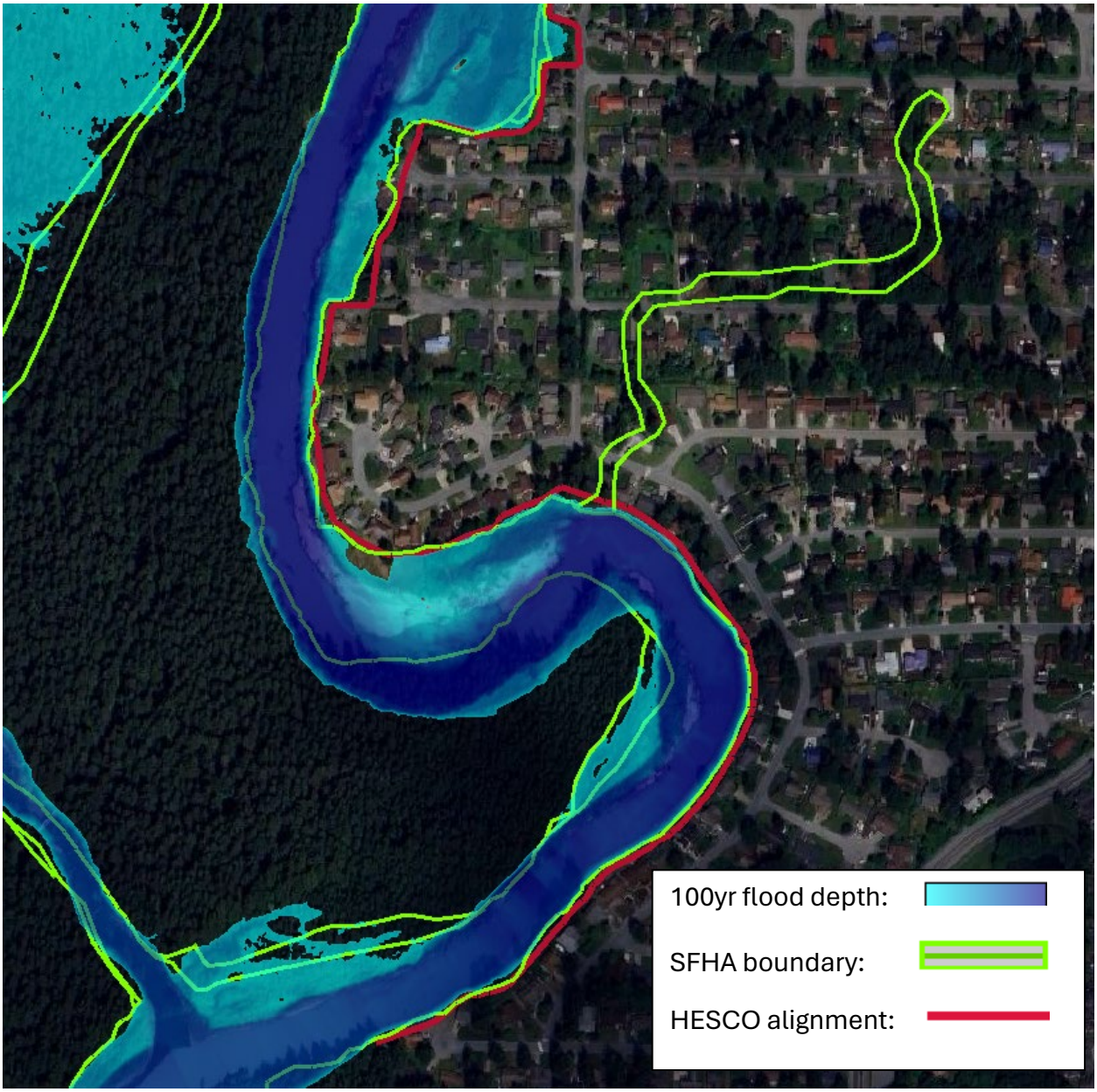
VERSION NUMBER
2.3.3.4

MAP NUMBER
02110C1527E

MAP REVISED
SEPTEMBER 18, 2020



Attachment 5: A comparison between the location of the SFHA boundary and the location of the HESCO barrier (Northern extent of project)



Attachment 5: A comparison between the location of the SFHA boundary and the location of the HESCO barrier (Southern extent of project)

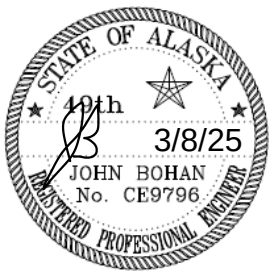
Project Name: Riverbank Armoring - HESCO Flood Barrier Phase I -

Project Address: along the east bank of Mendenhall River from 9399 Rivercourt Way north to 4395 Riverside Drive.

Project Armoring Addresses (along east riverbank of Mendenhall River)**:**

S. Meander: 9387 Rivercourt Way and 3315 to 3323 Meander Way - approx. 365 l.f. armoring
N. Meander: 3491 to 3499 and CBJ Parcel (NHN) Meander Way – approx. 250 l.f. armoring
Killewich: 3835 to 3849 Killewich Drive – approx. 500 l.f. armoring

Applicant: City and Borough of Juneau Public Works and Engineering Department
John Bohan – PE – CE 9796 – City Engineer



Design Approach:

The design approach followed for the riverbank armoring is to ensure the FEMA regulatory floodway cross sectional area is maintained or increased. The strategy is to remove the erodible soils and replace them with non-erodible riprap and not decrease the cross sectional area of the FEMA regulated floodway.

The design utilized an evaluation of the horizontal alignment to best fit the existing riverbank alignment with the design armoring cross section, sloped at 1.5H to 1V. to ensure bank stability, and maintain the existing streambank alignment. Survey data provided by the DOWL October 2024 UAV survey and site validations were used to generate cross sections and calculate cuts and fills using the average end area method. The generated cross sections and horizontal layout were carefully analyzed to balance cuts and fills and were reworked multiple times to ensure the amount of fill being removed will exceed the amount being places, ensuring the conditions for “replacement in kind” are met and the regulated floodway area is not decreased.

In addition to ensuring the cross-sectional area of the floodway is not restricted and the armored section exceeds the existing unarmored section, the roughness coefficient for riprap armoring (n= 0.03 to 0.04) is similar to or less than the roughness coefficient for that used by the FEMA effective HEC RAS 1-D model (n=0.033) for the Mendenhall River floodway. The existing riverbanks are also undulating and non-uniform with irregularities of root wads, large voids and other obstructions left by localized bank erosion and sloughing, resulting in obstructed and inefficient water flow along the riverbank. The armoring will result in a non-erodible uniform surface that will be more efficient at passing water flow without the obstructions of the eroded riverbank.

The toe of the armoring and the scour toe will follow the adjacent channel bottom and will not change the channel slope or bottom contour, which will not change the flow of the river.

The cross sections and calculations for the armoring at each of the locations are provided at the end of this document.

S. Meander Armoring

The bank armoring at these 4 properties will fill in the gaps left by the 4 homeowners who didn't armor their properties during the adjacent armoring work that occurred in 2022 and 2023. Armoring these properties is vital to ensuring the integrity of the HESCO Flood Barriers to prevent a breach in the barriers that could be caused by continued riverbank erosion. The FEMA Base Flood Elevation used at this location was taken from Section "O" at elevation 27.5, from the FEMA Flood Maps, which is immediately upstream of the armoring area.

9387 Rivercourt Way: a singular property that requires armoring to match the adjacent armored properties. The erosion of the riverbank has created a steep riverbank with highly erodible soils, but being protected by the armoring on each side. The construction of the 1.5H to 1V armoring section will connect to the existing armoring on either side. The net amount of material being removed from the FEMA Regulated Floodway by this armoring is 9 cubic yards, creating a larger floodway than currently exists.

3315 to 3323 Meander Way: - three contiguous properties that require armoring to match the adjacent upstream and downstream armored properties. The erosion of the riverbank has created a steep erodible riverbank. The eroded riverbank slopes are steeper on the downstream properties requiring more material removal than the upstream properties to maintain a uniform horizontal alignment matching the exiting river. The construction of the 1.5H to 1V armoring section will connect to the existing armoring on either side. The net amount of material being removed from the FEMA Regulated Floodway by this armoring is 131 cubic yards, creating a larger floodway than currently exists.

N. Meander Armoring

The bank armoring at these 4 properties will repair existing riprap bank armoring that has been compromised over many years of changes and downcutting of the river. Rebuilding the existing armoring is critical in this location because the HESCO alignment is confined to very close to the top of the riverbank, requiring a sound riverbank to prevent riverbank erosion from breaching the flood barriers. The FEMA Base Flood Elevation used at this location is elevation 30.4. This elevation was determined by interpolating between FEMA Flood Maps Section "Q" (el. 30.1) 250' downstream of the armoring location and Section "R" (el. 31.4) 1285 upstream of the armoring location.

The general slope of the existing riverbank has some undulations from undermined armoring sloughing and washing away due to bank erosion and river downcutting. Existing riprap that meets the requirements for the new armoring will be salvaged and reused, and the remaining unsuitable and highly erodible soils will be removed and replaced with riprap with shot rock filter. The construction of the 1.5H to 1V armoring section will connect to the existing armoring on either side. The net amount of material being removed from the FEMA Regulated Floodway by this armoring is 6 cubic yards, creating a larger floodway than currently exists.

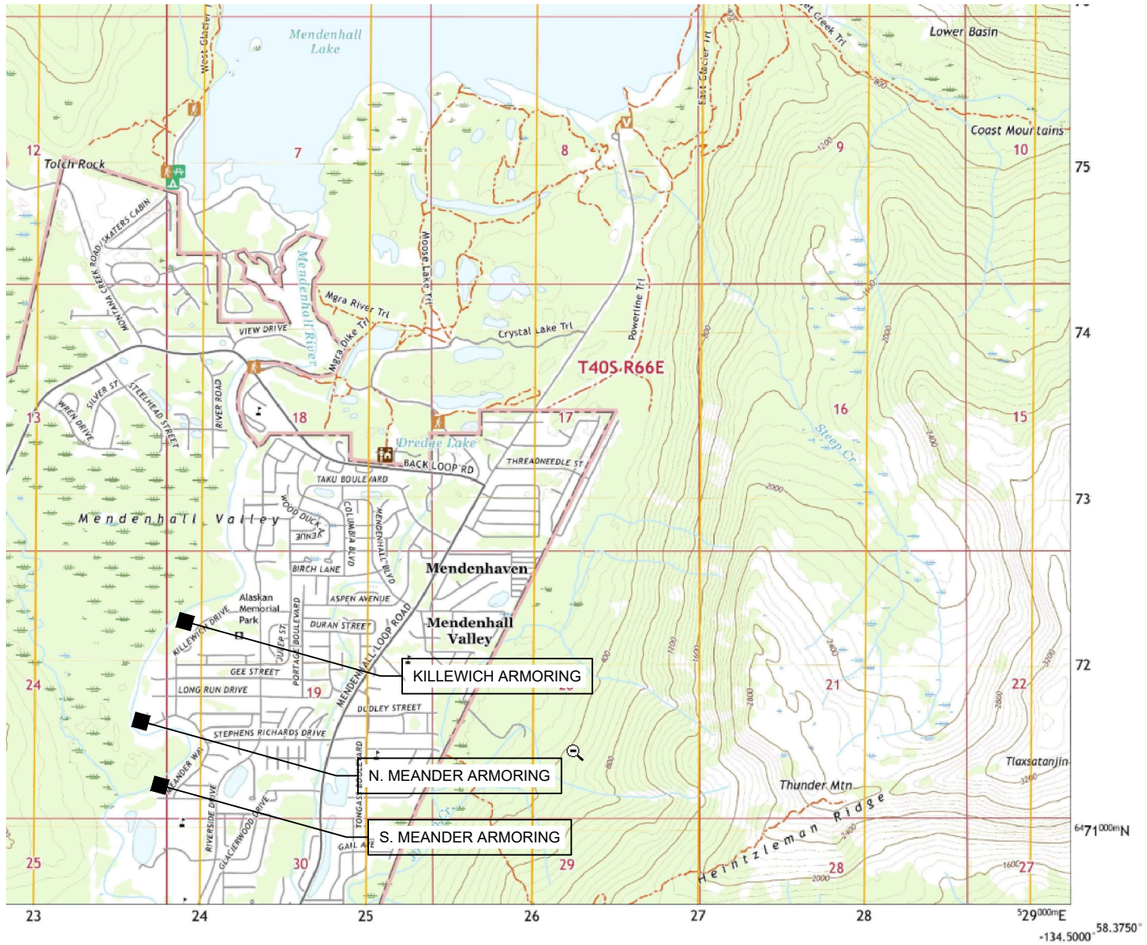
Killewich Armoring

The bank armoring at these 4 properties will repair eroding riverbanks with trees being undermined by the erosion and falling towards the river. The highly erodible soils in this area could mimic what occurred adjacent to the Riverside Condos in the 2023 GLOF, eroding a substantial chunk of land and undermining the buildings. The HESCOs in this location are placed away from the riverbank, but would be compromised if the riverbank were to erode as it is already showing to be doing fairly rapidly.

The riprap section will connect to existing armoring at the upstream end of the work and relatively stable unarmored slope downstream. The FEMA Base Flood Elevation used at this location is elevation 34.5 from FEMA Flood Maps Section "T", which is immediately upstream from the armoring location.

The general slope of the existing riverbank has significant undulations, cavities, undermined tree root wads and variations from sloughing and bank erosion of the fine, highly erodible soils comprising the riverbank. This material will be excavated and replaced with the rip-rap and shot rock filter section to protect the riverbank from further erosion. The topography of the lots drops as the armoring progresses downriver, requiring more material to be excavated from the downstream lots to maintain a consistent horizontal alignment matching the river. The construction of the 1.5H to 1V armoring section will connect to the existing armoring on the upstream side and the existing more stable riverbank on the downstream end. The net amount of material being removed from the FEMA Regulated Floodway by this armoring is 244 cubic yards, creating a larger floodway than currently exists.

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING
MENDENHALL RIVERBANK ARMORING
JUNEAU, AK



INDEX:

PROJECT LOCATION: USGS B-2 NW, AK - 2021

- S. MEANDER: 58.38114 LATITUDE -134.59365 LONGITUDE
  9387 RIVERCOURT WAY AND 3315, 3319, 3323 MEANDER WAY, JUNEAU AK
- N. MEANDER: 58.38544 LATITUDE -134.59597 LONGITUDE
  3491,3495,3499, CBJ(NHN) MEANDER WAY, JUNEAU, AK
- KILLEWICH: 58.39001 LATITUDE -139.59122 LONGITUDE
  3835,3839,3843,3847,3849 KILLEWICH DRIVE, JUNEAU, AK

PROJECT CONTACT:

CBJ ENGINEERING AND PUBLIC WORKS DEPT.
JOHN BOHAN
155 HERITAGE WAY
JUNEAU AK 99801
(907) 586-0800 X-4188 john.bohan@juneau.gov

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

COVER AND LOCATION MAP

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 1 of 7

DESCRIPTION

The work under this section includes providing all labor, tools and equipment necessary for furnishing and placing a protective covering of stone, as shown on the drawings or as directed by the engineer.

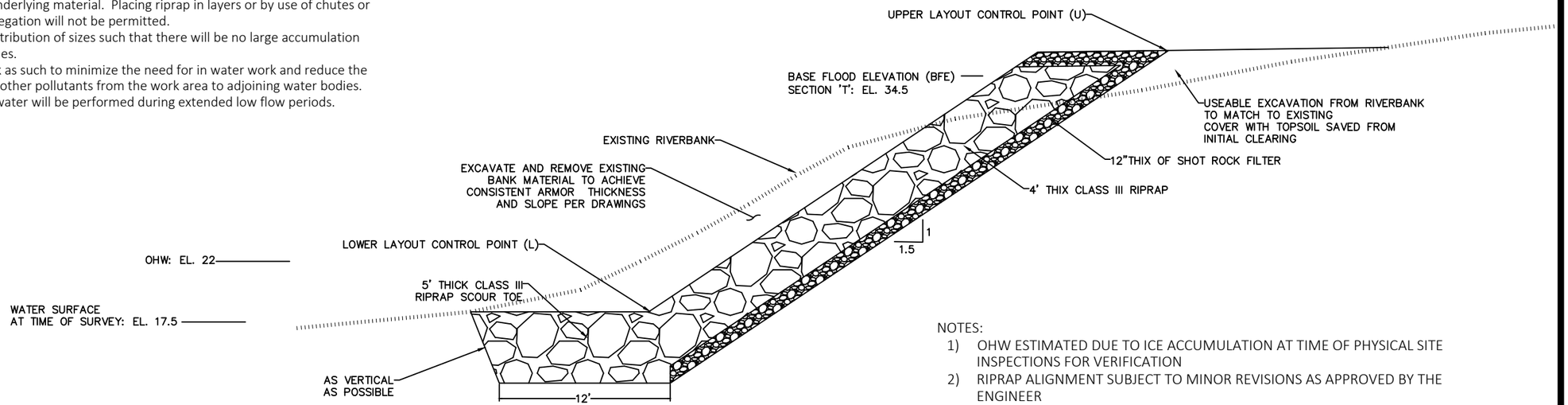
MATERIALS

SHOT ROCK BORROW: shall consist of 10" minus shot rock and shall contain no organics or other deleterious matter. The shot rock shall be evenly graded with at least 10% by weight retained on the 8" screen. Shot rock will be obtained from quarry rock unless otherwise approved by the engineer.

CLASS III RIPRAP: shall consist of no more than 10% total by weight more than 1400 pounds each, and no more than 15% of stones by weight shall weigh less than 25 pounds each. A minimum of 50% by weight shall weigh greater than 700 pounds.

CONSTRUCTION

A. Slopes to be protected with riprap shall be free of brush, trees stumps and other objectional material and shall be graded to a relative smooth surface.
B. The shot rock filter layer shall be place prior to placing riprap as shown on the drawings.
C. The riprap shall be placed to the thickness, height and length as shown on the drawings or as staked with a minimum of voids.
D. Undesirable voids shall be filled with small stones or spalls. The rock shall be manipulated sufficiently by means of excavator or other suitable equipment to secure a reasonably regular surface and mass stability.
E. Riprap protection shall be placed to full course thickness in one operation and in such a manner to avoid damaging the filter layer or underlying material. Placing riprap in layers or by use of chutes or similar activities likely to cause segregation will not be permitted.
F. Riprap shall be placed with a fair distribution of sizes such that there will be no large accumulation or area of mainly large or small stones.
G. The contractor shall phase the work as such to minimize the need for in water work and reduce the potential for sediment discharge or other pollutants from the work area to adjoining water bodies. Ideally, the work below mean high water will be performed during extended low flow periods.



NOTES:

1) OHW ESTIMATED DUE TO ICE ACCUMULATION AT TIME OF PHYSICAL SITE INSPECTIONS FOR VERIFICATION
2) RIPRAP ALIGNMENT SUBJECT TO MINOR REVISIONS AS APPROVED BY THE ENGINEER
3) EXCAVATION SPOILS, ORGANICS, MUCK AND OTHER DEBRIS GENERATED FROM BY THE WORK BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE DISPOSED OF AT AN OFF SITE LOCATION THAT IS PERMITTED AS SUCH.

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

KILLEWICH ARMORING TYPICAL SECTION

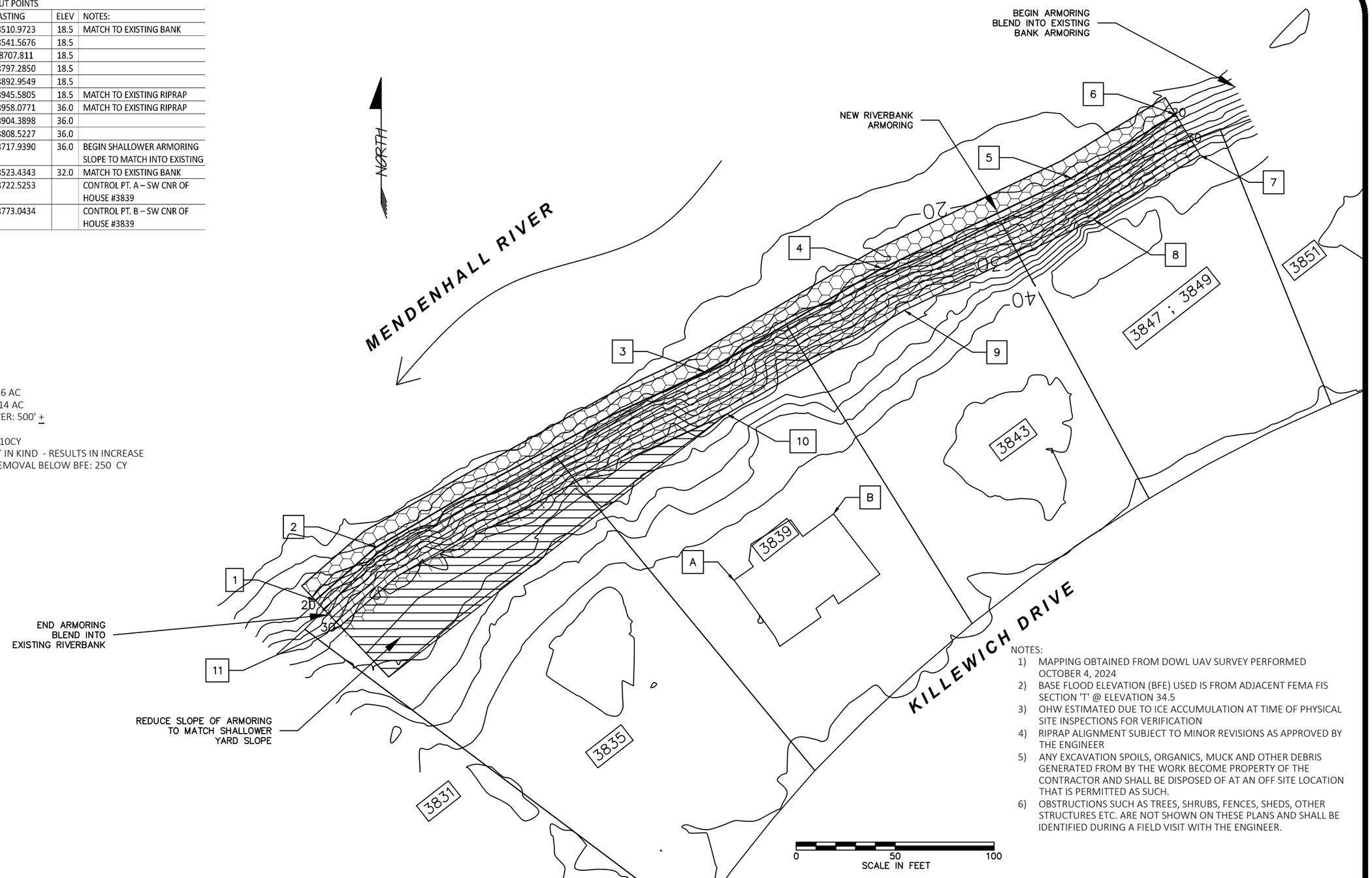
DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 2 of 7

LAYOUT POINTS				
POINT #	NORTHING	EASTING	ELEV	NOTES:
1	2395970.3710	2508510.9723	18.5	MATCH TO EXISTING BANK
2	2395997.1648	2508541.5676	18.5	
3	2396085.7665	2508707.811	18.5	
4	2396138.0306	2508797.2850	18.5	
5	2396183.6512	2508892.9549	18.5	
6	2396215.7526	2508945.5805	18.5	MATCH TO EXISTING RIPRAP
7	2396195.2627	2508958.0771	36.0	MATCH TO EXISTING RIPRAP
8	2396162.5192	2508904.3898	36.0	
9	2396116.8003	2508808.5227	36.0	
10	2396064.4721	2508717.9390	36.0	BEGIN SHALLOWER ARMORING SLOPE TO MATCH INTO EXISTING
11	2395957.3582	2508523.4343	32.0	MATCH TO EXISTING BANK
A	2395980.5465	2508722.5253		CONTROL PT. A – SW CNR OF HOUSE #3839
B	2396013.8097	2508773.0434		CONTROL PT. B – SW CNR OF HOUSE #3839

QUANTITIES:

1) TOTAL BANK ARMORING AREA: 0.46 AC
2) BANK ARMORING BELOW OHW: 0.14 AC
3) LENGTH OF ARMORING ALONG RIVER: 500' ±
4) TOTAL RIPRAP VOLUME: 4,950 CY
5) RIPRAP VOLUME BELOW OHW: 2210CY
6) BANK ARMORING IS REPLACEMENT IN KIND - RESULTS IN INCREASE OF FLOODWAY SIZE - MATERIAL REMOVAL BELOW BFE: 250 CY



NOTES:

1) MAPPING OBTAINED FROM DOWL UAV SURVEY PERFORMED OCTOBER 4, 2024
2) BASE FLOOD ELEVATION (BFE) USED IS FROM ADJACENT FEMA FIS SECTION 'T' @ ELEVATION 34.5
3) OHW ESTIMATED DUE TO ICE ACCUMULATION AT TIME OF PHYSICAL SITE INSPECTIONS FOR VERIFICATION
4) RIPRAP ALIGNMENT SUBJECT TO MINOR REVISIONS AS APPROVED BY THE ENGINEER
5) ANY EXCAVATION SPOILS, ORGANICS, MUCK AND OTHER DEBRIS GENERATED FROM BY THE WORK BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE DISPOSED OF AT AN OFF SITE LOCATION THAT IS PERMITTED AS SUCH.
6) OBSTRUCTIONS SUCH AS TREES, SHRUBS, FENCES, SHEDS, OTHER STRUCTURES ETC. ARE NOT SHOWN ON THESE PLANS AND SHALL BE IDENTIFIED DURING A FIELD VISIT WITH THE ENGINEER.

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

KILLEWICH ARMORING CONSTRUCTION PLAN

DATE: 2/1/2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 3 of 7

DESCRIPTION

The work under this section includes providing all labor, tools and equipment necessary for furnishing and placing a protective covering of stone, as shown on the drawings or as directed by the engineer.

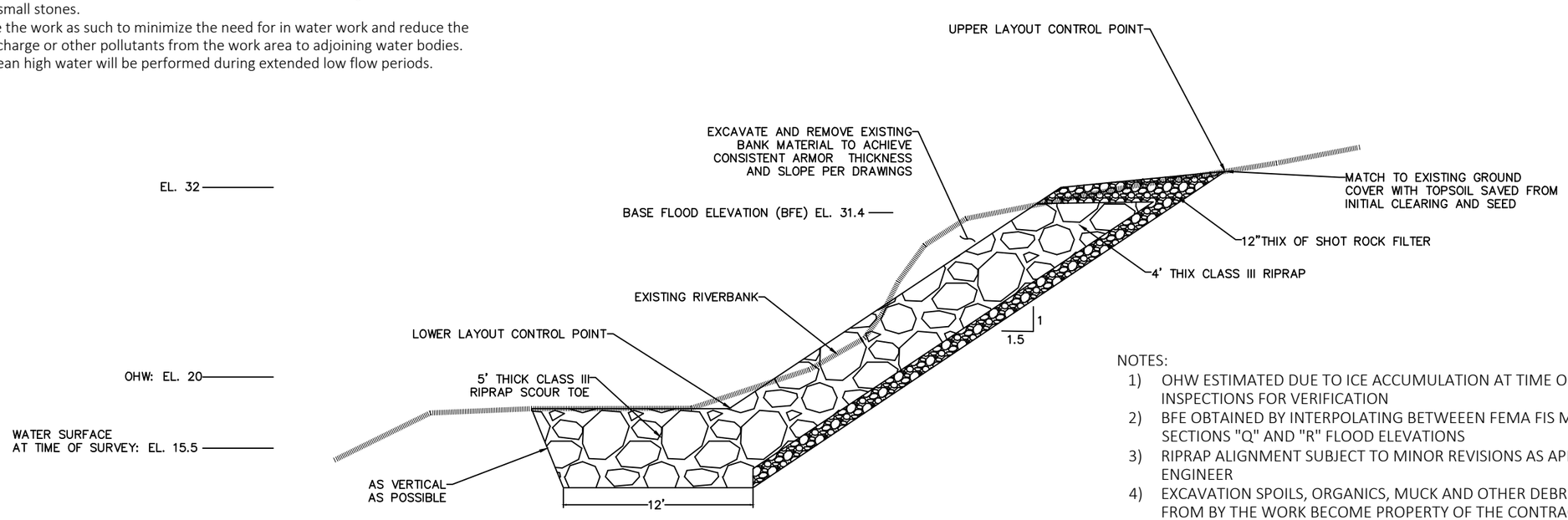
MATERIALS

SHOT ROCK BORROW: shall consist of 10" minus shot rock and shall contain no organics or other deleterious matter. The shot rock shall be evenly graded with at least 10% by weight retained on the 8" screen. Shot rock will be obtained from quarry rock unless otherwise approved by the engineer.

CLASS III RIPRAP: shall consist of no more than 10% total by weight more than 1400 pounds each, and no more than 15% of stones by weight shall weigh less than 25 pounds each. A minimum of 50% by weight shall weigh greater than 700 pounds.

CONSTRUCTION

A. Slopes to be protected with riprap shall be free of brush, trees stumps and other objectional material and shall be graded to a relative smooth surface.
B. The shot rock filter layer shall be place prior to placing riprap as shown on the drawings.
C. The riprap shall be placed to the thickness, height and length as shown on the drawings or as staked with a minimum of voids.
D. Undesirable voids shall be filled with small stones or spalls. The rock shall be manipulated sufficiently by means of excavator or other suitable equipment to secure a reasonably regular surface and mass stability.
E. Riprap protection shall be placed to full course thickness in one operation and in such a manner to avoid damaging the filter layer or underlying material. Placing riprap in layers or by use of chutes or similar activities likely to cause segregation will not be permitted.
F. Riprap shall be placed with a fair distribution of sizes such that there will be no large accumulation or area of mainly large or small stones.
G. The contractor shall phase the work as such to minimize the need for in water work and reduce the potential for sediment discharge or other pollutants from the work area to adjoining water bodies. Ideally, the work below mean high water will be performed during extended low flow periods.



NOTES:

1) OHW ESTIMATED DUE TO ICE ACCUMULATION AT TIME OF PHYSICAL SITE INSPECTIONS FOR VERIFICATION
2) BFE OBTAINED BY INTERPOLATING BETWEEEN FEMA FIS MAPPING SECTIONS "Q" AND "R" FLOOD ELEVATIONS
3) RIPRAP ALIGNMENT SUBJECT TO MINOR REVISIONS AS APPROVED BY THE ENGINEER
4) EXCAVATION SPOILS, ORGANICS, MUCK AND OTHER DEBRIS GENERATED FROM BY THE WORK BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE DISPOSED OF AT AN OFF SITE LOCATION THAT IS PERMITTED AS SUCH.

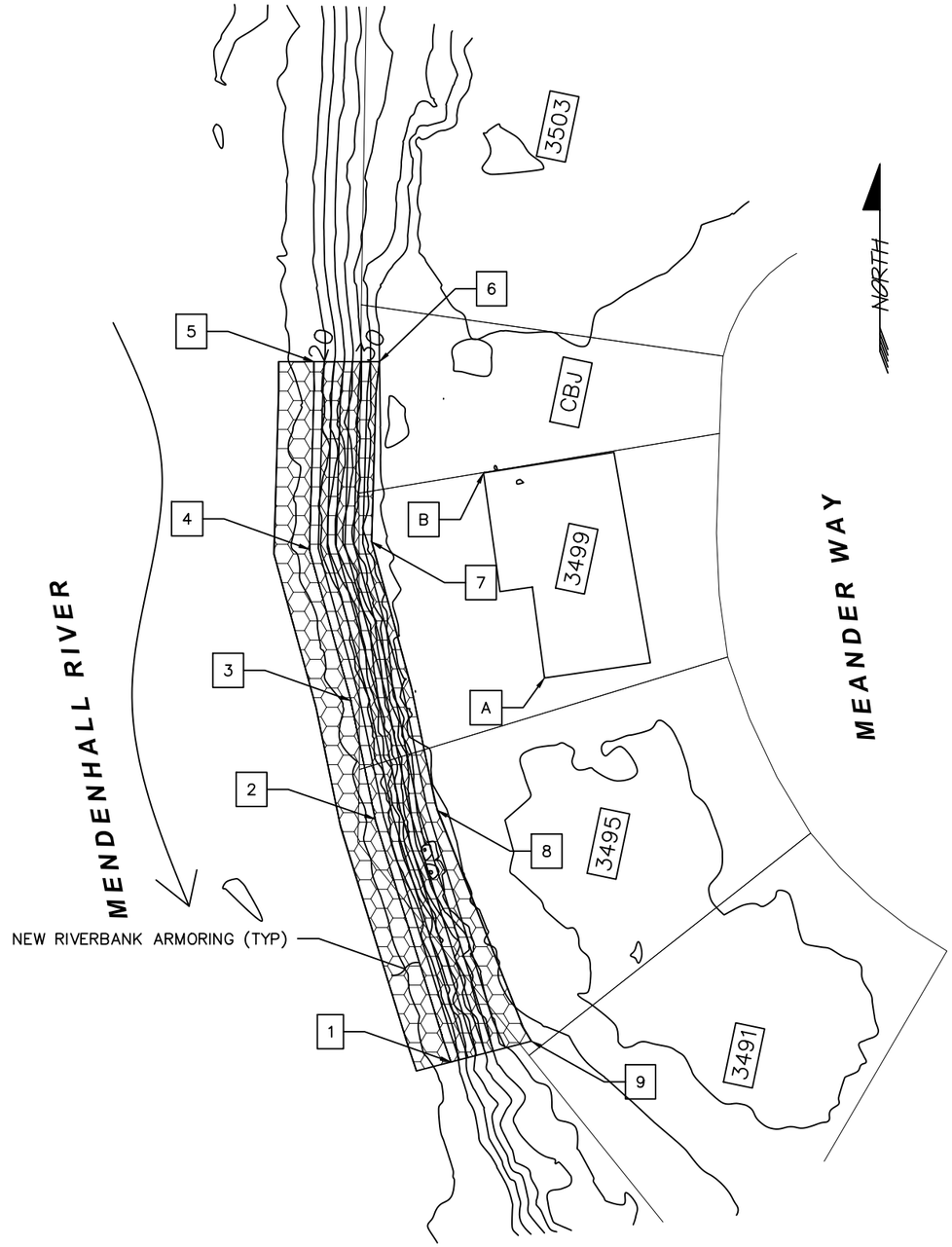
Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

N. MEANDER ARMORING TYPICAL SECTION

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: NOT TO SCALE



QUANTITIES:

1) TOTAL BANK ARMORING AREA: 0.19 AC
2) BANK ARMORING BELOW OHW: 0.10 AC
3) LENGTH OF ARMORING ALONG RIVER: 250' ±
4) TOTAL RIPRAP VOLUME: 1540 CY
5) RIPRAP VOLUME BELOW OHW: 770 CY
6) BANK ARMORING IS REPLACEMENT IN KIND - RESULTS IN INCREASE OF FLOODWAY SIZE - MATERIAL REMOVAL BELOW BFE: 7 CY

POINT #	NORTHING	EASTING	ELEV	NOTES:
1	2393896.5525	2507610.8681	18.0	Match TO EXISTING BANK
2	2393978.9938	2507585.2101	18.0	
3	2394019.0284	2507577.0045	18.0	
4	2394070.3146	2507562.9437	18.0	
5	2394133.9212	2507564.5190	18.0	MATCH TO EXISTING RIPRAP
6	2394133.9212	2507586.6734	32.0	MATCH TO EXISTING RIPRAP
7	2394072.8377	2507584.0270	32.0	
8	2393981.8148	2507606.2823	32.0	
9	2393903.6179	2507638.1839	32.0	MATCH TO EXISTING BANK
A	2394026.7173	2507642.6270		CONTROL POINT - SW CNR HOUSE #3499
B	2394096.2090	2507621.9639		CONTROL POINT – NW CNR HOUSE #3499

NOTES:

1) THIS WORK WILL BE TO RECONSTRUCT AN EXISTING RIPRAP ARMORED BANK. SALVAGE AND REUSE RIPRAP THAT MEETS THE REQUIREMENTS SPECIFIED.
2) MAPPING OBTAINED FROM DOWL UAV SURVEY PERFORMED OCTOBER 4, 2024
3) BASE FLOOD ELEVATION (BFE) USED IS ELEVATION 30.4. THIS HAS BEEN INTERPOLATED BETWEEN FEMA SECTIONS 'Q' AND 'R'
4) OHW APPROXIMATED DUE TO ICE ACCUMULATION AT TIME OF PHYSICAL SITE INSPECTIONS FOR VERIFICATION
5) RIPRAP ALIGNMENT SUBJECT TO MINOR REVISIONS AS APPROVED BY THE ENGINEER
6) ANY EXCAVATION SPOILS, ORGANICS, MUCK AND OTHER DEBRIS GENERATED FROM BY THE WORK BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE DISPOSED OF AT AN OFF SITE LOCATION THAT IS PERMITTED AS SUCH.
7) OBSTRUCTIONS SUCH AS TREES, SHRUBS, FENCES, SHEDS, OTHER STRUCTURES ETC. ARE NOT SHOWN ON THESE PLANS AND SHALL BE IDENTIFIED DURING A FIELD VISIT WITH THE ENGINEER.

0 50 100
SCALE IN FEET

Revisions				Prepared by:	2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING	N. MEANDER ARMORING CONSTRUCTION PLAN			SHEET: 5 of 7
Date	Description	Intls.		CITY AND BOROUGH OF JUNEAU ★ ALASKA'S CAPITAL CITY ENGINEERING DEPARTMENT		DATE: Feb 2025	DRAWN BY: STAFF	SCALE: As Shown	

DESCRIPTION

The work under this section includes providing all labor, tools and equipment necessary for furnishing and placing a protective covering of stone, as shown on the drawings or as directed by the engineer.

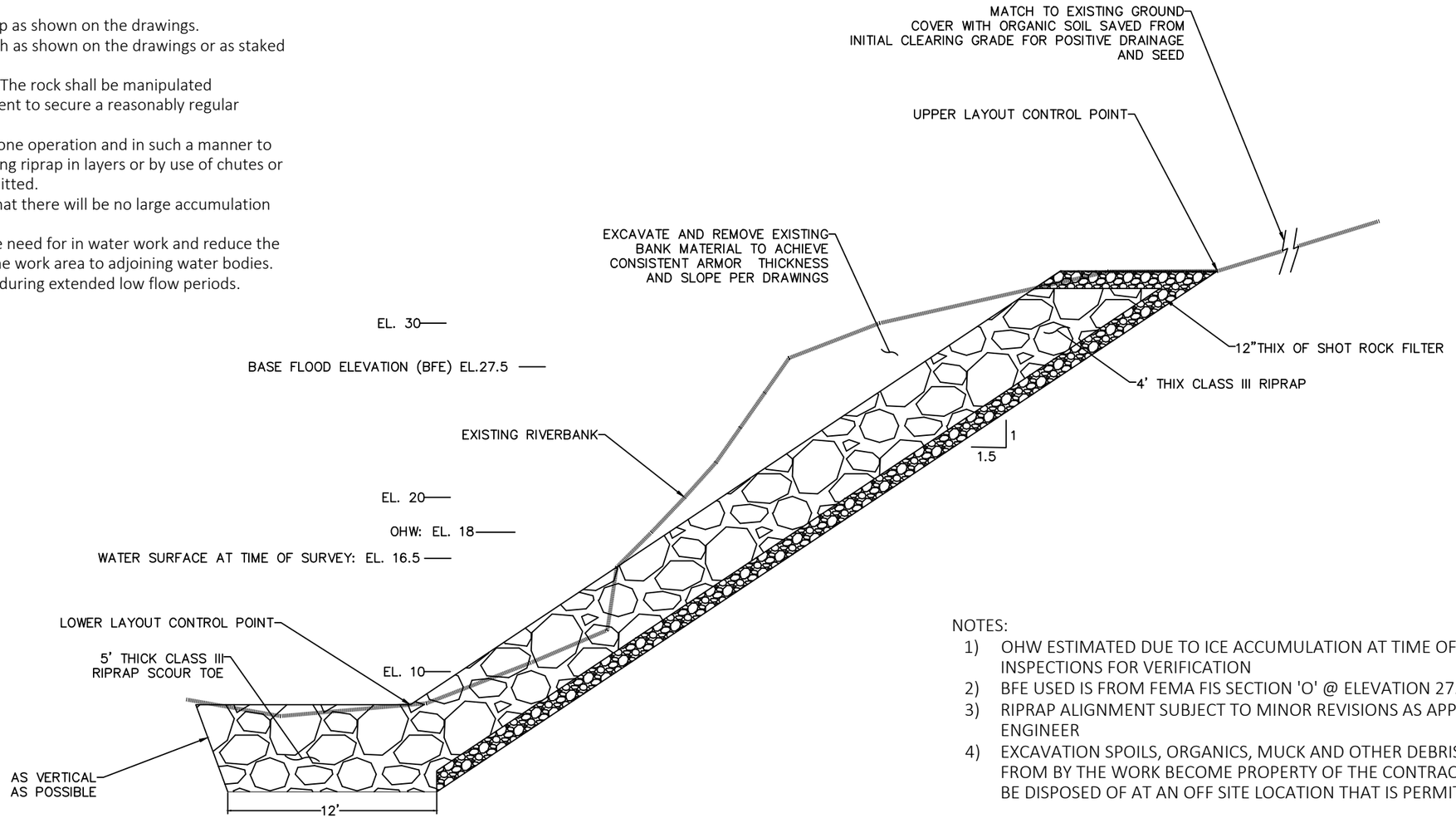
MATERIALS

SHOT ROCK BORROW: shall consist of 10" minus shot rock and shall contain no organics or other deleterious matter. The shot rock shall be evenly graded with at least 10% by weight retained on the 8" screen. Shot rock will be obtained from quarry rock unless otherwise approved by the engineer.

CLASS III RIPRAP: shall consist of no more than 10% total by weight more than 1400 pounds each, and no more than 15% of stones by weight shall weigh less than 25 pounds each. A minimum of 50% by weight shall weigh greater than 700 pounds.

CONSTRUCTION

A. Slopes to be protected with riprap shall be free of brush, trees stumps and other objectional material and shall be graded to a relative smooth surface.
B. The shot rock filter layer shall be place prior to placing riprap as shown on the drawings.
C. The riprap shall be placed to the thickness, height and length as shown on the drawings or as staked with a minimum of voids.
D. Undesirable voids shall be filled with small stones or spalls. The rock shall be manipulated sufficiently by means of excavator or other suitable equipment to secure a reasonably regular surface and mass stability.
E. Riprap protection shall be placed to full course thickness in one operation and in such a manner to avoid damaging the filter layer or underlying material. Placing riprap in layers or by use of chutes or similar activities likely to cause segregation will not be permitted.
F. Riprap shall be placed with a fair distribution of sizes such that there will be no large accumulation or area of mainly large or small stones.
G. The contractor shall phase the work as such to minimize the need for in water work and reduce the potential for sediment discharge or other pollutants from the work area to adjoining water bodies. Ideally, the work below mean high water will be performed during extended low flow periods.



NOTES:

1) OHW ESTIMATED DUE TO ICE ACCUMULATION AT TIME OF PHYSICAL SITE INSPECTIONS FOR VERIFICATION
2) BFE USED IS FROM FEMA FIS SECTION 'O' @ ELEVATION 27.5
3) RIPRAP ALIGNMENT SUBJECT TO MINOR REVISIONS AS APPROVED BY THE ENGINEER
4) EXCAVATION SPOILS, ORGANICS, MUCK AND OTHER DEBRIS GENERATED FROM BY THE WORK BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE DISPOSED OF AT AN OFF SITE LOCATION THAT IS PERMITTED AS SUCH.

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

S. MEANDER ARMORING TYPICAL SECTION

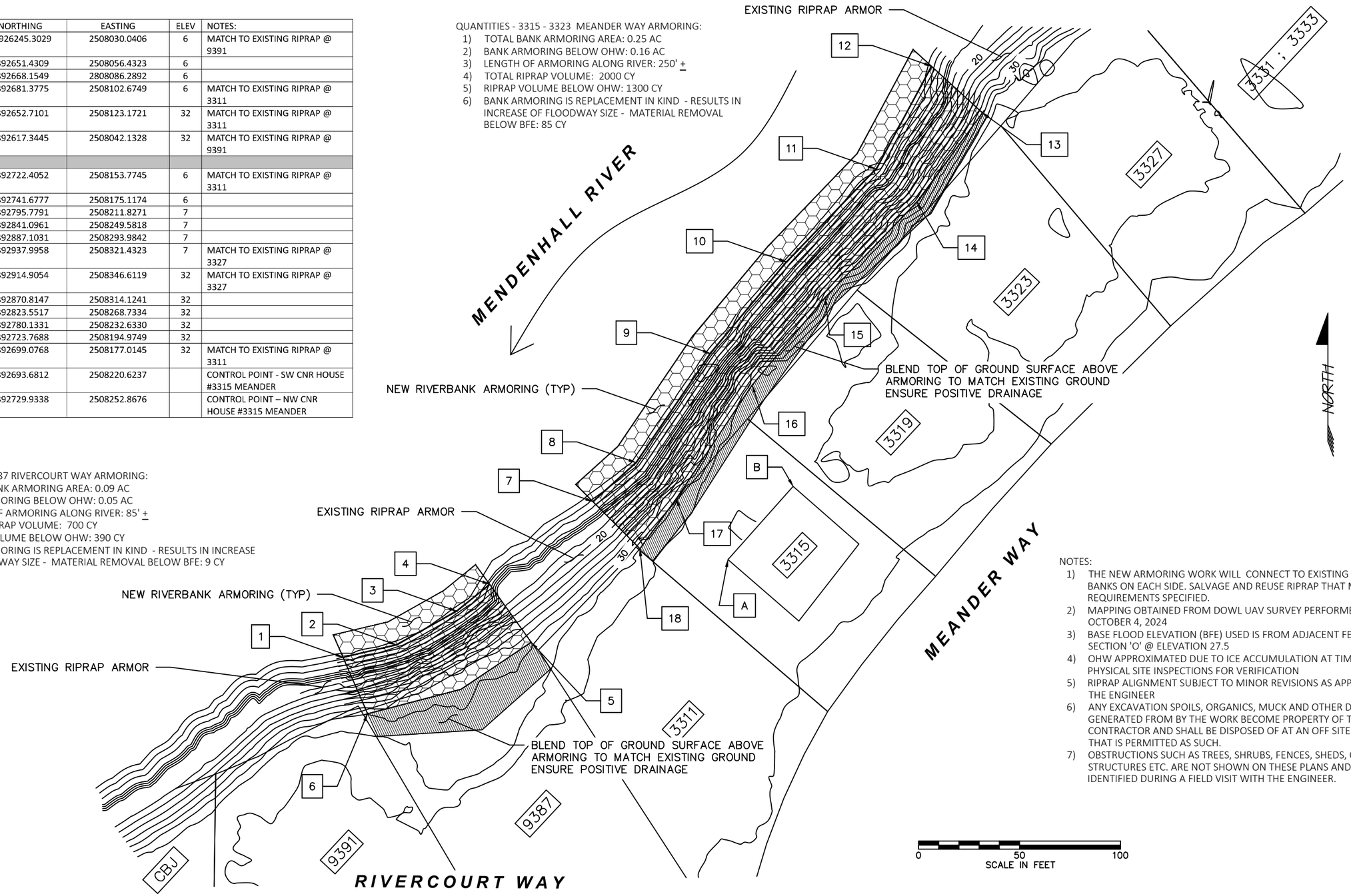
DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: NOT TO SCALE

SHEET: 6 of 7

POINT #	NORTHING	EASTING	ELEV	NOTES:
1	23926245.3029	2508030.0406	6	MATCH TO EXISTING RIPRAP @ 9391
2	2392651.4309	2508056.4323	6	
3	2392668.1549	2808086.2892	6	
4	2392681.3775	2508102.6749	6	MATCH TO EXISTING RIPRAP @ 3311
5	2392652.7101	2508123.1721	32	MATCH TO EXISTING RIPRAP @ 3311
6	2392617.3445	2508042.1328	32	MATCH TO EXISTING RIPRAP @ 9391
7	2392722.4052	2508153.7745	6	MATCH TO EXISTING RIPRAP @ 3311
8	2392741.6777	2508175.1174	6	
9	2392795.7791	2508211.8271	7	
10	2392841.0961	2508249.5818	7	
11	2392887.1031	2508293.9842	7	
12	2392937.9958	2508321.4323	7	MATCH TO EXISTING RIPRAP @ 3327
13	2392914.9054	2508346.6119	32	MATCH TO EXISTING RIPRAP @ 3327
14	2392870.8147	2508314.1241	32	
15	2392823.5517	2508268.7334	32	
16	2392780.1331	2508232.6330	32	
17	2392723.7688	2508194.9749	32	
18	2392699.0768	2508177.0145	32	MATCH TO EXISTING RIPRAP @ 3311
A	2392693.6812	2508220.6237		CONTROL POINT - SW CNR HOUSE #3315 MEANDER
B	2392729.9338	2508252.8676		CONTROL POINT – NW CNR HOUSE #3315 MEANDER

QUANTITIES - 3315 - 3323 MEANDER WAY ARMORING:
1) TOTAL BANK ARMORING AREA: 0.25 AC
2) BANK ARMORING BELOW OHW: 0.16 AC
3) LENGTH OF ARMORING ALONG RIVER: 250' ±
4) TOTAL RIPRAP VOLUME: 2000 CY
5) RIPRAP VOLUME BELOW OHW: 1300 CY
6) BANK ARMORING IS REPLACEMENT IN KIND - RESULTS IN INCREASE OF FLOODWAY SIZE - MATERIAL REMOVAL BELOW BFE: 85 CY

QUANTITIES - 9387 RIVERCOURT WAY ARMORING:
1) TOTAL BANK ARMORING AREA: 0.09 AC
2) BANK ARMORING BELOW OHW: 0.05 AC
3) LENGTH OF ARMORING ALONG RIVER: 85' ±
4) TOTAL RIPRAP VOLUME: 700 CY
5) RIPRAP VOLUME BELOW OHW: 390 CY
6) BANK ARMORING IS REPLACEMENT IN KIND - RESULTS IN INCREASE OF FLOODWAY SIZE - MATERIAL REMOVAL BELOW BFE: 9 CY



NOTES:
1) THE NEW ARMORING WORK WILL CONNECT TO EXISTING ARMORED BANKS ON EACH SIDE. SALVAGE AND REUSE RIPRAP THAT MEETS THE REQUIREMENTS SPECIFIED.
2) MAPPING OBTAINED FROM DOWL UAV SURVEY PERFORMED OCTOBER 4, 2024
3) BASE FLOOD ELEVATION (BFE) USED IS FROM ADJACENT FEMA FIS SECTION 'O' @ ELEVATION 27.5
4) OHW APPROXIMATED DUE TO ICE ACCUMULATION AT TIME OF PHYSICAL SITE INSPECTIONS FOR VERIFICATION
5) RIPRAP ALIGNMENT SUBJECT TO MINOR REVISIONS AS APPROVED BY THE ENGINEER
6) ANY EXCAVATION SPOILS, ORGANICS, MUCK AND OTHER DEBRIS GENERATED FROM BY THE WORK BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE DISPOSED OF AT AN OFF SITE LOCATION THAT IS PERMITTED AS SUCH.
7) OBSTRUCTIONS SUCH AS TREES, SHRUBS, FENCES, SHEDS, OTHER STRUCTURES ETC. ARE NOT SHOWN ON THESE PLANS AND SHALL BE IDENTIFIED DURING A FIELD VISIT WITH THE ENGINEER.

0 50 100
SCALE IN FEET

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

S. MEANDER ARMORING CONSTRUCTION PLAN

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 7 of 7

Killewich - Typical Bank Erosion

Eroding Riverbank - 3843 and 3847 Killewich – October 2024

S. Meander - Typical Bank Erosion

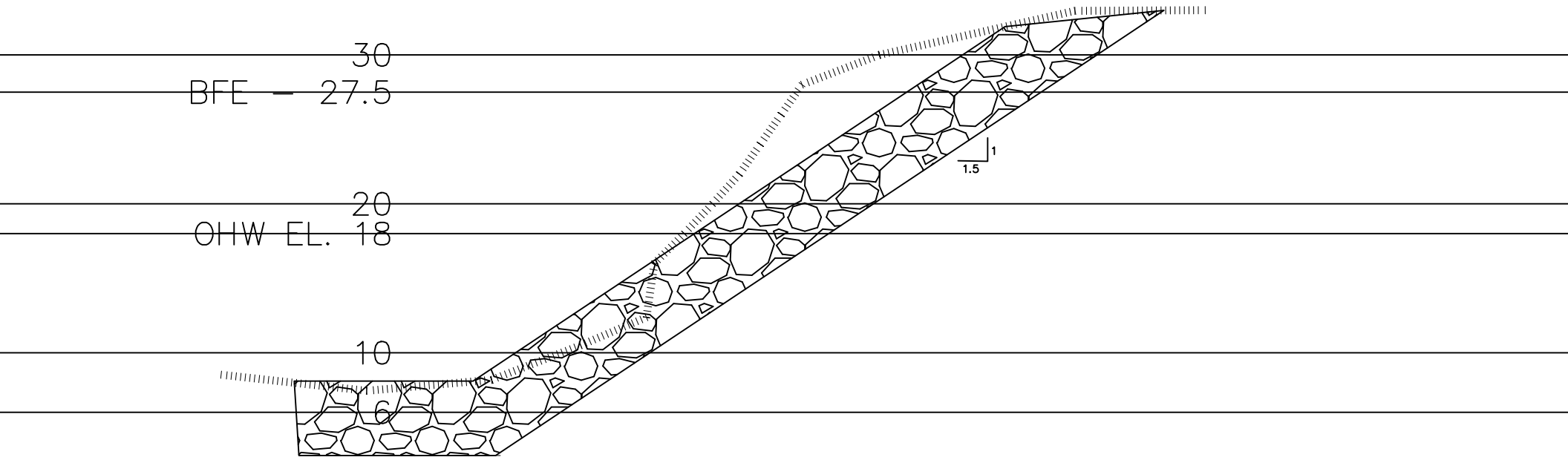
Eroding Riverbank - 3323,19,15 Meander Way, October 2024

N. Meander - Failing Armoring and Bank Erosion

Remaining Bank armoring 3499,3495 Meander Way

S. MEANDER ARMORING SECTIONS AND CALCULATIONS

Attachment 7

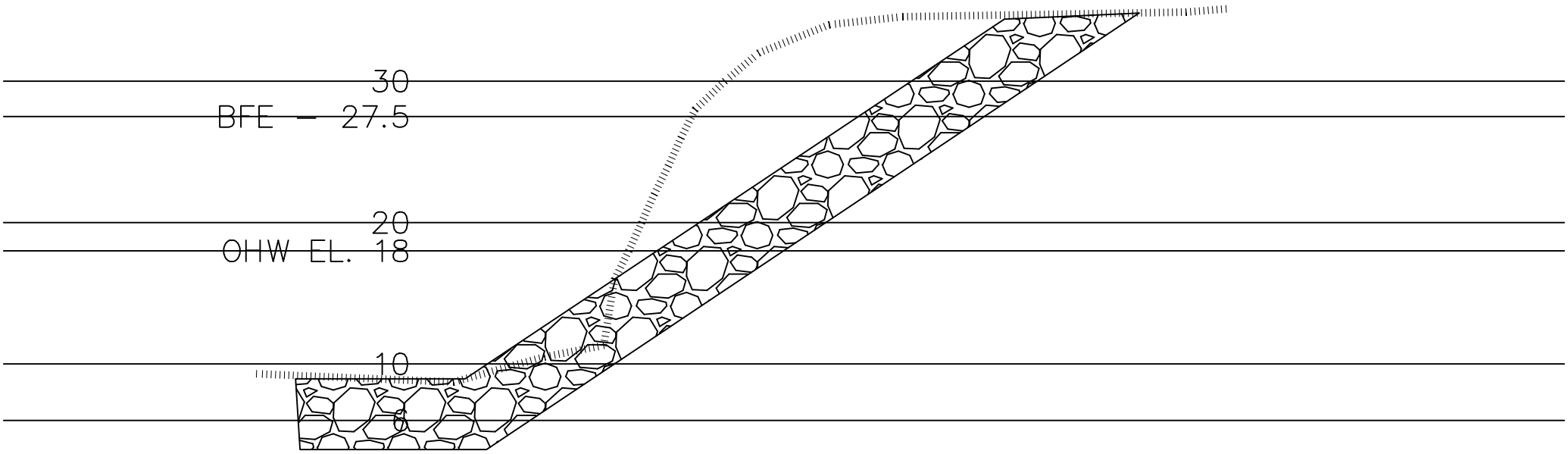


3315

CUT area below BFE: 39.9 s.f.

FILL area below BFE: 24.9 s.f.

NET area below BFE: CUT 15.0 s.f.

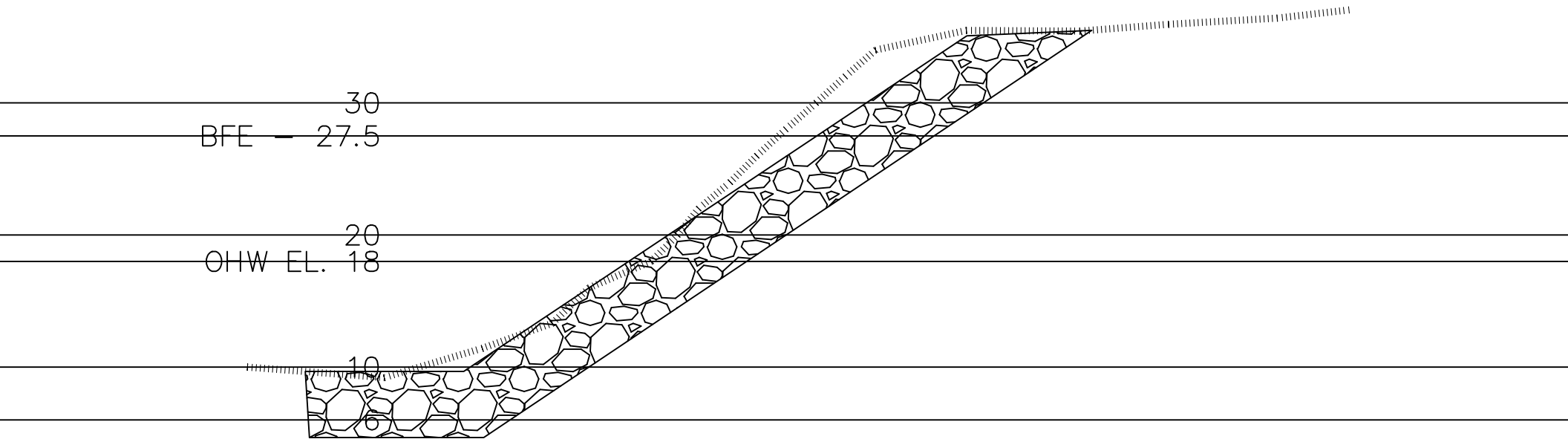


3319 D/S

CUT area below BFE: 73 s.f.

FILL area below BFE: 21.4 s.f.

NET area below BFE: CUT 51.6 s.f.

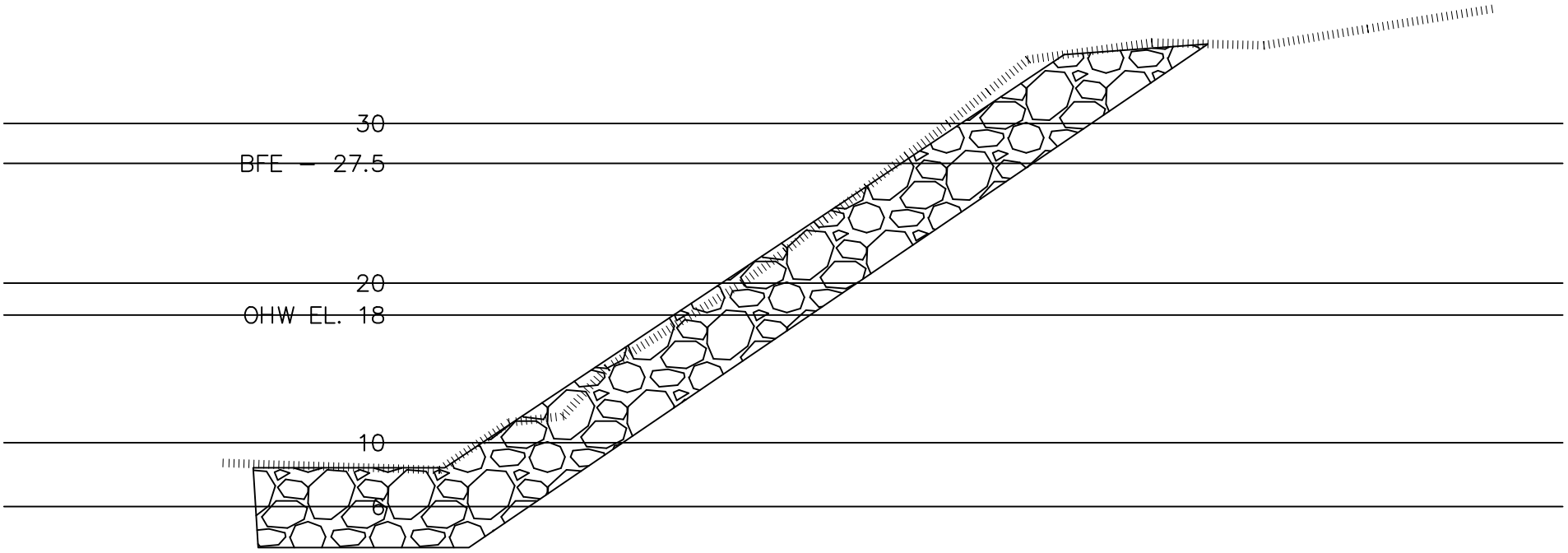


3319 U/S

CUT area below BFE: 15.5 s.f.

FILL area below BFE: 8.6 s.f.

NET area below BFE: CUT 6.9 s.f.



3323

CUT area below BFE: 1.5 s.f.

FILL area below BFE: 14.3 s.f.

NET area below BFE: FILL 12.8 s.f.

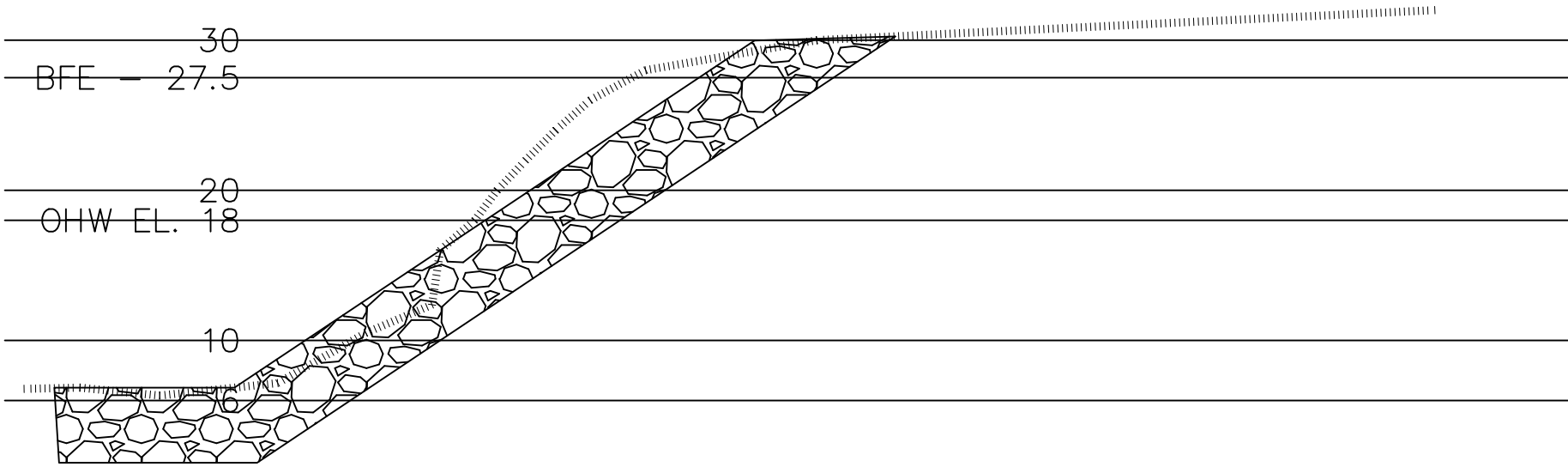
Bank Armoring 3315 Meander to 3323 MeanderWay

(+) = CUT (-) = FILL

	l (ft)	start area	end area	average	volume (cf)	CY
0 to 3315	29	0	15	7.5	217.5	8.1
3315 to 3319 d	65	15	51.6	33.3	2164.5	80.2
3319d to u	58	51.6	6.9	29.25	1696.5	62.8
3319u to 3323	65	6.9	-12.8	-2.95	-191.8	-7.1
3323 to end	56	-12.8	0	-6.4	-358.4	-13.3
					3528.4	130.7

130.7 Cubic Yard Cut for 3315 to 3323 Armoring

RIVERCOURT WAY (S. MEANDER)ARMORING SECTIONS AND CALCULATIONS

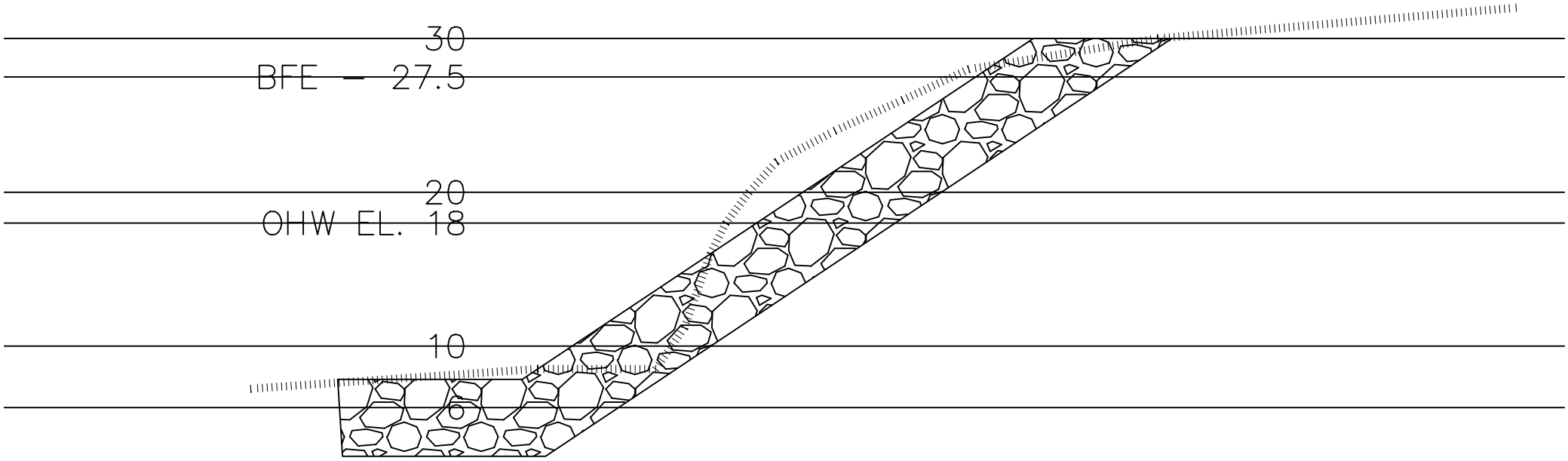


9387 D/S

CUT area below BFE: 33 s.f.

FILL area below BFE: 29.2 s.f.

NET area below BFE = CUT 4.2 s.f.



9387 U/S

CUT area below BFE: 35.9 s.f.

FILL area below BFE: 32.6 s.f.

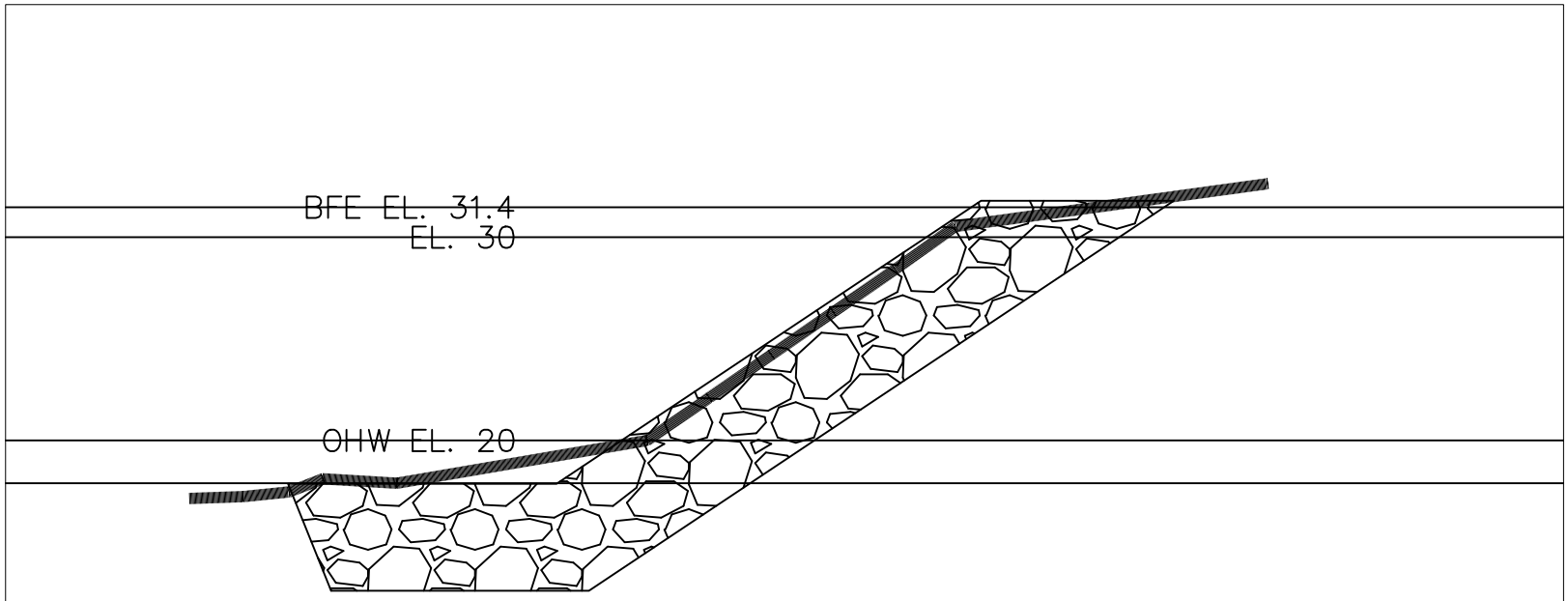
NETarea below BFE: CUT 3.3 s.f.

Bank Armoring 9387 Rivercourt Way

(+) = CUT (-) = FILL

	l (ft)	start area	end area	average	volume (cf)	CY
0 to 9387 D	30	0	4.2	2.1	63	2.3
9387 D to U	36	4.2	3.3	3.75	135	5.0
9387U to end	22	3.3	0	1.65	36.3	1.3
					234.3	8.7

8.7 Cubic Yard Cut for 9387 Armoring

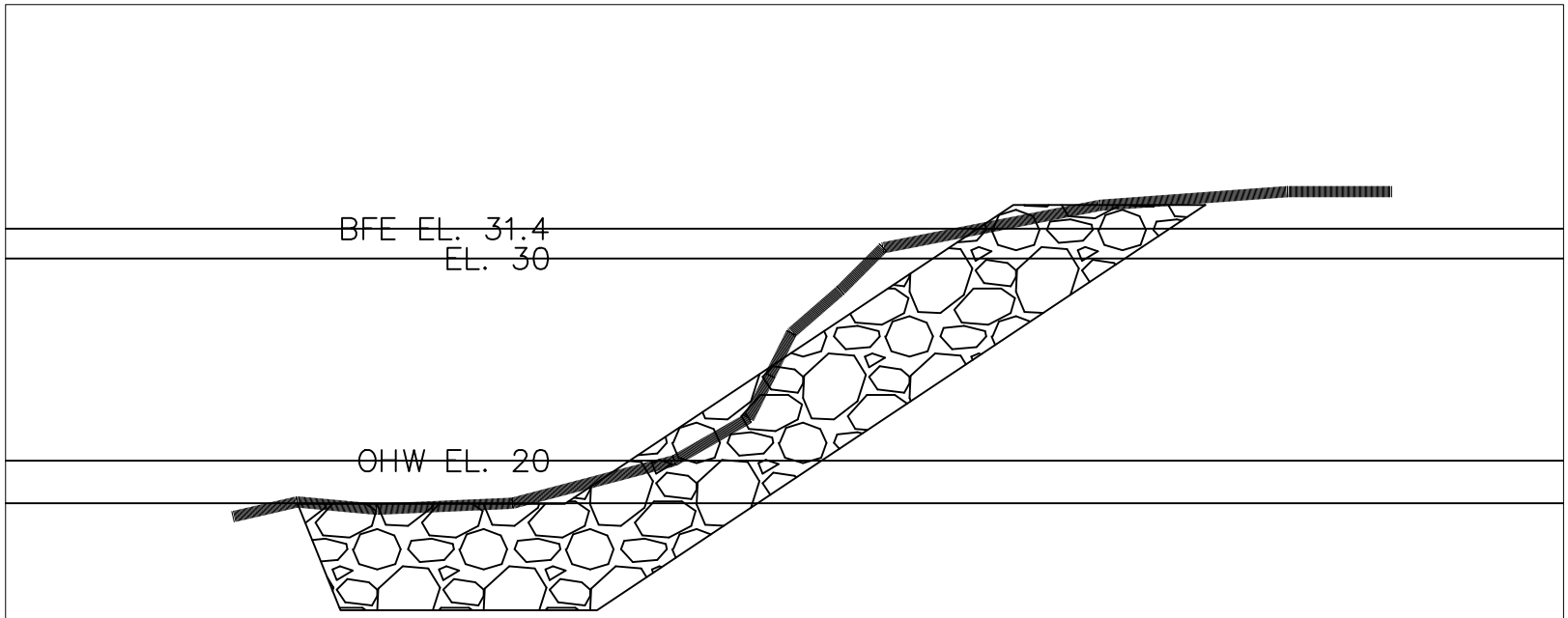


3495 Downstream

Cut area below BFE: 6.5 s.f.

Fill area below BFE: 9.9 s.f.

Net area below BFE: FILL 3.4 s.f.

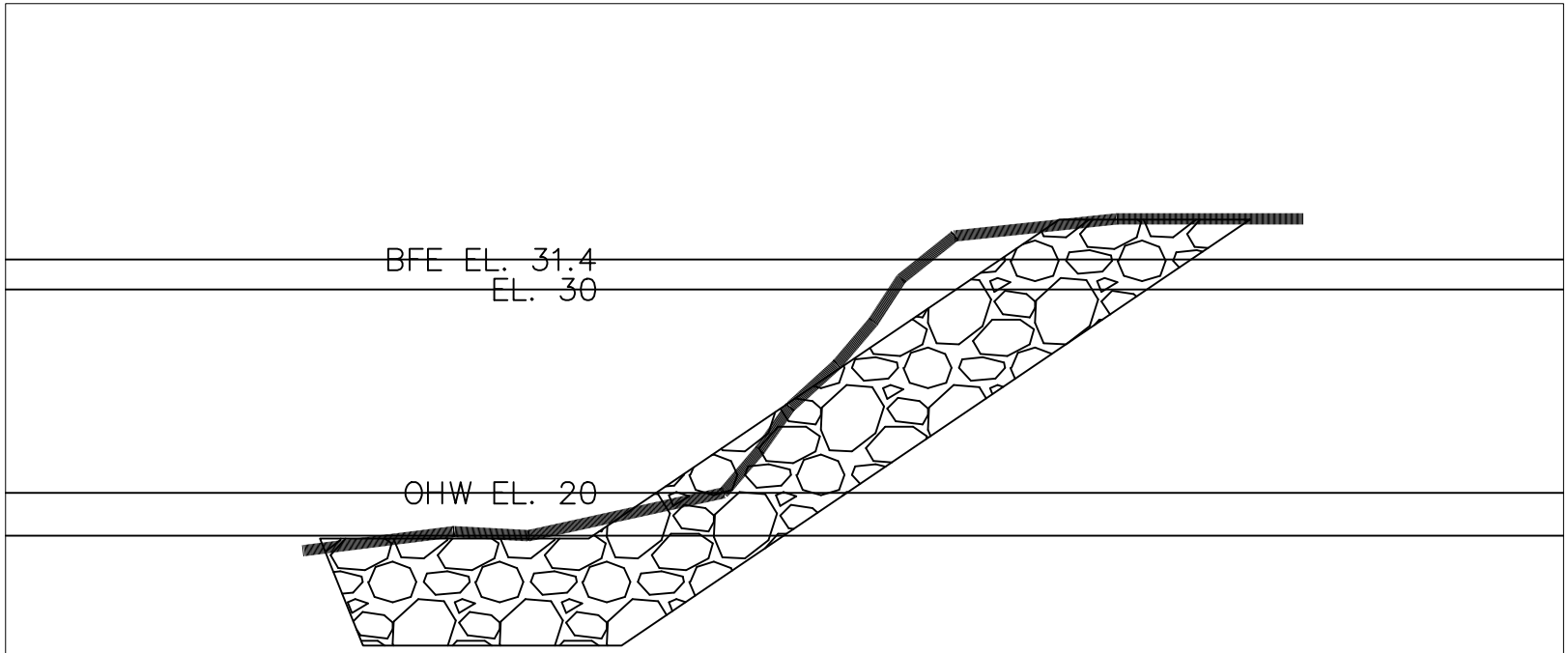


3495 Upstream

Cut area below BFE: 12.3 s.f.

Fill area below BFE: 9.0 s.f.

Net area below BFE: CUT +3.3 s.f.

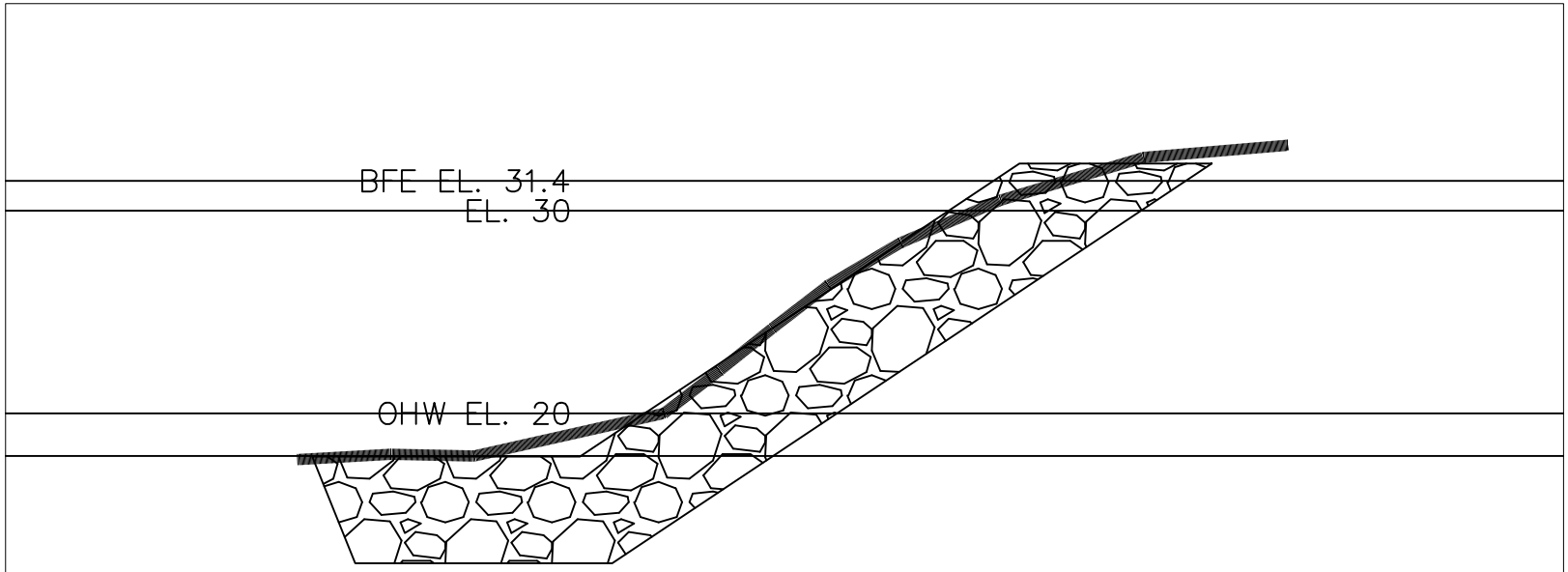


3499 Downstream

Cut area below BFE: 10 s.f.

Fill area below BFE: 9.0 s.f.

Net area below BFE: CUT 1.0 s.f.

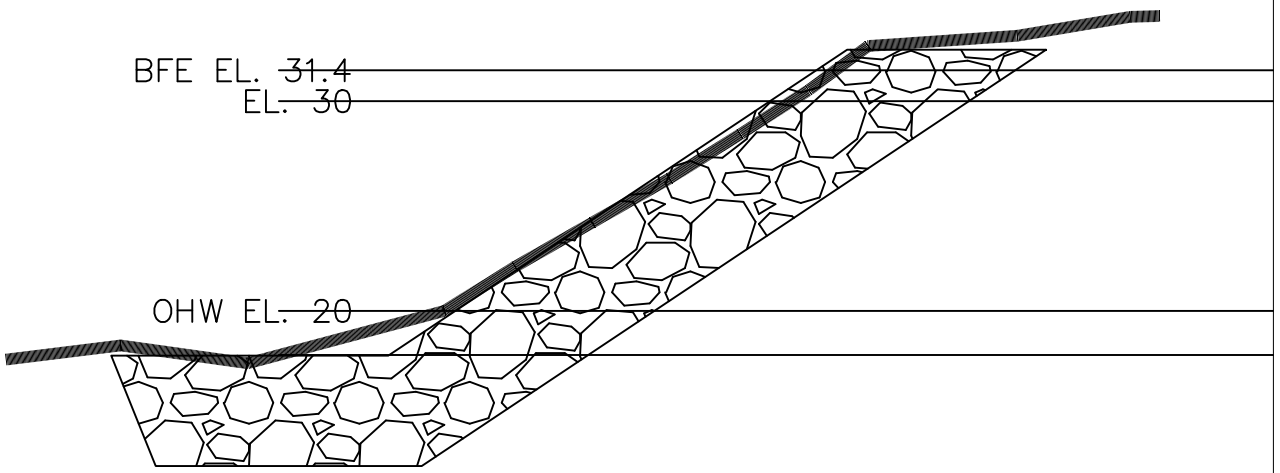


3499 Upstream

Cut area below BFE: 5.0 s.f.

Fill area below BFE: 4.4 s.f.

Net area below BFE: CUT 0.6 s.f.



CBJ - NHN

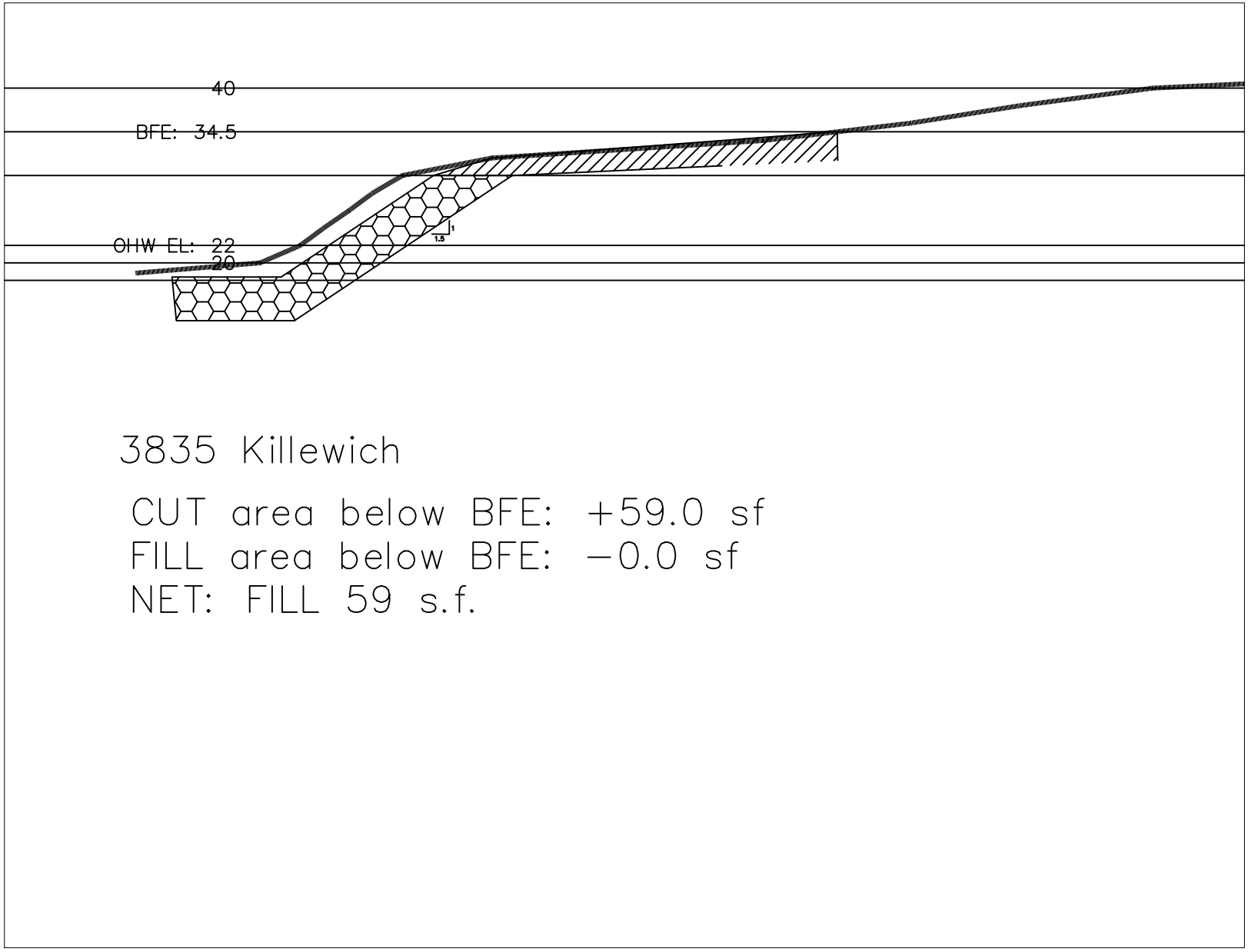
Cut area below BFE: 6.3 s.f.

Fill area below BFE: 4.9

Net area below BFE: CUT +1.4

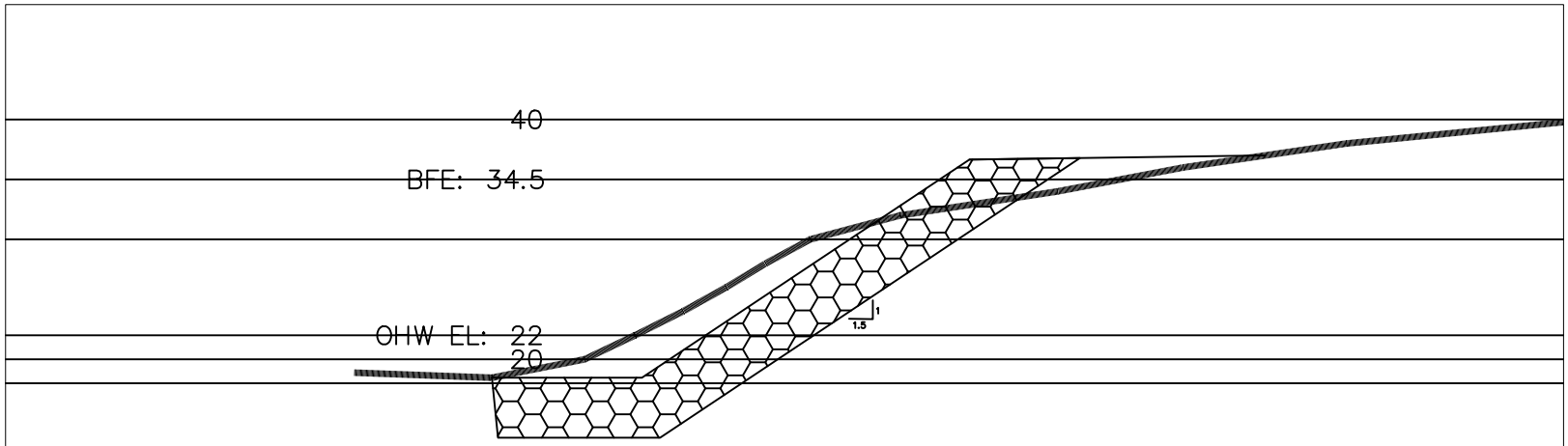
Bank Armoring 3495 Meander to CBJ (nhn) MeanderWay						
(+) = CUT (-) = FILL						
	l	start area	end area	average	volume (cf)	CY
0 to 3495 D	10.4	0	-3.4	-1.7	-17.68	-0.7
3495 d to u	76	-3.4	3.3	-0.05	-3.8	-0.1
3495u to 3499d	41	3.3	1	2.15	88.15	3.3
3499d to u	52.8	1	0.6	0.8	42.24	1.6
3499u to CBJ	51.2	0.6	1.4	1	51.2	1.9
CBJ to End	10	1.4	0	0.7	7	0.3
					167.1	6.2
6.2 Cubic Yard Cut for N. Meander Armoring						

KILLEWICH ARMORING SECTIONS AND CALCULATIONS



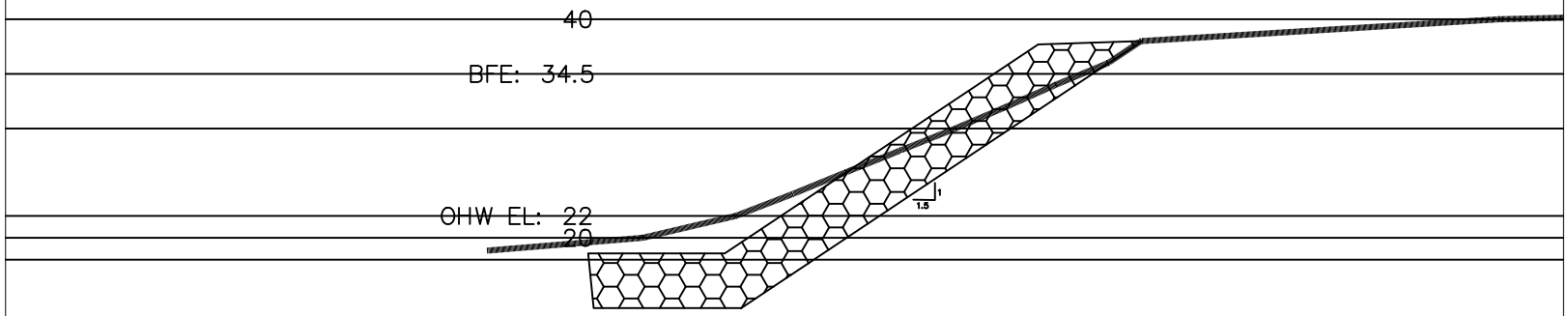
3835 Killewich

CUT area below BFE: +59.0 sf
FILL area below BFE: −0.0 sf
NET: FILL 59 s.f.



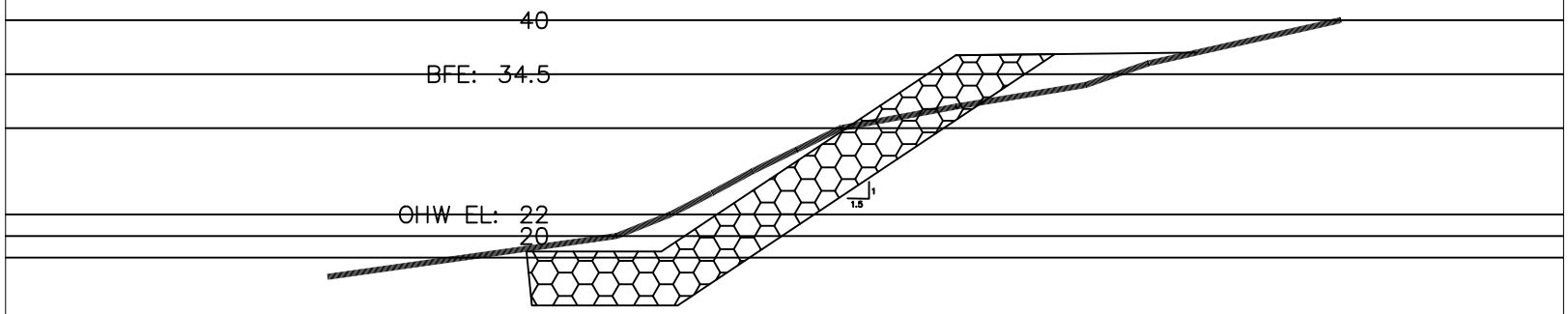
3839 U/S Killewich

CUT area below BFE: +35.4 sf
FILL area below BFE: −33.1 sf
NET : CUT 2.3 s.f.



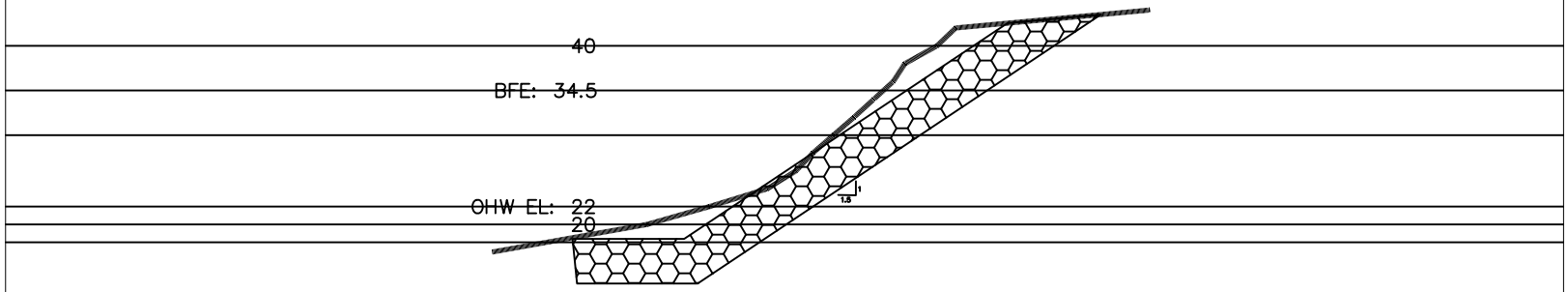
3839 D/S Killewich

CUT area below BFE: +41.9 sf
FILL area below BFE: −37.6 sf
NET: CUT 4.3 s.f.



3843 Killewich

CUT area below BFE: +51.1 sf
FILL area below BFE: −46.9 sf
NET: CUT 4.2 s.f.



3847 Killewich

CUT area below BFE: +17.0 sf

FILL area below BFE: −14.0 sf

NET: CUT 3.0 s.f.

Bank Armoring 3835 to 3847 Killewich

(+) = CUT (-) = FILL

	l	start area	end area	average	volume (cf)	CY
beginning to 3847	61	0	3	1.5	91.5	3.4
3847 to 3843	105	3	4.2	3.6	378	14.0
3843 to 3839 d/s	103	4.2	4.3	4.25	437.75	16.2
3839 d/s to u/s	50	4.3	2.3	3.3	165	6.1
3839 u/s to 3835	137	2.3	59	30.65	4199.05	155.5
3835 to end	45	59	0	29.5	1327.5	49.2
					6598.8	244.4

244 Cubic Yard Cut for Killewich Armoring

Attachment 8

Mendenhall River Preliminary 2D Surface Water Model Report

(204367-MBI-HH-RPT-001)

Prepared for:

City and Borough of Junea, AK
155 Heritage Way
Juneau, AK 99801
(907) 586-5385

Prepared by:

Michael Baker International
3900 C Street, Suite 900
Anchorage, Alaska 99503
(907) 273-1600

STATE OF ALASKA
49 TH
GARRETT YAGER
No. AELC 14867
6/6/2025
REGISTERED PROFESSIONAL ENGINEER

June 06, 2025

Revision History

REV	DATE	COMMENTS	MICHAEL BAKER APPROVAL	CLIENT APPROVAL
A	Feb 28, 2025	Draft	Garrett Yager	
B	Apr 25, 2025	Revise with USGS updates	Garrett Yager	
0	June 06, 2025	Final	Garrett Yager	

EXECUTIVE SUMMARY

This report documents the hydrologic and hydraulic analysis of the Mendenhall River Valley, Juneau, AK, in response to recent Suicide Basin Glacial Lake Outburst Flood (GLOF) events. This study was conducted to support the City and Borough of Juneau and other stakeholder agencies in evaluating current and future potential flood risk within a compressed schedule. To that end, a two-dimensional surface water model was developed using best available data. The surface water model was used to simulate a range of GLOF release events on the Mendenhall River. Hydrographs representing temporarily varied discharge from Suicide Basin, provided by the National Weather Service (NWS), were combined with U.S Geological Survey (USGS) flood frequency estimates to establish a suite of flood event scenarios.

Flood events were simulated to yield whole foot flood stage at the Mendenhall River streamgage near Auke Bay in Mendenhall Lake, managed by the USGS (Gage 15052500) and referenced by NWS (Gauge MNDA2) to provide real-time flood forecasting via the National Water Prediction Service. Inundation maps and depth grids whole foot stage discharge were developed from simulated flood events with the intent of updating current NWS flood forecasting maps.

The surface water model was also used to simulate HESCO barriers along the left (east) bank of the Mendenhall River, from Fireweed Lane to River Court Way. The HESCO barriers are intended to act as a temporary levee that will prevent floodwater from inundating the adjacent community. Simulation results were evaluated to assess the efficacy of HESCO barriers in prohibiting community flooding and possible impacts to previously unaffected community members. Small refinements to the HESCO barrier alignment were made to optimize layout based on model results. Breaches, or failures, in the HESCO barriers were not simulated as part of this study. As simulated, the proposed HESCO barriers prove highly effective in isolating the eastern floodplain from overbank flooding with very little impact to adjacent structures and property. Localized increases in water surface elevation occur within the Mendenhall River and western floodplain. Flooding extents increase most significantly in the undeveloped floodplain, with small increases near existing structures that are likely to be inundated by flooding in the absence of the barrier.

This model is considered preliminary. The model was calibrated to the 2024 GLOF event using high water survey and anecdotal data. The maximum simulated water surface had respective median and mean errors of 0.02 and -0.01 feet, and a standard error of 0.10 feet relative to high water survey. Incorporating supplemental survey and model updates will increase simulation accuracy and certainty.

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Figures

Tables

Acronyms and Abbreviations

1D	One-Dimensional
2D	Two-Dimensional
AC-FT	Acre-Feet
ADF&G	Alaska Department of Fish and Game
AEP	Annual Exceedance Probability
AKDOT&PF	Alaska Department of Transportation and Public Facilities
ASP	Alaska State Plane
BLE	Base Level Engineering
BN	Bridge Number
CBJ	City and Borough of Juneau, Alaska
CFS	Cubic Feet Per Second
DEM	Digital Elevation Model
DTM	Digital Terrain Model
DGGS	State of Alaska Division of Geological and Geophysical Surveys
FEMA	Federal Emergency Management Agency
FT	Feet
GLOF	Glacial Lake Outburst Flood
H&H	Hydrology and Hydraulics
HEC-RAS	Hydrologic Engineering Center's River Analysis System
LiDAR	Light Detection and Ranging
Michael Baker	Michael Baker International, Inc.
MHHW	Mean Higher-High Water
MLLW	Mean Lower-Low Water
NAD83	North American vertical Datum of 1983
NLCD	National Land Cover Dataset
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service (NOAA)
SfM	Structure from Motion
USACE	U.S. Army Corps of Engineers
UAS	University of Alaska Southeast
UAV	Unmanned Aerial Vehicle
USGS	U.S. Geological Survey
WGS84	World Geographic System 1984
WSE	Water Surface Elevation

1.0 Introduction

The Mendenhall River Valley (the Valley) is the most populated area within the City and Borough of Juneau (CBJ), Alaska. Located approximately 10 miles northwest of Downtown Juneau, it is surrounded by the Tongass National Forest. Within the Valley watershed lies the Mendenhall Glacier, Mendenhall Lake, and Mendenhall River.

Suicide Basin is a side basin of the Mendenhall Glacier located approximately one mile from the Mendenhall Glacier terminus. As Suicide Glacier retreated, the exposed terminus began filling with annual snowmelt, ice melt, and rainfall runoff. Being dammed by the Mendenhall Glacier, the calving face holds back water and sheds icebergs into the lake. In 2009 the first glacial lake outburst flood (GLOF) was recorded, with subsequent GLOFs occurring almost annually. The 2014 GLOF resulted in a peak discharge of 19,900 cubic feet per second (cfs), exceeding the Federal Emergency Management Agency (FEMA) estimated 100-year peak flow of the Mendenhall River of 17,100 cfs. The 100-year discharge, as reported in the 2020 flood insurance study (FEMA 2020), was calculated based on 34 years of historic flood data reported at the USGS-maintained streamgage station (15052500) located in Mendenhall Lake. The data used preceded historic GLOFs.

To provide a better understanding of flood risk within the Valley, the National Weather Service (NWS) completed a flood inundation study of the Mendenhall River (NWS 2016), from which flood inundation maps were developed and made accessible via the web (NWS 2025a). Inundation maps and much of the historical hydrologic data reference the Mendenhall River streamgage (gage) managed by the U.S. Geological Survey (USGS), identified as Gage 15052500, and referenced by NWS as Gage MNDA2.

During August of 2023 and 2024, Suicide Basin GLOFs resulted in subsequently historic peak flooding in the Valley, yielding respective peak discharges of 34,200 cfs and 42,700 cfs, and historic crests of 14.97 feet and 15.99 feet at the Mendenhall River gage. These events resulted in significant erosion and flooding of homes and property. The 2024 GLOF produced a historic crest elevation equivalent to the maximum stage (16 feet) currently mapped by NWS. Both events also resulted in significant morphological changes to the Mendenhall River, influencing flood hydraulics and associated flood inundation.

There is a growing concern that significant flooding equivalent to or greater than the 2024 GLOF will become an annual, or more frequent, occurrence. The affected flood area includes a high number of residential homes as well as critical infrastructure such vehicle roadways, schools and other developed facilities. A better understanding of future potential flooding and how flood waters interacted with the channel and surrounding topography is needed to better inform the community of potential risk and support short- and/or long-term solutions to minimize and prevent flood risk.

1.1 Purpose of Study

The purpose of this study was to develop a preliminary, base level engineering (BLE) two-dimensional (2D) surface water model that can be leveraged to update NWS flood inundation maps and evaluate efficacy of temporary flood fighting and mitigation measures. This study will support multi-agency collaborative action to further document, assess, and mitigate flood risk to community residents, businesses, and critical infrastructure in the Mendenhall River Valley. Given the increasing magnitude and frequency of GLOFs in the Valley, as well as significant changes to the Mendenhall River channel, CBJ plans to position

flood barriers along the east (left) bank of the Mendenhall River as an immediate, short-term countermeasure to future flooding.

1.2 Project Location

The CBJ governs an area of over 2,700 square miles, hosting a population of 32,100 residents (2022 census). It is bordered to the east by British Columbia, Canada, to the north and northwest by Haines Borough, and to the south and southwest by the unincorporated Tongass National Forest. Juneau International Airport is located at the southern extents of the Mendenhall Valley, located northwest of downtown Juneau. The project location covers the Mendenhall Valley, from Mendenhall Lake to the Gastineau Channel (Figure 1-1). The modeled study reach covers the Mendenhall River, from Mendenhall Lake to the Gastineau Channel.

Figure 1-1 Project Location Map

1.3 Overview of Approach

Project scope includes a hydrologic and hydraulic (H&H) analysis of the Mendenhall River Valley to tidewater in relation to Suicide Basin GLOFs, to be performed under a compressed schedule. The H&H analysis was based on best available data collected through multi-agency collaboration and close coordination with CBJ (Michael Baker 2024). To address project needs in the allotted time, a two-dimensional (2D) surface water model was developed using recent, best available topographic data calibrated to the 2024 flood event. Once a reasonably representative hydraulic model was developed for current conditions, predicted flood events were simulated to develop new inundation maps for each incremental whole foot stage elevation at the Mendenhall River gage.

The calibrated model was also used to simulate the proposed Phase 1 HESCO (HESCO) barrier positioned along the left (east) bank of the Mendenhall River, approximately from Fireweed Lane to River Court Way. Simulations with the HESCO in place are intended to assess the efficacy of HESCO barriers in prohibiting community flooding and possible impacts to previously unaffected community members.

2.0 Hydrology

2.1 Watershed Description

The Mendenhall River watershed covers an area of approximately 103 square miles, extending from 7,000 feet elevation in the Tongass National Forest to sea level at the coastal Gastineau Channel. A significant portion of the watershed is covered in glaciers, with much of the lower undeveloped watershed being covered by muskeg and spruce forest. The mountainous terrain and glaciers result in highly variable temperatures and precipitation across the watershed.

The Mendenhall River begins at the receding terminus of the Mendenhall Glacier at the north end of the valley. Mendenhall River drains into Mendenhall Lake, a large glacial moraine lake, which also receives flow from Nugget Creek, Steep Creek, and several small tributaries. Mendenhall River exits the lake near View Drive and flows southward through the valley before draining into the Gastineau Channel and Fritz Cove. Approximately 0.8 miles upstream of Egan Drive (Glacier Highway), Montana Creek enters Mendenhall River from the west.

The Mendenhall Valley is rising relative to sea level. This uplift is a result for both tectonic activity and glacial rebound. As the Valley rises the channel cuts (incises) into the surrounding terrain, reducing and in some cases abandoning adjacent floodplains (Neal and Host 1999) during equivalent flood events. However, this incision has only minimized the potential extent of historic flooding experienced during recent GLOFs.

2.2 Nature of Flood Risk and Historic Flooding

Mean annual precipitation is approximately 50 inches, which includes approximately 86 inches of snow, at Juneau Airport. Mean annual precipitation at the head (top) of the Mendenhall Glacier is estimated to be greater than 20 inches. Maximum annual precipitation typically occurs in the fall months, with increased occurrence and magnitude of regional storms and glacial runoff. Flooding associated with seasonal rainfall runoff and minor GLOF events is generally contained within the banks of the Mendenhall River study reach.

Between 2009 and 2014, the Mendenhall River received floodwater from Suicide Basin GLOFs one to two times per year (NWS 2016). Since then, the NWS has documented one to ten (2015) annual glacial damned lake releases from Suicide Basin (NWS 2025b). A plot of historic peak annual events (USGS 2025a) and reported GLOF events (NWS 2025b) is shown in Figure 2-1. Not all of the events resulted in flooding, though eight of the last 16 peak annual events were a result of GLOFs, with five of them yielding the top five peak annual events in the 59 year gage record. Recent 2023 and 2024 peak GLOF events yielded the top two historic flood events (Figure 2-2). The 2023 event release was approximately 58% greater discharge then the historic maximum rainfall runoff event, and nearly 48% greater than FEMA's effective 100-year discharge. The 2024 event released 35% greater discharge than the 2023 event, 113% greater discharge than the historic maximum rainfall runoff event, and nearly double (98% greater) FEMA's effective 100-year discharge.

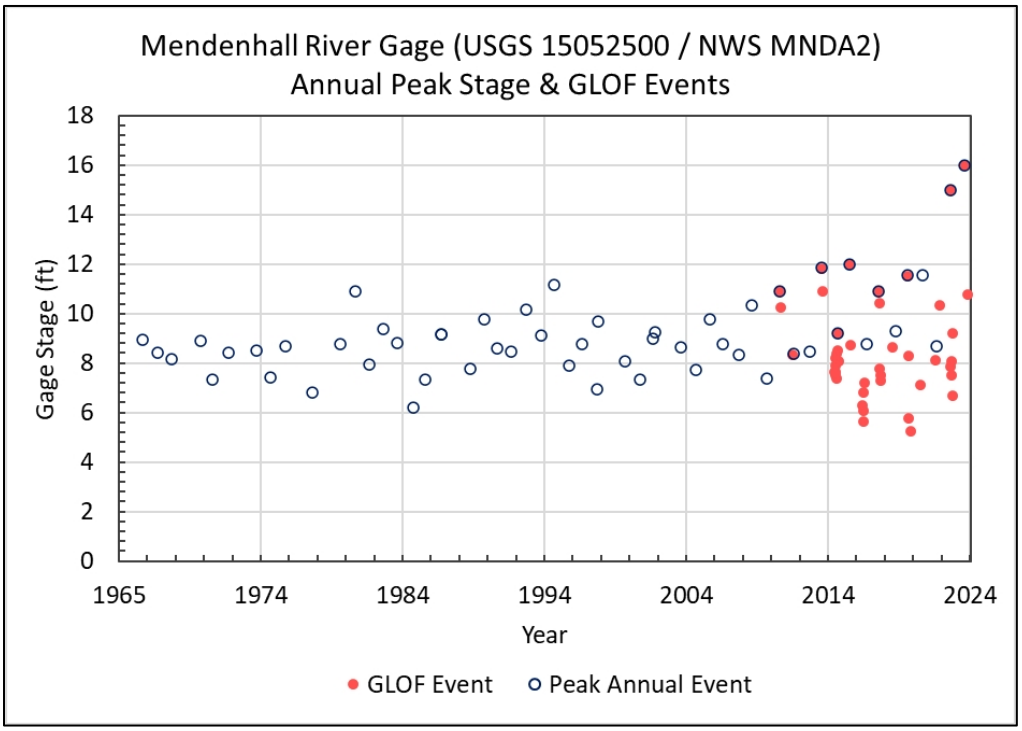

Figure 2-1 Peak annual stage and GLOF event records at the Mendenhall River gage

Prior to installation of the Mendenhall River gage, a large flood occurred in the late summer of 1961, having an estimated peak discharge of 27,000 cfs (Barnwell and Boning 1968). This event was associated with significant reported rainfall, with five inches recorded over a three day period in August. However, the one and three day rainfall recurrence intervals were roughly 2 and 10 years, respectively. This suggests that the 1961 flood may very well have been the result of a GLOF.

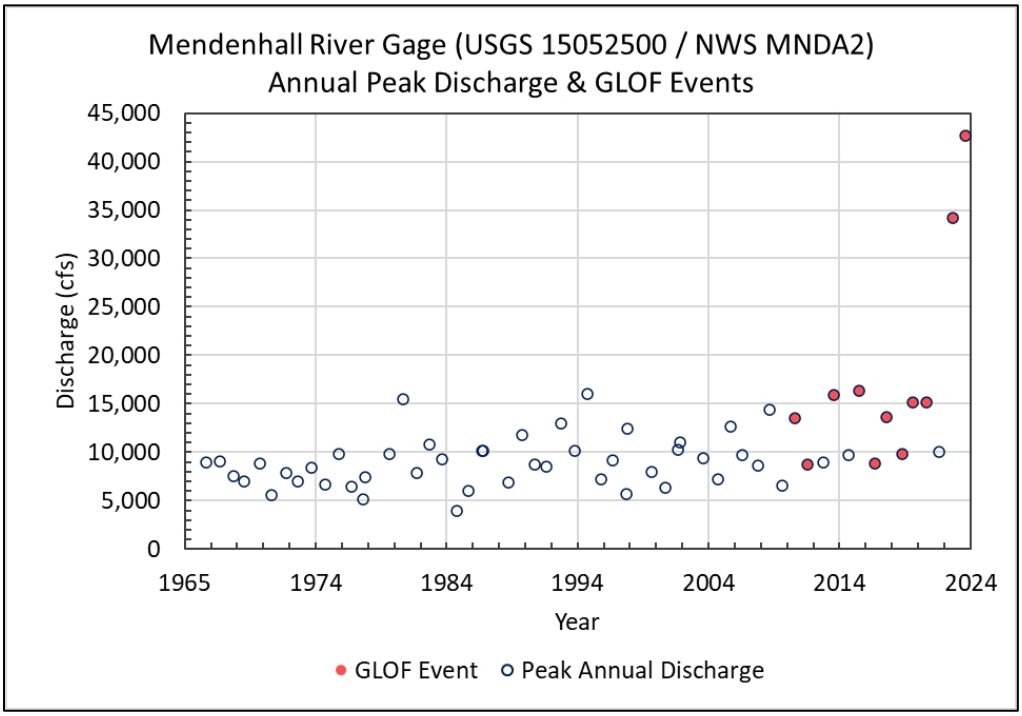

Figure 2-2 Peak annual discharge and GLOF event records at the Mendenhall River gage

Recent 2023 and 2024 GLOFs caused significant flooding upstream of Back Loop Road, impacting both residents and U.S. Forest Service (USFS) facilities, and in the heavily developed eastern floodplain downstream of Back Loop Road. The extent and magnitude of flooding has been well documented by CBJ, USGS, NWS, USACE, and University of Alaska Southeast (UAS) (Michael Baker 2024; NWS 2023, 2024, 2025c). These events also resulted in significant bank erosion, to which several residential buildings were lost. Bridge inspections performed by Alaska Department of Transportation & Public Facilities (ADOT&PF) also revealed substantial channel bed erosion at Back Loop Bridge and the Pedestrian Bridge downstream of the Montana Creek confluence; as much as 6 feet during the 2024 GLOF.

Significant sequential increases in annual flood magnitude associated with GLOF events, and the uncertainty of future events, warrants immediate concern and action by all local stakeholders.

2.3 Study Hydrology

The 2D surface water model relies on manually assigned boundary conditions representing riverine hydrology and downstream control. Inflow hydrology (discharge) for the Mendenhall River and Montana Creek were modeled. The downstream control represents tidewater in the Gastineau Channel and Fritz Cove to which the Mendenhall River drains.

2.3.1 Mendenhall River

Mendenhall River discharge was modeled as an unsteady hydrograph representing the GLOF release volume on top of a constant baseflow that the river may be experiencing prior to and following the GLOF.

Inflow hydrographs were developed using nested Suicide Basin GLOF hydrographs provided by NWS (2025d) and station-based flood frequency estimates published by USGS (Curran 2025).

The NWS-provided GLOF hydrographs were derived using a scaled average of the 2023 and 2024 GLOF hydrographs recorded at the Mendenhall River gage, normalized to a consistent time interval (15 minutes) and removal of baseflow. The average discharge was then computed in cumulative and hourly volumes. Scaling was performed by adjusting the total Suicide Basin release volume in 5,000 acre-feet (ac-ft) increments and distributing the relative runoff volume across the hourly timestep to yield a range of hourly hydrographs representing release volumes from 5,000 to 70,000 ac-ft.

Each of the nested GLOF hydrographs had an additional constant baseflow added to the incremental discharge value equal to the 50% annual exceedance probability (AEP), or 2-year recurrence interval, event. Subsequent baseflow events were then assigned to the 70,000 ac-ft hydrograph to steadily increase baseflow and total peak discharge. Modeled baseflows included the 50, 10, 4, 2, 1, and 0.5% AEP events. These coincide with the 2-, 10-, 25-, 50-, 100-, and 200-year flood recurrence intervals. This approach provided increased peak discharge using probable riverine hydrology without extrapolating GLOF release hydrographs beyond those established by NSW.

The peak discharge of each combined Mendenhall River inflow hydrograph was then compared against the USGS Mendenhall River gage rating curve (USGS 2025b) to identify the associated stage and respective whole foot event for inundation mapping. Only the 70,000 ac-ft GLOF and 4% AEP baseflow produced a combined peak discharge equivalent to a whole foot stage (18FT). Supplemental GLOF hydrographs were developed, while maintaining baseflow, to yield peak discharges associated with whole foot stage elevations from 9 to 20 feet, as requested by CBJ. This required expanding the range of GLOF release volumes and NWS-provided hydrographs, from 1,850 ac-ft to 100,500 ac-ft. It also required extrapolating the USGS rating curve from its upper limit of 18.92 feet to 20 feet. To achieve the 8-foot (8FT) stage, a constant baseflow less than the 50% AEP was modeled. The resulting Mendenhall River inflow hydrographs are plotted in Figure 2-3. Contributing and combined peak discharges for each event are tabulated in Table 2-1. Each event is identified by the associated.

For the 2024 calibration, the discharge hydrograph reported at the Mendenhall River gage (USGS 2025a) was modeled as inflow to the Mendenhall River. Similar data was used for the 2023 event used for model validation.

2.3.2 Montana Creek

Discharge modeled on Montana Creek is intended to serve as a probable contributing flow during a GLOF event, that increases downstream flow on the Mendenhall River and reduces flood storage capacity within the coincident Montana Creek and Mendenhall River floodplain. There is little certainty as to the magnitude or timing of peak discharge on Montana Creek during the GLOF. As such, a steady discharge equivalent to 10% of the Mendenhall River baseflow was applied. This approach is consistent with that used in the 2015 Mendenhall River Inundation Study (NWS 2016). Event-specific discharges are presented in Table 2-1.

For the 2024 and 2023 events, NWS provided the historic gage record on Montana Creek. The record was used to calculate an average flow which varied little during and between events; 105 cfs (2024) and 100 cfs (2023).

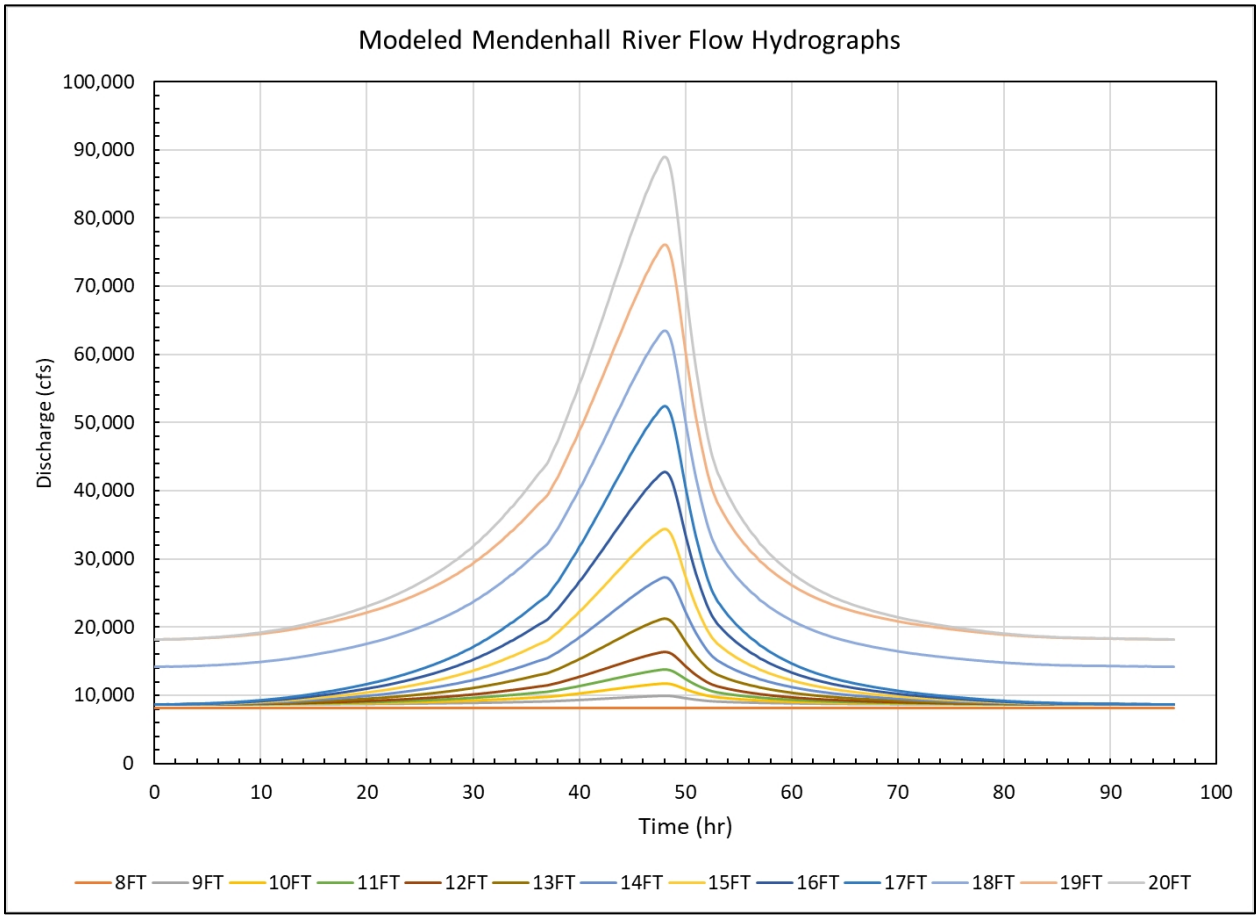

Figure 2-3 Modeled Mendenhall River Inflow Hydrographs for Inundation Events

Table 2-1 Inundation Event Hydrology

EVENT[1]	PEAK DISCHARGE (CFS)		GLOF Maximum Volume (AC-FT)	GLOF Peak Discharge (CFS)	Mendenhall Baseflow Discharge (CFS)	Mendenhall Baseflow AEP
	Mendenhall River[2]	Montana Creek[3]				
8FT	8,080	808	0	0	8,080	< 50%
9FT	9,923	862	1,850[5]	1,303	8,620	50%
10FT	11,706	862	4,380[5]	3,086	8,620	50%
11FT	13,798	862	7,350	5,178	8,620	50%
12FT	16,405	862	11,050	7,785	8,620	50%
13FT	21,301	862	18,000	12,681	8,620	50%
14FT	27,289	862	26,000	18,669	8,620	50%
15FT	34,404	862	36,600	25,784	8,620	50%
16FT	42,788	862	48,500	34,168	8,620	50%
17FT	52,369	862	62,100	43,749	8,620	50%
18FT	63,515	1,420	70,000	49,315	14,200	4%
19FT	76,039[4]	1,820	82,100[5]	57,839	18,200	0.5%
20FT	89,002[4]	1,820	100,500[5]	70,802	18,200	0.5%

Notes:
1. Modeled event name signifies the whole foot stage associated with peak discharge at USGS Gage 15052500 per 2025 rating curve (USGS 2025a).
2. Mendenhall River peak flow is a combination of GLOF peak discharge and baseflow.
3. Montana Creek flows applied as constant discharge equal to 10% of Mendenhall River baseflow.
4. USGS rating curve extrapolated beyond the 18.92 ft upper limit to establish a peak discharge.
5. GLOF hydrographs developed beyond the NWS-derived limits to achieve whole foot stage.

2.3.3 Tidewater Control

Downstream control was established as a known water surface elevation. For all predicted events a constant elevation of 20 feet (Mean Lower-Low Water, MLLW) was used. This is a conservative estimate, being approximately 3.7 feet above Mean Higher-High Water(MHHW) and held constant over the entire event. This approach is consistent with that used in the FEMA effective model (FEMA 2020) and the 2015 Mendenhall River Inundation Study (NWS 2016).

For the 2024 and 2023 events, verified tidal records were downloaded from the NOAA tide station 9452210 Juneau, AK webpage (NOAA 2024). The tidal data was modeled as a stage hydrograph boundary condition for the calibration and validation simulations.

All supporting model hydrology data, including raw source data, are provided with the model.

3.0 HEC-RAS 2D Surface Water Model Development

3.1 Background

The 2D surface water model was developed using the latest current Hydrologic Engineering Center's River Analysis System (HEC-RAS, USACE 2024) software, version 6.6. The 2D model simulates hydraulics of unsteady and quasi-steady stated riverine flood flows and tidal elevations. Relative to a one-dimensional (1D) surface water model, use of a 2D model provides greater detail in representing distributary flood flow from the channel into and across the adjacent floodplain. This allows the model to consider topographic features that limit or allow lateral flow to spill from the channel, as well as structures or roads that direct and convey flow through residential and commercial areas, capturing both global and local influences on flooding.

The structure and content of the model meets the typical standards of a 2D BLE Level D model (FEMA 2021) by incorporating hydraulic structures and calibrating to historical data but not including channel bathymetry. The selected level of modeling detail was chosen based on best available data and compressed project schedule. Future model revision is recommended as additional data, specifically bathymetry, becomes available and as channel geometries change with subsequent flood events.

Model extents and mesh detail were selected to reasonably represent flooding in the Mendenhall River Valley from the outlet of Mendenhall Lake to the outfall of the Mendenhall River into the Gastineau Channel. Boundary condition error exists at the terminal limits of the model domain, as with all hydraulic models, limiting model solution confidence to the Mendenhall River reach and lateral floodplains.

3.2 Modeled Scenarios

Two primary conditions were modeled: Existing and Phase 1 HESCO. Each condition was modeled under specific flood events creating a unique model scenario.

Existing conditions were modeled using best available data of the current topographic and hydraulic conditions of the Mendenhall River and adjacent floodplain. This condition best represents hydraulic conditions during the 2024 GLOF. The Existing condition was calibrated to the 2024 GLOF event and validated against the 2023 GLOF event. Each of the 21 flow events discussed in Section 2.3 and Table 2-1 were modeled using the calibrated Existing condition. Resulting flow conditions associated with whole foot stage at the Mendenhall River gage were used to generate inundation and depth grid maps.

The Phase 1 HESCO (HESCO) condition represents Existing conditions with the inclusion of HESCO barriers positioned along the left (east) bank of the Mendenhall River, approximately from Fireweed Lane to River Court Way. The HESCO condition is intended to assess the efficacy of HESCO barriers in prohibiting community flooding and possible impacts to previously unaffected community members. The 1% AEP (100-year), 2024 GLOF, 45K+50% and 65K+50% flow events were modeled using the HESCO condition. Inundation and depth grid maps were developed for the 45K+50% and 65K+50% flow events.

3.3 Topographic Base Map

The 2D model sources several terrain files of varying resolution and dates of capture. The best available local data was used to composite a topographic basemap referenced by the model. Five unique terrain files were used to generate the composite surface:

October 2024 Draft LiDAR DTM: The most recent survey, covering most of the project area, was collected and processed by Elevate UAS for AKDOT&PF. The light detection and ranging (LiDAR) survey was collected on October 21, 2024, during a declining river discharge of 4,500 to 2,800 cfs. Additional LiDAR was captured through most of the Mendenhall River corridor on October 31 and November 1 during lower flow, however this data had not been processed as part of the provided draft digital terrain model (DTM). The draft DTM has a resolution of 1-foot. A final digital terrain model (DTM) including the later river corridor survey was provided but was not included in the model due to time constraints. This terrain surface served as the primary terrain source, to be supplemented as data was available and required.

October 2024 DOWL UAV Survey: Survey of the Mendenhall River corridor was collected from the approximate outfall of Mendenhall Lake to approximately 500 feet downstream of Egan Drive. Data was collected on October 3 and 4, 2024 by DOWL using an unmanned aerial vehicle (UAV) during a declining discharge of 920 to 680 cfs. Photogrammetric data was processed using structure from motion (SfM). The terrain surface was provided in a drawing file format (.dwg) and was exported to a 1-foot resolution .tif file for further processing. This terrain served to enhance channel topography below the October 2024 Draft LiDAR DTM water surface.

2021 Mendenhall Lake Bathymetry: Lake bathymetry collected by PND for the U.S. Forest Service on May 23, 2021. Elevations were derived from measured depths referenced to a water surface elevation measured at USGS gage 15052500. This 1-meter resolution terrain served to provide bathymetry below the October 2024 Draft LiDAR DTM water surface.

Juneau 2013 LiDAR DEM: The most recent terrain data currently available via the State of Alaska Division of Geological and Geophysical Surveys (DGGS 2024). The 1-meter resolution digital elevation model (DEM), captured in April 2013, was downloaded from the DGGS portal on November 14, 2024. This terrain served to expand the lateral extents of the October 2024 Draft LiDAR DTM, predominantly to include the coastal Gastineau Channel.

No bathymetric data of the current channel is available outside of bridge soundings collected by ADOT&PF at the Back Loop Road Bridge (Bridge Number (BN) 0217), Pedestrian Bridge (BN 1904), and Egan Drive Brotherhood Bridge (BN 0737). Soundings suggest approximately 6.0 to 6.5 feet of thalweg scour occurred at the Back Loop Bridge, 6.3 feet of thalweg scour occurred at the Pedestrian Bridge, and little measured thalweg scour occurred at the Brotherhood Bridge during the August 2024 GLOF. Local enhanced bridge hydraulics often result in greater scour and deeper channels than unbridged channels. Given the nature of localized hydraulics, bridge spacing, and variability in channel shape and slope between bridges, interpolating a bathymetric surface from bridge soundings was deemed questionable and unnecessary during the preliminary model calibration. Prior studies (NWS 2016 and FEMA 2020) do include bathymetry and were evaluated against the topographic base map; this data was not adopted given the magnitude of channel bed change in response to 2023 and 2024 flooding.

Building footprints were also included in the topographic map. Further discussion of supporting data and processing of the building raster are discussed below (Section 3.3.3).

3.3.1 Vertical Datum

The vertical datum used was MLLW (NTDE 83-01) based on two NOAA benchmarks for tide station “9452210, Juneau, Gastineau Channel, Stephens Pass, AK”. This is the same vertical datum used by past studies and relevant survey, including LiDAR, UAV, bathymetry, and high water mark surveys. As part of the 2015 Mendenhall River Flood Inundation Study (NWS 2016), USGS gage 15052500 was surveyed to

this datum. Add 55.99 feet to convert the reported river gage stage (e.g. 16 feet) to the project datum (e.g. 71.99 feet MLLW).

3.3.2 Horizontal Coordinate System

The project used the Alaska State Plane (ASP) Zone 1 projection in feet based off the North American Datum of 1983 (NAD83). All model input data were projected into the spatial reference shown in Figure 3-1.

```
PROJCS["NAD_1983_2011_StatePlane_Alaska_1_FIPS_5001_Feet",GEOGCS
["GCS_NAD_1983_2011",DATUM["D_NAD_1983_2011",SPHEROID
["GRS_1980",6378137.0,298.257222101]],PRIMEM["Greenwich",0.0],UNIT
["Degree",0.0174532925199433]],PROJECTION
["Hotine_Oblique_Mercator_Azimuth_Natural_Origin"],PARAMETER
["False_Easting",16404166.66666666],PARAMETER["False_Northing",-16404166.66666666],PARAMETER
["Scale_Factor",0.9999],PARAMETER["Azimuth",-36.86989764583333],PARAMETER["Longitude_Of_Center",-
133.6666666666667],PARAMETER["Latitude_Of_Center",57.0],UNIT["Foot_US",0.3048006096012192]]
```

Figure 3-1 Project Horizontal Datum Parameters

3.3.3 Terrain Processing

Terrain sources were evaluated for accuracy and preference of use prior to developing the existing conditions topographic base map. Due to spatial transformation limitations in RAS Mapper, all raster terrain data was reprojected into the World Geographic System 1984 (WGS 84), prior to creating the topographic base map in RAS Mapper. Original raster resolution was maintained and the WGS 84 projected raster was snapped to the native raster.

The October 2024 Draft LiDAR (2024 LiDAR) surface was identified as the primary base surface for terrain processing. To enhance channel geometry below the LiDAR-captured water surface, the October 2024 DOWL UAV (2024 UAV) terrain was adopted. A manually derived masking polygon was digitized along the edge of water using aerial imagery, hillshade terrain symbology, and contours. Within this polygon, the 2024 UAV surface was burned into the 2024 LiDAR. Similarly, the 2021 Mendenhall Lake Bathymetry was burned into the 2024 LiDAR over the full extent of the 2021 surface. The 1-meter resolution bathymetry was resampled to the 1-foot resolution of the 2024 LiDAR. Composite terrains were snapped to 2024 LiDAR to maintain the original terrain outside the limits of terrain burning. The composite surface was reprojected to the WGS 84 projection. The resulting terrain surface, 2024DOT_2024UAV_2021USFS_ WGS84.tif was referenced as one of three surfaces in RAS Mapper to develop the model terrain.

The second surface was developed to represent buildings in the model terrain. Building footprints were downloaded from the Microsoft US Building Footprints GitHub link for Alaska (Microsoft 2024). Building polygons were reviewed against recent aerial imagery and the State of Alaska 911 Address Database (Alaska 2024) point file. Building footprints were removed where no structure was visible in aerial imagery and/or 911 point was missing. Building footprints were added where a 911 point was coincident with a structure in aerial imagery. A large number of the original building footprint features were manually adjusted where structures were poorly represented, likely due to image quality and the algorithm used to automatically generate original footprints. The footprints were then converted to a 1-foot resolution raster layer snapped to the 2024 LiDAR and assigned elevations 10 feet above the 2024 LiDAR. The resulting building surface, reprojected to the WGS 84 projection (Buildings_WGS84.tif), was referenced as the second of three surfaces in RAS Mapper.

The Juneau 2013 LiDAR was clipped to cover an area beyond the extents of hydraulic modeling, snapping the resulting terrain file to the original. Elevations, provided in meters, were converted to feet and the surface was reprojected to WGS84. The resulting 3-meter resolution raster (dtm_1m_Block7_masked_lp_FT_WGS84.tif) was referenced as third and final surface in RAS Mapper.

When developing the new terrain layer in RAS Mapper the three layers were not merged to a single raster and no vertical conversion was applied.

3.4 Hydraulic Inputs

Certain features and topographic characteristics influence the extent and magnitude of flooding within the model domain. The following describes the hydraulic inputs used to capture these influences within the model.

3.4.1 Hydraulic Control Features

Roadway spatial data provided by CBJ were leveraged to produce the initial hydraulic control feature dataset, or breaklines, for the 2D model. These datasets were reviewed and manually modified against the topographic basemap and aerial imagery. Unnecessary roads, such as those outside of maximum inundation extents, those having little no hydraulic control, or adding unnecessary complexity to the model, were removed from the final breakline layer.

Additional breaklines were added to high ground topographic breaks that could contain and/or direct floodwater, including but not limited to ridges, berms, and buildings. Breaklines were also delineated to represent channels and bounds of dominant conveyance corridors.

3.4.2 Buildings

Building footprints were incorporated into the topographic base map as discussed in Section 3.3.3.

3.4.3 Hydraulic Structures

Bridges on the Mendenhall River were modeled using SA/2D Connections and bridge geometries captured in ADOT&PF as-built plans and bridge sounding workbooks. Known culverts conveying channelized flow across roads were modeled using terrain modifications to provide hydraulic connectivity across the roads. In the absence of available data, the pedestrian bridge over Montana Creek was not modeled. Further discussion of hydraulic structure modeling is presented in sections 3.5.5 and 3.5.6.

3.4.4 Roughness coefficients

Polygons representing land cover classes were developed using aerial imagery, ground imagery, terrain, roadway spatial data, and the 2016 National Land Cover Dataset (NLCD). The 2016 NLCD data was deemed too coarse for use in the model, though associated land cover classes were referenced for assignment in the digitized land cover layer. Roadway polylines were buffered into polygons, which were cleaned and manipulated based on terrain and aerial imagery to represent roads. Additional paved, gravel, and turf areas with lower Manning's roughness values were manually delineated. The Mendenhall River was separated into four unique polygons, largely dictated by regions of homogenous channel slope captured in the terrain. These areas are roughly consistent with Manning's roughness regions used in the 2015 Flood Inundation Study (NWS 2016). Initial Manning's roughness coefficients were assigned based on past

studies and industry references. Roughness coefficients were adjusted as part of model calibration and sensitivity testing (Section 3.9).

Table 3-1 Material Types and Associated Manning Coefficient Values

LAND COVER CLASS (MATERIAL TYPE)	MANNING COEFFICIENT
Roads	0.02
Paved_Gravel_Turf	0.02
Mend_Lake	0.02
Mend_Lake_Outlet	0.048
Mendenhall River	0.03 – 0.06
Coastal_WB	0.024
Tidal_Marsh	0.035
Montana_Cr	0.05
Lakes_Ponds	0.03
Detention_Pond	0.045
Drainage_Ch	0.045
Developed_Residential	0.065
Developed_Woodland_Residential	0.12
Developed_Mixed	0.065
Woodland	0.15
Upland	0.05
Riprap	0.045
Open_Space	0.035
Shrub_Scrub	0.05

3.5 Mesh Generation

Three mesh geometries were developed having the same domain extents. The *Existing* conditions mesh geometry was developed to represent existing conditions within the Valley. The *Proposed_HESCO* conditions mesh geometry was developed to simulate the HESCO barrier in place. This allowed a breakline to be used to orient cell faces along the crest of the proposed HESCO barrier. It also allowed a separate terrain, modified to include elevated ground along the proposed HESCO alignment, to be associated with the *Proposed_HESCO* geometry (Section 3.7). To eliminate computational differences due to mesh variation when comparing existing and proposed HESCO conditions, a third geometry was developed. This geometry, identified as *Existing_woHESCO*, is a duplicate of the *Proposed_HESCO* geometry that is associated with the existing conditions terrain. Evaluating the direct impacts of the HESCO is achieved by comp

aring the *Proposed_HESCO* and *Existing_woHESCO* solutions, without introducing computational differences due to mesh structure.

3.5.1 Domain Extents

The model domain encompasses the entire Mendenhall River Valley, as presented in Figure 3-2. The upstream limit is located near the northern terminus of Glacier Spur Road, at a topographic constriction of Mendenhall Lake. The model does not extend to the current toe of the Mendenhall River Glacier, which will continue to retreat north. The downstream limit bisects the Gastineau Channel east of Juneau International Airport and the southwest terminus of the Gastineau Channel as it enters Fritz Cove. The model extends east and west to the topographic confines of the Mendenhall River Valley.

Figure 3-2 Mendenhall River (blue) study area and modeling extents

3.5.2 General Mesh Description

The modeled mesh geometries cover an area of approximately 14.5 square miles, consisting of approximately 120,000 cells. The nominal quadrilateral cell size is set to 50 feet.

3.5.3 Breaklines

The mesh was refined through the enforcement of breaklines, used to align cell faces (where the conveyance calculations occur) at key hydraulic influences. These include high ground, such as roadways, berms and natural ridges. Breaklines were also used to ensure cell faces captured the blockage of flow by buildings in critical locations, typically adjacent to the Mendenhall River. Manually delineated breaklines were also used to represent the stream network, generally aligning cell faces perpendicular to flow and refine the mesh along the stream corridors. For the With and Without HESCO geometries a breakline was assigned to the crest of the HESCO barrier. Final breaklines were enhanced with manual delineations. In places where the breaklines intersect, preference was given to the feature having the most hydraulic influence. Cell spacing around the breaklines is equal to the nominal cell size. In general, the following guidelines were followed:

- Breaklines aligned with or spanning Mendenhall River and Montana Creek were assigned a near spacing of 50 feet.
- Breaklines representing the Mendenhall River were assigned a near repeat of two to yield a total span of six cells, ensuring a minimum of two cells across the channel and capture of the adjacent banks.
- Additional breaklines were assigned along channel banks to capture localized elevated ground.

3.5.4 Refinement Regions

Refinement regions were used near the upstream and downstream limits of the model to increase nominal cell size to 100 feet. This yields a reduction in total cell count and computational instability without limiting solution accuracy.

3.5.5 SA/2D Connections

SA/2D connections were utilized to define hydraulic structures spanning the Mendenhall River; Back Loop Road Bridge (BN 0217), Pedestrian Bridge (BN 1904), and Egan Drive Brotherhood Bridge (BN 0737). Bridge geometries were entered using the Connection Data Editor, including bridge deck and piers. Bridge geometries are based on a review of as-built drawings, bridge inspection soundings, and geometries used in the 2015 Flood Inundation Study model (NOAA 2016). Cross section profiles were cut from the model terrain. The highest energy answer of standard step and momentum were used for low flow methods, while pressure and/or weir was selected as the high flow method. Hydraulic table parameters were selected to provide sufficient information without unnecessary detail covering the full range of modeled discharge. The resulting 1D family of rating curves were reviewed for anomalies.

3.5.6 Hydraulic Structures

Aside from the three bridges represented by SA/2D connections, no hydraulic structures were directly modeled within the HEC-RAS model. Hydroconnectors were used to approximate culvert openings through roadway embankments spanning dominant floodplain channels. Lines were drawn to represent

the structure and the openings were estimated as vertical walled slots based on available data. Opening widths were assigned based on attributed geospatial culvert data obtained from CBJ (2024) and Alaska Department of Fish and Game (ADF&G) fish passage survey reports (2024). Invert elevations were assigned from the modeled terrain. The hydroconnectors were burned into the DEM using RAS Mapper Terrain Modifications.

Mendenhall Valley's stormwater network was not included in this model, beyond major roadway culverts described above, as is typical of BLE models. Overbank floodwater conveyance via the stormwater network does occur but is not represented in simulated flood conditions.

3.5.7 Initial Condition Points

Initial condition points were used to represent the starting water surface elevation in Mendenhall Lake, downstream of Back Loop Road, and in Gastineau Channel. Initial condition points were used to 'fill' the Mendenhall River prior to model simulation to avoid losing significant runoff volume and initial model instability. Initial condition points were only referenced for calibration and validation simulations, as well as base flow simulations. All other modeled events referenced the final steady state solution for the respective base flow condition.

3.5.8 Reference Points

Reference points were used to represent the survey high water marks collected after the 20204 GLOF. Surveyed elevations were assigned to each of 22 unique reference points, which are plotted against the simulated stage hydrograph at each point providing a direct comparison of modeled and observed water surface elevations. High water mark survey was conducted by USACE. All high water mark survey data has been included with the model.

3.5.9 Manning's Roughness

The derived land cover polygons were input to RAS Mapper to generate a Land Cover layer with assigned roughness values. This layer was associated with the Existing and HESCO mesh geometries. The spatially Varied Manning's n on Faces option was selected to allow HEC-RAS to vary Manning's n values across cell each cell face. Manning's n values were manually adjusted in the Land Cover layer during model calibration; no calibration regions were used.

3.6 Boundary Conditions

External boundary condition lines were drawn to account for upstream inflow to Mendenhall Lake and downstream tidal stage. The lines were drawn roughly perpendicular to flow and covered the extent of flooding. An internal boundary condition line was used to assign baseflow along Montana Creek upstream of the Mendenhall River confluence.

3.6.1 Inflow

Inflow to Mendenhall Lake was assigned an unsteady flow hydrograph as discussed in Section 2.3. A quasi-steady flow hydrograph was assigned to Montana Creek equal to the baseflow discussed in Section 2.3. Modeled peak inflows are presented in Table 2-1.

3.6.2 Downstream

The downstream boundary condition was assigned a stage hydrograph, which was either unsteady for model calibration and validation or quasi-steady for all other model scenarios. Unsteady steady stage hydrographs were based on NOAA tide gage data reported for Juneau, AK Station 9452210 for the simulation period of interest. Quasi-steady stage hydrographs were assigned a value of +20 feet (MLLW). This is the same values used in the effective Flood Insurance Study (FEMA 2020) and the 2015 Flood Inundation Study (NWS 2016).

3.7 Terrain Modifications

Terrain modifications were used to recondition the Terrain Base Map to represent hydroconnectors across roadways, correct terrain errors, and approximate channel bathymetry at the Mendenhall Lake outlet. A terrain modification was also used to represent the current proposed HESCO barrier.

Hydroconnectors approximate conveyance conditions of culverts, allowing backwater to build and flow to pass high ground features. The dimensions of the terrain modification were defined to reflect those of the hydraulic connection (i.e., the diameter of a culvert). The placement of terrain modifications was based on available terrain and spatial data, as well as aerial imagery.

The 2024 UAS and LiDAR DEMs did not accurately capture pedestrian paths under the Egan Dr. Brotherhood Bridge, adjacent to each abutment. Inclusion of these paths increases bridge conveyance area at flood elevations exceeding top of bank elevations. Terrain modification dimensions were defined to reflect connectivity between upstream and downstream ground elevations, supported by terrain data and aerial imagery.

The absence of bathymetry at the Mendenhall Lake outlet has a direct influence on both lake stage and total downstream flood volume. Channel bathymetry was approximated by a trapezoidal channel with bounding thalweg elevations defined by available lake bathymetry and 2024 UAS elevations upstream of Back Loop Road Bridge. Slope breaks between terminal points approximate those captured in terrain data, supported by aerial imagery and general channel planform (i.e., steeper slope through contracted section at end of View Drive).

An elevated rectangular terrain feature was added along the proposed HESCO barrier alignment. The proposed alignment was offset 5 feet landward to represent the HESCO centerline. Underlying terrain was elevated 30 feet to ensure floodwater containment riverward of the barrier. A top width of 10 feet was assumed, locating the riverward face of the modeled barrier coincident with the proposed alignment. Additional, barrier footprint width will extend landward of the modeled barrier having no influence on channel conveyance. Failures, or breaches, in the HESCO barrier were not modeled as part of this study.

3.8 Simulation Parameters (Model Control)

3.8.1 Equation Set

The Diffusion Wave equation set was selected to expedite model calibration and simulation times to meet the compressed schedule. Sensitivity tests were performed using the available full momentum equations. Relative differences in modeled maximum water surface elevations varied little across the different equations set solutions. Water surface elevations did differ between equation sets but initial testing

indicates calibration adjustments could achieve historical observed data of comparable accuracy using full momentum to those obtained using the Diffusion Wave equation set.

3.8.2 Initial Conditions

An initial condition time of 6 hours, with a ramp up fraction of 1.0, was used for the 2024 calibration and 2023 validation simulations. This allowed the model to run the 2D computations for the 2D flow area by slowly transitioning the initial WSE from zero to their initial values in the simulated hydrograph. This allowed the model to stabilize to initial condition throughout the extent of the model domain. All other simulation events used the default initial condition time of 1 hour with a ramp up fraction of 0.1.

3.8.3 Simulation Period

The simulation period was a function of the modeled flow hydrograph. At a minimum, simulation periods were set to capture the storm peak at the basin outlet. Calibration and validation simulations were modeled over a period of 120 hours and 96 hours, respectively, centered around peak flow recorded at the Mendenhall River gage. Base flow simulations were modeled for a period of 48 hours to ensure steady state condition were achieved. Inundation events were modeled over a period of 96 hours.

The computation interval was controlled by the Courant Number, which allows the model to choose the optimal time step to resolve instabilities in the model. The hydrograph and detailed output interval were set to 15 minutes to match the shortest interval of historical gage data.

3.9 Calibration and Validation

There is currently one active streamgage on the Mendenhall River that can be used for calibration/validation: USGS Gage 15052500 (NWS Gage MNDA2). The gage, located along the north shore of Mendenhall Lake, was used as just one point of model calibration/validation. Simulated water surface elevations have a greater potential of being impacted by modeled boundary condition error and uncertainties associated with assumed bathymetry at the Mendenhall Lake outlet. Therefore, additional data was referenced with equivalent weight.

High water mark survey data collected by USACE following the 2024 calibration and 2023 validation events was also referenced, as was anecdotal information including resident interviews, aerial and ground imagery, and summary reports released by NWS. A reasonable amount of uncertainty should be applied to each observation: high water marks can be effected by wave action or local variations in hydraulic conveyance not captured in the model; public reports can be influenced by errors in perception or recollection as well as the timing of observed conditions relative to peak; timing of imagery, aerial or ground, may not be coincident with peak flood conditions.

Validation against past modeling studies was not performed given the significant amount of channel erosion that has been documented in terrain and bridge bathymetry.

Calibration and validation were performed prior to simulating inundation events.

3.9.1 Convergence metrics

The purpose of this study was to develop a preliminary, BLE 2D surface water model that can be leveraged to update flood inundation maps and evaluate efficacy of temporary flood fighting/mitigation measures.

With this purpose in mind, model convergence was identified as an acceptable 'collective' convergence of peak observed and simulated water surface elevations across the model. No one observed dataset was assigned greater weight than another, however the timing of documented observations was considered (e.g. image or video capture relative to peak flooding).

3.9.2 Model Adjustments

To best match calibration event stage, global Manning's n values were adjusted within the Land Cover map layer. Calibration regions were initially used but did not yield any appreciable advantage to model calibration. Division of the Mendenhall River into individual reaches with a unique assigned Manning's n did serve as relative calibration regions.

Another adjustment was the inclusion and modeled geometry of assumed bathymetry at the Mendenhall Lake outlet. This model adjustment served to prohibit excess stage in Mendenhall Lake, driven by limited outlet conveyance.

3.9.3 Calibration Results

Several regions were referenced during model calibration, dictated by available data. A general description of calibration results is presented below by region, progressing north to south. Detailed calibration data are provided with the model.

USGS/NWS gage: Simulated peak flood stage was 0.11 feet above reported peak stage.

Skater's Cabin Road: Simulated peak flood stage was 0.01 to 0.08 feet above reported peak stage at three high water survey points, with an average error of 0.05 feet. The simulated peak stage was consistent across all three points.

View Drive: Simulated peak stage varied from 1.2 feet above to 0.55 feet below reported peak stage. The average error at the seven high water marks is 0.05 feet. Despite repeated efforts to adjust Manning's roughness values, which included the addition of the Developed Woodland Residential land cover classification, and the inclusion of outlet bathymetry, calibration in this region was difficult. There is some uncertainty associated with high water marks, as evidenced by the range of error within a relatively small hydraulically connected area. This area likely experiences considerable bedform and conveyance capacity change during a large flood event which cannot be modeled with the static terrain.

Marion Drive: Public outreach interviews and local imagery provide anecdotal flood data along Marrion Drive. Generally, simulated inundation extents compare well with resident reports. Reported flood depths, which are highly subjective, were generally consistent with or slightly greater than simulated peak flood depths. Simulated flood extents are greater than observed, particularly along Fireweed Lane. This was deemed an accepted tradeoff to achieve sufficient overbank flooding at the intersection of Killewich Drive and Riverside Drive.

Killewich Drive: Three high water survey points were collected near the Killewich Drive Region, which includes two points along North Riverside Drive. Simulated peak stage was -0.80 to -0.56 feet below survey. Reasonable adjustments to Manning's n values could not achieve high water survey elevations. When maximizing Manning's n values to best achieve survey, simulated flood stages were carried across the floodplain to downstream regions of Meander Way and Riverside Drive. To better understand flooding and support calibration, resident reports and drone imagery were referenced. Seventeen resident reports

along Killewich Drive and Betty Court suggest flood extents are reasonably represented by simulated peak flooding, referencing distance form edge of riverbank, building pad, or home/deck. This was supported by aerial drone imagery captured during the 2024 GLOF. However, drone imagery and resident accounts indicate slightly less floodwater along the north end of Killewich Drive, but near equivalent flood extents near the south end of Killewich. Reported flood depths adjacent to homes were generally equivalent to simulated depths. Reported flood depth behind 3875 Killewich was 2 feet, with simulated depths ranging from 2.5 feet near the river to 1.6 foot near the home. Increasing simulated flood depth increased deviation of observed and simulated flood stage further south in the Valley. The need to balance negative and positive calibration error across the Vally became most evident in this and southern regions.

Meander Way: Four high water points were collected along and adjacent to Meander Way, including Turn Street, Parkview Court, and Center Court. At the northern terminus of Meander Way simulated peak stage was 0.20 feet higher than survey. Progressing south the simulated depths we 0.34 feet higher at Turn Street, 0.15 feet higher at Parkview Court, and 0.02 higher at Center Court. Anecdotal information suggests above bank depths increasing from 2 to 4 feet around the northern terminus of Meander Way, with simulated depths following a similar range of values. Simulated inundation extents in this area are nearly equivalent to or slightly exceed those documented in aerial drone imagery captured at approximately the same time as the simulated peak stage and presumably peak observed stage.

South Riverside Drive: Four survey points fall within this area. Two points along Rivercourt Way had simulated peak stage that was -0.31 and -0.13 feet lower than survey. On Riverside Drive near Mendenhall Valley Public Library the model simulated a peak stage that was approximately 0.52 to 0.57 feet higher than observed. Modeled inundation of Dimond Park, south of the library, was not evident in aerial drone imagery.

Egan Drive (Glacier Highway) / Brotherhood Bridge: A single highwater mark just downstream of the bridge is the southern-most calibration data point. The simulated peak stage was -0.07 feet lower than survey.

Across all 22 high water survey points, the simulated peak stage had a median error of 0.02 feet, a mean error of -0.01 feet, with a range of -0.8 and +1.2 feet, and a standard error of 0.10 feet.

3.9.4 Validation Results

The 2023 GLOF was modeled as a coarse validation of the 2D model. Changes in channel morphology during the 2024 GLOF, as captured in the modeled topographic base map, prohibits accurate modeling of the 2023 GLOF. This is evident in the difference between simulated peak stage and high water data collected by NWS survey following the 2023 event. Survey points were thinned to eliminate points of poor quality or inconsistent elevations at coincident locations.

The most significant differences occur along the south side of View Drive, where the simulated peak stage was approximately -2.73 to -4.80 feet lower than observed survey. This likely attributable to the approximate 6.0 to 6.5 feet of vertical scour recorded at Back Loop Bridge.

Downstream of Back Loop Bridge, the remaining 19 high water survey points had a median error of 0.36 feet, a mean error of 0.41 feet, with a range of -0.67 and +1.48 feet, and a standard error of 0.11 feet.

While this validation does not provide good correlation with the 2024 calibration, it does provide a general understanding of possible changes in model accuracy following future channel-modifying flood events.

This further supports the need to update future model versions following major flood events. Ideally, the model would be updated to represent new bathymetry and topography. At a minimum, model calibration should be performed to the latest event.

4.0 Simulated Event Results

Following model calibration, hypothetical flood events of varying intensity (Section 2.3) were simulated to develop flood fighting inundation maps and evaluate impacts and efficacy of the proposed HESCO barrier.

Inundation mapping was to be established at whole foot stage elevations at the Mendenhall River gage. Events yielding whole foot elevations at the gage were determined using a rating curve established from stage and discharge hydrographs reported by the USGS during the 2024 GLOF event. Establishing a new rating curve from recent gage data provides the most representative rating curve for current channel conveyance up to the peak historic flood event.

4.1 Existing Conditions

Simulated peak stage at the Mendenhall River gage deviates from the USGS rating curve at upper and lower limits, intersecting the rating curve near the 2024 GLOF event to which the model was calibrated. (Figure 4-1). At lower magnitude events this is attributed to error imparted by a lack of bathymetry in the model, specifically at Mendenhall Lake Outlet through the river reach to Back Loop Road. It is this geometry that largely controls stage at the gage, as well as the discharge conveyed through the modeled reach. At higher flood events, differences are likely attributed to extrapolating the curve beyond the 2024 maximum historic peak event, as well as model limitations. A comparison of rating curve and simulated peak stage at the gage are presented in Table 4-1.

It is unknown what magnitude of error is imparted through the study reach. Because the model was calibrated to the 2024 event, there is incrementally more uncertainty in simulation error for events that fall below the 2024 peak. However, there is still uncertainty in the accuracy of the rating curve as it assumes a relationship between measured stage and reported discharge. Above the 2024 peak stage the rating curve has been projected, imparting even greater uncertainty that cannot be quantified.

Ultimately, a gage rating curve will be used to relate discharge and stage when reporting future flood events. Given the error imparted by missing bathymetry, inundation maps were developed for the event discharges that yield whole foot elevations as determined by the rating curve, not the model.

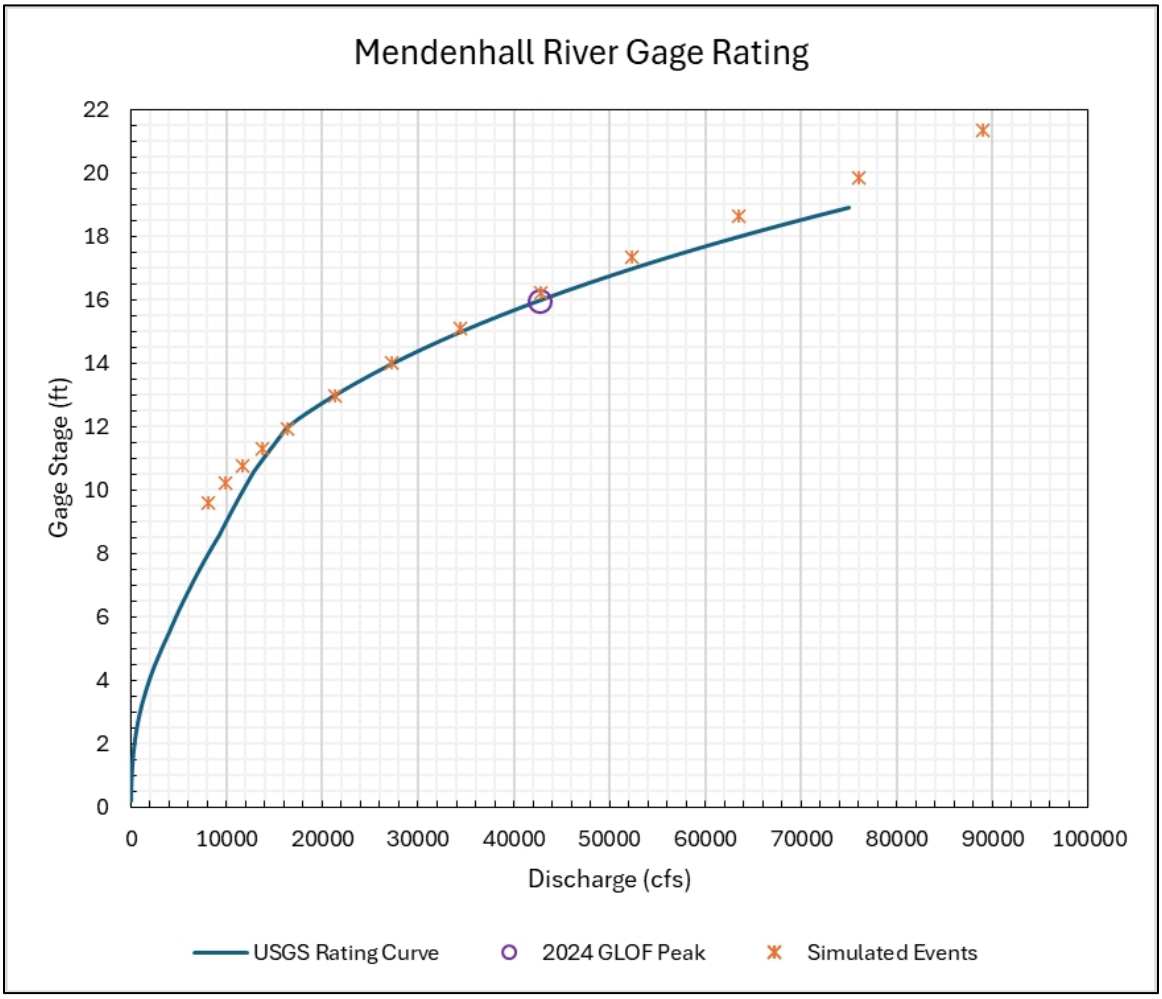

Figure 4-1 Rating Curve and Simulated Results at Mendenhall River Gage (USGS 15052500 / NWS MNDA2)

Table 4-1 Rating Curve and Simulated Peak Stage at USGS 15052500 / NWS MNDA2

EVENT	PEAK DISCHARGE (CFS)	RATING STAGE (FT)	SIMULATED STAGE (FT)	STAGE DIFFERENCE (FT)
8FT	8,080	8.00	9.58	1.58
9FT	9,923	8.99	10.23	1.24
10FT	11,706	9.99	10.75	0.76
11FT	13,798	10.99	11.30	0.31
12FT	16,405	11.99	11.93	-0.06
13FT	21,301	12.99	12.95	-0.04
14FT	27,289	13.99	14.02	0.03
15FT	34,404	14.99	15.10	0.11
16FT	42,788	16.00	16.21	0.21
17FT	52,369	16.99	17.36	0.37
18FT	63,515	18.00	18.62	0.62
19FT	76,039	19.00	19.86	0.86
20FT	89,002	20.00	21.33	1.33

4.2 Proposed HESCO Barrier Condition

The initial proposed HESCO barrier alignment was simulated using the 1% AEP (100-year) flood event and reviewed with CBJ. Minor changes were made to the alignment to minimize localized increases in stage with the HESCO in place. Restrictions in allowable HESCO placement, largely due to proximity of riverfront structures resulted in minor localized increases of 0.01 feet in the 100-year stage (Figure 4-2). This rise falls within the accuracy/resolution of the model and has no impact on existing structures (buildings).

The modified HESCO barrier alignment was then simulated using the 2024 GLOF event, which at 15.99 feet was nearly equivalent to the 16 foot gage stage, to evaluate relative efficacy and impacts of the HESCO barrier under the maximum historic flood condition. The HESCO barrier, as delineated in the model, provides complete protection of the Valley east of the barrier (Figure 4-3). As a result of confining eastern overflow to the channel, water surface elevations increase with only minor increases in flooding extents west of the channel. Simulated stage begins to increase at the Back Loop Road Bridge (+0.01 feet), achieving a maximum rise of 0.39 feet in the channel adjacent to Killewich Drive and dropping down to +0.08 feet at the Brotherhood Bridge. Increases in inundation are limited to low lying areas in the western floodplain. No residential or commercial structures are impacted by increases in flooding with the HESCO barrier in place during the 2024 GLOF.

During the simulated 18FT stage flood event the HESCO barrier continued to provide protection to the eastern Valley floodplain (Figure 4-4). Stage increased as much as 1.7 feet in the western floodplain near Montana Creek, with the maximum channelized rise of 1.40 feet occurring adjacent to Killewich Drive. Expa

nded flood extents with the HESCO in place do occur, most notably in the western floodplain. Downstream of Back Loop Road stage increases as much as 0.49 feet along N. Riverside Dr. and Tournure St., resulting in an approximate 15 to 20 foot widening of the floodplain. Additional flood extents do not capture buildings that are not already captured by flooding but could increase the magnitude of flooding to those existing structures. Under this condition, flooding of the Valley floodplain south of the HESCO barrier remains, however the stage largely drops in the eastern floodplain, as much as 0.8 feet, with a maximum rise of just 0.10 feet. The western floodplain near the Brotherhood Bridge experiences a rise of just 0.01 feet and no perceptible increase in flood extents.

Figure 4-2 Localized rise in 100-Year flood stage (red) as a result of the Proposed HESCO Barrier (white line)

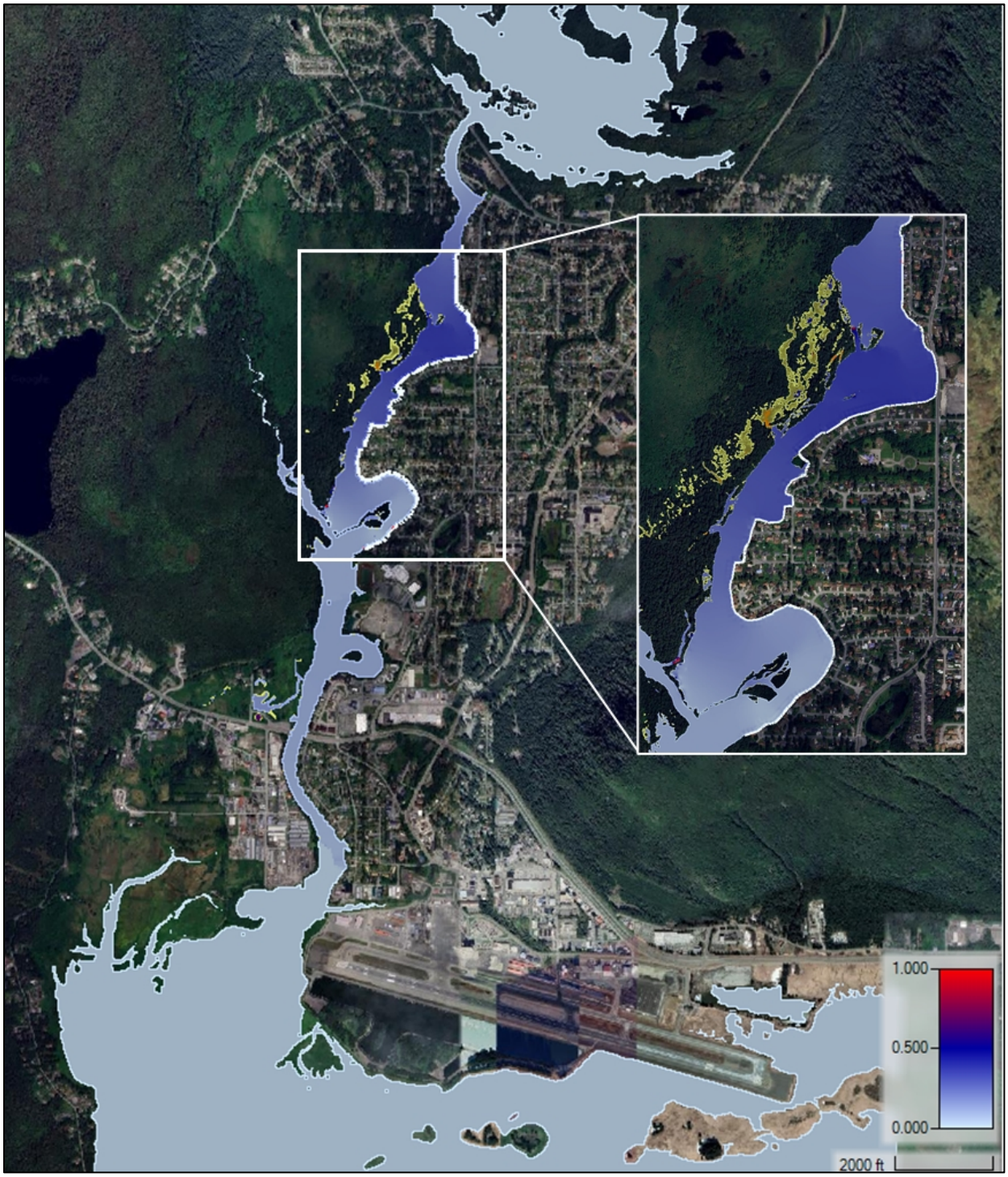

Figure 4-3 Simulated flood extents and rise in stage (feet) of 2024 GLOF as a result of the Proposed HESCO Barrier. Yellow depicts expanded flood extents as a result of barrier.

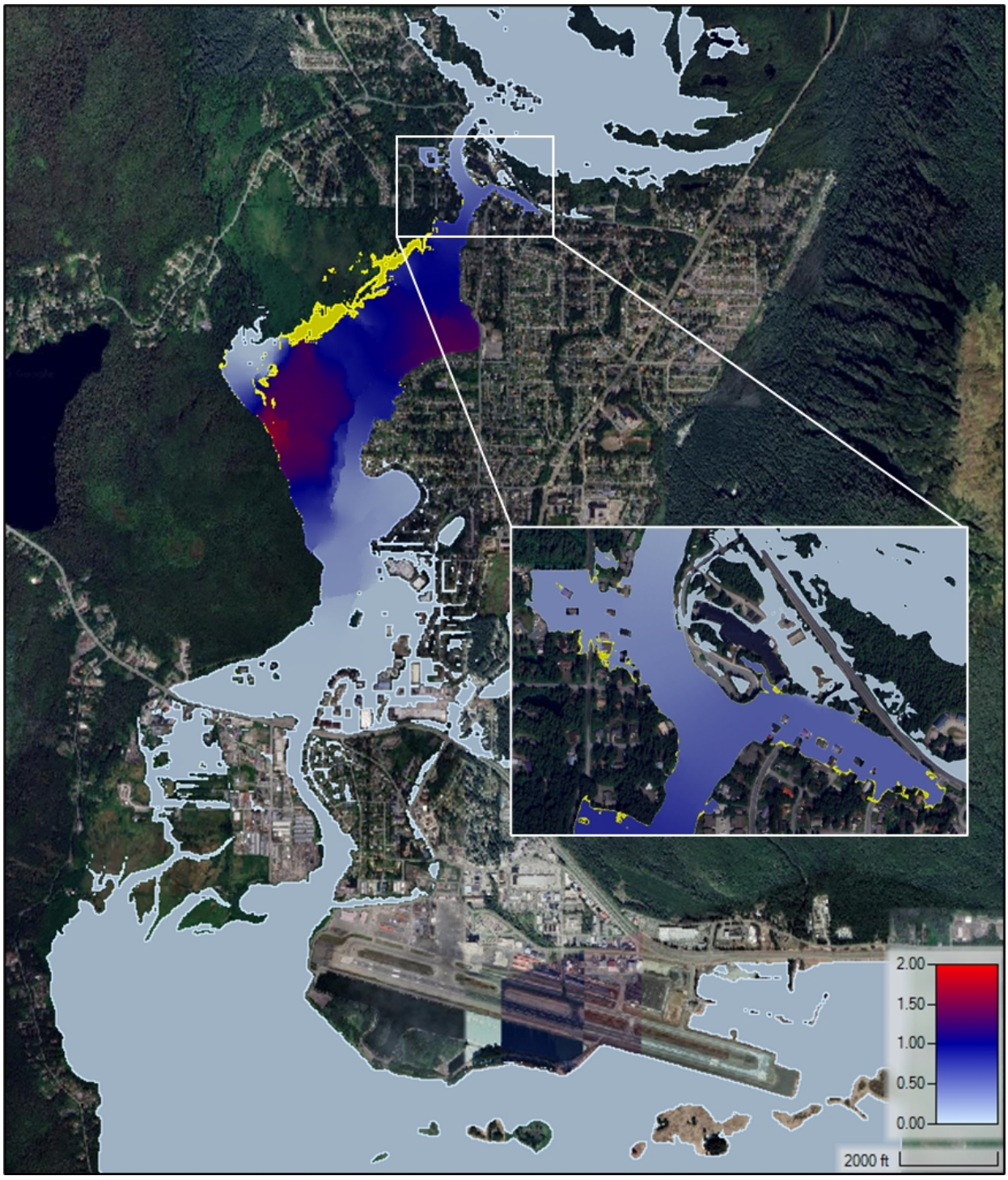

Figure 4-4 Simulated flood extents and rise in stage (feet) during an 18 FT flood event as a result of the Proposed HESCO barrier. Yellow depicts expanded flood extents as a result of barrier.

5.0 Inundation Mapping

Inundation maps of existing conditions were developed for the 8 ft to 20 ft stage events as determined by the USGS rating curve at the Mendenhall River gage. With each smaller event at lower stages, inundation mapping is largely inconsistent with historic measurements and is overly conservative near Mendenhall Lake (i.e. Skater's Cabin and USFS facilities). Future detailed modeling that incorporates Mendenhall River bathymetry at and downstream of the Lake outlet would likely minimize this error and allow for more accurate inundation maps at lower flood stage.

Extending simulated inundation mapping at higher events can similarly provide maps with increased uncertainty, given model limitations and use of an extrapolated rating curve. Flood maps out to the 20 ft stage should be used with an abundance of caution in their ability to predict actual flood conditions.

Inundation maps were developed for the 14 ft through 18 ft stage events under the proposed HESCO barrier condition. Additional information, including surveyed location and heights of HESCO barriers will be required to develop these maps above 18 ft stage. Actual HESCO elevations may not provide full protection under larger events.

5.1 Topographic Data

The topographic data used for inundation mapping is the same as the modeled topographic base map, described in Section 3.3.

5.2 Processing Steps

HEC-RAS 6.6 RAS Mapper was used to create an initial inundation boundary polygons and maximum depth grid raster for each event scenario. Render mode was set to Sloping (Cell Corners + Face Centers). RAS Mapper exported three depth rasters at a user defined resolution of 3 feet, one associated with each of the three source rasters used to develop the topographic base map.

Depth rasters exported from RAS Mapper were imported into ArcGIS Pro and merged using the Mosaic to New Raster tool. The inundation polygon generated in RAS Mapper was exploded, with individual polygon features selectively removed to eliminate hydraulically isolated ponding. This ponding is an artifact of mesh resolution and cell face placement, contributing a very small fraction of overall runoff volume and having no appreciable impact on model results. Some areas that appear to be hydraulically isolated but are connected via culverts or storm drains were maintained where reasonable. Remaining polygon feature parts were merged into a single feature representing the event specific inundation extents. Bridge decks were also removed from the inundation polygon where local maximum stage was equivalent to or greater than the bridge low chord. The merged depth grid raster was then clipped to the inundation polygon, snapping the clipped raster to the original mosaiced raster.

5.3 Uncertainties and Limitations

Results of this modeling and mapping effort have inherent uncertainties and limitations. Modeling is based on best available topography and bathymetry following the 2024 GLOF, largely limited by an absence of channel bathymetry. Simulation computations used the faster, more stable diffusion wave equation set that allowed for rapid development of flood maps and HESCO barrier analysis under the compressed project schedule. Though sensitivity analyses suggested little relative difference in model

solutions, the use of a full momentum equation set would provide more accurate results at the expense of computational time. Additional limitations include the uncertainty of future GLOF hydrograph characteristics, including probable release volume and peak discharge.

Model calibration was performed using observed flood data during the 2024 GLOF, the maximum historic flood. Uncertainties in observational data and the inability to simulate equivalent peak flood conditions at all observation points are not uncommon limitations that yield some level of model inaccuracy. Additional, uncertainty occurs when projecting simulated events above or below the calibration event.

Flood inundation maps are also subject to some uncertainty and error. Boundaries are based on simulated peak stage of a hypothetical flood hydrograph routed through a fixed channel geometry. Differences in the actual flood hydrograph and dynamic changes in channel geometry during flooding can yield differences in global and local flooding from those mapped in this study. Flood routing via the local stormwater system, not included in this model (Section 3.4.3), can also decrease or increase flooding in certain areas that are not currently represented in the maps.

5.4 Disclaimer

The flood inundation maps developed as part of this study are not intended to replace effective FEMA NFIP regulatory maps. The extents shown are intended to provide the community with a general understanding of potential near-term flood risk and to provide the City and Borrough of Juneau planning resources to mitigate that flood risk. With HESCO maps assume full protection by the HESCO barrier: no overtopping and no breach. Actual HESCO elevations and structural integrity may not provide full protection under larger events

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Frequently Asked Questions About Base Level Engineering

August 2022

FEMA

Attachment 9

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1. What is Base Level Engineering?

Base Level Engineering (BLE) creates flood data through an automated process. It combines high-resolution ground elevation data and the latest flood models. The results give communities a basic understanding of their flood hazards. Engineering models from a BLE analysis produce data that meet FEMA's standards for flood risk analysis and mapping.

BLE analyses can be cost-effectively done on a large scale, for a county or a watershed. They can also target a portion of a single stream. The results of BLE analyses—including flood elevations—help communities learn more about their floodprone areas.

2. What are the benefits of Base Level Engineering?

BLE analyses support a more complete picture of flood hazards. They produce data for areas that have not yet been studied for a Flood Insurance Rate Map (FIRM). They can also provide Base Flood Elevation (BFE) information for a FIRM's Zone A areas that are not supported by an existing hydraulic model. FEMA also uses BLE data to help communities identify areas where the FIRM needs to be updated.

It's important to note that BLE analyses are scalable, and their results can be published on FIRMs. Users can refine BLE modeling to assess the impacts of changes in a watershed. This is useful for development reviews, permitting, Letters of Map Change, and planning FIRM updates.

3. What is my community's role in the BLE process?

Communities work with FEMA to review the BLE data. They discuss ways to use it. It can increase local awareness of flood risk, aid emergency response, and inform planning or economic development.

4. What data will my community receive?

The datasets below will be available for all studied streams. Additional datasets may be produced. BLE results meet all of FEMA's technical, engineering and mapping standards. They can be used to help update FIRMs.

- Hydrologic Analysis – Each assessment estimates the peak flows for multiple storm events. At a minimum, the 10%, 4%, 2%, 1%, and 0.2%-annual-chance events are included.
- Hydraulic Modeling – Either 1- or 2-dimensional models are developed. Models are typically generated from a terrain surface. They may include channel surveys and hydraulic structures.
- Flood Extents –The 1%- and 0.2%- annual-chance events have seamless floodplain boundaries.
- Estimated Water Surface Elevation Grids – Grids are made for the 1%- and 0.2%- annual-chance events. Grids for other events may also be available. They report a water-surface elevation for each grid cell.

- **Flood Depth Grids** – These are prepared for the 1%- and 0.2%-annual-chance events. Grids for other events may also be available. They report the depth of water expected during a flood for each grid cell.

5. How can my community use Base Level Engineering data?

BLE datasets can inform planning decisions and activities that lead to a stronger community:

- **Hazard Mitigation Planning:** Mitigation planners need high-quality hazard data to properly assess risk. This helps them build a mitigation strategy for their community. BLE data show the limits of flood hazard areas, which can be used to quantify potential losses. Using BLE results in FEMA's Hazus program can help users prioritize flood mitigation projects.

- **Floodplain Management, Community Planning and Permitting:** Data from BLE analyses can help a community identify its flood-prone areas. The data can be used to guide development. A community can also use the flood elevations for building permits and elevation certificates, where BFEs are not available. See Floodplain Management Bulletin 1-98, Use of Flood Insurance Study (FIS Data) as Available Data. This explains how to use draft or preliminary FIS data to regulate floodplain development.

- **Emergency Management:** The results of BLE analyses can be used in many phases of emergency management. These include planning, preparedness, response, and recovery. They can help identify routes for evacuations and first responders, and locations for shelters.

- **Letters of Map Change:** Estimated BFEs from BLE analyses can be used to request a Letter of Map Amendment (LOMA) or Letter of Map Revision Based on Fill (LOMR-F) in Zone A.

- **Risk Communication:** BLE data can help users understand their community's flood hazards. It can help them focus evacuation plan messaging on the most at-risk locations.

6. Does Base Level Engineering data replace the effective FIRM in my community?

No, not immediately. BLE data supplements the flood hazard data you are already using. It gives you more data to use for permitting and development decisions.

If your community's risk level is high and the current FIRM data is shown to be inadequate, FEMA may develop or update a FIRM using the BLE information. Another option would be to select areas to prioritize for an enhanced (Zone AE) study based on the BLE information. This may be appropriate for communities with an ordinance that requires the use of adopted FIRMs for local development regulation and floodplain management.

7. Can I use Base Level Engineering results to determine Base Flood Elevations in my community?

Yes. In most cases, you can use the results from a BLE analysis in local BFE determinations. It can be used for areas mapped as Zone A or D. It is also useful in areas where the effective FIRM has no mapped Special Flood Hazard Area (SFHA). If the area has been studied by more enhanced methods (Zone AE), use the effective FIRM and the flood profiles in the FIS report instead.

8. Can I use Base Level Engineering information to support a Letter of Map Change?

BLE data can be used to determine a BFE in Zone A. It can also support a request to remove the SFHA designation from a lot or structure. Submit the BLE results to FEMA with your LOMA or LOMR-F application. FEMA will see if it meets the technical and accuracy requirements for this kind of request.

You can also use a draft BLE analysis for a Letter of Map Revision (LOMR) request. If the data comes from a source other than the agency, FEMA will check whether it meets the technical and accuracy requirements for regulatory information. If additional data is needed, FEMA will ask you or your community to submit it.

9. Can my community adopt Base Level Engineering information through my local floodplain ordinance?

Yes. In general, communities may use BLE results as best available information if it is stricter than the effective data. They can also use it in areas with no data. Check your community bylaws, ordinances, and codes to find the appropriate way to adopt BLE information before using it to make decisions.

10. How does BLE data help during and after Discovery?

When it is available, communities can use BLE data for communication during the Discovery phase of Risk MAP. BLE data and mapping can be effective in the following ways. It can be used to:

- Address stakeholder interests when new flood hazard information becomes available.
- Identify areas at risk that may not have been mapped previously.
- Inform floodplain management and disaster recovery.
- Show where floodplain boundaries or BFEs may change and what areas would be affected.
- Identify streams where an enhanced analysis may be needed.

TECHNICAL SPECIFICATIONS

FLOOD BARRIERS

FLOODLINE™ 4836 UNIT

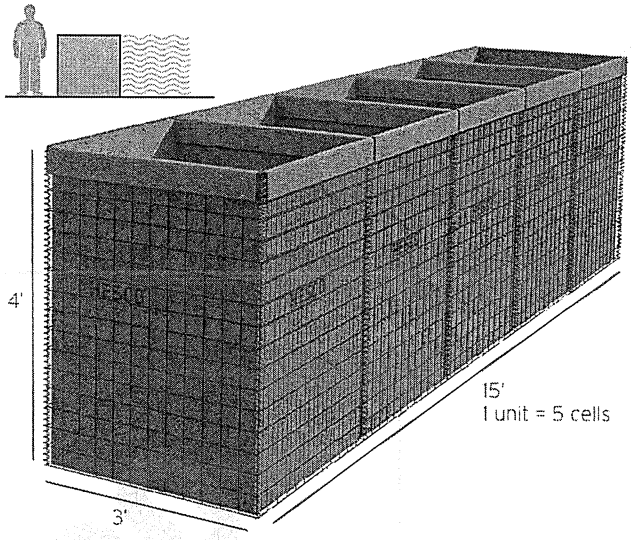
UNIT	HEIGHT	WIDTH	LENGTH
SL4836 (Green)	4' (1.22m)	3' (0.91m)	15' (4.57m)

Geotextile-lined units suitable for a wide range of uses, including the construction of walls and barriers, flood protection, erosion protection, protection against accidental explosions and homeland security applications. FLOODLINE units are particularly suitable in flood areas where damage from floating debris may be an issue.

GENERAL SPECIFICATIONS

Geotextile-lined welded mesh barrier coated to ASTM A 856. All wires conform to BS EN 10218-2:2012. Zinc-Aluminum coatings are to BS EN 10244-2:2009, where appropriate. The geotextile is a heavy-duty, non-woven, permeable, polypropylene fabric, available in green color.

All dimensions and weights are nominal. Diagrams and product images are for illustrative purposes only.



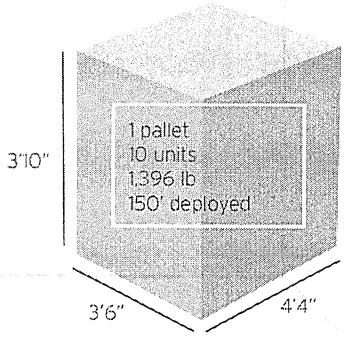
PACKAGING AND TRANSPORT INFORMATION

FLAT-PACKED INDIVIDUAL UNIT DIMENSIONS & WEIGHTS

HEIGHT	WIDTH	LENGTH	WEIGHT
5" (0.13m)	3'6" (1.07m)	4' (1.22m)	136 lb (62kg)

PALLET INFORMATION

PER PALLET	HEIGHT	WIDTH	LENGTH	WEIGHT
10 units	3'10" (1.17m)	3'6" (1.06m)	4'4" (1.32m)	1,396 lb (633kg)



TRANSPORT INFORMATION

TYPE	PALLETS	UNITS	DEPLOYED LENGTH
13.5 Trailer	31	310	4,650' (1,417m)
20' Container	16	160	2,400' (732m)
40' Container	36	360	5,400' (1,646m)

Hesco Group
4100 Park Approach
Thorpe Park, Leeds
LS15 8GB
United Kingdom

Telephone: +44 113 248 6633
Email: support@hesco.com

SITE CONSIDERATIONS, FOUNDATIONS AND DRAINAGE

The location where the structure will be built will normally be dictated by operational/ environmental requirements in response to the nature of the threat and the position of assets to be protected.

In most cases site preparation will be required. The level will depend on local conditions, wall design and/or time that the wall is expected to be in service.

The most basic requirement is a relatively level surface with a base of sufficient strength to support the structure. Where ground preparation is required the minimum procedure would be to strip all organic or topsoil material and replace with a granular fill material.

An improved foundation may be required when:

- The planned structure is large.
- The structure is to be in place for more than six months.
- The soil to be built on is weak and is unlikely to support the weight of the wall to be built.

The strength of the ground can be confirmed by using a cone penetrometer to ascertain the CBR[1].

[1]CBR, or California Bearing Ratio - measure of the ground's ability to support loads.

BASIC CONSTRUCTION TECHNIQUES

Whether the structure is a simple, single-course wall or a more complex structure, basic construction techniques are still the same:

- Layout
- Joining
- Forming corners and curves
- Filling

LAYOUT

- Units are delivered to site, flat-packed on pallets.
- Units are lifted off the pallet and placed in the desired location.
- Unit placed on the ground horizontally with the arrow pointing away from the desired direction the wall is to be erected *(Figure 3)*.
- Two men each grasp the end panel and together move in the desired direction. The unit will concertina from the horizontal to the vertical and become self supporting *(Figure 4)*.
- Pull the unit out to its full length. Check it is in the correct position *(Figure 5)*.
- Adjust the outer walls of the unit so that they are parallel.
- Make any joints or extensions required before filling the unit *(see Joining, page 19)*.

SAFETY Ensure all personnel are properly briefed on the correct method of lifting and carrying weight. Persons should only lift and carry the weight that they feel comfortable with.

JOINING

Most walls will require units to be joined end to end. This is achieved by using the supplied joining pins.

Butt together the units to be joined and overlap and interlock the coils on each butted corner *(Figure 6)*.

Insert the supplied joining pin through the overlapped coils, ensuring that it connects the coils fully and that it is fully inserted *(Figure 7)*.

Before filling, ensure all geotextile flaps at the base of the unit are tucked in *(Figure 8)*.

If a single tier is required, filling can start after all units in a run are aligned and joined. Compacting must be undertaken *(Figure 9)*, for every 300mm (1') lift of fill. *(See page 25 for the correct approach to filling).*

NOTE The joining operation must be carried out prior to placing fill in any of the cells to be joined. Care should be taken to ensure that units are horizontally aligned before joining.

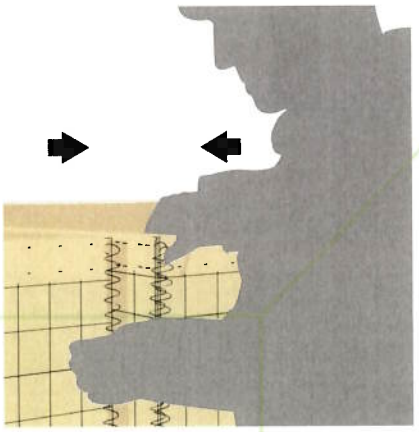


Figure 6 *Butt together and overlap coils*

Figure 7 *Place joining pins*

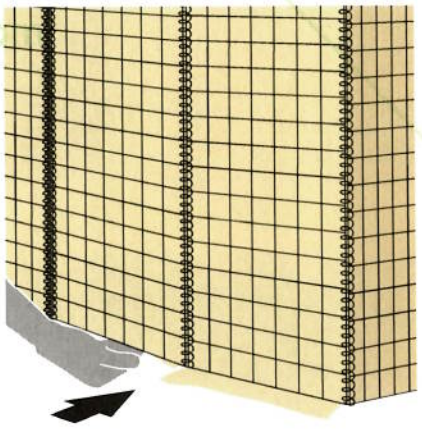


Figure 8 *Tuck in flaps at base*

JOINING VERTICALLY STACKED UNITS

Joining is achieved using the supplied hog rings.

- Fill the bottom unit to within approximately 100mm (4") from the top *(Figure 10)*.
- Place the upper units and pull out *(Figure 11)*.
- Alignment is achieved by lining the coils up vertically.

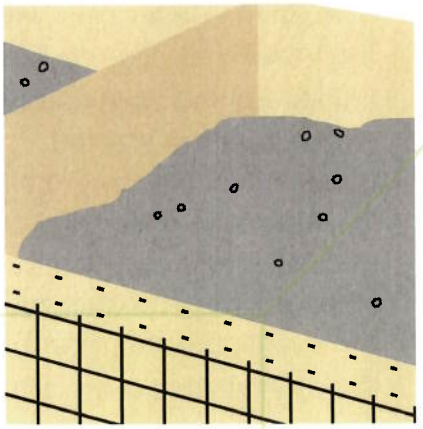
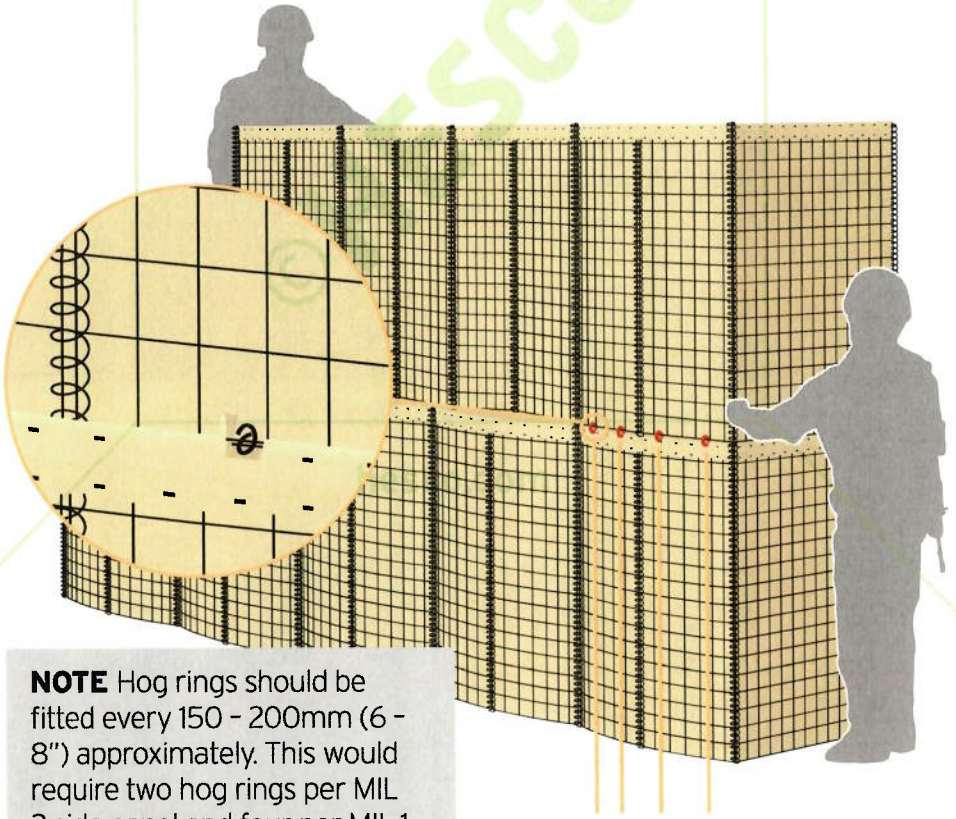


Figure 10



Suggested positions for hog rings

Figure 11

NOTE Hog rings should be fitted every 150 - 200mm (6 - 8") approximately. This would require two hog rings per MIL 2 side panel and four per MIL 1 side panel.

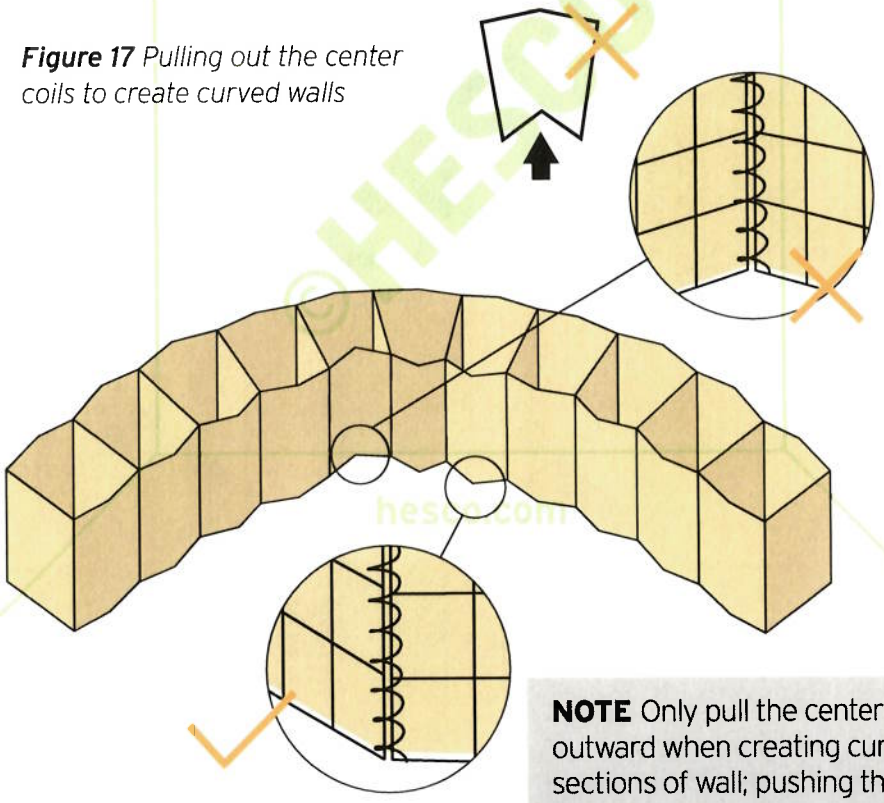
CORNERS AND CURVES

There are various methods of making corners and curves with units.

Where a curve is required, pull out the center coils on each cell until you achieve the desired curve *(Figures 16 and 17)*.

Figure 16

Figure 17 *Pulling out the center coils to create curved walls*

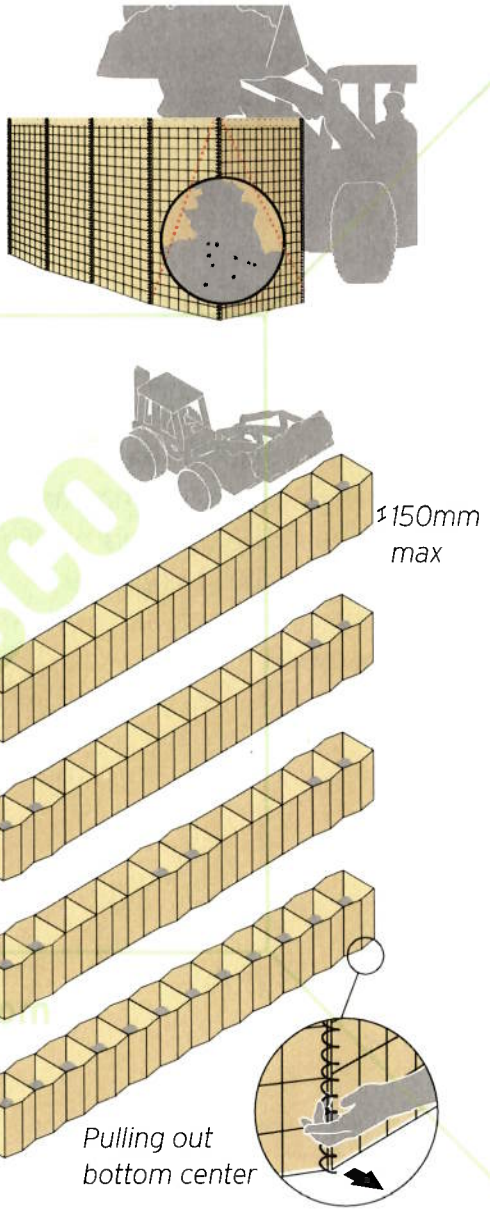


NOTE Only pull the center coils outward when creating curved sections of wall; pushing the center coils inward creates a wall section with less than the minimum protective thickness.

FILLING

The filling of a basic wall should be commenced with placing no more than 150mm (6") of material in the order shown in the diagram below.

It is important that the unit is checked for correct position, line and level prior to filling. The diagram assumes that the loading equipment will straddle two cells at once. The fill material should be loaded into units centrally.



NOTE It is important that the bottom center of each cell is pulled out after the first layer of material has been placed and spread, as shown at the bottom of the diagram.

DIVIDING AND SHORTENING

It is likely when building walls and structures that the unit may have to be shortened. Units are easily modified to suit this requirement. The majority of units arrive on site with the in-built ability to be split into two. With the MIL 1 unit, for example, this will result in two segments: one of four cells and the other of five.

Segments can be further shortened simply by folding in the end cells and securing by overlapping the coils and fitting pins. This can reduce the segment length by either one or two cell lengths. A unit can be further shortened using the procedure below:

- Erect the unit as shown on page 18, but do not fill.
- Open the coil hinges by bending at the desired location of the cut *(Figure 20)*, this will normally be at the center coil if one is fitted. The coil must be opened at the top and bottom to facilitate its removal.
- Remove the coil by unscrewing, counter-clockwise, completely *(Figure 21)*. Repeat on the opposite side.
- Cut the geotextile. Leave a 150mm (6") overlap if incorporating into a wall *(see page 29)*.
- Separate the shortened segments *(Figure 22)*.
- The coil can then be re-inserted to secure the loose side panels if required; alternatively, the loose ends can simply be incorporated into the wall.

Shortening the EPW 1 (UK MOD only) unit can be achieved by removing the pin securing the side panels.

NOTE If available, bolt croppers can be used to cut the welded mesh to speed the above operation.

All of the above methods result in the loss of a cell.

HALF SEGMENTS

Walls built up to existing structures may not fit exactly, therefore it may be necessary to split an end segment in half or add an extra half segment to the end to fill the gap *(Figure 23)*.

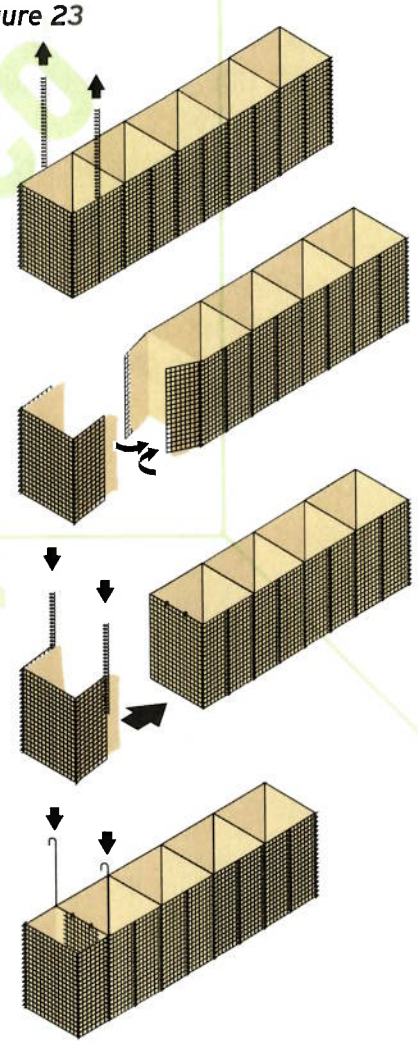
- To shorten a segment by half, unwind the two center coil hinges from the end cell of the unit.
- Cut the geotextile, leaving a 150mm (6") overlap, as shown. Fold in the two panels still attached to the unit and secure using hog rings.
- Rewind the hinges, butt the three loose panels up to the end panel of the unit.
- Fasten using joining pins.

To add a half segment to the end of a unit, remove a half segment from a spare unit and fit it to the unit to be lengthened by following the last two steps above.

NOTE This method is only applicable to units with a split side panel, as shown. Alternatively it can also be achieved by cutting the panel to the desired length.

The EPW 1 unit is split by removing the pins at the center of the side panel and then refastening the half cell to the end of the unit. To add half a cell, remove half a cell from a spare unit and fix it to the end of the unit in use.

Figure 23



BUILDING HIGHER WALLS

The building of higher walls will normally require a pyramid type structure to be formed. This is by far the best means of creating a competent high structure.

- Make sure the ground is level and firm before proceeding to build a tall wall.
- Deploy lower units and fill completely to the top *(Figure 27)*.
- Place and join the units for the second layer and fill them completely *(Figure 28)*.
- Place and join the units for the third layer and fill them completely *(Figure 29)*.

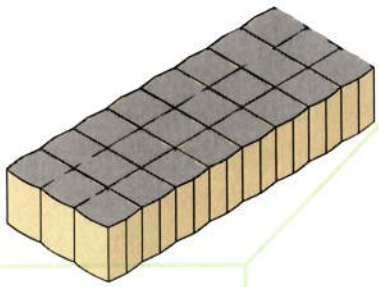


Figure 27

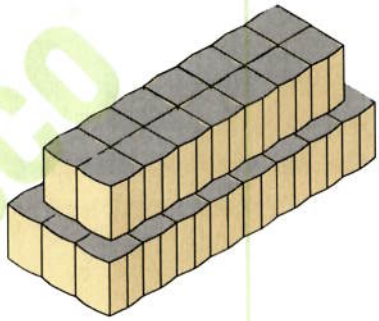


Figure 28

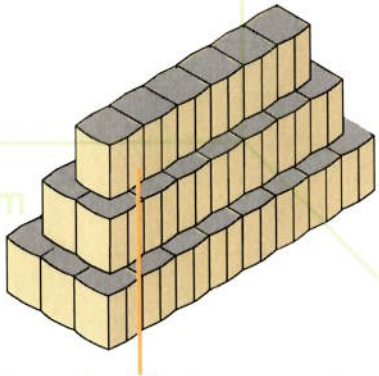


Figure 29 *Offset subsequent tiers from the edge*

WARNING Ensure the ground can withstand the loads from the units to be constructed.

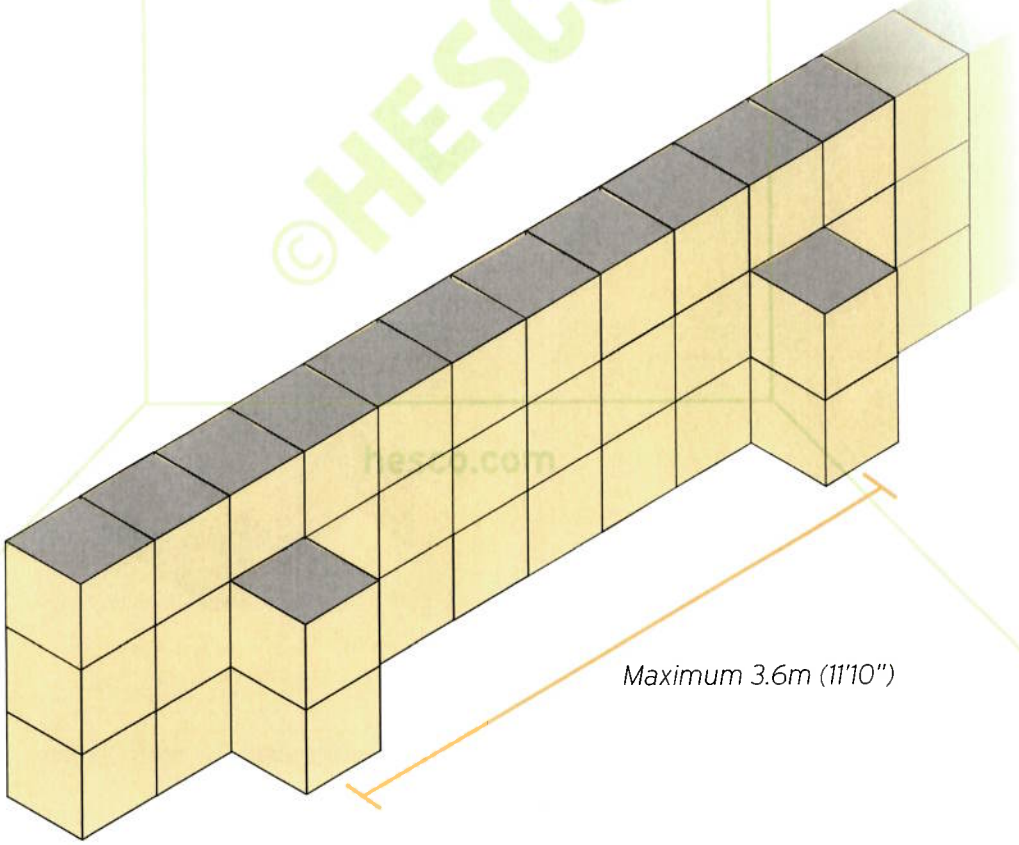
When building higher walls ensure the end wall is stepped in as shown in figure 29.

NOTE There is very little vertical joining required on a structure of this type.

INCREASE STABILITY OF THINNER WALLS

Due to a number of factors you may be required to build a tall, thin wall. In order to increase the stability of thinner defense walls, various alternative layouts can be used, as shown.

For example, if a MIL 2 wall, three storeys high, is adopted, then the wall should be laterally braced by intersecting walls or in-built stiffeners at no more than 3.6m (11'10") centers.



CONSTRUCTION PLANNING BASICS

FILL MATERIAL

The fill material used in building walls has a significant bearing on the walls' protective qualities. Generally, the ideal fill is a sand/gravel mix. This offers good construction characteristics, but, more importantly, offers a high degree of protection, with little incidence of secondary fragmentation.

Fine material such as silt and clay do not offer the same protection and may, indeed, require the wall to be wider. They are also not reliable construction materials.

Large clumps of earth should be avoided, as these may damage the unit, as can large stones.

In the main, large rocks or stones should be avoided as during a large blast they may present a secondary fragmentation risk. However, large rocks have been used where the threat has been accurately defined and there is no risk from secondary fragmentation.

TABLE 2
FILL MATERIAL REQUIREMENT PER UNIT

UNIT TYPE	UNIT LENGTH (m)	NO. OF CELLS	MATERIAL PER UNIT (m^3)	MATERIAL PER UNIT (y^3)
MIL 1	10	9	22	29
MIL 2	1.22	2	0.5	0.7
MIL 3	10	10	13	17
MIL 4	10	10	20	26
MIL 5	3.05	5	1.2	1.6
MIL 6	3.05	5	4	5.2
MIL 7	27.74	13	190	249
MIL 8	10	9	25	33
MIL 9	9.14	12	9	12
MIL 10	30.5	20	133	174
MIL 11	3.18	6	9.2	12
MIL 12	33	30	103	135
MIL 19	3.3	3	13	17

NOTE The figures in Table 2 account for expansion of the unit, compaction of the fill and loss of fill.

REMOVAL

There may be a requirement to remove protective structures. This operation is often undertaken using heavy earthmoving plant to topple the walls and rip the welded mesh away from the fill material. While this method works, it results in a mass of welded mesh that is very difficult to handle and dispose of. The following pages, describe three alternative methods for removal.

The following risks may be present during demolition work:

- Working at height.
- Premature collapse of structure.
- Manual handling injuries.
- Collisions between earthmoving plant and pedestrians.

A safe system of work must be adopted and followed and should include the practices described below:

- Working at height should be minimized.
- When cutting the welded mesh always cut from the bottom up.
- Wear gloves and protective eye wear when handling cut and removed welded mesh.
- Competent banksmen to be appointed to manage earthmoving equipment and to ensure the operating area is kept clear of personnel.
- Ensure dump trucks are supervised whilst reversing.
- When an electric angle grinder or disk cutter is used it should be supplied with site-safe electricity.

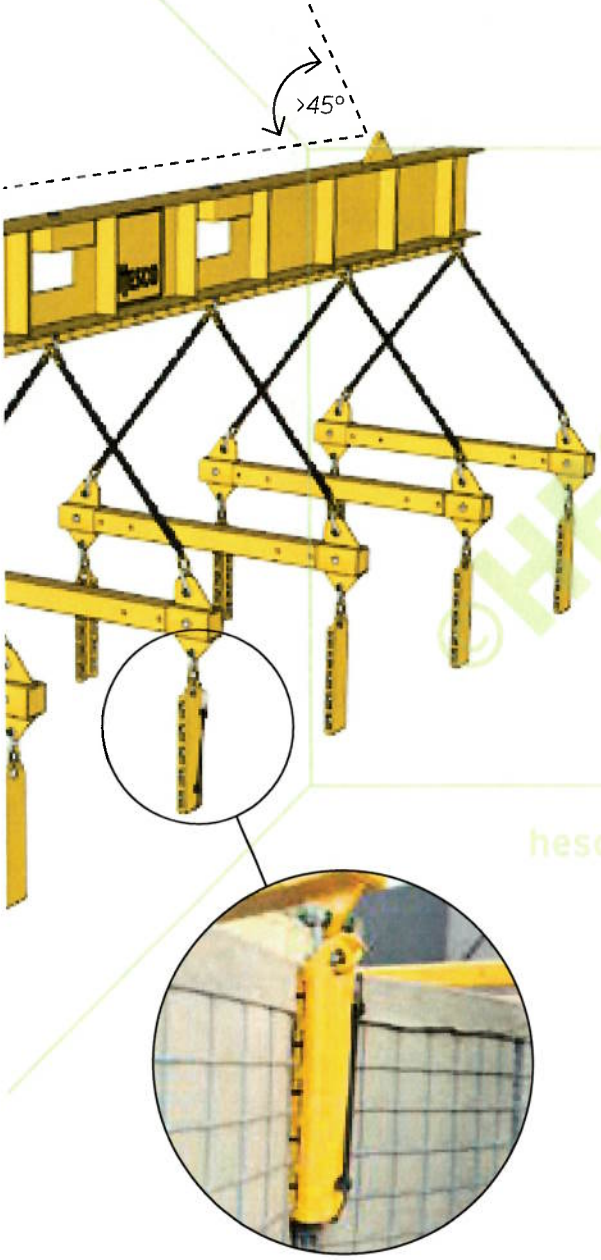
WARNING Any demolition work can be dangerous. It is imperative that a safe system of work is adopted and followed, as described on this page.

REMOVAL - METHOD 2

This method involves removing the welded mesh by hand and is only suitable for low walls.

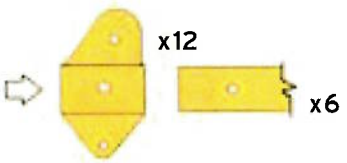
- Identify and remove all material and equipment that is not to be disposed of.
- Use bolt croppers or an angle grinder to cut off all hog rings.
- Beginning at the bottom, cut the welded mesh all the way up both sides adjacent to the corner coils. Then cut the welded mesh across the top just under the stapled flap. Continue cutting until the welded mesh panel can be removed.
- Remove all accessible panels on a cell, as described in the previous step. The welded mesh of the diaphragm wall (between each cell's geotextile) should be removed as and when it becomes free.
- Do not cut the geotextile.
- Use earthmoving equipment to remove the fill (this will still be contained in the geotextile). The removal of the fill, where possible, should be carried out cell by cell.
- Continue until the site is cleared.

Lifting strops/chains must be no less than 45 degrees from the horizontal Recovery Frame

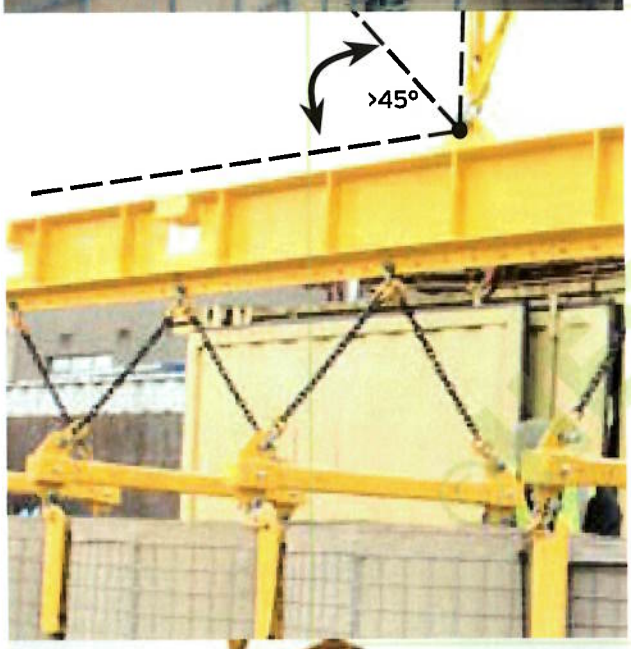


Ensure all nuts on 'D' shackles are secured correctly using the split pins provided

Securing cords used to hold the grips in place during the lifting phase

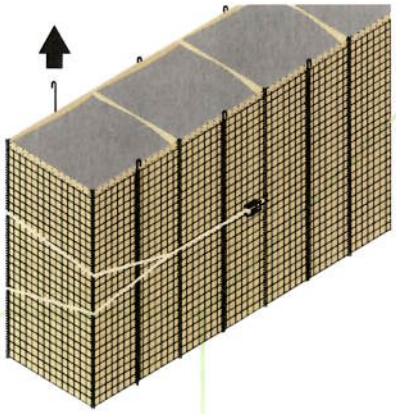


Secure sleeve on the spreader-bar using the pin, with 'R' Clip

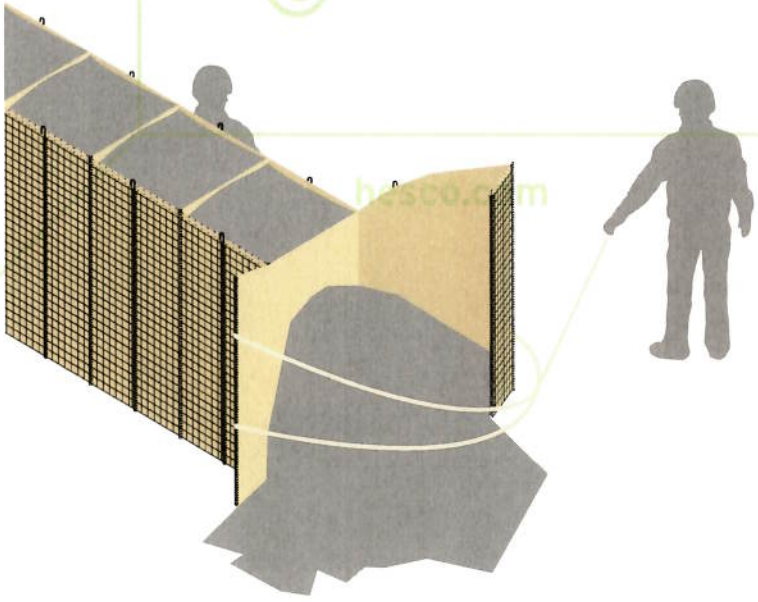


- Prior to lifting, all personnel are to stand clear at least 5m from the units to be lifted. Once the banksman has confirmed that all lugs are located and that all personnel are clear from the area, the recovery process can begin.
- The lifting strops/chains must be no less than 45 degrees from the horizontal Recovery Frame as shown.
- Care should be taken to lift slowly and carefully paying particular attention to ensure that no chains or slings are twisted during lifting.
- Once the units have been lifted clear of the fill, the empty units can be lowered to the ground under guidance.
- Using a competent banksman; position the forks into the beam and secure using the T screws provided.
- Ensure that the beam is level, that the forks are parallel to the ground before securing and lifting, and that the machine is as close to the units to be lifted as reasonably practical.

The plain end of the Y-shaped strap is fed around the cell then joined to the ratchet strap, which is then hooked onto the far corner coil of the cell adjacent to the one being removed. Tighten the straps, using the ratchet, without distorting the coils.



Ensure only the pin on the opposite panel to the ratchet mechanism is removed. After removing this pin, release the ratchet strap, upon which the cell will swing open to release the fill material. Using a length of cordage assist in the operation. **All personnel must stand clear at this point.**



REPAIR PROCEDURE

Prior to repair, an assessment of the structure must be carried out by a qualified engineer/ competent person.

Repairs to structures may be required as a result of attack or accidental mechanical damage. There are a number of repair techniques available, with the technique adopted depending on the nature and extent of the damage. In the majority of cases once repairs have been carried out the wall will once again be as competent as it was before the damage occurred.

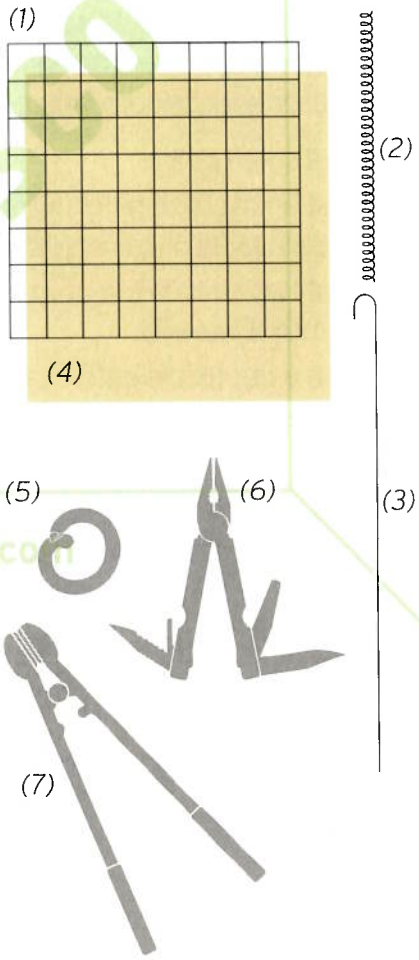
In general, material required for repair consists of:

- Welded mesh panels *(1)*
- Coils *(2)*
- Pins *(3)*
- Geotextile *(4)*
- Hog rings *(5)*
- Multi-tool *(6)*
- Bolt cutters *(7)*

Alternately repair material can be gained by cannibalizing parts from unused units.

Repairs may range from minor repair of torn geotextile to the repair or replacement of complete sections of wall.

The modular design of the units allows all of these repairs to be completed in an economical and efficient manner.



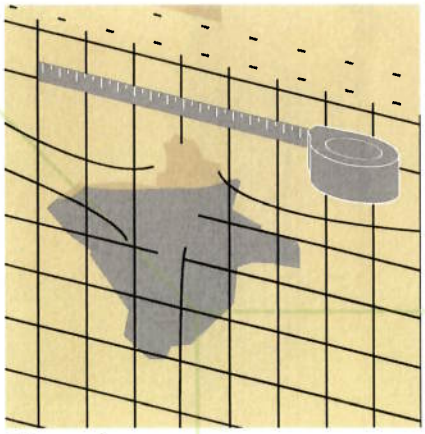


Figure 1

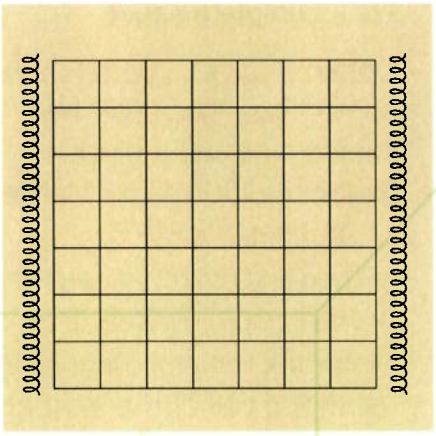


Figure 2

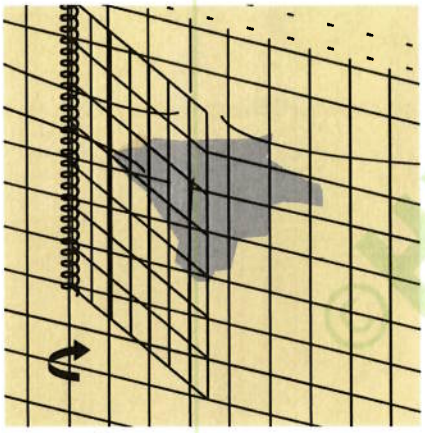


Figure 3

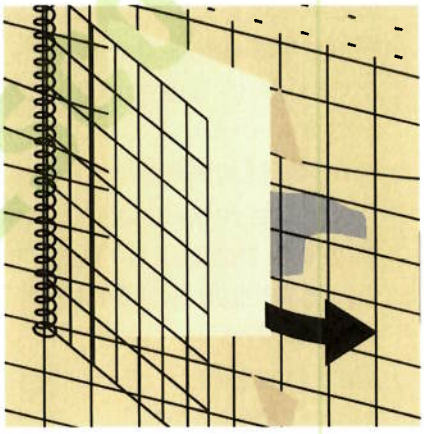


Figure 4

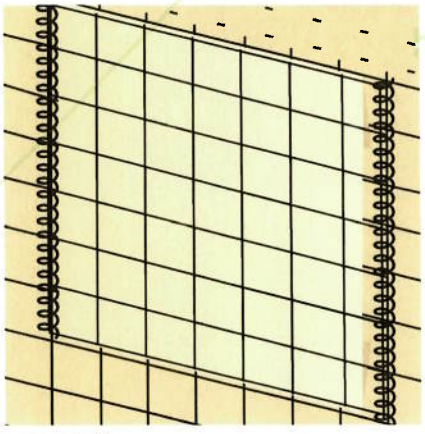


Figure 5

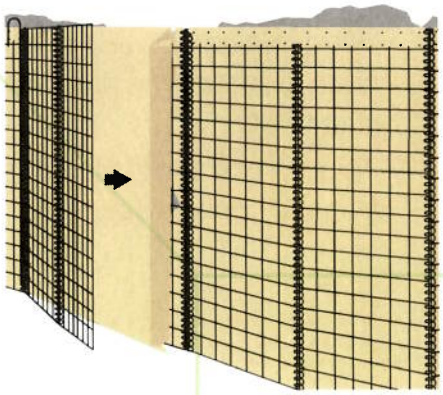


Figure 8

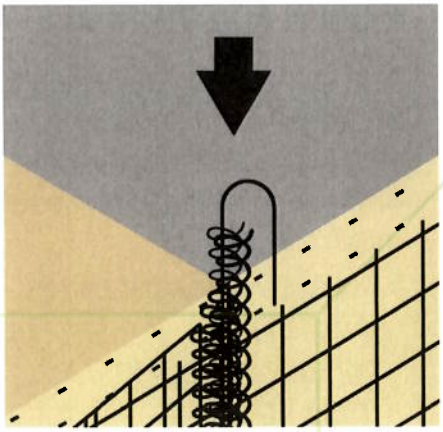


Figure 9

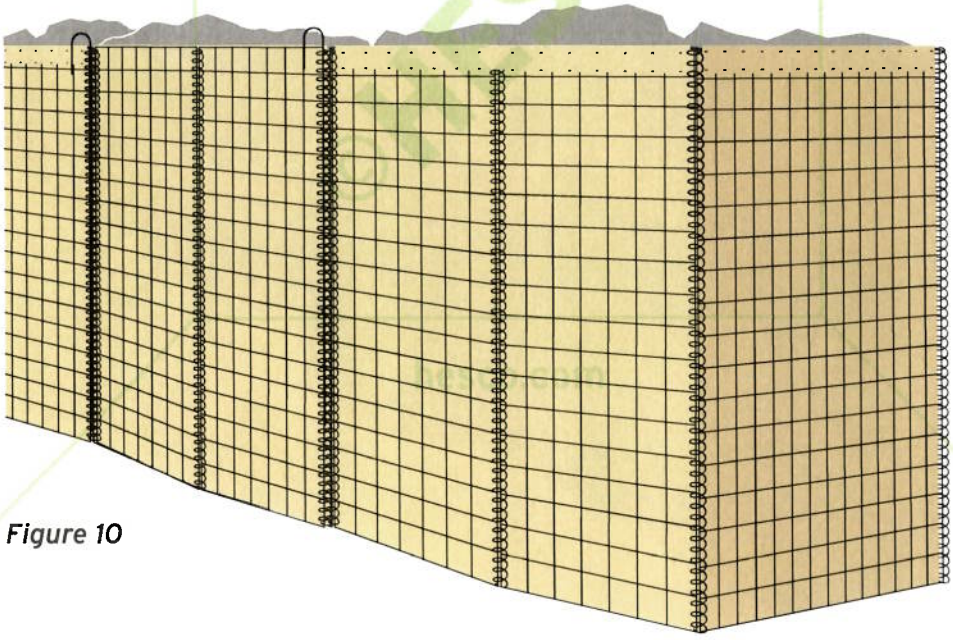


Figure 10

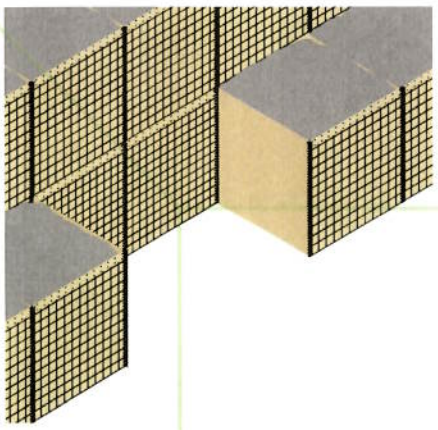


Figure 12

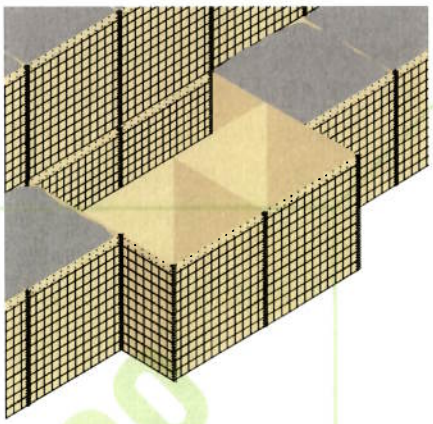


Figure 13

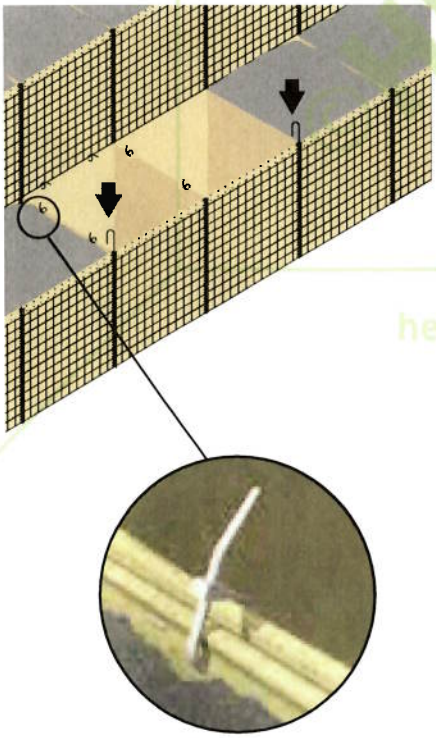


Figure 14 Cable tie or hog ring

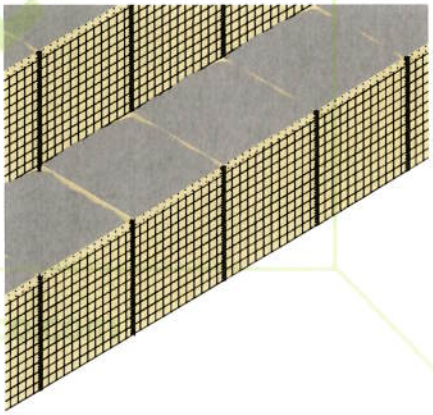


Figure 15

CAPPING

For structures which are expected to have a long service life, are in wind-affected areas or are adjacent to aircraft operating surfaces, it is important that loss of fill material is prevented. This can be achieved by a number of means:

- Fill material should be shaped and sufficiently compacted to allow moisture to run off.
- The structure can be covered by tarpaulins or other waterproof membranes.
- A lean mix concrete or cement bound material can be used as the final layer.
- Where fine sand has been used as the bulk fill and is susceptible to being blown out by the wind, then a slightly coarser aggregate can be used to cap the cells.

PROTECTION AGAINST ULTRAVIOLET RADIATION

The geotextile used in HESCO Units is susceptible to the effects of UV radiation after a period of prolonged exposure.

Substantial developments and testing was carried out to produce the geotextile.

One of the problems with trying to predict the effects of UV is that it varies considerably from region to region and can, in fact, differ within the same region. There are, of course, a number of other issues which affect the severity of any degradation that may occur:

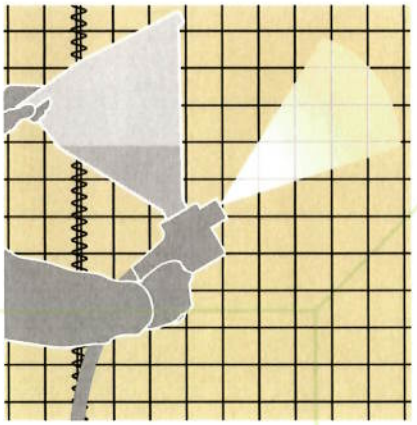
- Fill material used in the cells.
- Orientation of the units exposure to the sun.
- The level of fill within the unit.
- Stresses placed on the geotextile.

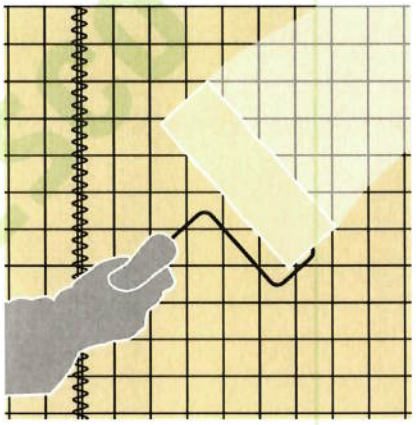
APPLICATION OF PROTECTIVE COATINGS

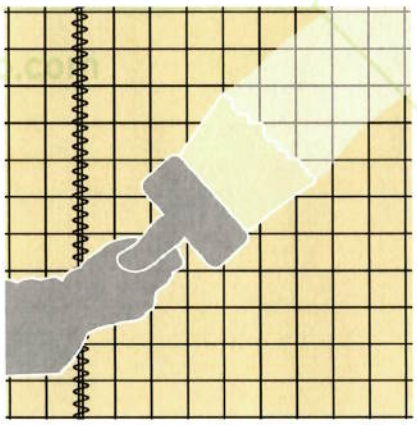
The application of a protective coating, such as cement slurry or, indeed, paint (water-based emulsion), is likely to significantly extend the life span of the geotextile.

A sprayer such as a stucco gun (texture gun) connected to a 7.5 cu ft/min compressor is ideal for the application of cement slurry or paint. Cement slurry or paint can also be applied by brush or roller.

Cement slurry is simply a mixture of cement powder and water. It is mixed to a strength of approximately 1:1 but this can be adjusted to suit whatever application method is being used. Sand can also be added if desired. The unit to be coated is often wetted prior to the application of the slurry; this prevents the slurry from drying out too quickly.







DEPARTMENT OF THE ARMY
ALASKA DISTRICT, U.S. ARMY CORPS OF ENGINEERS
REGULATORY DIVISION
P.O. BOX 22270
JUNEAU, AK 99802-2270

March 14, 2025

Regulatory Division
POA-2025-0089

Mr. John Bohan
City and Borough of Juneau
155 Heritage Way
Juneau, Alaska 99801

Dear Mr. Bohan:

This is in response to your February 16, 2025, application for a Department of the Army (DA) permit to place 935 cubic yards of shot rock and 3,735 cubic yards of rip rap fill material into 0.45 acres below the ordinary high water mark of the Mendenhall River to stabilize 1,085 linear feet of river bank. It has been assigned file number POA-2025-0089, Mendenhall River, which should be referred to in all future correspondence with this office. The project site is located within Section 24, T. 40 S., R. 65 E., Copper River Meridian; USGS Quad Map QUAD Juneau B-2; Latitude 58.38544° N, Longitude 134.59597° W; at three locations off Killewich Drive, North Meander Way, and South Meander Way in the Mendenhall Valley, in Juneau, Alaska.

DA authorization is necessary because your project will involve the placement of fill material into waters of the United States under our regulatory jurisdiction.

Based upon the information and plans you provided, we hereby verify that the work described above, which will be performed in accordance with the enclosed plan (sheets 1-7), dated February 2025, is authorized by Nationwide Permit (NWP) No. 13, Bank Stabilization. Enclosed is a copy of the NWP No. 13, as well as the Regional and General Conditions. These documents are also available on our website at https://www.poa.usace.army.mil/Missions/Regulatory/Types-of-Permits/Nationwide-Permits/. The following Regional Conditions apply to your project: E – Delineation of Project Footprint and Maintenance of Hydrology Patterns. You must comply with all terms and conditions associated with NWP No. 13.

Further, please note General Condition 30 requires that you submit a signed certification to us once any work and required mitigation are completed. Enclosed is the form for you to complete and return to our office.

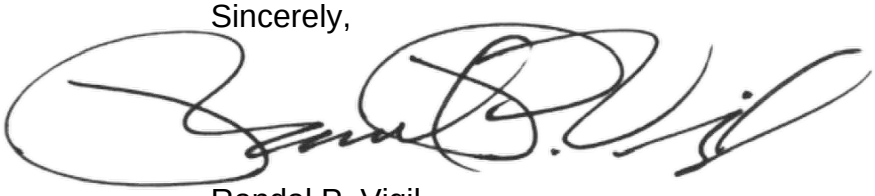
Unless this NWP is modified or revoked, it expires on March 14, 2026. If you commence or are under contract to commence this activity before the date that the

NWPs are modified or revoked, you will have twelve (12) months from the date of the modification or revocation of the NWPs to complete the activity under the present terms and conditions of these nationwide permits. It is incumbent upon you to remain informed of the changes to the NWPs.

Nothing in this letter excuses you from compliance with other Federal, state, or local statutes, ordinances, or regulations.

Please contact me via email at Ranal.P.Vigil@usace.army.mil, by mail at the address above, by phone at (907) 201-5022, if you have questions. For more information about the Regulatory Program, please visit our website at www.poa.usace.army.mil/Missions/Regulatory.

Sincerely,



Randal P. Vigil
Chief, Southeast Section

Enclosures

ENCLOSURE

US Army Corps of Engineers
Alaska District

Permit Number: POA-2025-00089

Name of Permittee: City and Borough of Juneau

Date of Issuance: March 14, 2025

Upon completion of the activity authorized by this permit and any mitigation required by the permit, sign this certification and return it to Randal Vigil at regpagemaster@usace.army.mil, or the following address:

U.S. Army Corps of Engineers
Alaska District
Regulatory Division
P.O. Box 22270
Juneau, AK 99802-2270

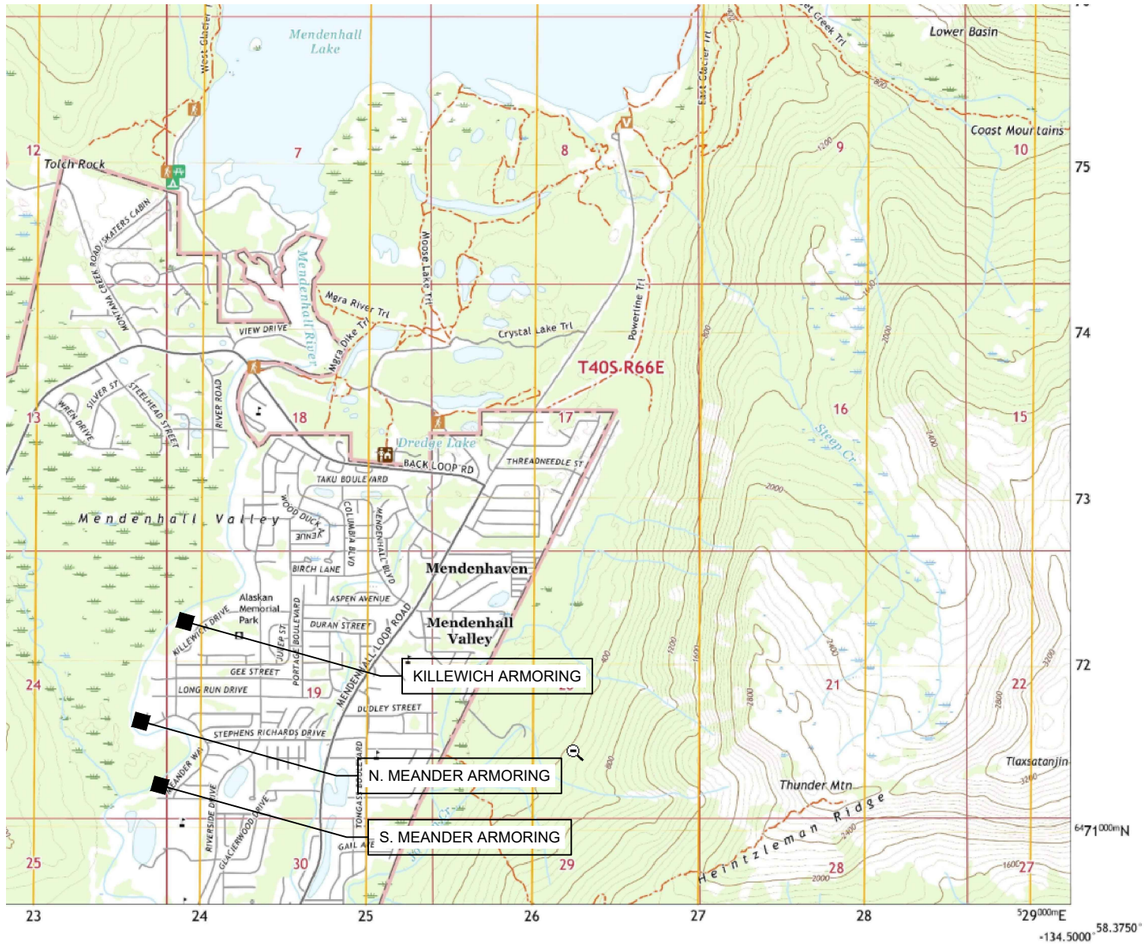
Please note that your permitted activity is subject to a compliance inspection by a U.S. Army Corps of Engineers representative. If you fail to comply with this permit you are subject to permit suspension, modification, or revocation.

I hereby certify that the work authorized by the above-referenced permit has been completed in accordance with the terms and conditions of the said permit, and required mitigation was completed in accordance with the permit conditions.

_____ _____

Signature of Permittee Date

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING
MENDENHALL RIVERBANK ARMORING
JUNEAU, AK



INDEX:

POA-2025-00089 Mendenhall River

PROJECT LOCATION: USGS B-2 NW, AK - 2021

- S. MEANDER: 58.38114 LATITUDE -134.59365 LONGITUDE
  9387 RIVERCOURT WAY AND 3315, 3319, 3323 MEANDER WAY, JUNEAU AK
- N. MEANDER: 58.38544 LATITUDE -134.59597 LONGITUDE
  3491,3495,3499, CBJ(NHN) MEANDER WAY, JUNEAU, AK
- KILLEWICH: 58.39001 LATITUDE -139.59122 LONGITUDE
  3835,3839,3843,3847,3849 KILLEWICH DRIVE, JUNEAU, AK

PROJECT CONTACT:

CBJ ENGINEERING AND PUBLIC WORKS DEPT.
JOHN BOHAN
155 HERITAGE WAY
JUNEAU AK 99801
(907) 586-0800 X-4188 john.bohan@juneau.gov

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

COVER AND LOCATION MAP

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 1 of 7

DESCRIPTION

The work under this section includes providing all labor, tools and equipment necessary for furnishing and placing a protective covering of stone, as shown on the drawings or as directed by the engineer.

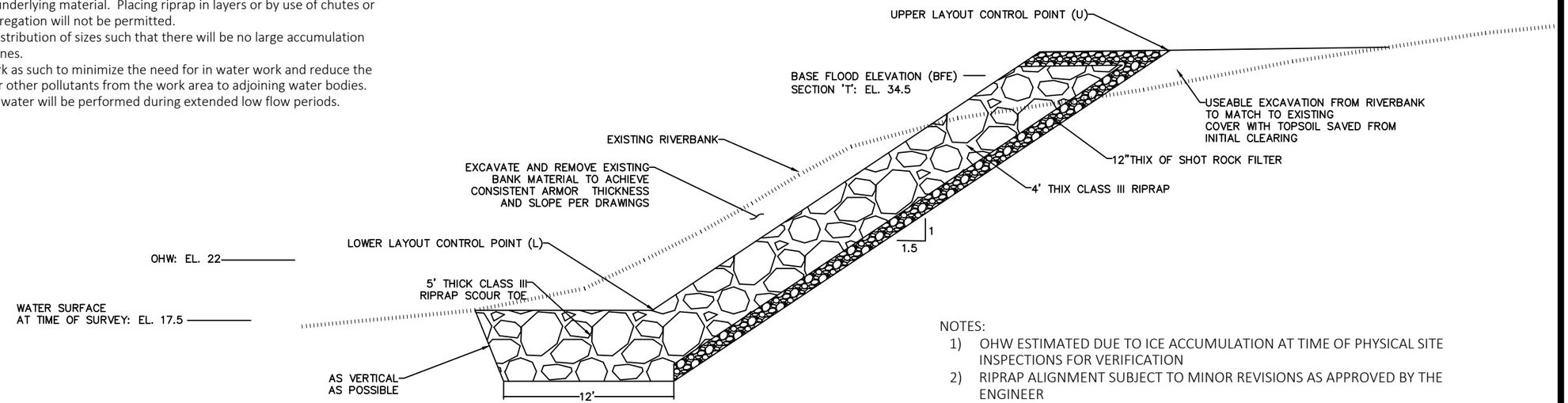
MATERIALS

SHOT ROCK BORROW: shall consist of 10" minus shot rock and shall contain no organics or other deleterious matter. The shot rock shall be evenly graded with at least 10% by weight retained on the 8" screen. Shot rock will be obtained from quarry rock unless otherwise approved by the engineer.

CLASS III RIPRAP: shall consist of no more than 10% total by weight more than 1400 pounds each, and no more than 15% of stones by weight shall weigh less than 25 pounds each. A minimum of 50% by weight shall weigh greater than 700 pounds.

CONSTRUCTION

A. Slopes to be protected with riprap shall be free of brush, trees stumps and other objectional material and shall be graded to a relative smooth surface.
B. The shot rock filter layer shall be place prior to placing riprap as shown on the drawings.
C. The riprap shall be placed to the thickness, height and length as shown on the drawings or as staked with a minimum of voids.
D. Undesirable voids shall be filled with small stones or spalls. The rock shall be manipulated sufficiently by means of excavator or other suitable equipment to secure a reasonably regular surface and mass stability.
E. Riprap protection shall be placed to full course thickness in one operation and in such a manner to avoid damaging the filter layer or underlying material. Placing riprap in layers or by use of chutes or similar activities likely to cause segregation will not be permitted.
F. Riprap shall be placed with a fair distribution of sizes such that there will be no large accumulation or area of mainly large or small stones.
G. The contractor shall phase the work as such to minimize the need for in water work and reduce the potential for sediment discharge or other pollutants from the work area to adjoining water bodies. Ideally, the work below mean high water will be performed during extended low flow periods.



NOTES:

1) OHW ESTIMATED DUE TO ICE ACCUMULATION AT TIME OF PHYSICAL SITE INSPECTIONS FOR VERIFICATION
2) RIPRAP ALIGNMENT SUBJECT TO MINOR REVISIONS AS APPROVED BY THE ENGINEER
3) EXCAVATION SPOILS, ORGANICS, MUCK AND OTHER DEBRIS GENERATED FROM BY THE WORK BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE DISPOSED OF AT AN OFF SITE LOCATION THAT IS PERMITTED AS SUCH.

POA-2025-00089 Mendenhall River

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

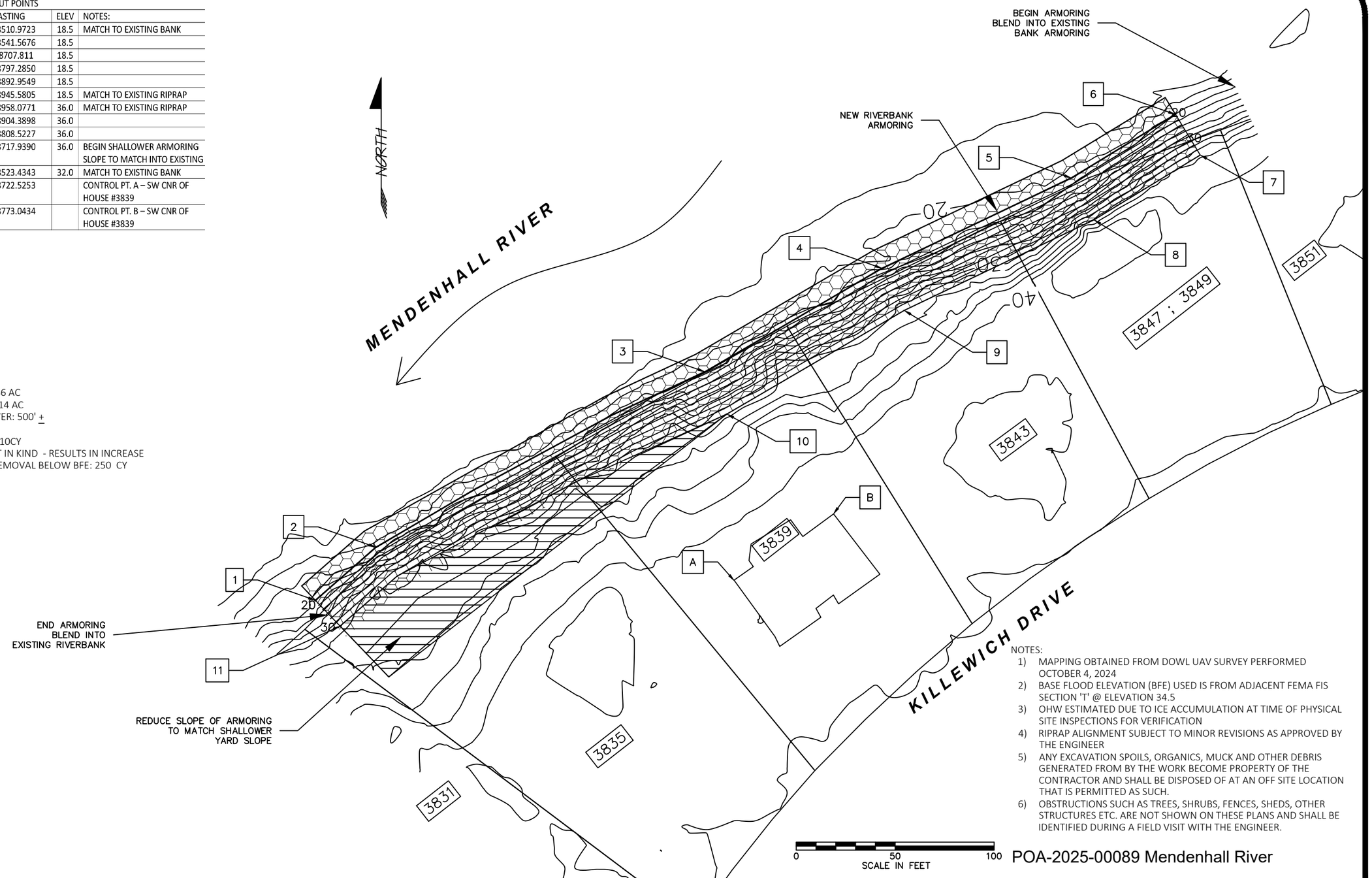
KILLEWICH ARMORING TYPICAL SECTION

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 2 of 7

LAYOUT POINTS				
POINT #	NORTHING	EASTING	ELEV	NOTES:
1	2395970.3710	2508510.9723	18.5	MATCH TO EXISTING BANK
2	2395997.1648	2508541.5676	18.5	
3	2396085.7665	2508707.811	18.5	
4	2396138.0306	2508797.2850	18.5	
5	2396183.6512	2508892.9549	18.5	
6	2396215.7526	2508945.5805	18.5	MATCH TO EXISTING RIPRAP
7	2396195.2627	2508958.0771	36.0	MATCH TO EXISTING RIPRAP
8	2396162.5192	2508904.3898	36.0	
9	2396116.8003	2508808.5227	36.0	
10	2396064.4721	2508717.9390	36.0	BEGIN SHALLOWER ARMORING SLOPE TO MATCH INTO EXISTING
11	2395957.3582	2508523.4343	32.0	MATCH TO EXISTING BANK
A	2395980.5465	2508722.5253		CONTROL PT. A – SW CNR OF HOUSE #3839
B	2396013.8097	2508773.0434		CONTROL PT. B – SW CNR OF HOUSE #3839

QUANTITIES:
1) TOTAL BANK ARMORING AREA: 0.46 AC
2) BANK ARMORING BELOW OHW: 0.14 AC
3) LENGTH OF ARMORING ALONG RIVER: 500' ±
4) TOTAL RIPRAP VOLUME: 4,950 CY
5) RIPRAP VOLUME BELOW OHW: 2210CY
6) BANK ARMORING IS REPLACEMENT IN KIND - RESULTS IN INCREASE OF FLOODWAY SIZE - MATERIAL REMOVAL BELOW BFE: 250 CY



NOTES:
1) MAPPING OBTAINED FROM DOWL UAV SURVEY PERFORMED OCTOBER 4, 2024
2) BASE FLOOD ELEVATION (BFE) USED IS FROM ADJACENT FEMA FIS SECTION 'T' @ ELEVATION 34.5
3) OHW ESTIMATED DUE TO ICE ACCUMULATION AT TIME OF PHYSICAL SITE INSPECTIONS FOR VERIFICATION
4) RIPRAP ALIGNMENT SUBJECT TO MINOR REVISIONS AS APPROVED BY THE ENGINEER
5) ANY EXCAVATION SPOILS, ORGANICS, MUCK AND OTHER DEBRIS GENERATED FROM BY THE WORK BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE DISPOSED OF AT AN OFF SITE LOCATION THAT IS PERMITTED AS SUCH.
6) OBSTRUCTIONS SUCH AS TREES, SHRUBS, FENCES, SHEDS, OTHER STRUCTURES ETC. ARE NOT SHOWN ON THESE PLANS AND SHALL BE IDENTIFIED DURING A FIELD VISIT WITH THE ENGINEER.

POA-2025-00089 Mendenhall River

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

KILLEWICH ARMORING CONSTRUCTION PLAN

DATE: 2/1/2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 3 of 7

DESCRIPTION

The work under this section includes providing all labor, tools and equipment necessary for furnishing and placing a protective covering of stone, as shown on the drawings or as directed by the engineer.

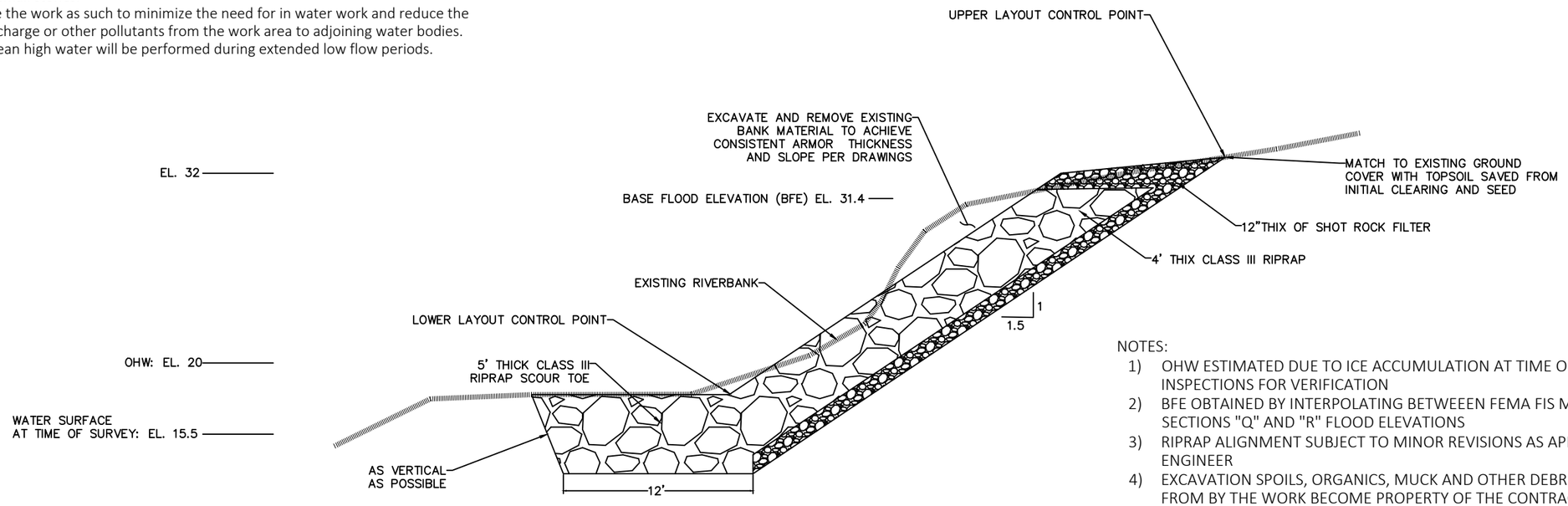
MATERIALS

SHOT ROCK BORROW: shall consist of 10" minus shot rock and shall contain no organics or other deleterious matter. The shot rock shall be evenly graded with at least 10% by weight retained on the 8" screen. Shot rock will be obtained from quarry rock unless otherwise approved by the engineer.

CLASS III RIPRAP: shall consist of no more than 10% total by weight more than 1400 pounds each, and no more than 15% of stones by weight shall weigh less than 25 pounds each. A minimum of 50% by weight shall weigh greater than 700 pounds.

CONSTRUCTION

A. Slopes to be protected with riprap shall be free of brush, trees stumps and other objectional material and shall be graded to a relative smooth surface.
B. The shot rock filter layer shall be place prior to placing riprap as shown on the drawings.
C. The riprap shall be placed to the thickness, height and length as shown on the drawings or as staked with a minimum of voids.
D. Undesirable voids shall be filled with small stones or spalls. The rock shall be manipulated sufficiently by means of excavator or other suitable equipment to secure a reasonably regular surface and mass stability.
E. Riprap protection shall be placed to full course thickness in one operation and in such a manner to avoid damaging the filter layer or underlying material. Placing riprap in layers or by use of chutes or similar activities likely to cause segregation will not be permitted.
F. Riprap shall be placed with a fair distribution of sizes such that there will be no large accumulation or area of mainly large or small stones.
G. The contractor shall phase the work as such to minimize the need for in water work and reduce the potential for sediment discharge or other pollutants from the work area to adjoining water bodies. Ideally, the work below mean high water will be performed during extended low flow periods.



NOTES:

1) OHW ESTIMATED DUE TO ICE ACCUMULATION AT TIME OF PHYSICAL SITE INSPECTIONS FOR VERIFICATION
2) BFE OBTAINED BY INTERPOLATING BETWEEEN FEMA FIS MAPPING SECTIONS "Q" AND "R" FLOOD ELEVATIONS
3) RIPRAP ALIGNMENT SUBJECT TO MINOR REVISIONS AS APPROVED BY THE ENGINEER
4) EXCAVATION SPOILS, ORGANICS, MUCK AND OTHER DEBRIS GENERATED FROM BY THE WORK BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE DISPOSED OF AT AN OFF SITE LOCATION THAT IS PERMITTED AS SUCH.

POA-2025-00089 Mendenhall River

Revisions		
Date	Description	Intls.

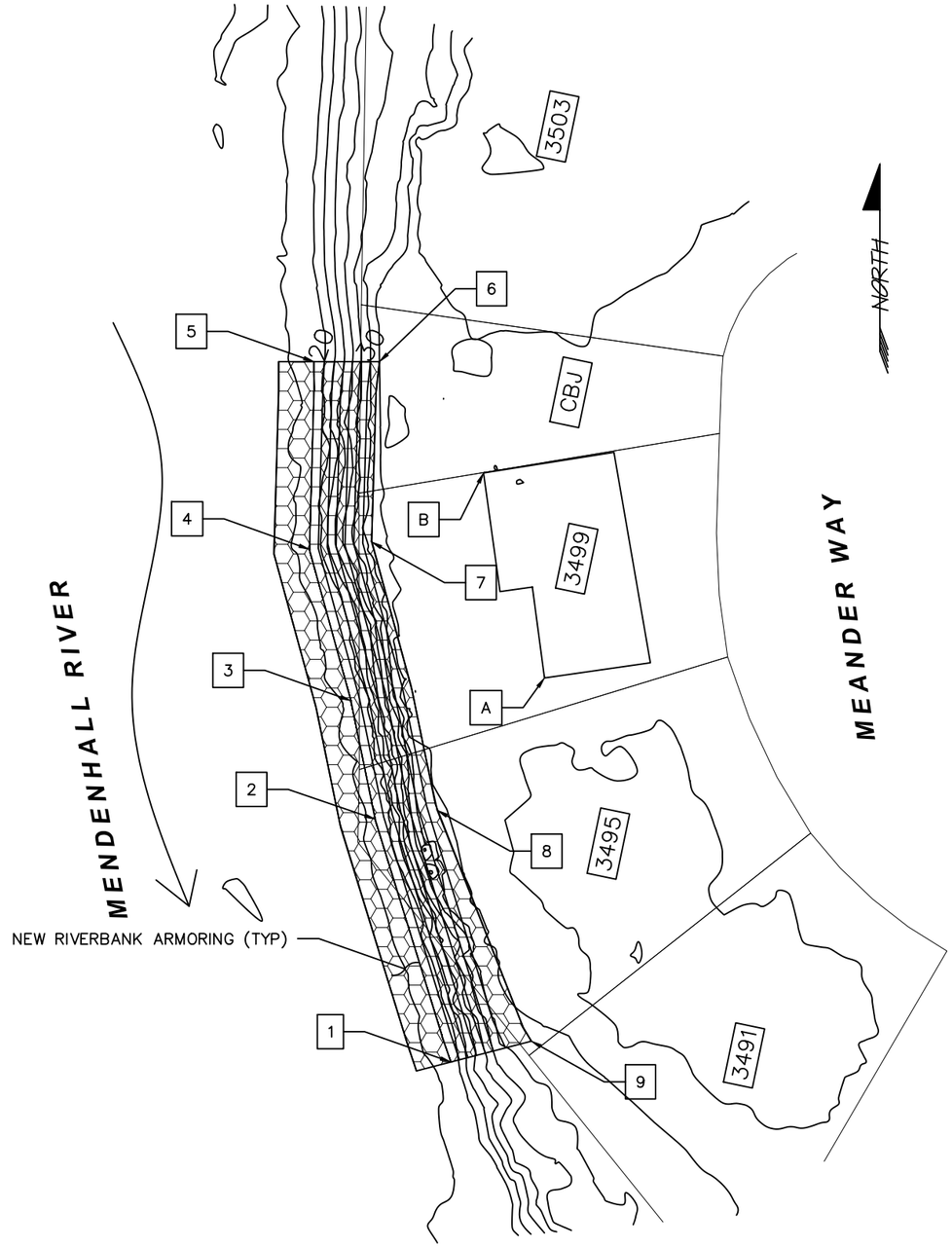
Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

N. MEANDER ARMORING TYPICAL SECTION

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: NOT TO SCALE

SHEET: 4 of 7



QUANTITIES:

1) TOTAL BANK ARMORING AREA: 0.19 AC
2) BANK ARMORING BELOW OHW: 0.10 AC
3) LENGTH OF ARMORING ALONG RIVER: 250' ±
4) TOTAL RIPRAP VOLUME: 1540 CY
5) RIPRAP VOLUME BELOW OHW: 770 CY
6) BANK ARMORING IS REPLACEMENT IN KIND - RESULTS IN INCREASE OF FLOODWAY SIZE - MATERIAL REMOVAL BELOW BFE: 7 CY

POINT #	NORTHING	EASTING	ELEV	NOTES:
1	2393896.5525	2507610.8681	18.0	Match TO EXISTING BANK
2	2393978.9938	2507585.2101	18.0	
3	2394019.0284	2507577.0045	18.0	
4	2394070.3146	2507562.9437	18.0	
5	2394133.9212	2507564.5190	18.0	MATCH TO EXISTING RIPRAP
6	2394133.9212	2507586.6734	32.0	MATCH TO EXISTING RIPRAP
7	2394072.8377	2507584.0270	32.0	
8	2393981.8148	2507606.2823	32.0	
9	2393903.6179	2507638.1839	32.0	MATCH TO EXISTING BANK
A	2394026.7173	2507642.6270		CONTROL POINT - SW CNR HOUSE #3499
B	2394096.2090	2507621.9639		CONTROL POINT – NW CNR HOUSE #3499

NOTES:

1) THIS WORK WILL BE TO RECONSTRUCT AN EXISTING RIPRAP ARMORED BANK. SALVAGE AND REUSE RIPRAP THAT MEETS THE REQUIREMENTS SPECIFIED.
2) MAPPING OBTAINED FROM DOWL UAV SURVEY PERFORMED OCTOBER 4, 2024
3) BASE FLOOD ELEVATION (BFE) USED IS ELEVATION 30.4. THIS HAS BEEN INTERPOLATED BETWEEN FEMA SECTIONS 'Q' AND 'R'
4) OHW APPROXIMATED DUE TO ICE ACCUMULATION AT TIME OF PHYSICAL SITE INSPECTIONS FOR VERIFICATION
5) RIPRAP ALIGNMENT SUBJECT TO MINOR REVISIONS AS APPROVED BY THE ENGINEER
6) ANY EXCAVATION SPOILS, ORGANICS, MUCK AND OTHER DEBRIS GENERATED FROM BY THE WORK BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE DISPOSED OF AT AN OFF SITE LOCATION THAT IS PERMITTED AS SUCH.
7) OBSTRUCTIONS SUCH AS TREES, SHRUBS, FENCES, SHEDS, OTHER STRUCTURES ETC. ARE NOT SHOWN ON THESE PLANS AND SHALL BE IDENTIFIED DURING A FIELD VISIT WITH THE ENGINEER.

0 50 100
SCALE IN FEET

POA-2025-00089 Mendenhall River

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

N. MEANDER ARMORING CONSTRUCTION PLAN

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 5 of 7

DESCRIPTION

The work under this section includes providing all labor, tools and equipment necessary for furnishing and placing a protective covering of stone, as shown on the drawings or as directed by the engineer.

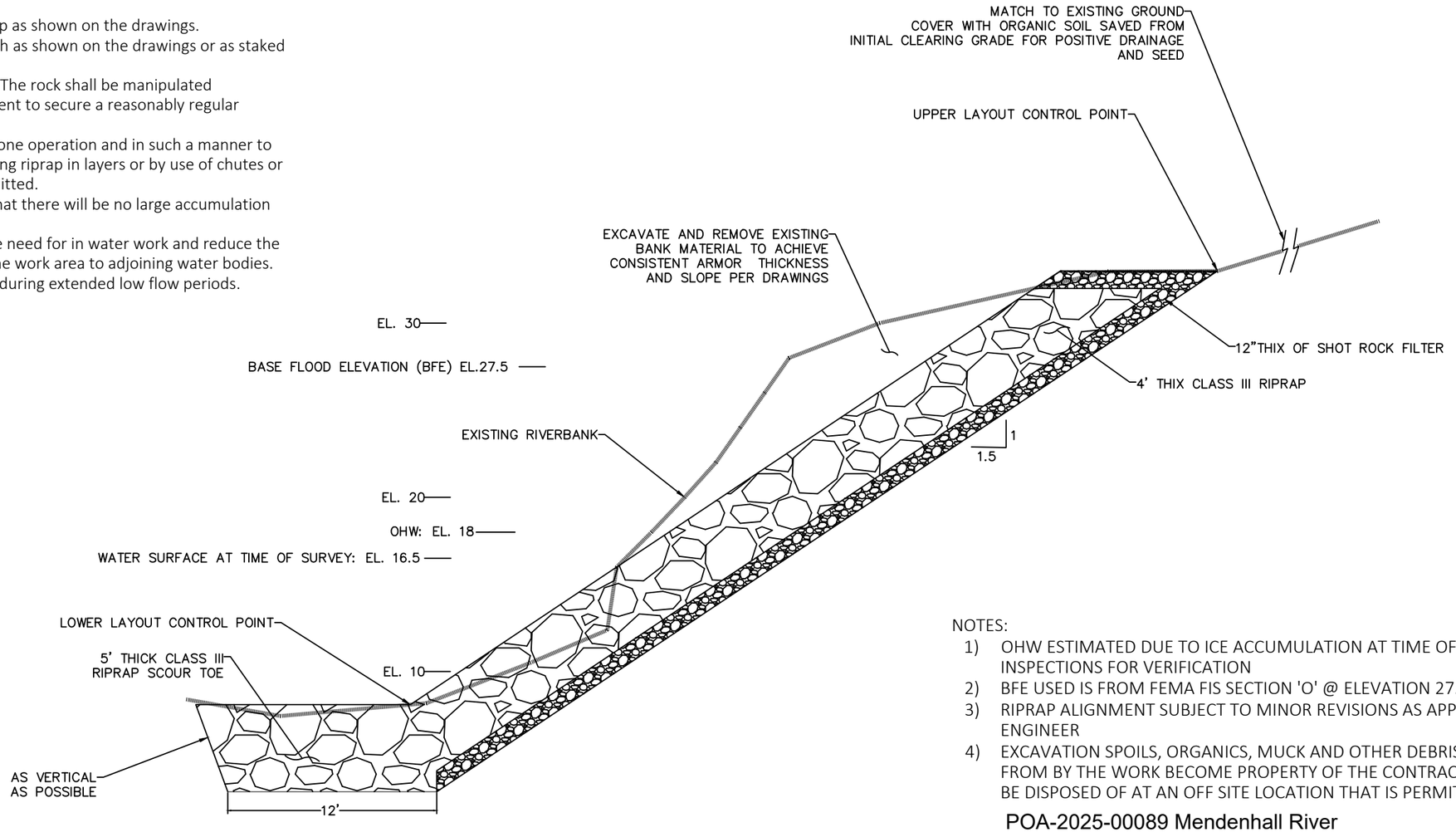
MATERIALS

SHOT ROCK BORROW: shall consist of 10" minus shot rock and shall contain no organics or other deleterious matter. The shot rock shall be evenly graded with at least 10% by weight retained on the 8" screen. Shot rock will be obtained from quarry rock unless otherwise approved by the engineer.

CLASS III RIPRAP: shall consist of no more than 10% total by weight more than 1400 pounds each, and no more than 15% of stones by weight shall weigh less than 25 pounds each. A minimum of 50% by weight shall weigh greater than 700 pounds.

CONSTRUCTION

A. Slopes to be protected with riprap shall be free of brush, trees stumps and other objectional material and shall be graded to a relative smooth surface.
B. The shot rock filter layer shall be place prior to placing riprap as shown on the drawings.
C. The riprap shall be placed to the thickness, height and length as shown on the drawings or as staked with a minimum of voids.
D. Undesirable voids shall be filled with small stones or spalls. The rock shall be manipulated sufficiently by means of excavator or other suitable equipment to secure a reasonably regular surface and mass stability.
E. Riprap protection shall be placed to full course thickness in one operation and in such a manner to avoid damaging the filter layer or underlying material. Placing riprap in layers or by use of chutes or similar activities likely to cause segregation will not be permitted.
F. Riprap shall be placed with a fair distribution of sizes such that there will be no large accumulation or area of mainly large or small stones.
G. The contractor shall phase the work as such to minimize the need for in water work and reduce the potential for sediment discharge or other pollutants from the work area to adjoining water bodies. Ideally, the work below mean high water will be performed during extended low flow periods.



NOTES:

1) OHW ESTIMATED DUE TO ICE ACCUMULATION AT TIME OF PHYSICAL SITE INSPECTIONS FOR VERIFICATION
2) BFE USED IS FROM FEMA FIS SECTION 'O' @ ELEVATION 27.5
3) RIPRAP ALIGNMENT SUBJECT TO MINOR REVISIONS AS APPROVED BY THE ENGINEER
4) EXCAVATION SPOILS, ORGANICS, MUCK AND OTHER DEBRIS GENERATED FROM BY THE WORK BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE DISPOSED OF AT AN OFF SITE LOCATION THAT IS PERMITTED AS SUCH.

POA-2025-00089 Mendenhall River

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

S. MEANDER ARMORING TYPICAL SECTION

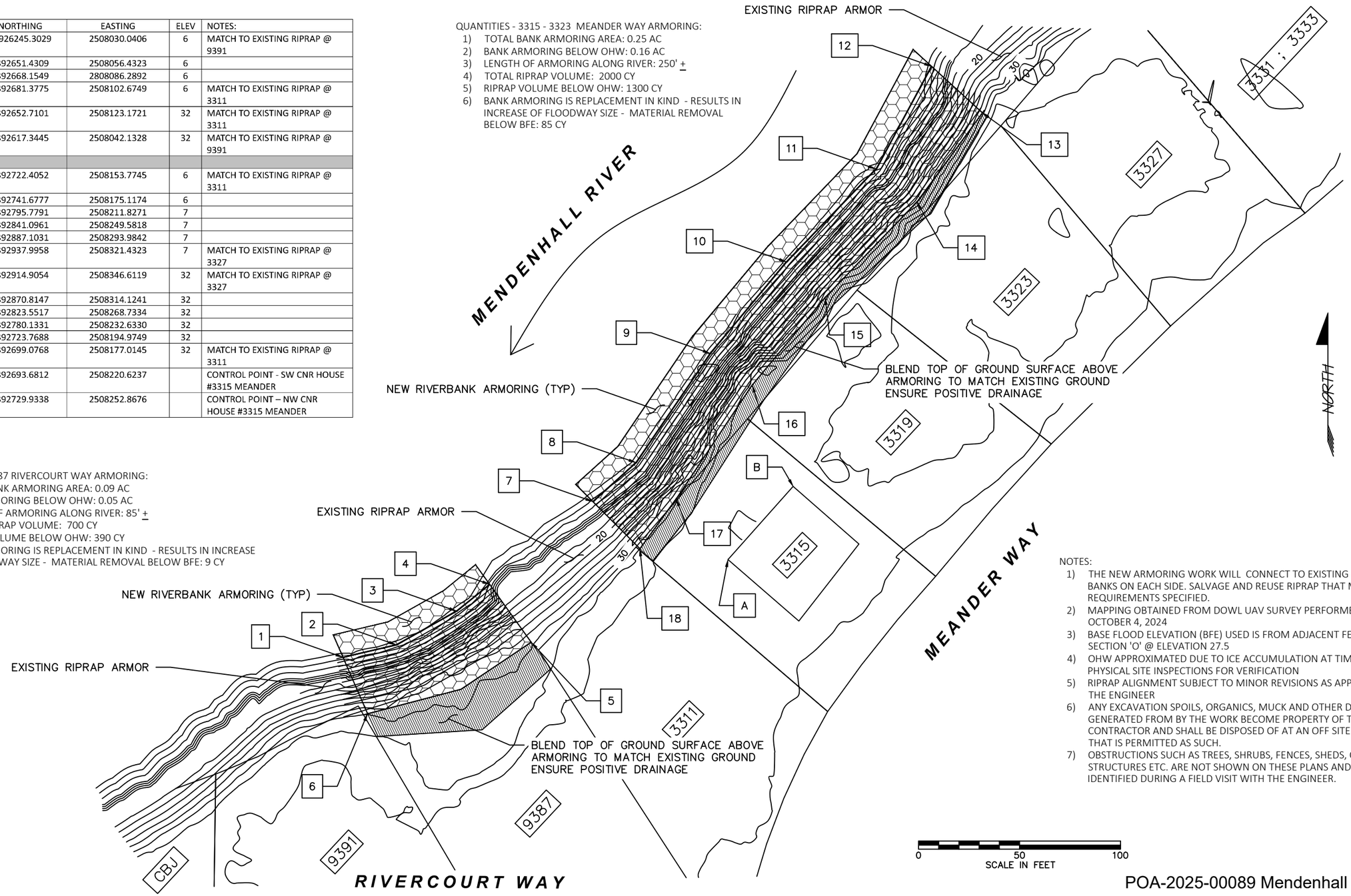
DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: NOT TO SCALE

SHEET: 6 of 7

POINT #	NORTHING	EASTING	ELEV	NOTES:
1	23926245.3029	2508030.0406	6	MATCH TO EXISTING RIPRAP @ 9391
2	2392651.4309	2508056.4323	6	
3	2392668.1549	2808086.2892	6	
4	2392681.3775	2508102.6749	6	MATCH TO EXISTING RIPRAP @ 3311
5	2392652.7101	2508123.1721	32	MATCH TO EXISTING RIPRAP @ 3311
6	2392617.3445	2508042.1328	32	MATCH TO EXISTING RIPRAP @ 9391
7	2392722.4052	2508153.7745	6	MATCH TO EXISTING RIPRAP @ 3311
8	2392741.6777	2508175.1174	6	
9	2392795.7791	2508211.8271	7	
10	2392841.0961	2508249.5818	7	
11	2392887.1031	2508293.9842	7	
12	2392937.9958	2508321.4323	7	MATCH TO EXISTING RIPRAP @ 3327
13	2392914.9054	2508346.6119	32	MATCH TO EXISTING RIPRAP @ 3327
14	2392870.8147	2508314.1241	32	
15	2392823.5517	2508268.7334	32	
16	2392780.1331	2508232.6330	32	
17	2392723.7688	2508194.9749	32	
18	2392699.0768	2508177.0145	32	MATCH TO EXISTING RIPRAP @ 3311
A	2392693.6812	2508220.6237		CONTROL POINT - SW CNR HOUSE #3315 MEANDER
B	2392729.9338	2508252.8676		CONTROL POINT – NW CNR HOUSE #3315 MEANDER

QUANTITIES - 9387 RIVERCOURT WAY ARMORING:
1) TOTAL BANK ARMORING AREA: 0.09 AC
2) BANK ARMORING BELOW OHW: 0.05 AC
3) LENGTH OF ARMORING ALONG RIVER: 85' ±
4) TOTAL RIPRAP VOLUME: 700 CY
5) RIPRAP VOLUME BELOW OHW: 390 CY
6) BANK ARMORING IS REPLACEMENT IN KIND - RESULTS IN INCREASE OF FLOODWAY SIZE - MATERIAL REMOVAL BELOW BFE: 9 CY

QUANTITIES - 3315 - 3323 MEANDER WAY ARMORING:
1) TOTAL BANK ARMORING AREA: 0.25 AC
2) BANK ARMORING BELOW OHW: 0.16 AC
3) LENGTH OF ARMORING ALONG RIVER: 250' ±
4) TOTAL RIPRAP VOLUME: 2000 CY
5) RIPRAP VOLUME BELOW OHW: 1300 CY
6) BANK ARMORING IS REPLACEMENT IN KIND - RESULTS IN INCREASE OF FLOODWAY SIZE - MATERIAL REMOVAL BELOW BFE: 85 CY



NOTES:
1) THE NEW ARMORING WORK WILL CONNECT TO EXISTING ARMORED BANKS ON EACH SIDE. SALVAGE AND REUSE RIPRAP THAT MEETS THE REQUIREMENTS SPECIFIED.
2) MAPPING OBTAINED FROM DOWL UAV SURVEY PERFORMED OCTOBER 4, 2024
3) BASE FLOOD ELEVATION (BFE) USED IS FROM ADJACENT FEMA FIS SECTION 'O' @ ELEVATION 27.5
4) OHW APPROXIMATED DUE TO ICE ACCUMULATION AT TIME OF PHYSICAL SITE INSPECTIONS FOR VERIFICATION
5) RIPRAP ALIGNMENT SUBJECT TO MINOR REVISIONS AS APPROVED BY THE ENGINEER
6) ANY EXCAVATION SPOILS, ORGANICS, MUCK AND OTHER DEBRIS GENERATED FROM BY THE WORK BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE DISPOSED OF AT AN OFF SITE LOCATION THAT IS PERMITTED AS SUCH.
7) OBSTRUCTIONS SUCH AS TREES, SHRUBS, FENCES, SHEDS, OTHER STRUCTURES ETC. ARE NOT SHOWN ON THESE PLANS AND SHALL BE IDENTIFIED DURING A FIELD VISIT WITH THE ENGINEER.

POA-2025-00089 Mendenhall River

Revisions			
Date	Description	Intls.	

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

S. MEANDER ARMORING CONSTRUCTION PLAN

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 7 of 7

13. Bank Stabilization

Bank stabilization activities necessary for erosion control or prevention, such as vegetative stabilization, bioengineering, sills, rip rap, revetment, gabion baskets, stream barbs, and bulkheads, or combinations of bank stabilization techniques, provided the activity meets all of the following criteria:

(a) No material is placed in excess of the minimum needed for erosion protection;

(b) The activity is no more than 500 feet in length along the bank, unless the district engineer waives this criterion by making a written determination concluding that the discharge of dredged or fill material will result in no more than minimal adverse environmental effects (an exception is for bulkheads – the district engineer cannot issue a waiver for a bulkhead that is greater than 1,000 feet in length along the bank);

(c) The activity will not exceed an average of one cubic yard per running foot, as measured along the length of the treated bank, below the plane of the ordinary high water mark or the high tide line, unless the district engineer waives this criterion by making a written determination concluding that the discharge of dredged or fill material will result in no more than minimal adverse environmental effects;

(d) The activity does not involve discharges of dredged or fill material into special aquatic sites, unless the district engineer waives this criterion by making a written determination concluding that the discharge of dredged or fill material will result in no more than minimal adverse environmental effects;

(e) No material is of a type, or is placed in any location, or in any manner, that will impair surface water flow into or out of any waters of the United States;

(f) No material is placed in a manner that will be eroded by normal or expected high flows (properly anchored native trees and treetops may be used in low energy areas);

(g) Native plants appropriate for current site conditions, including salinity, must be used for bioengineering or vegetative bank stabilization;

(h) The activity is not a stream channelization activity; and

(i) The activity must be properly maintained, which may require repairing it after severe storms or erosion events. This NWP authorizes those maintenance and repair activities if they require authorization.

This NWP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to construct the bank stabilization activity. Appropriate

measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges of dredged or fill material, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. After construction, temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity if the bank stabilization activity: (1) involves discharges of dredged or fill material into special aquatic sites; or (2) is in excess of 500 feet in length; or (3) will involve the discharge of dredged or fill material of greater than an average of one cubic yard per running foot as measured along the length of the treated bank, below the plane of the ordinary high water mark or the high tide line. (See general condition 32.) (Authorities: Sections 10 and 404)

Note: In coastal waters and the Great Lakes, living shorelines may be an appropriate option for bank stabilization, and may be authorized by NWP 54.

2021 Nationwide Permit General Conditions

Note: To qualify for NWP authorization, the prospective permittee must comply with the following general conditions, as applicable, in addition to any regional or case-specific conditions imposed by the division engineer or district engineer. Prospective permittees should contact the appropriate Corps district office to determine if regional conditions have been imposed on an NWP. Prospective permittees should also contact the appropriate Corps district office to determine the status of Clean Water Act Section 401 water quality certification and/or Coastal Zone Management Act consistency for an NWP. Every person who may wish to obtain permit authorization under one or more NWPs, or who is currently relying on an existing or prior permit authorization under one or more NWPs, has been and is on notice that all of the provisions of 33 CFR 330.1 through 330.6 apply to every NWP authorization. Note especially 33 CFR 330.5 relating to the modification, suspension, or revocation of any NWP authorization.

1. ***Navigation.*** (a) No activity may cause more than a minimal adverse effect on navigation.

(b) Any safety lights and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee's expense on authorized facilities in navigable waters of the United States.

(c) The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his or her authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

2. ***Aquatic Life Movements.*** No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. All permanent and temporary crossings of waterbodies shall be suitably culverted, bridged, or otherwise designed and constructed to maintain low flows to sustain the movement of those aquatic species. If a bottomless culvert cannot be used, then the crossing should be designed and constructed to minimize adverse effects to aquatic life movements.

3. ***Spawning Areas.*** Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized.

4. ***Migratory Bird Breeding Areas.*** Activities in waters of the United States that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.

5. ***Shellfish Beds.*** No activity may occur in areas of concentrated shellfish populations, unless the activity is directly related to a shellfish harvesting activity authorized by NWPs 4 and 48, or is a shellfish seeding or habitat restoration activity authorized by NWP 27.

6. ***Suitable Material.*** No activity may use unsuitable material (*e.g.,* trash, debris, car bodies, asphalt, etc.). Material used for construction or discharged must be free from toxic pollutants in toxic amounts (see section 307 of the Clean Water Act).

7. ***Water Supply Intakes.*** No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.

8. ***Adverse Effects From Impoundments.*** If the activity creates an impoundment of water, adverse effects to the aquatic system due to accelerating the passage of water, and/or restricting its flow must be minimized to the maximum extent practicable.

9. ***Management of Water Flows.*** To the maximum extent practicable, the preconstruction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization, storm water management activities, and temporary and permanent road crossings, except as provided below. The activity must be constructed to withstand expected high flows. The activity must not restrict or impede the passage of normal or high flows, unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the preconstruction course, condition, capacity, and location of open waters if it benefits the aquatic environment (*e.g.,* stream restoration or relocation activities).

10. ***Fills Within 100-Year Floodplains.*** The activity must comply with applicable FEMA-approved state or local floodplain management requirements.

11. ***Equipment.*** Heavy equipment working in wetlands or mudflats must be placed on mats, or other measures must be taken to minimize soil disturbance.

12. ***Soil Erosion and Sediment Controls.*** Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the United States during periods of low-flow or no-flow, or during low tides.

13. ***Removal of Temporary Structures and Fills****.* Temporary structures must be removed, to the maximum extent practicable, after their use has been discontinued. Temporary fills must be removed in their entirety and the affected areas returned to preconstruction elevations. The affected areas must be revegetated, as appropriate.

14. ***Proper Maintenance.*** Any authorized structure or fill shall be properly maintained, including maintenance to ensure public safety and compliance with applicable NWP general conditions, as well as any activity-specific conditions added by the district engineer to an NWP authorization.

15. ***Single and Complete Project.*** The activity must be a single and complete project. The same NWP cannot be used more than once for the same single and complete project.

16. ***Wild and Scenic Rivers.*** (a) No NWP activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a ''study river'' for possible inclusion in the system while the river is in an official study status, unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation or study status.

(b) If a proposed NWP activity will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a ''study river'' for possible inclusion in the system while the river is in an official study status, the permittee must submit a pre-construction notification (see general condition 32). The district engineer will coordinate the PCN with the Federal agency with direct management responsibility for that river. Permittees shall not begin the NWP activity until notified by the district engineer that the Federal agency with direct management responsibility for that river has determined in writing that the proposed NWP activity will not adversely affect the Wild and Scenic River designation or study status.

(c) Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency responsible for the designated Wild and Scenic River or study river (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service). Information on these rivers is also available at: http://www.rivers.gov/.

17. ***Tribal Rights.*** No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

18. ***Endangered Species.*** (a) No activity is authorized under any NWP which is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will directly or indirectly destroy or adversely modify designated critical habitat or critical habitat proposed for such designation. No activity is authorized under any NWP which ''may affect'' a listed species or critical habitat, unless ESA section 7 consultation addressing the consequences of the proposed activity on listed species or critical habitat has been completed. See 50 CFR 402.02 for the definition of ''effects of the action'' for the purposes of ESA section 7 consultation, as well as 50 CFR 402.17, which provides further explanation under ESA section 7 regarding ''activities that are reasonably certain to occur'' and ''consequences caused by the proposed action.''

(b) Federal agencies should follow their own procedures for complying with the requirements of the ESA (see 33 CFR 330.4(f)(1)). If pre-construction notification is required for the proposed activity, the Federal permittee must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will verify that the appropriate documentation has been submitted. If the appropriate documentation has not been submitted, additional ESA section 7 consultation may be necessary for the activity and the respective federal agency would be responsible for fulfilling its obligation under section 7 of the ESA.

(c) Non-federal permittees must submit a pre-construction notification to the district engineer if any listed species (or species proposed for listing) or designated critical habitat (or critical habitat proposed such designation) might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat or critical habitat proposed for such designation, and shall not begin work on the activity until notified by the district engineer that the requirements of the ESA have been satisfied and that the activity is authorized. For activities that might affect Federally-listed endangered or threatened species (or species proposed for listing) or designated critical habitat (or critical habitat proposed for such designation), the pre-construction notification must include the name(s) of the endangered or threatened species (or species proposed for listing) that might be affected by the proposed activity or that utilize the designated critical habitat (or critical habitat proposed for such designation) that might be affected by the proposed activity. The district engineer will determine whether the proposed activity ''may affect'' or will have ''no effect'' to listed species and designated critical habitat and will notify the non-Federal applicant of the Corps' determination within 45 days of receipt of a complete pre-construction notification. For activities where the non-Federal applicant has identified listed species (or species proposed for listing) or designated critical habitat (or critical habitat proposed for such designation) that might be affected or is in the vicinity of the activity, and has so notified the Corps, the applicant shall not begin work until the Corps has provided notification that the proposed activity will have ''no effect'' on listed species (or species proposed for listing or designated critical habitat (or critical habitat proposed for such designation), or until ESA section 7 consultation or conference has been completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.

(d) As a result of formal or informal consultation or conference with the FWS or NMFS the district engineer may add species-specific permit conditions to the NWPs.

(e) Authorization of an activity by an NWP does not authorize the ''take'' of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (*e.g.,* an ESA Section 10 Permit, a Biological Opinion with ''incidental take'' provisions, etc.) from the FWS or the NMFS, the Endangered Species Act prohibits any person subject to the jurisdiction of the United States to take a listed species, where ''take'' means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The

word ‘‘harm’’ in the definition of ‘‘take’’ means an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

(f) If the non-federal permittee has a valid ESA section 10(a)(1)(B) incidental take permit with an approved Habitat Conservation Plan for a project or a group of projects that includes the proposed NWP activity, the non-federal applicant should provide a copy of that ESA section 10(a)(1)(B) permit with the PCN required by paragraph (c) of this general condition. The district engineer will coordinate with the agency that issued the ESA section 10(a)(1)(B) permit to determine whether the proposed NWP activity and the associated incidental take were considered in the internal ESA section 7 consultation conducted for the ESA section 10(a)(1)(B) permit. If that coordination results in concurrence from the agency that the proposed NWP activity and the associated incidental take were considered in the internal ESA section 7 consultation for the ESA section 10(a)(1)(B) permit, the district engineer does not need to conduct a separate ESA section 7 consultation for the proposed NWP activity. The district engineer will notify the non-federal applicant within 45 days of receipt of a complete pre-construction notification whether the ESA section 10(a)(1)(B) permit covers the proposed NWP activity or whether additional ESA section 7 consultation is required.

(g) Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the FWS and NMFS or their world wide web pages at http://www.fws.gov/ or http://www.fws.gov/ipac and http://ww.nmfs.noaa.gov/pr/species/esa/ respectively.

19. ***Migratory Birds and Bald and Golden Eagles.*** The permittee is responsible for ensuring that an action authorized by an NWP complies with the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The permittee is responsible for contacting the appropriate local office of the U.S. Fish and Wildlife Service to determine what measures, if any, are necessary or appropriate to reduce adverse effects to migratory birds or eagles, including whether ‘‘incidental take’’ permits are necessary and available under the Migratory Bird Treaty Act or Bald and Golden Eagle Protection Act for a particular activity.

20. ***Historic Properties.*** (a) No activity is authorized under any NWP which may have the potential to cause effects to properties listed, or eligible for listing, in the National Register of Historic Places until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied.

(b) Federal permittees should follow their own procedures for complying with the requirements of section 106 of the National Historic Preservation Act (see 33 CFR 330.4(g)(1)). If preconstruction notification is required for the proposed NWP activity, the Federal permittee must provide the district engineer with the appropriate documentation to demonstrate compliance

with those requirements. The district engineer will verify that the appropriate documentation has been submitted. If the appropriate documentation is not submitted, then additional consultation under section 106 may be necessary. The respective federal agency is responsible for fulfilling its obligation to comply with section 106.

(c) Non-federal permittees must submit a pre-construction notification to the district engineer if the NWP activity might have the potential to cause effects to any historic properties listed on, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. For such activities, the preconstruction notification must state which historic properties might have the potential to be affected by the proposed NWP activity or include a vicinity map indicating the location of the historic properties or the potential for the presence of historic properties. Assistance regarding information on the location of, or potential for, the presence of historic properties can be sought from the State Historic Preservation Officer, Tribal Historic Preservation Officer, or designated tribal representative, as appropriate, and the National Register of Historic Places (see 33 CFR 330.4(g)). When reviewing pre-construction notifications, district engineers will comply with the current procedures for addressing the requirements of section 106 of the National Historic Preservation Act. The district engineer shall make a reasonable and good faith effort to carry out appropriate identification efforts commensurate with potential impacts, which may include background research, consultation, oral history interviews, sample field investigation, and/or field survey. Based on the information submitted in the PCN and these identification efforts, the district engineer shall determine whether the proposed NWP activity has the potential to cause effects on the historic properties. Section 106 consultation is not required when the district engineer determines that the activity does not have the potential to cause effects on historic properties (see 36 CFR 800.3(a)). Section 106 consultation is required when the district engineer determines that the activity has the potential to cause effects on historic properties. The district engineer will conduct consultation with consulting parties identified under 36 CFR 800.2(c) when he or she makes any of the following effect determinations for the purposes of section 106 of the NHPA: No historic properties affected, no adverse effect, or adverse effect.

(d) Where the non-Federal applicant has identified historic properties on which the proposed NWP activity might have the potential to cause effects and has so notified the Corps, the non Federal applicant shall not begin the activity until notified by the district engineer either that the activity has no potential to cause effects to historic properties or that NHPA section 106 consultation has been completed. For non-federal permittees, the district engineer will notify the prospective permittee within 45 days of receipt of a complete pre-construction notification whether NHPA section 106 consultation is required. If NHPA section 106 consultation is required, the district engineer will notify the non-Federal applicant that he or she cannot begin the activity until section 106 consultation is completed. If the non Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.

(e) Prospective permittees should be aware that section 110k of the NHPA (54 U.S.C. 306113) prevents the Corps from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the Corps, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the Corps is required to notify the ACHP and provide documentation specifying the circumstances, the degree of damage to the integrity of any historic properties affected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/ THPO, appropriate Indian tribes if the undertaking occurs on or affects historic properties on tribal lands or affects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.

21. ***Discovery of Previously Unknown Remains and Artifacts.*** Permittees that discover any previously unknown historic, cultural or archeological remains and artifacts while accomplishing the activity authorized by an NWP, they must immediately notify the district engineer of what they have found, and to the maximum extent practicable, avoid construction activities that may affect the remains and artifacts until the required coordination has been completed. The district engineer will initiate the Federal, Tribal, and state coordination required to determine if the items or remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

22. ***Designated Critical Resource Waters.*** Critical resource waters include, NOAA-managed marine sanctuaries and marine monuments, and National Estuarine Research Reserves. The district engineer may designate, after notice and opportunity for public comment, additional waters officially designated by a state as having particular environmental or ecological significance, such as outstanding national resource waters or state natural heritage sites. The district engineer may also designate additional critical resource waters after notice and opportunity for public comment.

(a) Discharges of dredged or fill material into waters of the United States are not authorized by NWPs 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, 50, 51, 52, 57 and 58 for any activity within, or directly affecting, critical resource waters, including wetlands adjacent to such waters.

(b) For NWPs 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, 38, and 54, notification is required in accordance with general condition 32, for any activity proposed by permittees in the designated critical resource waters including wetlands adjacent to those waters. The district engineer may authorize activities under these NWPs only after she or he determines that the impacts to the critical resource waters will be no more than minimal.

23. ***Mitigation.*** The district engineer will consider the following factors when determining appropriate and practicable mitigation necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal:

(a) The activity must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States to the maximum extent practicable at the project site (*i.e.,* on site).

(b) Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating for resource losses) will be required to the extent necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal.

(c) Compensatory mitigation at a minimum one-for-one ratio will be required for all wetland losses that exceed 1/10 acre and require preconstruction notification, unless the district engineer determines in writing that either some other form of mitigation would be more environmentally appropriate or the adverse environmental effects of the proposed activity are no more than minimal, and provides an activity-specific waiver of this requirement. For wetland losses of 1/10 acre or less that require preconstruction notification, the district engineer may determine on a case-by case basis that compensatory mitigation is required to ensure that the activity results in only minimal adverse environmental effects.

(d) Compensatory mitigation at a minimum one-for-one ratio will be required for all losses of stream bed that exceed 3/100 acre and require preconstruction notification, unless the district engineer determines in writing that either some other form of mitigation would be more environmentally appropriate or the adverse environmental effects of the proposed activity are no more than minimal, and provides an activity-specific waiver of this requirement. This compensatory mitigation requirement may be satisfied through the restoration or enhancement of riparian areas next to streams in accordance with paragraph (e) of this general condition. For losses of stream bed of 3/100 acre or less that require preconstruction notification, the district engineer may determine on a case-by case basis that compensatory mitigation is required to ensure that the activity results in only minimal adverse environmental effects. Compensatory mitigation for losses of streams should be provided, if practicable, through stream rehabilitation, enhancement, or preservation, since streams are difficult to-replace resources (see 33 CFR 332.3(e)(3)).

(e) Compensatory mitigation plans for NWP activities in or near streams or other open waters will normally include a requirement for the restoration or enhancement, maintenance, and legal protection (e.g., conservation easements) of riparian areas next to open waters. In some cases, the restoration or maintenance/protection of riparian areas may be the only compensatory mitigation required. If restoring riparian areas involves planting vegetation, only native species should be planted. The width of the required riparian area will address documented water quality or aquatic habitat loss concerns. Normally, the riparian area will be 25 to 50 feet wide on each side of the

stream, but the district engineer may require slightly wider riparian areas to address documented water quality or habitat loss concerns. If it is not possible to restore or maintain/protect a riparian area on both sides of a stream, or if the waterbody is a lake or coastal waters, then restoring or maintaining/protecting a riparian area along a single bank or shoreline may be sufficient. Where both wetlands and open waters exist on the project site, the district engineer will determine the appropriate compensatory mitigation (*e.g.,* riparian areas and/or wetlands compensation) based on what is best for the aquatic environment on a watershed basis. In cases where riparian areas are determined to be the most appropriate form of minimization or compensatory mitigation, the district engineer may waive or reduce the requirement to provide wetland compensatory mitigation for wetland losses.

(f) Compensatory mitigation projects provided to offset losses of aquatic resources must comply with the applicable provisions of 33 CFR part 332.

(1) The prospective permittee is responsible for proposing an appropriate compensatory mitigation option if compensatory mitigation is necessary to ensure that the activity results in no more than minimal adverse environmental effects. For the NWPs, the preferred mechanism for providing compensatory mitigation is mitigation bank credits or in-lieu fee program credits (see 33 CFR 332.3(b)(2) and (3)). However, if an appropriate number and type of mitigation bank or in-lieu credits are not available at the time the PCN is submitted to the district engineer, the district engineer may approve the use of permittee-responsible mitigation.

(2) The amount of compensatory mitigation required by the district engineer must be sufficient to ensure that the authorized activity results in no more than minimal individual and cumulative adverse environmental effects (see 33 CFR 330.1(e)(3)). (See also 33 CFR 332.3(f).)

(3) Since the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, aquatic resource restoration should be the first compensatory mitigation option considered for permittee-responsible mitigation.

(4) If permittee-responsible mitigation is the proposed option, the prospective permittee is responsible for submitting a mitigation plan. A conceptual or detailed mitigation plan may be used by the district engineer to make the decision on the NWP verification request, but a final mitigation plan that addresses the applicable requirements of 33 CFR 332.4(c)(2) through (14) must be approved by the district engineer before the permittee begins work in waters of the United States, unless the district engineer determines that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation (see 33 CFR 332.3(k)(3)). If permittee responsible mitigation is the proposed option, and the proposed compensatory mitigation site is located on land in which another federal agency holds an easement, the district engineer will coordinate with that federal agency to determine if proposed compensatory mitigation project is compatible with the terms of the easement.

(5) If mitigation bank or in-lieu fee program credits are the proposed option, the mitigation plan needs to address only the baseline conditions at the impact site and the number of credits to be provided (see 33 CFR 332.4(c)(1)(ii)).

(6) Compensatory mitigation requirements (*e.g.,* resource type and amount to be provided as compensatory mitigation, site protection, ecological performance standards, monitoring requirements) may be addressed through conditions added to the NWP authorization, instead of components of a compensatory mitigation plan (see 33 CFR 332.4(c)(1)(ii)).

(g) Compensatory mitigation will not be used to increase the acreage losses allowed by the acreage limits of the NWPs. For example, if an NWP has an acreage limit of 1/2 acre, it cannot be used to authorize any NWP activity resulting in the loss of greater than 1/2 acre of waters of the United States, even if compensatory mitigation is provided that replaces or restores some of the lost waters. However, compensatory mitigation can and should be used, as necessary, to ensure that an NWP activity already meeting the established acreage limits also satisfies the no more than minimal impact requirement for the NWPs.

(h) Permittees may propose the use of mitigation banks, in-lieu fee programs, or permittee-responsible mitigation. When developing a compensatory mitigation proposal, the permittee must consider appropriate and practicable options consistent with the framework at 33 CFR 332.3(b). For activities resulting in the loss of marine or estuarine resources, permittee responsible mitigation may be environmentally preferable if there are no mitigation banks or in-lieu fee programs in the area that have marine or estuarine credits available for sale or transfer to the permittee. For permittee responsible mitigation, the special conditions of the NWP verification must clearly indicate the party or parties responsible for the implementation and performance of the compensatory mitigation project, and, if required, its long-term management.

(i) Where certain functions and services of waters of the United States are permanently adversely affected by a regulated activity, such as discharges of dredged or fill material into waters of the United States that will convert a forested or scrub-shrub wetland to a herbaceous wetland in a permanently maintained utility line right-of-way, mitigation may be required to reduce the adverse environmental effects of the activity to the no more than minimal level.

24. ***Safety of Impoundment Structures.*** To ensure that all impoundment structures are safely designed, the district engineer may require non-Federal applicants to demonstrate that the structures comply with established state or federal, dam safety criteria or have been designed by qualified persons. The district engineer may also require documentation that the design has been independently reviewed by similarly qualified persons, and appropriate modifications made to ensure safety.

25. ***Water Quality.*** (a) Where the certifying authority (state, authorized tribe, or EPA, as appropriate) has not previously certified compliance of an NWP with CWA section 401, a CWA section 401 water quality certification for the proposed discharge must be obtained or waived

(see 33 CFR 330.4(c)). If the permittee cannot comply with all of the conditions of a water quality certification previously issued by certifying authority for the issuance of the NWP, then the permittee must obtain a water quality certification or waiver for the proposed discharge in order for the activity to be authorized by an NWP.

(b) If the NWP activity requires preconstruction notification and the certifying authority has not previously certified compliance of an NWP with CWA section 401, the proposed discharge is not authorized by an NWP until water quality certification is obtained or waived. If the certifying authority issues a water quality certification for the proposed discharge, the permittee must submit a copy of the certification to the district engineer. The discharge is not authorized by an NWP until the district engineer has notified the permittee that the water quality certification requirement has been satisfied by the issuance of a water quality certification or a waiver.

(c) The district engineer or certifying authority may require additional water quality management measures to ensure that the authorized activity does not result in more than minimal degradation of water quality.

26. ***Coastal Zone Management.*** In coastal states where an NWP has not previously received a state coastal zone management consistency concurrence, an individual state coastal zone management consistency concurrence must be obtained, or a presumption of concurrence must occur (see 33 CFR 330.4(d)). If the permittee cannot comply with all of the conditions of a coastal zone management consistency concurrence previously issued by the state, then the permittee must obtain an individual coastal zone management consistency concurrence or presumption of concurrence in order for the activity to be authorized by an NWP. The district engineer or a state may require additional measures to ensure that the authorized activity is consistent with state coastal zone management requirements.

27. ***Regional and Case-By-Case Conditions.*** The activity must comply with any regional conditions that may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with any case specific conditions added by the Corps or by the state, Indian Tribe, or U.S. EPA in its CWA section 401 Water Quality Certification, or by the state in its Coastal Zone Management Act consistency determination.

28. ***Use of Multiple Nationwide Permits.*** The use of more than one NWP for a single and complete project is authorized, subject to the following restrictions:

(a) If only one of the NWPs used to authorize the single and complete project has a specified acreage limit, the acreage loss of waters of the United States cannot exceed the acreage limit of the NWP with the highest specified acreage limit. For example, if a road crossing over tidal waters is constructed under NWP 14, with associated bank stabilization authorized by NWP 13, the maximum acreage loss of waters of the United States for the total project cannot exceed 1/3 acre.

(b) If one or more of the NWPs used to authorize the single and complete project has specified acreage limits, the acreage loss of waters of the United States authorized by those NWPs cannot exceed their respective specified acreage limits. For example, if a commercial development is constructed under NWP 39, and the single and complete project includes the filling of an upland ditch authorized by NWP 46, the maximum acreage loss of waters of the United States for the commercial development under NWP 39 cannot exceed 1/2 acre, and the total acreage loss of waters of United States due to the NWP 39 and 46 activities cannot exceed 1 acre.

29. ***Transfer of Nationwide Permit Verifications.*** If the permittee sells the property associated with a nationwide permit verification, the permittee may transfer the nationwide permit verification to the new owner by submitting a letter to the appropriate Corps district office to validate the transfer. A copy of the nationwide permit verification must be attached to the letter, and the letter must contain the following statement and signature:

‘‘When the structures or work authorized by this nationwide permit are still in existence at the time the property is transferred, the terms and conditions of this nationwide permit, including any special conditions, will continue to be binding on the new owner(s) of the property. To validate the transfer of this nationwide permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.’’

_____

(Transferee)

_____

(Date)

30. ***Compliance Certification.*** Each permittee who receives an NWP verification letter from the Corps must provide a signed certification documenting completion of the authorized activity and implementation of any required compensatory mitigation. The success of any required permittee-responsible mitigation, including the achievement of ecological performance standards, will be addressed separately by the district engineer. The Corps will provide the permittee the certification document with the NWP verification letter. The certification document will include:

(a) A statement that the authorized activity was done in accordance with the NWP authorization, including any general, regional, or activity-specific conditions;

(b) A statement that the implementation of any required compensatory mitigation was completed in accordance with the permit conditions. If credits from a mitigation bank or in-lieu fee program are used to satisfy the compensatory mitigation requirements, the certification must include the documentation required by 33 CFR 332.3(l)(3) to confirm that the permittee secured the appropriate number and resource type of credits; and

(c) The signature of the permittee certifying the completion of the activity and mitigation. The completed certification document must be submitted to the district engineer within 30 days of completion of the authorized activity or the implementation of any required compensatory mitigation, whichever occurs later.

31. ***Activities Affecting Structures or Works Built by the United States.*** If an NWP activity also requires review by, or permission from, the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers (USACE) federally authorized Civil Works project (a ''USACE project''), the prospective permittee must submit a pre-construction notification. See paragraph (b)(10) of general condition 32. An activity that requires section 408 permission and/or review is not authorized by an NWP until the appropriate Corps office issues the section 408 permission or completes its review to alter, occupy, or use the USACE project, and the district engineer issues a written NWP verification.

32. ***Pre-Construction Notification.*** (a) *Timing.* Where required by the terms of the NWP, the prospective permittee must notify the district engineer by submitting a pre-construction notification (PCN) as early as possible. The district engineer must determine if the PCN is complete within 30 calendar days of the date of receipt and, if the PCN is determined to be incomplete, notify the prospective permittee within that 30 day period to request the additional information necessary to make the PCN complete. The request must specify the information needed to make the PCN complete. As a general rule, district engineers will request additional information necessary to make the PCN complete only once. However, if the prospective permittee does not provide all of the requested information, then the district engineer will notify the prospective permittee that the PCN is still incomplete and the PCN review process will not commence until all of the requested information has been received by the district engineer. The prospective permittee shall not begin the activity until either:

(1) He or she is notified in writing by the district engineer that the activity may proceed under the NWP with any special conditions imposed by the district or division engineer; or

(2) 45 calendar days have passed from the district engineer's receipt of the complete PCN and the prospective permittee has not received written notice from the district or division engineer. However, if the permittee was required to notify the Corps pursuant to general condition 18 that listed species or critical habitat might be affected or are in the vicinity of the activity, or to notify the Corps pursuant to general condition 20 that the activity might have the potential to cause effects to historic properties, the permittee cannot begin the activity until receiving written notification from the Corps that there is ''no effect'' on listed species or ''no potential to cause effects'' on historic properties, or that any consultation required under Section 7 of the Endangered Species Act (see 33 CFR 330.4(f)) and/or section 106 of the National Historic Preservation Act (see 33 CFR 330.4(g)) has been completed. If the proposed activity requires a written waiver to exceed specified limits of an NWP, the permittee may not begin the activity until the district engineer issues the waiver. If the district or division engineer notifies the

permittee in writing that an individual permit is required within 45 calendar days of receipt of a complete PCN, the permittee cannot begin the activity until an individual permit has been obtained. Subsequently, the permittee's right to proceed under the NWP may be modified, suspended, or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d)(2).

(b) *Contents of Pre-Construction Notification:* The PCN must be in writing and include the following information:

(1) Name, address and telephone numbers of the prospective permittee;

(2) Location of the proposed activity;

(3) Identify the specific NWP or NWP(s) the prospective permittee wants to use to authorize the proposed activity;

(4) (i) A description of the proposed activity; the activity's purpose; direct and indirect adverse environmental effects the activity would cause, including the anticipated amount of loss of wetlands, other special aquatic sites, and other waters expected to result from the NWP activity, in acres, linear feet, or other appropriate unit of measure; a description of any proposed mitigation measures intended to reduce the adverse environmental effects caused by the proposed activity; and any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity, including other separate and distant crossings for linear projects that require Department of the Army authorization but do not require pre-construction notification. The description of the proposed activity and any proposed mitigation measures should be sufficiently detailed to allow the district engineer to determine that the adverse environmental effects of the activity will be no more than minimal and to determine the need for compensatory mitigation or other mitigation measures. (ii) For linear projects where one or more single and complete crossings require pre-construction notification, the PCN must include the quantity of anticipated losses of wetlands, other special aquatic sites, and other waters for each single and complete crossing of those wetlands, other special aquatic sites, and other waters (including those single and complete crossings authorized by an NWP but do not require PCNs). This information will be used by the district engineer to evaluate the cumulative adverse environmental effects of the proposed linear project, and does not change those non-PCN NWP activities into NWP PCNs. (iii) Sketches should be provided when necessary to show that the activity complies with the terms of the NWP. (Sketches usually clarify the activity and when provided results in a quicker decision. Sketches should contain sufficient detail to provide an illustrative description of the proposed activity (e.g., a conceptual plan), but do not need to be detailed engineering plans);

(5) The PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial and intermittent streams, on the project site. Wetland delineations must be prepared in accordance with the current method required by the Corps. The permittee may ask the Corps to delineate the special aquatic sites and other waters on the project

site, but there may be a delay if the Corps does the delineation, especially if the project site is large or contains many wetlands, other special aquatic sites, and other waters. Furthermore, the 45-day period will not start until the delineation has been submitted to or completed by the Corps, as appropriate;

(6) If the proposed activity will result in the loss of greater than 1/10-acre of wetlands or 3/100-acre of stream bed and a PCN is required, the prospective permittee must submit a statement describing how the mitigation requirement will be satisfied, or explaining why the adverse environmental effects are no more than minimal and why compensatory mitigation should not be required. As an alternative, the prospective permittee may submit a conceptual or detailed mitigation plan.

(7) For non-federal permittees, if any listed species (or species proposed for listing) or designated critical habitat (or critical habitat proposed for such designation) might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat (or critical habitat proposed for such designation), the PCN must include the name(s) of those endangered or threatened species (or species proposed for listing) that might be affected by the proposed activity or utilize the designated critical habitat (or critical habitat proposed for such designation) that might be affected by the proposed activity. For NWP activities that require pre-construction notification, Federal permittees must provide documentation demonstrating compliance with the Endangered Species Act;

(8) For non-federal permittees, if the NWP activity might have the potential to cause effects to a historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places, the PCN must state which historic property might have the potential to be affected by the proposed activity or include a vicinity map indicating the location of the historic property. For NWP activities that require pre-construction notification, Federal permittees must provide documentation demonstrating compliance with section 106 of the National Historic Preservation Act;

(9) For an activity that will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a ''study river'' for possible inclusion in the system while the river is in an official study status, the PCN must identify the Wild and Scenic River or the ''study river'' (see general condition 16); and

(10) For an NWP activity that requires permission from, or review by, the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers federally authorized civil works project, the pre-construction notification must include a statement confirming that the project proponent has submitted a written request for section 408 permission from, or review by, the Corps office having jurisdiction over that USACE project.

(c) *Form of Pre-Construction Notification:* The nationwide permit pre-construction notification form (Form ENG 6082) should be used for NWP PCNs. A letter containing the required information may also be used. Applicants may provide electronic files of PCNs and supporting materials if the district engineer has established tools and procedures for electronic submittals.

(d) *Agency Coordination:* (1) The district engineer will consider any comments from Federal and state agencies concerning the proposed activity's compliance with the terms and conditions of the NWPs and the need for mitigation to reduce the activity's adverse environmental effects so that they are no more than minimal.

(2) Agency coordination is required for: (i) All NWP activities that require pre-construction notification and result in the loss of greater than 1/2-acre of waters of the United States; (ii) NWP 13 activities in excess of 500 linear feet, fills greater than one cubic yard per running foot, or involve discharges of dredged or fill material into special aquatic sites; and (iii) NWP 54 activities in excess of 500 linear feet, or that extend into the waterbody more than 30 feet from the mean low water line in tidal waters or the ordinary high water mark in the Great Lakes.

(3) When agency coordination is required, the district engineer will immediately provide (e.g., via email, facsimile transmission, overnight mail, or other expeditious manner) a copy of the complete PCN to the appropriate Federal or state offices (FWS, state natural resource or water quality agency, EPA, and, if appropriate, the NMFS). With the exception of NWP 37, these agencies will have 10 calendar days from the date the material is transmitted to notify the district engineer via telephone, facsimile transmission, or email that they intend to provide substantive, site-specific comments. The comments must explain why the agency believes the adverse environmental effects will be more than minimal. If so contacted by an agency, the district engineer will wait an additional 15 calendar days before making a decision on the preconstruction notification. The district engineer will fully consider agency comments received within the specified time frame concerning the proposed activity's compliance with the terms and conditions of the NWPs, including the need for mitigation to ensure that the net adverse environmental effects of the proposed activity are no more than minimal. The district engineer will provide no response to the resource agency, except as provided below. The district engineer will indicate in the administrative record associated with each pre-construction notification that the resource agencies' concerns were considered. For NWP 37, the emergency watershed protection and rehabilitation activity may proceed immediately in cases where there is an unacceptable hazard to life or a significant loss of property or economic hardship will occur. The district engineer will consider any comments received to decide whether the NWP 37 authorization should be modified, suspended, or revoked in accordance with the procedures at 33 CFR 330.5.

(4) In cases of where the prospective permittee is not a Federal agency, the district engineer will provide a response to NMFS within 30 calendar days of receipt of any Essential Fish Habitat

conservation recommendations, as required by section 305(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act.

(5) Applicants are encouraged to provide the Corps with either electronic files or multiple copies of preconstruction notifications to expedite agency coordination.

ALASKA DISTRICT REGIONAL CONDITIONS
for the
2021 NATIONWIDE PERMITS (NWP)

The Alaska District Regulatory Office has issued the following Regional Conditions to ensure that activities authorized by NWPs in the Alaska District cause no more than minimal adverse environmental effects, individually and cumulatively. Before the Alaska District will verify an activity under one or more NWPs, the proposed activity must comply with the NWP terms and all applicable General and Regional Conditions.

APPLICABILITY: The following apply throughout the state of Alaska.

RESTRICTIONS:

Regional Condition A – Revoked Permits: The following NWPs are revoked within Alaska:
2. Structures in Artificial Canals
24. Indian Tribe or State Administered Section 404 Programs
30. Moist Soil Management for Wildlife
34. Cranberry Production Activities

Regional Condition B – Additional Pre-Construction Notification (PCN) Requirements
1. NWP 13, Bank Stabilization: In addition to the PCN requirements specified by NWP 13, a PCN is required for proposed bank stabilization projects in fresh water when the proposed methods and techniques are not included in the Streambank Revegetation and Protection: A Guide for Alaska Revised 2005 (Walter, Hughes and Moore, April 2005) (Guide) or its future revisions. The Guide is available at: http://www.adfg.alaska.gov/index.cfm?adfg=streambankprotection.main.

2. A PCN is required for projects that qualify for NWPs 12, 57 (C), and 58 (D) within the Municipality of Anchorage.

3. NWP 48: A PCN is required for impacts to greater than 1/2 acre of special aquatic sites (wetlands, mudflats, vegetated shallows, coral reefs, etc.).

4. NWP 12, 57 (C), 58 (D). In addition to other triggers for the PCN, a PCN is required for projects located within permafrost soils identified using the appropriate soil survey or other appropriate data.

REGIONAL CONDITION C - Activities Involving Trenching
Trenches may not be constructed or backfilled in such a manner as to drain waters of the U.S. (e.g., backfilling with extensive gravel layers, creating a French drain effect). Ditch plugs or other methods shall be used to prevent this situation.

Except for material placed as minor trench over-fill or surcharge necessary to offset subsidence or compaction, all excess materials shall be removed to a non waters of the U.S. location. The backfilled trench shall achieve the pre-construction elevation, within a year of disturbance unless climatic conditions warrant additional time. The additional time must be approved by the Corps.

Excavated material temporarily sidecast into wetlands shall be underlain with geotextile, ice pads, or similar material, to allow for removal of the temporary material to the maximum extent practicable.

REGIONAL CONDITION D - Site Revegetation for Projects with Ground Disturbing Activities
Re-vegetation of all disturbed areas within the project site shall begin as soon as site conditions allow and in the same growing season as the disturbance, unless climatic conditions warrant additional time. Topsoil (the outermost layer of soil, usually the top 2 – 8 inches) removed from the

construction area shall be separated and used for site rehabilitation. When backfilling, topsoil shall be placed as the top layer to provide a seed bed for regrowth. If topsoil is not available from the project site, local native soil material obtained from an approved site may be used. Species usedfor seeding and planting shall be certified seed sources free of invasive species and follow this order of preference: 1) species native to the site; 2) species native to the region; 3) species native to the state.

REGIONAL CONDITION E - Delineation of Project Footprint
Prior to commencement of construction activities within waters of the U.S., the permittee shall clearly identify the permitted limits of disturbance at the project site with highly visible markers (e.g. construction fencing, flagging, silt barriers, etc.). The permittee shall properly maintain such identification until construction is complete and the soils have been stabilized. The permittee is prohibited from conducting any unauthorized Corps-regulated activity outside of the permitted limits of disturbance (as shown on the permit drawings).

REGIONAL CONDITION F - Maintenance of Hydrology Patterns
Natural drainage patterns shall be maintained using appropriate methods. Excessive ponding or drying adjacent to fill areas shall indicate non-compliance with this condition.

REGIONAL CONDITIONS G, H, I AND J APPLY TO SPECIFIC NWPs

REGIONAL CONDITION G - NWP 40 Agricultural Activities
The following activities are not authorized by NWP 40: a. Installation, placement, or construction of drain tiles, ditches, or levees; and b. Mechanized land clearing or land leveling in wetlands within 300 feet of an anadromous water (anadromous water is defined by the state of AK see https://www.adfg.alaska.gov/sf/SARR/AWC/index.cfm?ADFG=main.interactive).

REGIONAL CONDITION H - NWP 44 Mining Activities
Placer mining activities are excluded from coverage by NWP 44 (Mining Activities). Placer mining may be authorized by Regional General Permit POA-2014-00055-M1. In Alaska, NWP 44 may only authorize the following activities:

1. Hard rock mining within waters jurisdictional under only Section 404 of the Clean Water Act, not including trenching, drilling, or access road construction.

2. Temporary stockpiling of sand and gravel in waters of the U.S., limited to seasonally dewatered unvegetated sand/gravel bars. Stockpiles shall be completely removed and the area restored to pre-project contours within one year, in advance of seasonal ordinary high water events, or prior to equipment being removed from site, whichever occurs first.

REGIONAL CONDITION I – NWP 48, 55 (A), and 56 (B):
When an Aquatic Farm Lease is required from the Alaska Department of Natural Resources (ADNR) for a new or modified aquatic farm, the applicant must obtain and submit a copy of the ADNR preliminary decision with a Preconstruction Notification to the USACE.

REGIONAL CONDITION J –- NWPs 21, 29, 39, 40, 42, 43, 44, 50, 51, and 52:
The proposed NWP activity must not cause:
1) the loss of anadromous streambed, and/or
2) the discharge of dredged or fill material into waterbodies, including wetlands, adjacent to and/or upstream of an anadromous waterbody;
unless the district engineer issues a waiver by making a written determination concluding that these discharges will result in no more than minimal individual and cumulative adverse environmental effects.

STATE OF ALASKA DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINING, LAND AND WATER
Southeast Regional Land Office
ADL 109422
City and Borough of Juneau
Authorization for Development within an Existing Easement
AS 38.05.850

The Department of Natural Resources, Division of Mining, Land and Water (DNR-DMLW), herein known as Grantor, authorizes the City and Borough of Juneau (CBJ), herein known as Grantee, for development within the following state managed easement: ADL 109338.

Property Description:
Located along the Mendenhall River in Juneau, Alaska, on portions of DMLW-managed state land within the NW ¼ and SW ¼ of Section 19, Township 40 South, Range 66 East and the SE ¼ of Section 24, Township 40 South, Range 65 East, Copper River Meridian.

Background:
On August 5, 2023, a glacial outburst originating in Suicide Basin caused sudden, severe flooding of the Mendenhall River in Juneau, Alaska. On August 9, 2023, in response to the damage caused by the flooding, the Governor's Office issued a 30-day Emergency Declaration suspending Alaska statute and regulation-related provisions requiring authorization prior to the use of, or entry upon, state land under AS 26.23.020(g)(1) and (7). On September 8, 2023, the Department of Mining, Land and Water, Southeast Regional Office (DMLW-SERO) issued Regional Manager's Decision (RMD) ADL 109338. The decision granted a public easement in perpetuity on state land underlying the Mendenhall River to encompass subsequent revetment construction and erosion control activity.

On August 6, 2024, a second glacial outburst originating in Suicide Basin caused flooding along the Mendenhall River. In response to the damage caused by the flooding, the Governor's Office issued a 30-day Emergency Declaration the same day, August 6, 2024. On September 5, 2024, DMLW-SERO issued an amendment to RMD ADL 109338 consistent with the August 6, 2024, Emergency Declaration.

On February 18, 2025, CBJ submitted an application to DMLW-SERO, serialized as ADL 109422, requesting authorization for revetment construction and erosion control work within public easement ADL 109338 along the Mendenhall River.

Authorization:
Revetment construction, erosion control and mitigation activity, at three sites on state-owned land along the east bank of the Mendenhall River. The site-locations are identified as: Killewich Drive, North Meander Way, and South Meander Way. Construction consists of riverbank slope excavation, river bottom scouring, and installation of Class III riprap armor and filter rock to an

approximate thickness of five feet. The total length and volume of construction is estimated at 1,085 feet and 8,500 cubic yards. See Attachment 1 for the approved development diagram. Construction should follow the submitted plan and should any changes be made, DMLW-SERO should be notified immediately.

Approximate length and volume of construction at the site adjacent to Killewich Drive is estimated at 500 feet and 4,950 cubic yards. Approximate length and volume of construction at the site adjacent to North Meander Way is estimated at 250 feet and 1,540 cubic yards. Approximate length and volume of construction at the site adjacent to South Meander Way is estimated at 250 feet and 2,000 cubic yards.

This authorization does not create or convey a real property interest and as such is revocable, with or without cause. The term of this authorization corresponds to the term of state managed easement, ADL 109338, which is issued in perpetuity.

Correspondence concerning this authorization may be directed to the Department of Natural Resources, Division of Mining, Land and Water, Southeast Regional Office, P.O. Box 111020, Juneau, AK 99801-1020, (907) 465-3400.

I have read and understand all of the foregoing and attached stipulations. By signing this authorization, I agree to conduct the authorized activity in accordance with the terms and conditions of this authorization.

John Bohan	City Engineer	March 13, 2025
Signature of Grantee or Authorized Representative	Title	Date

155 Heritage Way, Juneau AK 99801			
Grantee's Address	City	State	Zip

John Bohan - (907)586-0800 x-4188		
Contact Person	Primary Phone	Alternate Phone

Mason Auger	Natural Resource Manager II	3/13/2025
Signature of Authorized State Representative	Title	Date

Appeal

An eligible person affected by this decision may appeal to the DNR Commissioner per AS 44.37.011 and 11 AAC 02. Any appeal must be received within twenty (20) calendar days after issuance of this decision under 11 AAC 02.040. An eligible person must first appeal a decision to the Commissioner before seeking relief in superior court. The Alaska Court System establishes its own rules for timely appealing final administrative orders and decisions of the department.

Appeals may be mailed or hand-delivered to the DNR Commissioner's Office, 550 W. 7th Avenue, Suite 1400, Anchorage, Alaska, 99501; or faxed to (907)-269-8918; or sent by electronic mail to dnr.appeals@alaska.gov. Appeals must be accompanied by the fee established in 11 AAC 05.160(d)(1)(F), which has been set at $200 under the provisions of 11 AAC 05.160 (a)-(b). A copy of 11 AAC 02 is available on the department's website at https://dnr.alaska.gov/mlw/pdf/DNR-11-AAC-02.pdf.

ADL 109422
Stipulations

1. **Authorized Officer:** The Authorized Officer (AO) for the State of Alaska (State), Department of Natural Resources (DNR), Division of Mining, Land and Water (DMLW), is the Regional Manager or designee.

2. **Change of Contact Information:** The Grantee shall maintain current contact information with the AO. Any change of contact information must be submitted in writing to the AO.

3. **Development Plan:** Development shall be limited to the authorized area and improvements specified in the approved development plan or subsequent modifications approved by the AO. The Grantee is responsible for accurately siting development and operations within the authorized area. Any proposed revisions to the development plan must be approved in writing by the AO before the change in use or development occurs.

4. **Survey:** The Grantee is required to contact DMLW Survey Section regarding development construction no less than one week upon signing of this authorization. Additional requirements may be required by the DMLW Survey Section prior to construction.

5. **Directives:** Directives may be issued for corrective actions that are required to correct a deviation from design criteria, project specifications, stipulations, State statutes or regulations. Work at the area subject to the Directive may continue while implementing the corrective action. Corrective action may include halting or avoiding specific conduct, implementing alternative measures, repairing any damage to state resources that may have resulted from the conduct, or other action as determined by DNR.

6. **Violations:** A violation of this authorization is subject to any action available to the State for enforcement and remedies, including revocation of the authorization, civil action for forcible entry and detainer, ejectment, trespass, damages, and associated costs, or arrest and prosecution for criminal trespass in the second degree. The State may seek damages available under a civil action, including restoration damages, compensatory damages, and treble damages under AS 09.45.730 or AS 09.45.735 for violations involving injuring or removing trees or shrubs, gathering geotechnical data, or taking mineral resources.

7. **Public Access:** The construction, operation, use, and maintenance of the authorized area shall not interfere with public use of roads, trails, waters, landing areas, and public access easements. The ability to use or access state land or public waters may not be restricted in any manner. However, if a specific activity poses a safety concern, the AO may allow the

restriction of public access for a specific period of time. The Grantee is required to contact the AO in advance for approval. No restriction is allowed unless specifically authorized in writing by the AO.

8. **Public Trust Doctrine:** The Public Trust Doctrine guarantees public access to, and the public right to use, navigable and public waters and the land beneath them for navigation, commerce, fishing, and other purposes. This authorization is subject to the principles of the Public Trust Doctrine regarding navigable or public waters. The AO reserves the right to grant other interests consistent with the Public Trust Doctrine.

9. **Valid Existing Rights:** This authorization is subject to all valid existing rights and reservations in and to the authorized area. The State makes no representations or warranties, whatsoever, either expressed or implied, as to the existence, number, or nature of such valid existing rights.

10. **Site Maintenance:** The authorized area shall be maintained in a neat, clean, and safe condition, free of any solid waste, debris, or litter, except as specifically authorized herein. Nothing may be stored that would be an attractive nuisance to wildlife or create a potentially hazardous situation.

11. **Maintenance of Improvements:** The Grantor is not responsible for maintenance of authorized improvements or liable for injuries or damages related to those improvements. No action or inaction of the Grantor is to be construed as assumption of responsibility.

12. **Removal of Improvements and Site Restoration:** Upon termination of this authorization, whether by abandonment, revocation or any other means, the Grantee shall within 30 days remove all improvements from the area herein granted, except those owned by the State, and the site shall be restored to a condition acceptable to the AO. Should the Grantee fail or refuse to remove said structures or improvements within the time allotted, they shall revert to and become the property of the State; however, the Grantee shall not be relieved of the cost of the removal of the structures, improvements and/or the cost of restoring the area.

13. **Amendment or Modification:** The Grantee may request an amendment or modification of this authorization; the Grantee's request must be in writing. Any amendment or modification must be approved by the AO in advance and may require additional fees and changes to the terms of this authorization.

14. **Assignment**: This authorization may not be transferred or assigned.

15. **Request for Information**: The AO, at any time, may require the Grantee to provide any information directly or indirectly related to this authorization, in a manner prescribed by the AO.

16. **Inspections:** The AO shall have reasonable access to the authorized area for inspection, which may be conducted without prior notice. If the Grantee is found to be in noncompliance the authorized area may be subject to reinspection. The Grantee may be charged for actual expenses of any inspection.

17. **Waste Disposal:** On-site refuse disposal is prohibited, unless specifically authorized. All waste generated during operation, maintenance, and termination activities under this authorization shall be removed and disposed of at an off-site DEC approved disposal facility. Waste, in this paragraph, means all discarded matter, including but not limited to human waste, trash, garbage, refuse, oil drums, petroleum products, ashes and discarded equipment.

18. **Surface Drainage:** Adequate culverts shall be installed to maintain surface drainage and to prevent ponding and/or erosion.

19. **Site Disturbance:**

    a. Site disturbance shall be kept to a minimum to protect local habitats. All activities at the site shall be conducted in a manner that will minimize the disturbance of soil and vegetation and changes in the character of natural drainage systems.
    b. Brush clearing is allowed but shall be kept to the minimum necessary to conduct or complete the authorized activity. Removal or destruction of the vegetative mat outside of the authorized area is not allowed.
    c. Establishment of, or improvements to, tidal, submerged, shoreland or riparian landing areas (e.g.: leveling the ground, bank cutting or removing or modifying a substantial amount of vegetation) is prohibited without the prior written consent of the AO.
    d. The Grantee shall conduct all operations in a manner which will prevent unwarranted pollution, erosion, and siltation. Any pollution, erosion, or siltation shall be repaired/remediated in a manner and time frame satisfactory to the AO at the Grantee's expense.

20. **Ground Disturbance and Repair:** Grantee will refill holes, trenches and surface depressions resulting from development or maintenance activities with sand, gravel, native materials, or a substitute approved by the AO. Surface areas will be recontoured to the satisfaction of the AO so that they do not pose a threat to human safety or wildlife transit.

21. **Destruction of Markers:** The Grantee shall protect all survey monuments, witness corners, reference monuments, mining claim posts, bearing trees, and unsurveyed corner posts against damage, destruction, or obliteration. The Grantee shall notify the AO of any damaged, destroyed, or obliterated markers and shall reestablish the markers at the Grantee’s expense in accordance with accepted survey practices of the DMLW.

22. **Insurance:** In accordance with 11 AAC 96.065, the requirements for insurance are met by the self-insurance of the applicant, as a political subdivision of the State. DMLW reserves the right to request insurance during the term of this authorization.

23. **Incurred Expenses:** The Grantor shall in no way be held liable for expenses incurred by the Grantee connected with the activities directly or indirectly related to this authorization.

24. **In Lieu of Indemnification:** In connection with the entry on or use of lands, subject to the limitations and provisions of AS 09.50.250-.270 and AS 37.05.170, the Grantee shall ensure that its contractors and subcontractors shall indemnify, save harmless, and defend the State, its agents and its employees from any and all claims or actions for injuries or damages sustained by any person or property arising directly or indirectly from the construction or the contractor's performance of the contract, except when the proximate cause of the injury or damage is the State's sole negligence.

25. **Preference Right:** No preference right for subsequent authorizations are granted or implied by this authorization.

26. **Alaska Historic Preservation Act:** The Alaska Historic Preservation Act, AS 41.35.200, prohibits the appropriation, excavation, removal, injury, or destruction of any state owned historic, prehistoric, archaeological or paleontological site without written approval from the DNR Commissioner. Should any sites be discovered, the Grantee shall cease any activities that may cause damage and immediately contact the AO and the Office of History and Archaeology in the Division of Parks and Recreation.

27. **Compliance with Government Requirements:** The Grantee shall, at its expense, comply with all federal, state, and local laws, regulations, and ordinances directly or indirectly related to this authorization. The Grantee shall ensure compliance by its employees, agents, contractors, subcontractors, licensees, or invitees.

28. **Waiver of Forbearance:** Any failure on the part of the AO to enforce the terms of this authorization, or the waiver of any right under this authorization by the Grantee, unless in writing, shall not discharge or invalidate the authorization of such terms. No forbearance or written waiver affects the right of the AO to enforce any terms in the event of any subsequent violations of terms of this authorization.

29. **Severability Clause:** If any clause or provision of this authorization is, in a final judicial proceeding, determined illegal, invalid, or unenforceable under present or future laws, then the Grantor and the Grantee agree that the remainder of this authorization will not be affected, and in lieu of each clause or provision of this authorization that is illegal, invalid, or unenforceable, there will be added as a part of this authorization a clause or provision as similar in terms to the illegal, invalid, or unenforceable clause or provision as may be possible, legal, valid, and enforceable.

30. **Fire Prevention, Protection and Liability:** The Grantee shall take all reasonable precautions to prevent and suppress forest, structure, brush and grass fires, and shall assume full liability for any damage to state land and structures resulting from the negligent use of fire. The State is not liable for damage to the Grantee’s personal property

and is not responsible for forest fire protection of the Grantee's activity. To report a wildfire, call 911 or 1-800-237-3633.

31. **Notification of Discharge:** The Grantee shall immediately notify the Department of Environmental Conservation (DEC) and AO of any unauthorized discharge of any amount of oil to water, a discharge of any amount of a hazardous substance (other than oil), and any discharge of oil greater than 55 gallons on land. All fires and explosions must also be reported immediately.
    If a discharge, including a cumulative discharge, of oil is greater than 10 gallons but less than 55 gallons, or a discharge of oil greater than 55 gallons is made to an impermeable secondary containment area, the Grantee shall report the discharge within 48 hours. Any discharge of oil greater than one gallon up to 10 gallons, including a cumulative discharge, solely to land, must be reported in writing on a monthly basis.

    Notification of discharge must be made to DEC online at ReportSpills.alaska.gov or by phone at 1-800-478-9300.

    Notification of discharge must be made to the appropriate DNR Office, preferably by e-mail: Anchorage email dnr.scro.spill@alaska.gov, (907) 269-8528; Fairbanks email dnr.nro.spill@alaska.gov, (907) 451-2739; Juneau email dnr.sero.spill@alaska.gov, (907) 465-3513. The Grantee shall supply the AO with all incident reports submitted to DEC**.**

32. **Fuel and Hazardous Substances:** No fuel or hazardous substances may be stored on state land.

33. **Forest Resources:** Site preparation and development work such as clearing must be performed in a reasonable manner that is commensurate with the scope of your project. Any materials such as trees that are disturbed in the course of development are the property of the underlying landowner and should be handled according to the landowner's instructions.

34. **Termination:** The authorization remains in effect for the term issued, unless revoked sooner. The department will give 30 days' notice before revoking an authorization at will. A revocation for cause is effective immediately.

35. **Other Authorizations:** The issuance of this authorization does not alleviate the necessity of the Grantee to obtain authorizations required by other agencies for this activity.

Attachments:

1. Approved Development Diagram

THE STATE of ALASKA
GOVERNOR MIKE DUNLEAVY

Department of Fish and Game

HABITAT SECTION
Southeast Region Office

802 3rd Street
Douglas, Alaska
P.O. Box 110024
Juneau, Alaska 99811-0024
Main: 907.465.4105
Email: dfg.hab.infodou@alaska.gov

FISH HABITAT PERMIT FH25-I-0020

ISSUED: March 11, 2025
EXPIRES: Life of Structure

Frank and Mimi Mesdag
3847/3849 Killewich Drive
Juneau, Alaska 99801

RE: Bank Stabilization
Mendenhall River (Stream Number 111-50-10500)
Section 19, T 40S, R 66E, CRM (Juneau B-2)
Location: 58.39084 N, 134.58915 W

Dear Frank and Mimi Mesdag:

Pursuant to the Anadromous Fish Act at AS 16.05.871(b), the Alaska Department of Fish and Game (ADF&G) Habitat Section reviewed your proposal to stabilize your streambank on your property along the Mendenhall River. Since 2011, the glacial-dammed lake at Suicide Basin in the Mendenhall Glacier has burst annually, causing the waters of Mendenhall Lake to rise and subsequent flooding of the Mendenhall River.[a]

Project Description
You will notify the Habitat Section three days prior to construction. During low water, your contractor will use heavy equipment to stabilize the riverbank with clean class III riprap and shot rock material according to specifications outlined in the project design provided by the City and Borough of Juneau Engineering and Public Works Department (enclosed). The revetment will be constructed at a 1.5:1 slope and a 5 ft riprap keyway will be constructed at the toe of the slope. End-dumping into the actively flowing river is not allowed.

Anadromous Fish Act
Stream Number 111-50-10500 has been specified as being important for the spawning, rearing, or migration of anadromous fishes pursuant to AS 16.05.871(a). The Mendenhall River provides habitat for Chinook, chum, coho, pink, and sockeye salmon, Dolly Varden, and cutthroat and steelhead trout; all species migrate through the project area.

[a] National Weather Service. 2024. Juneau/Mendenhall River Flooding Suicide Basin Glacier Dammed Lake Release. National Oceanic and Atmospheric Administration, Juneau Weather Forecast Office.

In accordance with AS 16.05.871(d), your project is approved subject to the project description and permit terms.

Permit Terms

This letter constitutes a permit issued under the authority of AS 16.05.871 and must be retained on site during project activities. Please be advised that this determination applies only to Habitat Section regulated activities; other agencies also may have jurisdiction under their respective authorities. This determination does not relieve you of your responsibility to secure other state, federal, or local permits. You are still required to comply with all other applicable laws.

You are responsible for the actions of contractors, agents, or other persons who perform work to accomplish the approved project. Prior to engaging in any activity that significantly deviates from the approved plan, you shall notify the Habitat Section and obtain written approval in the form of a permit amendment. Any action that increases the project's overall scope or that negates, alters, or minimizes the intent or effectiveness of any provision contained in this permit will be deemed a significant deviation from the approved plan. The final determination as to the significance of any deviation and the need for a permit amendment is a Habitat Section responsibility. Therefore, it is recommended the Habitat Section be consulted immediately when a deviation from the approved plan is being considered.

You shall give an authorized representative of the state free and unobstructed access to the permit site, at safe and reasonable times, for the purpose of inspecting or monitoring compliance with any provision of this permit. You shall furnish whatever assistance and information the authorized representative reasonably requires for monitoring and inspection purposes.

In addition to the penalties provided by law, this permit may be terminated or revoked for failure to comply with its provisions or failure to comply with applicable statutes and regulations. You shall mitigate any adverse effect upon fish or wildlife, their habitats, or any restriction or interference with public use that the commissioner determines was a direct result of your failure to comply with this permit or any applicable law.

You shall indemnify, save harmless, and defend the department, its agents, and its employees from any and all claims, actions, or liabilities for injuries or damages sustained by any person or property arising directly or indirectly from permitted activities or your performance under this permit. However, this provision has no effect if, and only if, the sole proximate cause of the injury is the department's negligence.

You may appeal this permit decision relating to AS 16.05.871 in accordance with the provisions of AS 44.62.330–630.

Please direct questions about this permit to Habitat Biologist Nicholas Jensen at (907) 465-6646 or nicholas.jensen@alaska.gov.

Sincerely,
Doug Vincent-Lang
Commissioner

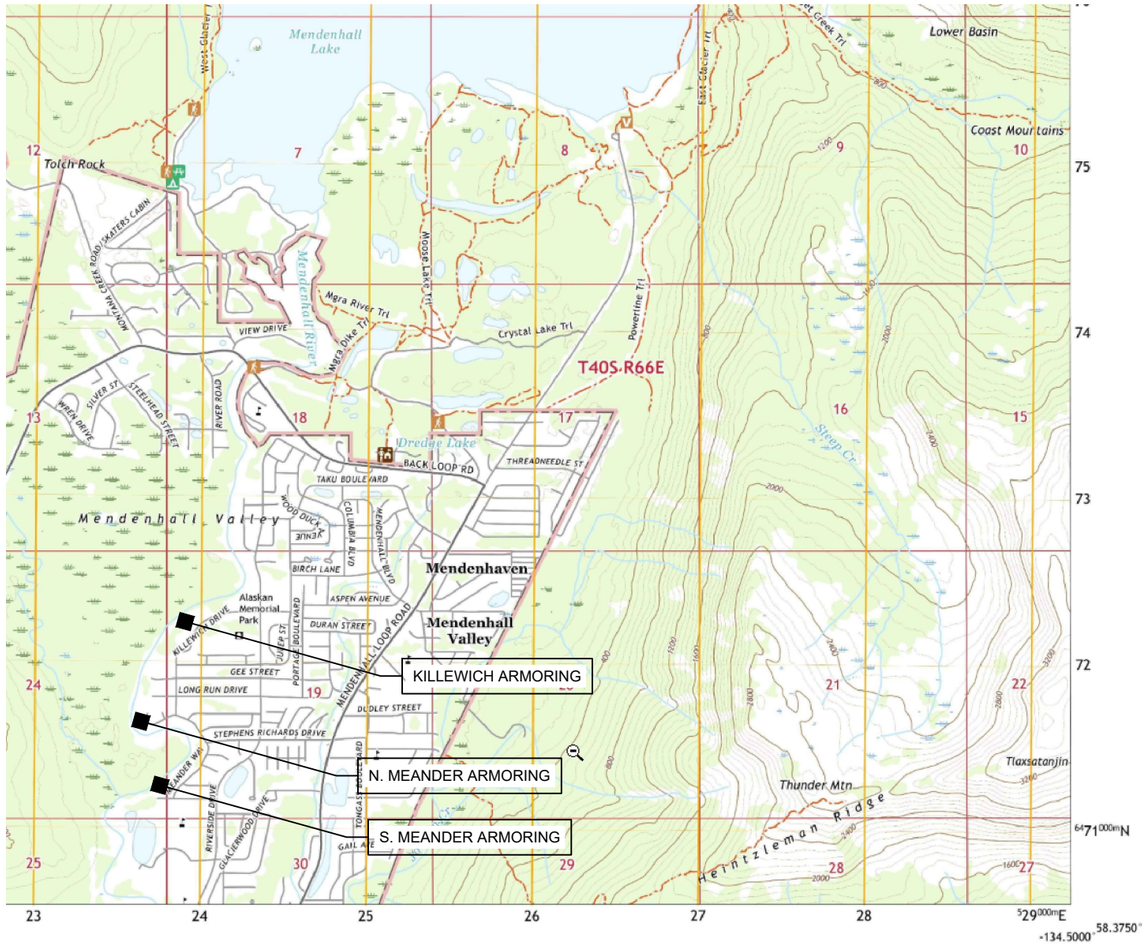
Kate Kanouse

By: Kate Kanouse
Regional Supervisor

Enclosure: 2025 CBJ GLOF Emergency Flood Fighting Mendenhall Riverbank Armoring, Juneau, AK

Email cc:
Al Ott, ADF&G Habitat, Fairbanks
ADF&G Habitat Staff, Douglas
Dan Teske, ADF&G SF, Douglas
Scott Forbes, ADF&G CF, Douglas
Carl Koch, ADF&G WC, Douglas
Forrest Courtney, CBJ, Juneau
Randy Vigil, USACE, Juneau
Andy Stevens, USFWS, Anchorage
Habitat Conservation Division, NMFS, Juneau
Laurel Smith, DNR MWL, Juneau
Sgt. Branden Forst, DPS/AWT, Juneau

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING
MENDENHALL RIVERBANK ARMORING
JUNEAU, AK



PROJECT LOCATION: USGS B-2 NW, AK - 2021

- S. MEANDER: 58.38114 LATITUDE -134.59365 LONGITUDE
  9387 RIVERCOURT WAY AND 3315, 3319, 3323 MEANDER WAY, JUNEAU AK
- N. MEANDER: 58.38544 LATITUDE -134.59597 LONGITUDE
  3491,3495,3499, CBJ(NHN) MEANDER WAY, JUNEAU, AK
- KILLEWICH: 58.39001 LATITUDE -139.59122 LONGITUDE
  3835,3839,3843,3847,3849 KILLEWICH DRIVE, JUNEAU, AK

INDEX:

PROJECT CONTACT:

CBJ ENGINEERING AND PUBLIC WORKS DEPT.
JOHN BOHAN
155 HERITAGE WAY
JUNEAU AK 99801
(907) 586-0800 X-4188 john.bohan@juneau.gov

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

COVER AND LOCATION MAP

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 1 of 7

LAYOUT POINTS				
POINT #	NORTHING	EASTING	ELEV	NOTES:
1	2395970.3710	2508510.9723	18.5	MATCH TO EXISTING BANK
2	2395997.1648	2508541.5676	18.5	
3	2396085.7665	2508707.811	18.5	
4	2396138.0306	2508797.2850	18.5	
5	2396183.6512	2508892.9549	18.5	
6	2396215.7526	2508945.5805	18.5	MATCH TO EXISTING RIPRAP
7	2396195.2627	2508958.0771	36.0	MATCH TO EXISTING RIPRAP
8	2396162.5192	2508904.3898	36.0	
9	2396116.8003	2508808.5227	36.0	
10	2396064.4721	2508717.9390	36.0	BEGIN SHALLOWER ARMORING SLOPE TO MATCH INTO EXISTING
11	2395957.3582	2508523.4343	32.0	MATCH TO EXISTING BANK
A	2395980.5465	2508722.5253		CONTROL PT. A – SW CNR OF HOUSE #3839
B	2396013.8097	2508773.0434		CONTROL PT. B – SW CNR OF HOUSE #3839

QUANTITIES:
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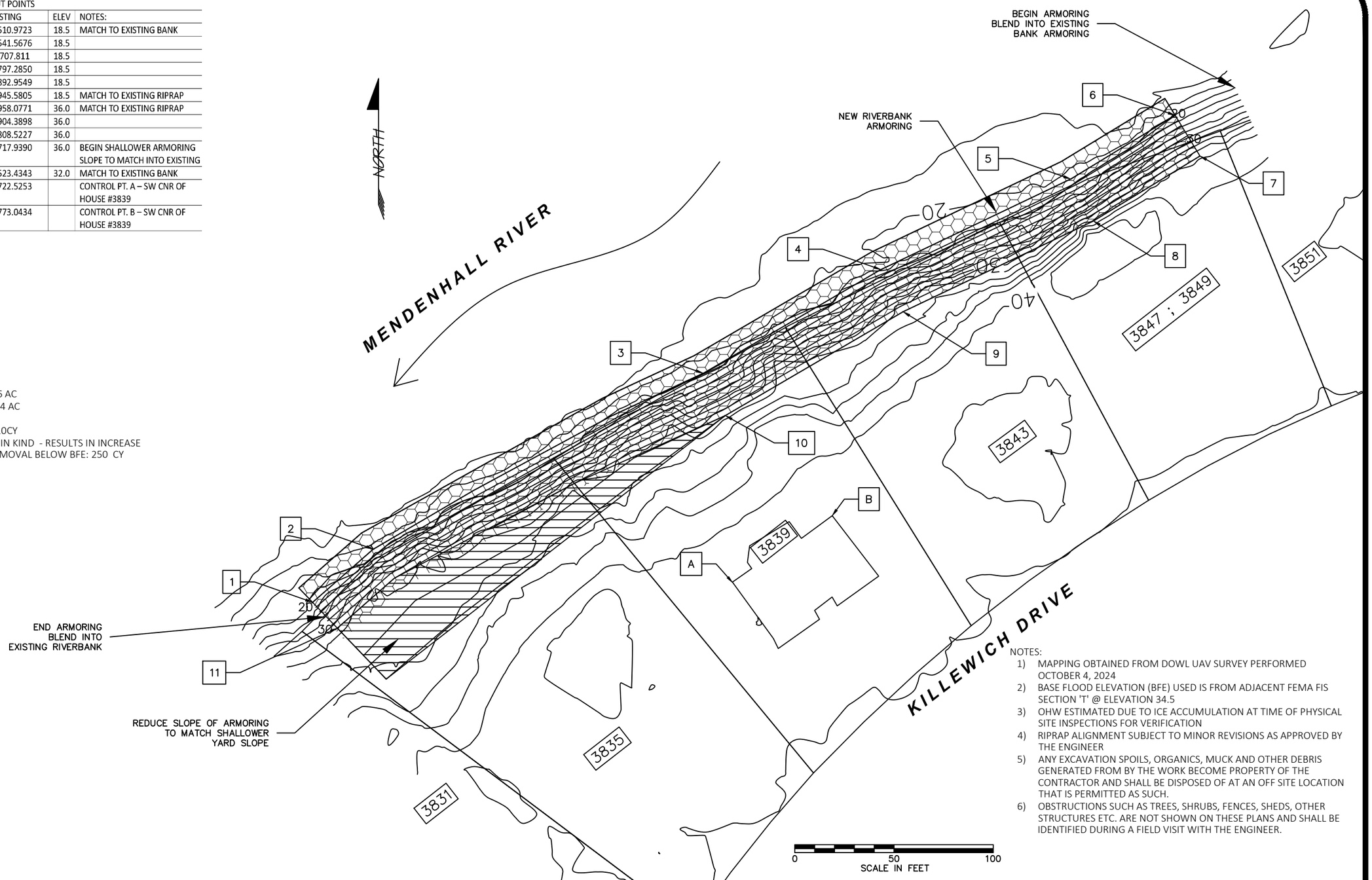
2) BANK ARMORING BELOW OHW: 0.14 AC
3) TOTAL RIPRAP VOLUME: 4,950 CY
4) RIPRAP VOLUME BELOW OHW: 2210CY
5) BANK ARMORING IS REPLACEMENT IN KIND - RESULTS IN INCREASE OF FLOODWAY SIZE - MATERIAL REMOVAL BELOW BFE: 250 CY



NOTES:
1) MAPPING OBTAINED FROM DOWL UAV SURVEY PERFORMED OCTOBER 4, 2024
2) BASE FLOOD ELEVATION (BFE) USED IS FROM ADJACENT FEMA FIS SECTION 'T' @ ELEVATION 34.5
3) OHW ESTIMATED DUE TO ICE ACCUMULATION AT TIME OF PHYSICAL SITE INSPECTIONS FOR VERIFICATION
4) RIPRAP ALIGNMENT SUBJECT TO MINOR REVISIONS AS APPROVED BY THE ENGINEER
5) ANY EXCAVATION SPOILS, ORGANICS, MUCK AND OTHER DEBRIS GENERATED FROM BY THE WORK BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE DISPOSED OF AT AN OFF SITE LOCATION THAT IS PERMITTED AS SUCH.
6) OBSTRUCTIONS SUCH AS TREES, SHRUBS, FENCES, SHEDS, OTHER STRUCTURES ETC. ARE NOT SHOWN ON THESE PLANS AND SHALL BE IDENTIFIED DURING A FIELD VISIT WITH THE ENGINEER.

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

KILLEWICH ARMORING CONSTRUCTION PLAN

DATE: 2/1/2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 3 of 7

DESCRIPTION

The work under this section includes providing all labor, tools and equipment necessary for furnishing and placing a protective covering of stone, as shown on the drawings or as directed by the engineer.

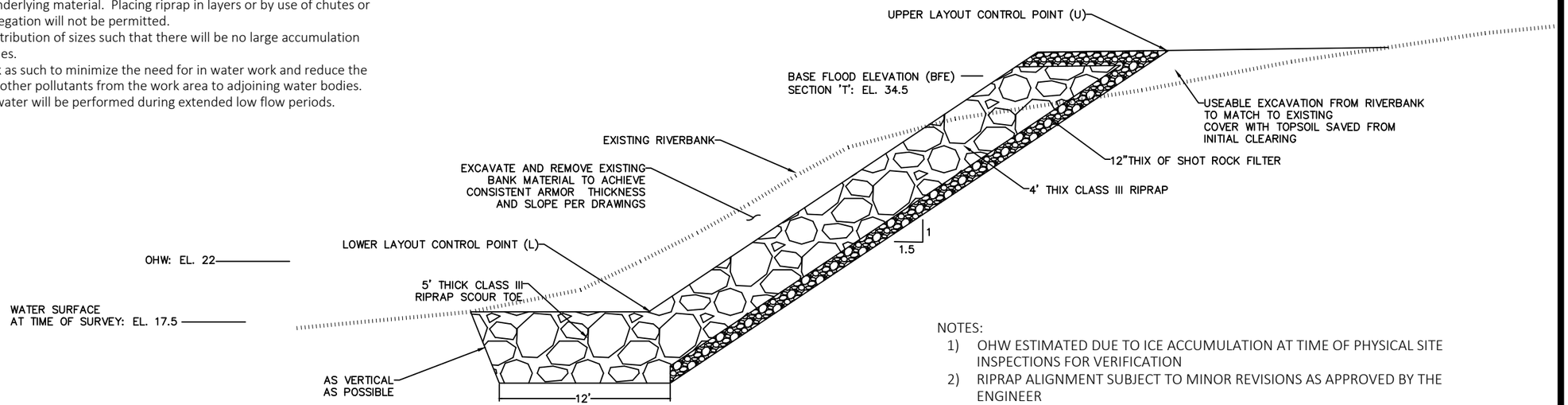
MATERIALS

SHOT ROCK BORROW: shall consist of 10" minus shot rock and shall contain no organics or other deleterious matter. The shot rock shall be evenly graded with at least 10% by weight retained on the 8" screen. Shot rock will be obtained from quarry rock unless otherwise approved by the engineer.

CLASS III RIPRAP: shall consist of no more than 10% total by weight more than 1400 pounds each, and no more than 15% of stones by weight shall weigh less than 25 pounds each. A minimum of 50% by weight shall weigh greater than 700 pounds.

CONSTRUCTION

A. Slopes to be protected with riprap shall be free of brush, trees stumps and other objectional material and shall be graded to a relative smooth surface.
B. The shot rock filter layer shall be place prior to placing riprap as shown on the drawings.
C. The riprap shall be placed to the thickness, height and length as shown on the drawings or as staked with a minimum of voids.
D. Undesirable voids shall be filled with small stones or spalls. The rock shall be manipulated sufficiently by means of excavator or other suitable equipment to secure a reasonably regular surface and mass stability.
E. Riprap protection shall be placed to full course thickness in one operation and in such a manner to avoid damaging the filter layer or underlying material. Placing riprap in layers or by use of chutes or similar activities likely to cause segregation will not be permitted.
F. Riprap shall be placed with a fair distribution of sizes such that there will be no large accumulation or area of mainly large or small stones.
G. The contractor shall phase the work as such to minimize the need for in water work and reduce the potential for sediment discharge or other pollutants from the work area to adjoining water bodies. Ideally, the work below mean high water will be performed during extended low flow periods.



NOTES:

1) OHW ESTIMATED DUE TO ICE ACCUMULATION AT TIME OF PHYSICAL SITE INSPECTIONS FOR VERIFICATION
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Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

KILLEWICH ARMORING TYPICAL SECTION

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

THE STATE of ALASKA
GOVERNOR MIKE DUNLEAVY

Department of Fish and Game

HABITAT SECTION
Southeast Region Office

802 3rd Street
Douglas, Alaska
P.O. Box 110024
Juneau, Alaska 99811-0024
Main: 907.465.4105
Email: dfg.hab.infodou@alaska.gov

FISH HABITAT PERMIT FH25-I-0021

ISSUED: March 11, 2025
EXPIRES: Life of Structure

Scott Gende and Amy Reifenstein
3843 Killewich Drive
Juneau, Alaska 99801

RE: Bank Stabilization
Mendenhall River (Stream Number 111-50-10500)
Section 19, T 40S, R 66E, CRM (Juneau B-2)
Location: 58.39066 N, 134.58962 W

Dear Scott Gende and Amy Reifenstein:

Pursuant to the Anadromous Fish Act at AS 16.05.871(b), the Alaska Department of Fish and Game (ADF&G) Habitat Section reviewed your proposal to stabilize your streambank on your property along the Mendenhall River. Since 2011, the glacial-dammed lake at Suicide Basin in the Mendenhall Glacier has burst annually, causing the waters of Mendenhall Lake to rise and subsequent flooding of the Mendenhall River.[a]

Project Description
You will notify the Habitat Section three days prior to construction. During low water, your contractor will use heavy equipment to stabilize the riverbank with clean class III riprap and shot rock material according to specifications outlined in the project design provided by the City and Borough of Juneau Engineering and Public Works Department (enclosed). The revetment will be constructed at a 1.5:1 slope and a 5 ft riprap keyway will be constructed at the toe of the slope. End-dumping into the actively flowing river is not allowed.

Anadromous Fish Act
Stream Number 111-50-10500 has been specified as being important for the spawning, rearing, or migration of anadromous fishes pursuant to AS 16.05.871(a). The Mendenhall River provides habitat for Chinook, chum, coho, pink, and sockeye salmon, Dolly Varden, and cutthroat and steelhead trout; all species migrate through the project area.

[a] National Weather Service. 2024. Juneau/Mendenhall River Flooding Suicide Basin Glacier Dammed Lake Release. National Oceanic and Atmospheric Administration, Juneau Weather Forecast Office.

In accordance with AS 16.05.871(d), your project is approved subject to the project description and permit terms.

Permit Terms
This letter constitutes a permit issued under the authority of AS 16.05.871 and must be retained on site during project activities. Please be advised that this determination applies only to Habitat Section regulated activities; other agencies also may have jurisdiction under their respective authorities. This determination does not relieve you of your responsibility to secure other state, federal, or local permits. You are still required to comply with all other applicable laws.

You are responsible for the actions of contractors, agents, or other persons who perform work to accomplish the approved project. Prior to engaging in any activity that significantly deviates from the approved plan, you shall notify the Habitat Section and obtain written approval in the form of a permit amendment. Any action that increases the project's overall scope or that negates, alters, or minimizes the intent or effectiveness of any provision contained in this permit will be deemed a significant deviation from the approved plan. The final determination as to the significance of any deviation and the need for a permit amendment is a Habitat Section responsibility. Therefore, it is recommended the Habitat Section be consulted immediately when a deviation from the approved plan is being considered.

You shall give an authorized representative of the state free and unobstructed access to the permit site, at safe and reasonable times, for the purpose of inspecting or monitoring compliance with any provision of this permit. You shall furnish whatever assistance and information the authorized representative reasonably requires for monitoring and inspection purposes.

In addition to the penalties provided by law, this permit may be terminated or revoked for failure to comply with its provisions or failure to comply with applicable statutes and regulations. You shall mitigate any adverse effect upon fish or wildlife, their habitats, or any restriction or interference with public use that the commissioner determines was a direct result of your failure to comply with this permit or any applicable law.

You shall indemnify, save harmless, and defend the department, its agents, and its employees from any and all claims, actions, or liabilities for injuries or damages sustained by any person or property arising directly or indirectly from permitted activities or your performance under this permit. However, this provision has no effect if, and only if, the sole proximate cause of the injury is the department's negligence.

You may appeal this permit decision relating to AS 16.05.871 in accordance with the provisions of AS 44.62.330–630.

Please direct questions about this permit to Habitat Biologist Nicholas Jensen at (907) 465-6646 or nicholas.jensen@alaska.gov.

Sincerely,
Doug Vincent-Lang
Commissioner

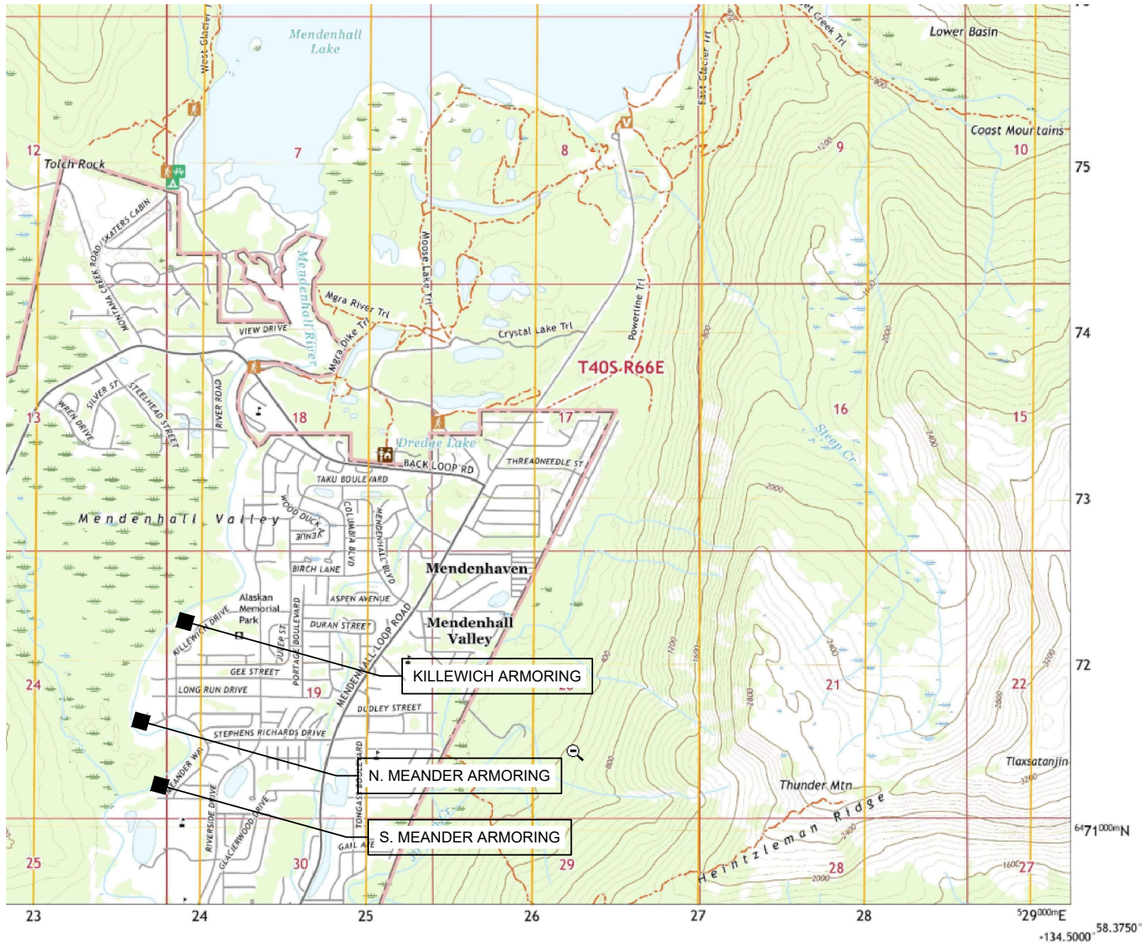
Kate Kanouse

By: Kate Kanouse
Regional Supervisor

Enclosure: 2025 CBJ GLOF Emergency Flood Fighting Mendenhall Riverbank Armoring, Juneau, AK

Email cc:
Al Ott, ADF&G Habitat, Fairbanks
ADF&G Habitat Staff, Douglas
Dan Teske, ADF&G SF, Douglas
Scott Forbes, ADF&G CF, Douglas
Carl Koch, ADF&G WC, Douglas
Forrest Courtney, CBJ, Juneau
Randy Vigil, USACE, Juneau
Andy Stevens, USFWS, Anchorage
Habitat Conservation Division, NMFS, Juneau
Laurel Smith, DNR MWL, Juneau
Sgt. Branden Forst, DPS/AWT, Juneau

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING
MENDENHALL RIVERBANK ARMORING
JUNEAU, AK



PROJECT LOCATION: USGS B-2 NW, AK - 2021

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- KILLEWICH: 58.39001 LATITUDE -139.59122 LONGITUDE
  3835,3839,3843,3847,3849 KILLEWICH DRIVE, JUNEAU, AK

INDEX:

PROJECT CONTACT:

CBJ ENGINEERING AND PUBLIC WORKS DEPT.
JOHN BOHAN
155 HERITAGE WAY
JUNEAU AK 99801
(907) 586-0800 X-4188 john.bohan@juneau.gov

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

COVER AND LOCATION MAP

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 1 of 7

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QUANTITIES:
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2) BANK ARMORING BELOW OHW: 0.14 AC
3) TOTAL RIPRAP VOLUME: 4,950 CY
4) RIPRAP VOLUME BELOW OHW: 2210CY
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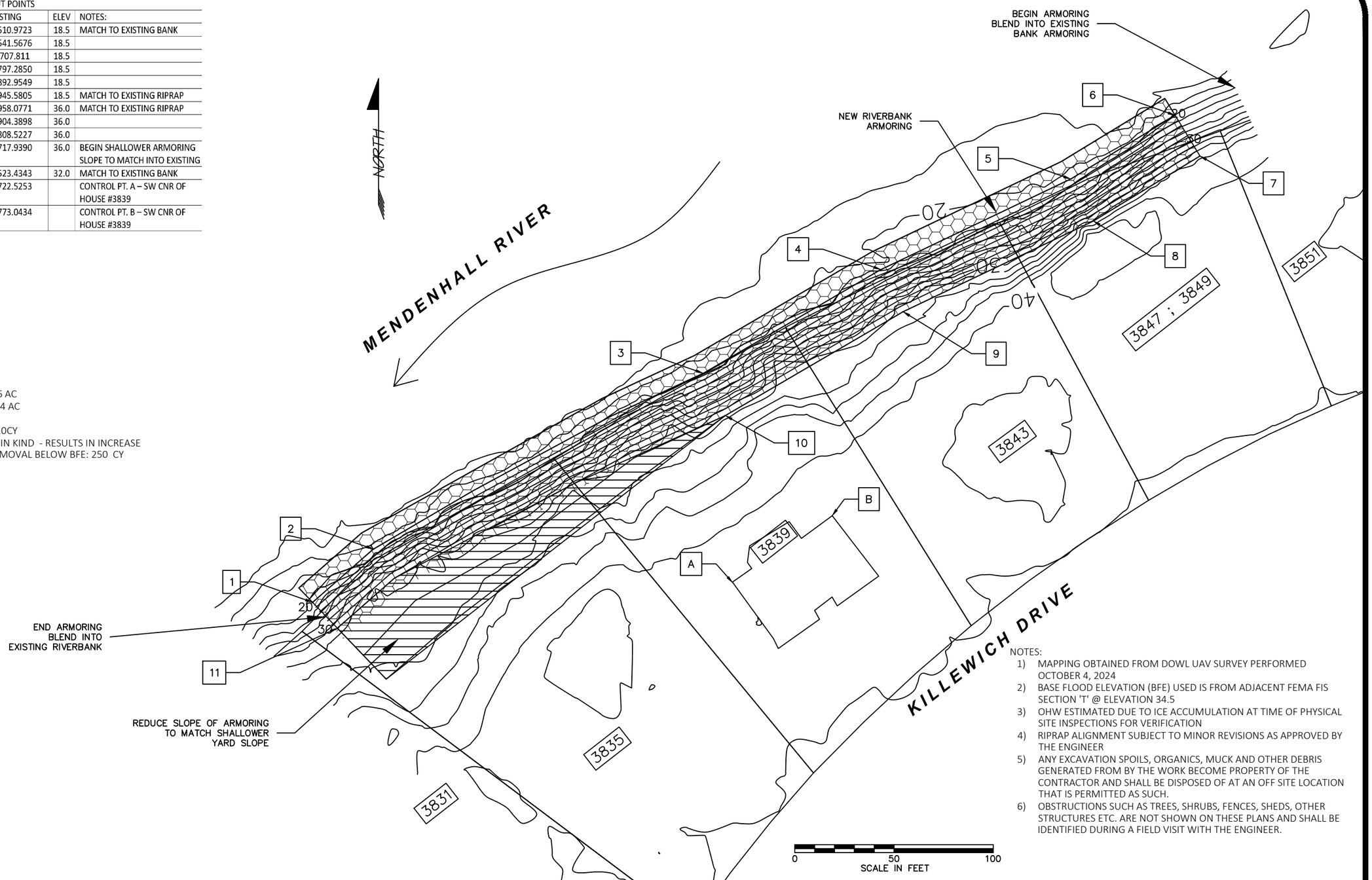

NOTES:
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Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

KILLEWICH ARMORING CONSTRUCTION PLAN

DATE: 2/1/2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 3 of 7

DESCRIPTION

The work under this section includes providing all labor, tools and equipment necessary for furnishing and placing a protective covering of stone, as shown on the drawings or as directed by the engineer.

MATERIALS

SHOT ROCK BORROW: shall consist of 10" minus shot rock and shall contain no organics or other deleterious matter. The shot rock shall be evenly graded with at least 10% by weight retained on the 8" screen. Shot rock will be obtained from quarry rock unless otherwise approved by the engineer.

CLASS III RIPRAP: shall consist of no more than 10% total by weight more than 1400 pounds each, and no more than 15% of stones by weight shall weigh less than 25 pounds each. A minimum of 50% by weight shall weigh greater than 700 pounds.

CONSTRUCTION

A. Slopes to be protected with riprap shall be free of brush, trees stumps and other objectional material and shall be graded to a relative smooth surface.
B. The shot rock filter layer shall be place prior to placing riprap as shown on the drawings.
C. The riprap shall be placed to the thickness, height and length as shown on the drawings or as staked with a minimum of voids.
D. Undesirable voids shall be filled with small stones or spalls. The rock shall be manipulated sufficiently by means of excavator or other suitable equipment to secure a reasonably regular surface and mass stability.
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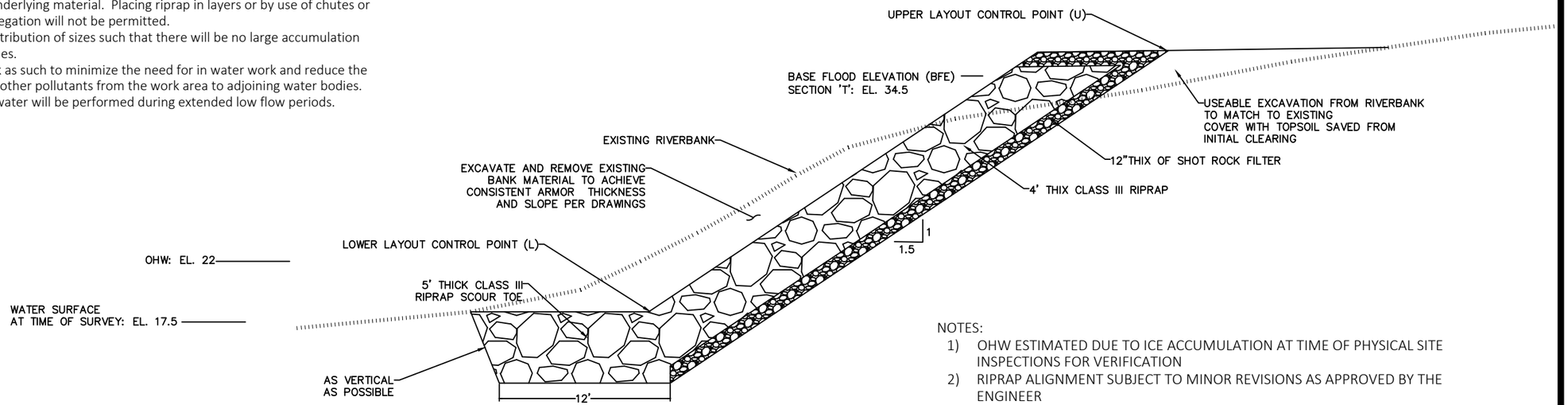
F. Riprap shall be placed with a fair distribution of sizes such that there will be no large accumulation or area of mainly large or small stones.
G. The contractor shall phase the work as such to minimize the need for in water work and reduce the potential for sediment discharge or other pollutants from the work area to adjoining water bodies. Ideally, the work below mean high water will be performed during extended low flow periods.



NOTES:

1) OHW ESTIMATED DUE TO ICE ACCUMULATION AT TIME OF PHYSICAL SITE INSPECTIONS FOR VERIFICATION
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Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

KILLEWICH ARMORING TYPICAL SECTION

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

THE STATE of ALASKA
GOVERNOR MIKE DUNLEAVY

Department of Fish and Game

HABITAT SECTION
Southeast Region Office

802 3rd Street
Douglas, Alaska
P.O. Box 110024
Juneau, Alaska 99811-0024
Main: 907.465.4105
Email: dfg.hab.infodou@alaska.gov

FISH HABITAT PERMIT FH25-I-0022

ISSUED: March 11, 2025
EXPIRES: Life of Structure

Jonathan and Brooke Gunstrom
3839 Killewich Drive
Juneau, Alaska 99801

RE: Bank Stabilization
Mendenhall River (Stream Number 111-50-10500)
Section 19, T 40S, R 66E, CRM (Juneau B-2)
Location: 58.39048 N, 134.59022 W

Dear Jonathan and Brook Gunstrom:

Pursuant to the Anadromous Fish Act at AS 16.05.871(b), the Alaska Department of Fish and Game (ADF&G) Habitat Section reviewed your proposal to stabilize your streambank on your property along the Mendenhall River. Since 2011, the glacial-dammed lake at Suicide Basin in the Mendenhall Glacier has burst annually, causing the waters of Mendenhall Lake to rise and subsequent flooding of the Mendenhall River.[a]

Project Description
You will notify the Habitat Section three days prior to construction. During low water, your contractor will use heavy equipment to stabilize the riverbank with clean class III riprap and shot rock material according to specifications outlined in the project design provided by the City and Borough of Juneau Engineering and Public Works Department (enclosed). The revetment will be constructed at a 1.5:1 slope and a 5 ft riprap keyway will be constructed at the toe of the slope. End-dumping into the actively flowing river is not allowed.

Anadromous Fish Act
Stream Number 111-50-10500 has been specified as being important for the spawning, rearing, or migration of anadromous fishes pursuant to AS 16.05.871(a). The Mendenhall River provides habitat for Chinook, chum, coho, pink, and sockeye salmon, Dolly Varden, and cutthroat and steelhead trout; all species migrate through the project area.

[a] National Weather Service. 2024. Juneau/Mendenhall River Flooding Suicide Basin Glacier Dammed Lake Release. National Oceanic and Atmospheric Administration, Juneau Weather Forecast Office.

In accordance with AS 16.05.871(d), your project is approved subject to the project description and permit terms.

Permit Terms

This letter constitutes a permit issued under the authority of AS 16.05.871 and must be retained on site during project activities. Please be advised that this determination applies only to Habitat Section regulated activities; other agencies also may have jurisdiction under their respective authorities. This determination does not relieve you of your responsibility to secure other state, federal, or local permits. You are still required to comply with all other applicable laws.

You are responsible for the actions of contractors, agents, or other persons who perform work to accomplish the approved project. Prior to engaging in any activity that significantly deviates from the approved plan, you shall notify the Habitat Section and obtain written approval in the form of a permit amendment. Any action that increases the project's overall scope or that negates, alters, or minimizes the intent or effectiveness of any provision contained in this permit will be deemed a significant deviation from the approved plan. The final determination as to the significance of any deviation and the need for a permit amendment is a Habitat Section responsibility. Therefore, it is recommended the Habitat Section be consulted immediately when a deviation from the approved plan is being considered.

You shall give an authorized representative of the state free and unobstructed access to the permit site, at safe and reasonable times, for the purpose of inspecting or monitoring compliance with any provision of this permit. You shall furnish whatever assistance and information the authorized representative reasonably requires for monitoring and inspection purposes.

In addition to the penalties provided by law, this permit may be terminated or revoked for failure to comply with its provisions or failure to comply with applicable statutes and regulations. You shall mitigate any adverse effect upon fish or wildlife, their habitats, or any restriction or interference with public use that the commissioner determines was a direct result of your failure to comply with this permit or any applicable law.

You shall indemnify, save harmless, and defend the department, its agents, and its employees from any and all claims, actions, or liabilities for injuries or damages sustained by any person or property arising directly or indirectly from permitted activities or your performance under this permit. However, this provision has no effect if, and only if, the sole proximate cause of the injury is the department's negligence.

You may appeal this permit decision relating to AS 16.05.871 in accordance with the provisions of AS 44.62.330–630.

Please direct questions about this permit to Habitat Biologist Nicholas Jensen at (907) 465-6646 or nicholas.jensen@alaska.gov.

Sincerely,
Doug Vincent-Lang
Commissioner

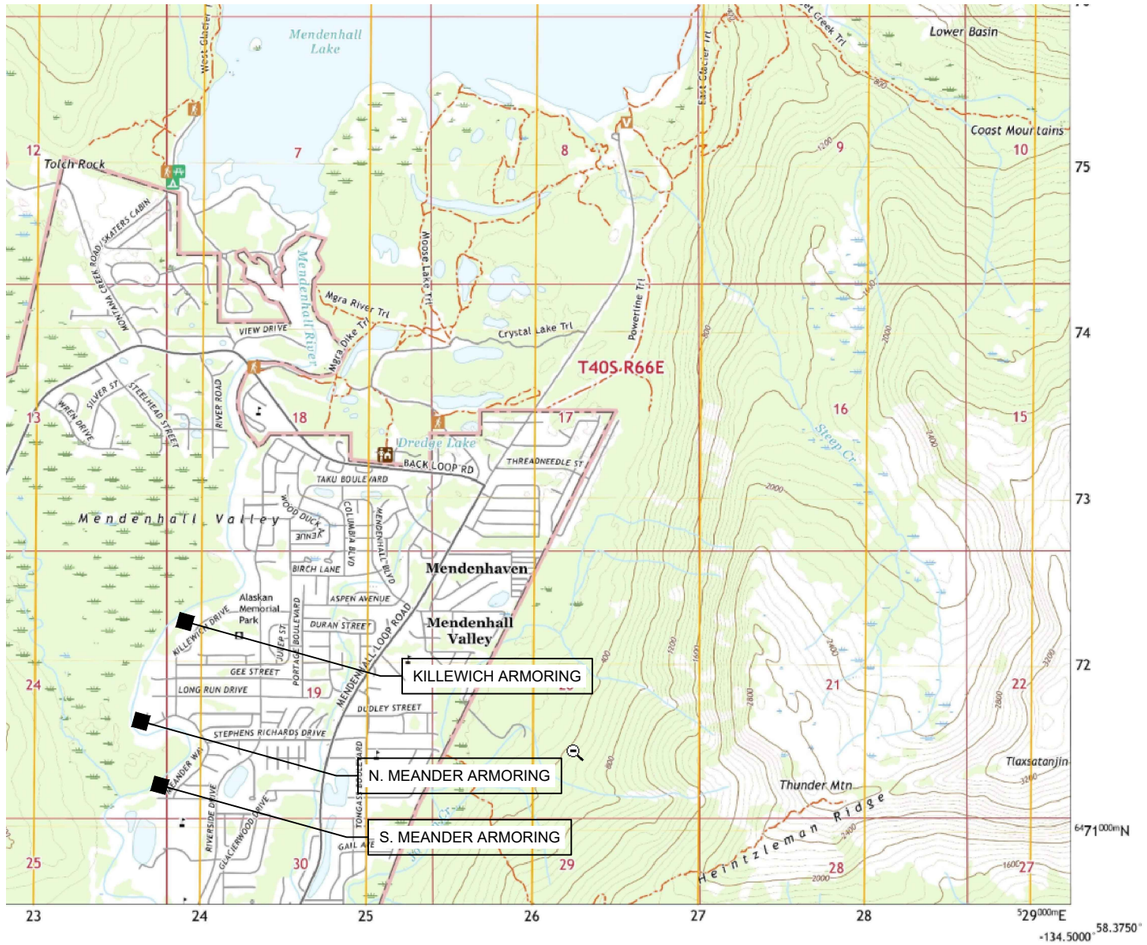
Kate Kanouse

By: Kate Kanouse
Regional Supervisor

Enclosure: 2025 CBJ GLOF Emergency Flood Fighting Mendenhall Riverbank Armoring, Juneau, AK

Email cc:
Al Ott, ADF&G Habitat, Fairbanks
ADF&G Habitat Staff, Douglas
Dan Teske, ADF&G SF, Douglas
Scott Forbes, ADF&G CF, Douglas
Carl Koch, ADF&G WC, Douglas
Forrest Courtney, CBJ, Juneau
Randy Vigil, USACE, Juneau
Andy Stevens, USFWS, Anchorage
Habitat Conservation Division, NMFS, Juneau
Laurel Smith, DNR MWL, Juneau
Sgt. Branden Forst, DPS/AWT, Juneau

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING
MENDENHALL RIVERBANK ARMORING
JUNEAU, AK



PROJECT LOCATION: USGS B-2 NW, AK - 2021

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- N. MEANDER: 58.38544 LATITUDE -134.59597 LONGITUDE
  3491,3495,3499, CBJ(NHN) MEANDER WAY, JUNEAU, AK
- KILLEWICH: 58.39001 LATITUDE -139.59122 LONGITUDE
  3835,3839,3843,3847,3849 KILLEWICH DRIVE, JUNEAU, AK

INDEX:

PROJECT CONTACT:

CBJ ENGINEERING AND PUBLIC WORKS DEPT.
JOHN BOHAN
155 HERITAGE WAY
JUNEAU AK 99801
(907) 586-0800 X-4188 john.bohan@juneau.gov

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

COVER AND LOCATION MAP

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 1 of 7

LAYOUT POINTS				
POINT #	NORTHING	EASTING	ELEV	NOTES:
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B	2396013.8097	2508773.0434		CONTROL PT. B – SW CNR OF HOUSE #3839

QUANTITIES:
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3) TOTAL RIPRAP VOLUME: 4,950 CY
4) RIPRAP VOLUME BELOW OHW: 2210CY
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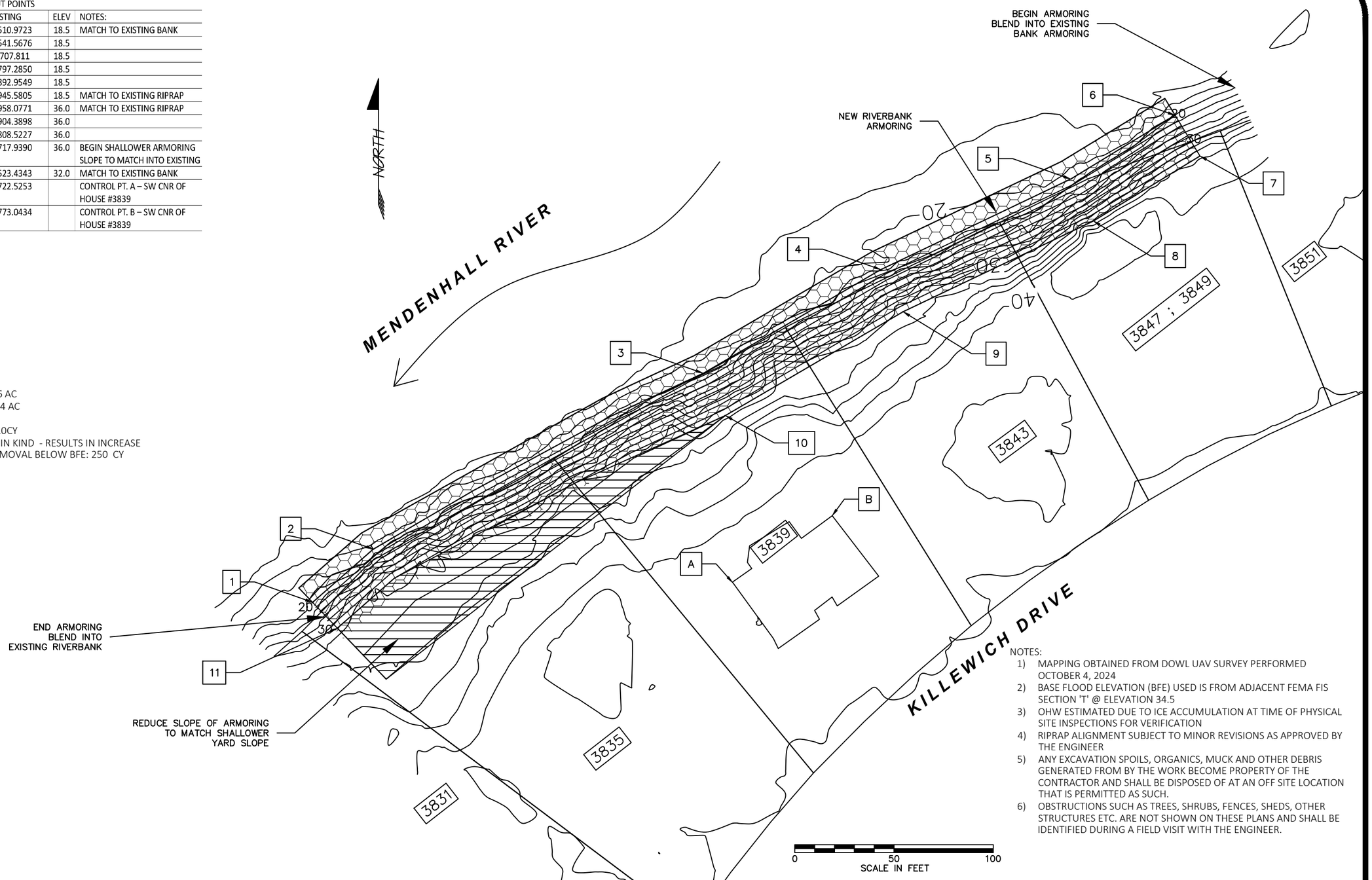

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6) OBSTRUCTIONS SUCH AS TREES, SHRUBS, FENCES, SHEDS, OTHER STRUCTURES ETC. ARE NOT SHOWN ON THESE PLANS AND SHALL BE IDENTIFIED DURING A FIELD VISIT WITH THE ENGINEER.

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

KILLEWICH ARMORING CONSTRUCTION PLAN

DATE: 2/1/2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 3 of 7

DESCRIPTION

The work under this section includes providing all labor, tools and equipment necessary for furnishing and placing a protective covering of stone, as shown on the drawings or as directed by the engineer.

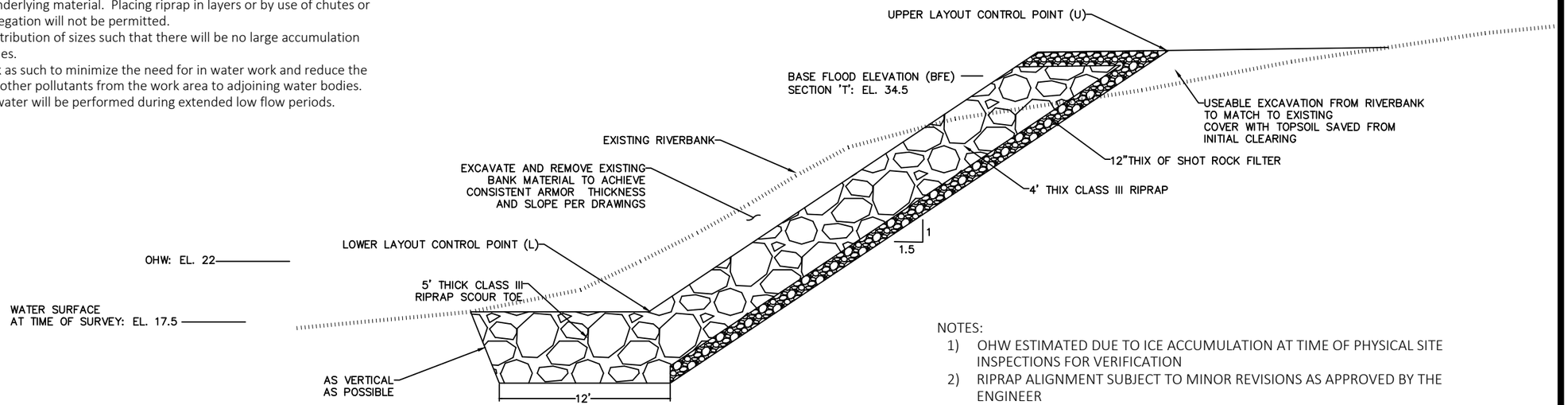
MATERIALS

SHOT ROCK BORROW: shall consist of 10" minus shot rock and shall contain no organics or other deleterious matter. The shot rock shall be evenly graded with at least 10% by weight retained on the 8" screen. Shot rock will be obtained from quarry rock unless otherwise approved by the engineer.

CLASS III RIPRAP: shall consist of no more than 10% total by weight more than 1400 pounds each, and no more than 15% of stones by weight shall weigh less than 25 pounds each. A minimum of 50% by weight shall weigh greater than 700 pounds.

CONSTRUCTION

A. Slopes to be protected with riprap shall be free of brush, trees stumps and other objectional material and shall be graded to a relative smooth surface.
B. The shot rock filter layer shall be place prior to placing riprap as shown on the drawings.
C. The riprap shall be placed to the thickness, height and length as shown on the drawings or as staked with a minimum of voids.
D. Undesirable voids shall be filled with small stones or spalls. The rock shall be manipulated sufficiently by means of excavator or other suitable equipment to secure a reasonably regular surface and mass stability.
E. Riprap protection shall be placed to full course thickness in one operation and in such a manner to avoid damaging the filter layer or underlying material. Placing riprap in layers or by use of chutes or similar activities likely to cause segregation will not be permitted.
F. Riprap shall be placed with a fair distribution of sizes such that there will be no large accumulation or area of mainly large or small stones.
G. The contractor shall phase the work as such to minimize the need for in water work and reduce the potential for sediment discharge or other pollutants from the work area to adjoining water bodies. Ideally, the work below mean high water will be performed during extended low flow periods.



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Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

KILLEWICH ARMORING TYPICAL SECTION

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

THE STATE of ALASKA
GOVERNOR MIKE DUNLEAVY

Department of Fish and Game

HABITAT SECTION
Southeast Region Office

802 3rd Street
Douglas, Alaska
P.O. Box 110024
Juneau, Alaska 99811-0024
Main: 907.465.4105
Email: dfg.hab.infodou@alaska.gov

FISH HABITAT PERMIT FH25-I-0023

ISSUED: March 11, 2025
EXPIRES: Life of Structure

Mike and Bonnie Erickson
3835 Killewich Drive
Juneau, Alaska 99801

RE: Bank Stabilization
Mendenhall River (Stream Number 111-50-10500)
Section 19, T 40S, R 66E, CRM (Juneau B-2)
Location: 58.39028 N, 134.59075W

Dear Mike and Bonnie Erickson:

Pursuant to the Anadromous Fish Act at AS 16.05.871(b), the Alaska Department of Fish and Game (ADF&G) Habitat Section reviewed your proposal to stabilize your streambank on your property along the Mendenhall River. Since 2011, the glacial-dammed lake at Suicide Basin in the Mendenhall Glacier has burst annually, causing the waters of Mendenhall Lake to rise and subsequent flooding of the Mendenhall River.[a]

Project Description
You will notify the Habitat Section three days prior to construction. During low water, your contractor will use heavy equipment to stabilize the riverbank with clean class III riprap and shot rock material according to specifications outlined in the project design provided by the City and Borough of Juneau Engineering and Public Works Department (enclosed). The revetment will be constructed at a 1.5:1 slope and a 5 ft riprap keyway will be constructed at the toe of the slope. End-dumping into the active flowing river is not allowed.

Anadromous Fish Act
Stream Number 111-50-10500 has been specified as being important for the spawning, rearing, or migration of anadromous fishes pursuant to AS 16.05.871(a). The Mendenhall River provides habitat for Chinook, chum, coho, pink, and sockeye salmon, Dolly Varden, and cutthroat and steelhead trout; all species migrate through the project area.

[a] National Weather Service. 2024. Juneau/Mendenhall River Flooding Suicide Basin Glacier Dammed Lake Release. National Oceanic and Atmospheric Administration, Juneau Weather Forecast Office.

In accordance with AS 16.05.871(d), your project is approved subject to the project description and permit terms.

Permit Terms
This letter constitutes a permit issued under the authority of AS 16.05.871 and must be retained on site during project activities. Please be advised that this determination applies only to Habitat Section regulated activities; other agencies also may have jurisdiction under their respective authorities. This determination does not relieve you of your responsibility to secure other state, federal, or local permits. You are still required to comply with all other applicable laws.

You are responsible for the actions of contractors, agents, or other persons who perform work to accomplish the approved project. Prior to engaging in any activity that significantly deviates from the approved plan, you shall notify the Habitat Section and obtain written approval in the form of a permit amendment. Any action that increases the project's overall scope or that negates, alters, or minimizes the intent or effectiveness of any provision contained in this permit will be deemed a significant deviation from the approved plan. The final determination as to the significance of any deviation and the need for a permit amendment is a Habitat Section responsibility. Therefore, it is recommended the Habitat Section be consulted immediately when a deviation from the approved plan is being considered.

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In addition to the penalties provided by law, this permit may be terminated or revoked for failure to comply with its provisions or failure to comply with applicable statutes and regulations. You shall mitigate any adverse effect upon fish or wildlife, their habitats, or any restriction or interference with public use that the commissioner determines was a direct result of your failure to comply with this permit or any applicable law.

You shall indemnify, save harmless, and defend the department, its agents, and its employees from any and all claims, actions, or liabilities for injuries or damages sustained by any person or property arising directly or indirectly from permitted activities or your performance under this permit. However, this provision has no effect if, and only if, the sole proximate cause of the injury is the department's negligence.

You may appeal this permit decision relating to AS 16.05.871 in accordance with the provisions of AS 44.62.330–630.

Please direct questions about this permit to Habitat Biologist Nicholas Jensen at (907) 465-6646 or nicholas.jensen@alaska.gov.

Sincerely,
Doug Vincent-Lang
Commissioner

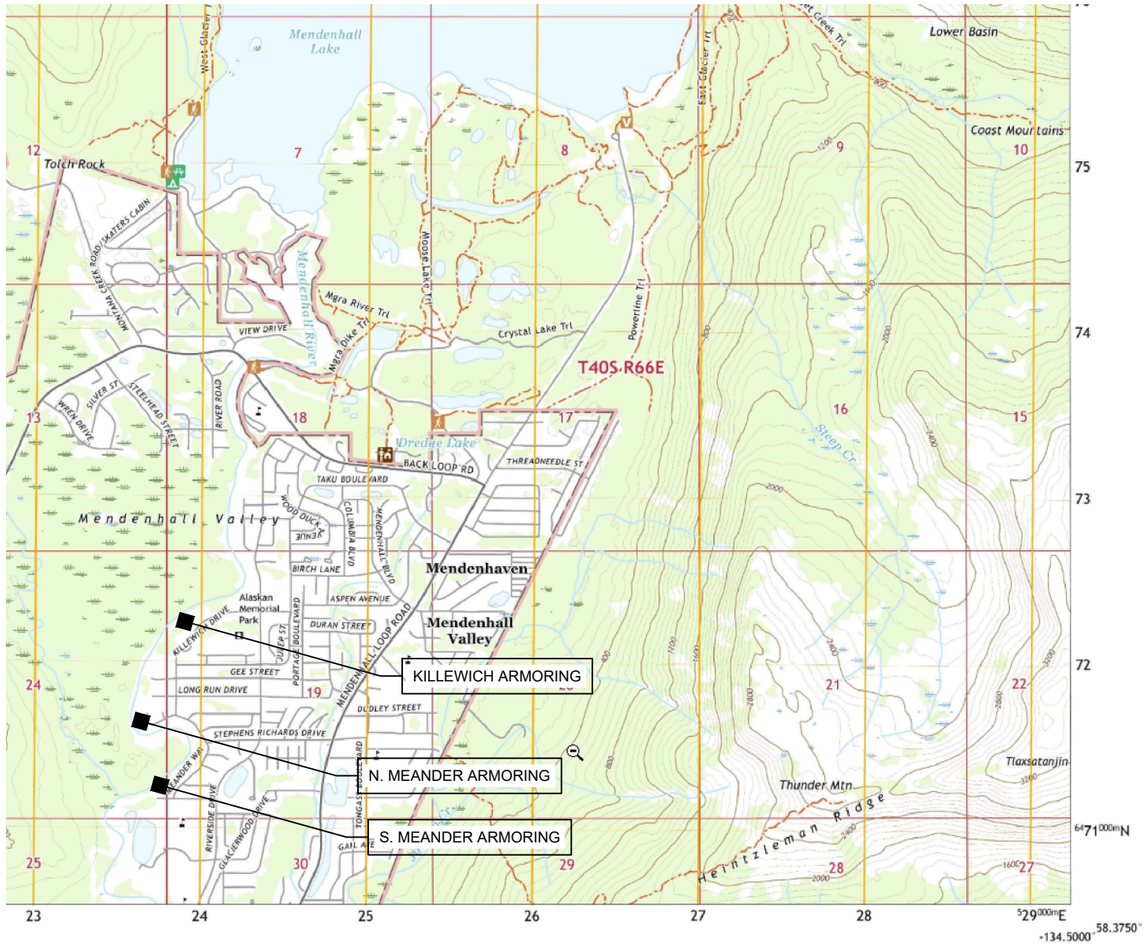
Kate Kanouse

By: Kate Kanouse
Regional Supervisor

Enclosure: 2025 CBJ GLOF Emergency Flood Fighting Mendenhall Riverbank Armoring, Juneau, AK

Email cc:
Al Ott, ADF&G Habitat, Fairbanks
ADF&G Habitat Staff, Douglas
Dan Teske, ADF&G SF, Douglas
Scott Forbes, ADF&G CF, Douglas
Carl Koch, ADF&G WC, Douglas
Forrest Courtney, CBJ, Juneau
Randy Vigil, USACE, Juneau
Andy Stevens, USFWS, Anchorage
Habitat Conservation Division, NMFS, Juneau
Laurel Smith, DNR MWL, Juneau
Sgt. Branden Forst, DPS/AWT, Juneau

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING
MENDENHALL RIVERBANK ARMORING
JUNEAU, AK



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INDEX:

PROJECT CONTACT:

CBJ ENGINEERING AND PUBLIC WORKS DEPT.
JOHN BOHAN
155 HERITAGE WAY
JUNEAU AK 99801
(907) 586-0800 X-4188 john.bohan@juneau.gov

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

COVER AND LOCATION MAP

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 1 of 7

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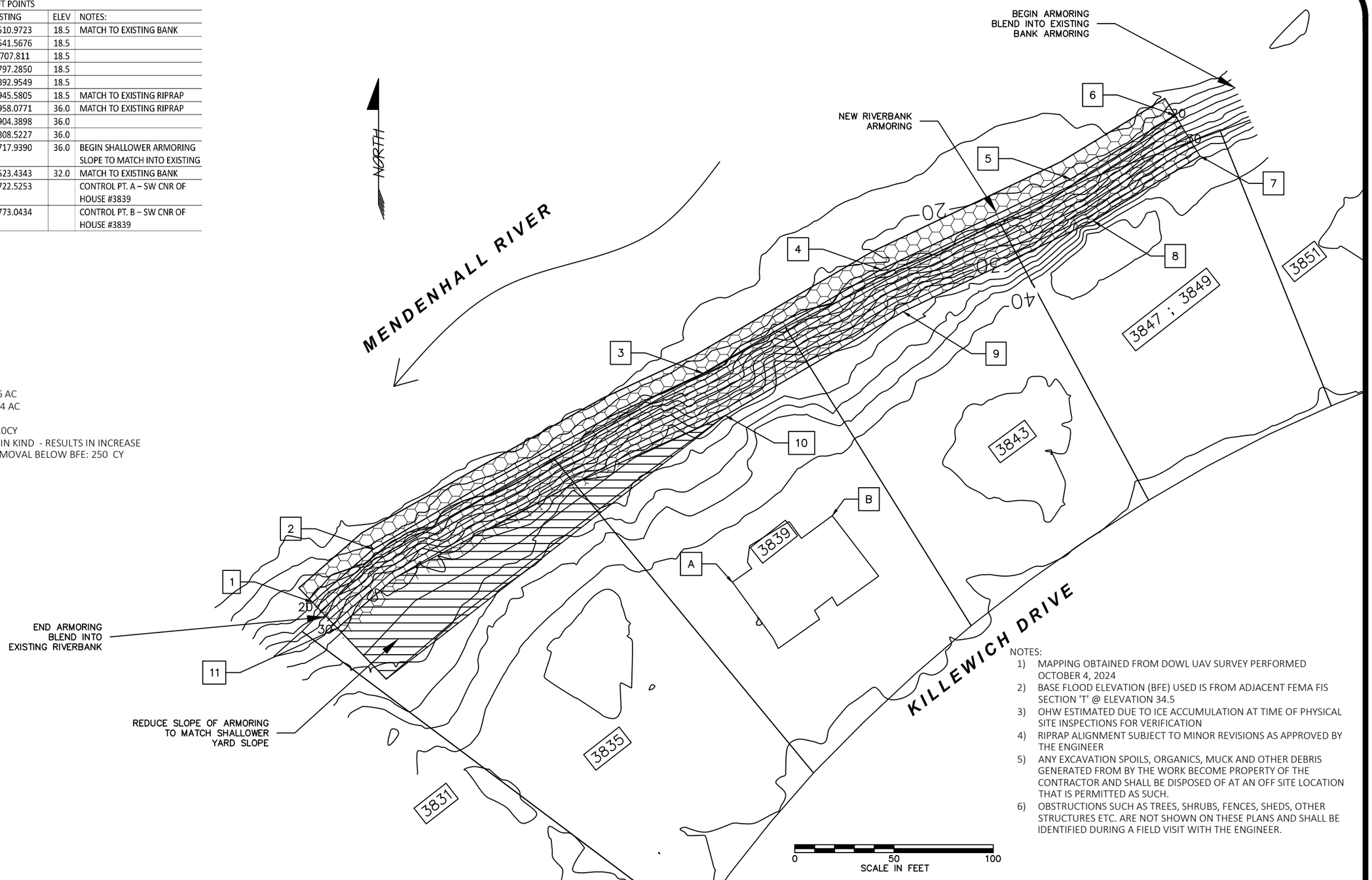

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Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

KILLEWICH ARMORING CONSTRUCTION PLAN

DATE: 2/1/2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 3 of 7

DESCRIPTION

The work under this section includes providing all labor, tools and equipment necessary for furnishing and placing a protective covering of stone, as shown on the drawings or as directed by the engineer.

MATERIALS

SHOT ROCK BORROW: shall consist of 10" minus shot rock and shall contain no organics or other deleterious matter. The shot rock shall be evenly graded with at least 10% by weight retained on the 8" screen. Shot rock will be obtained from quarry rock unless otherwise approved by the engineer.

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CONSTRUCTION

A. Slopes to be protected with riprap shall be free of brush, trees stumps and other objectional material and shall be graded to a relative smooth surface.
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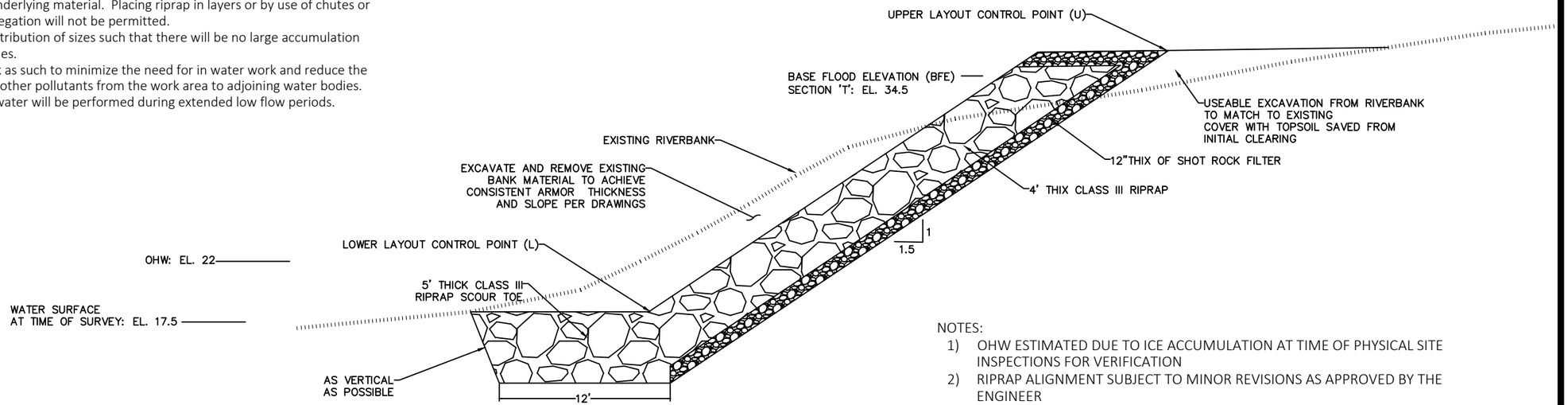

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CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
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2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

KILLEWICH ARMORING TYPICAL SECTION

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

THE STATE of ALASKA
GOVERNOR MIKE DUNLEAVY

Department of Fish and Game

HABITAT SECTION
Southeast Region Office

802 3rd Street
Douglas, Alaska
P.O. Box 110024
Juneau, Alaska 99811-0024
Main: 907.465.4105
Email: dfg.hab.infodou@alaska.gov

FISH HABITAT PERMIT FH25-I-0026

ISSUED: March 11, 2025
EXPIRES: Life of Structure

Brian and Kimberly Goettler
3323 Meander Way
Juneau, Alaska 99801

RE: Bank Stabilization
Mendenhall River (Stream Number 111-50-10500)
Section 19, T 40S, R 66E, CRM (Juneau B-2)
Location: 58.38179 N, 134.59197 W

Dear Brian and Kimberly Goettler:

Pursuant to the Anadromous Fish Act at AS 16.05.871(b), the Alaska Department of Fish and Game (ADF&G) Habitat Section reviewed your proposal to stabilize your streambank on your property along the Mendenhall River. Since 2011, the glacial-dammed lake at Suicide Basin in the Mendenhall Glacier has burst annually, causing the waters of Mendenhall Lake to rise and subsequent flooding of the Mendenhall River.[a]

Project Description
You will notify the Habitat Section three days prior to construction. During low water, your contractor will use heavy equipment to stabilize the riverbank with clean class III riprap and shot rock material according to specifications outlined in the project design provided by the City and Borough of Juneau Engineering and Public Works Department (enclosed). The revetment will be constructed at a 1.5:1 slope and a 5 ft riprap keyway will be constructed at the toe of the slope. End-dumping into the actively flowing river is not allowed.

Anadromous Fish Act
Stream Number 111-50-10500 has been specified as being important for the spawning, rearing, or migration of anadromous fishes pursuant to AS 16.05.871(a). The Mendenhall River provides habitat for Chinook, chum, coho, pink, and sockeye salmon, Dolly Varden, and cutthroat and steelhead trout; all species migrate through the project area.

[a] National Weather Service. 2024. Juneau/Mendenhall River Flooding Suicide Basin Glacier Dammed Lake Release. National Oceanic and Atmospheric Administration, Juneau Weather Forecast Office.

In accordance with AS 16.05.871(d), your project is approved subject to the project description and permit terms.

Permit Terms
This letter constitutes a permit issued under the authority of AS 16.05.871 and must be retained on site during project activities. Please be advised that this determination applies only to Habitat Section regulated activities; other agencies also may have jurisdiction under their respective authorities. This determination does not relieve you of your responsibility to secure other state, federal, or local permits. You are still required to comply with all other applicable laws.

You are responsible for the actions of contractors, agents, or other persons who perform work to accomplish the approved project. Prior to engaging in any activity that significantly deviates from the approved plan, you shall notify the Habitat Section and obtain written approval in the form of a permit amendment. Any action that increases the project's overall scope or that negates, alters, or minimizes the intent or effectiveness of any provision contained in this permit will be deemed a significant deviation from the approved plan. The final determination as to the significance of any deviation and the need for a permit amendment is a Habitat Section responsibility. Therefore, it is recommended the Habitat Section be consulted immediately when a deviation from the approved plan is being considered.

You shall give an authorized representative of the state free and unobstructed access to the permit site, at safe and reasonable times, for the purpose of inspecting or monitoring compliance with any provision of this permit. You shall furnish whatever assistance and information the authorized representative reasonably requires for monitoring and inspection purposes.

In addition to the penalties provided by law, this permit may be terminated or revoked for failure to comply with its provisions or failure to comply with applicable statutes and regulations. You shall mitigate any adverse effect upon fish or wildlife, their habitats, or any restriction or interference with public use that the commissioner determines was a direct result of your failure to comply with this permit or any applicable law.

You shall indemnify, save harmless, and defend the department, its agents, and its employees from any and all claims, actions, or liabilities for injuries or damages sustained by any person or property arising directly or indirectly from permitted activities or your performance under this permit. However, this provision has no effect if, and only if, the sole proximate cause of the injury is the department's negligence.

You may appeal this permit decision relating to AS 16.05.871 in accordance with the provisions of AS 44.62.330–630.

Please direct questions about this permit to Habitat Biologist Nicholas Jensen at (907) 465-6646 or nicholas.jensen@alaska.gov.

Sincerely,
Doug Vincent-Lang
Commissioner

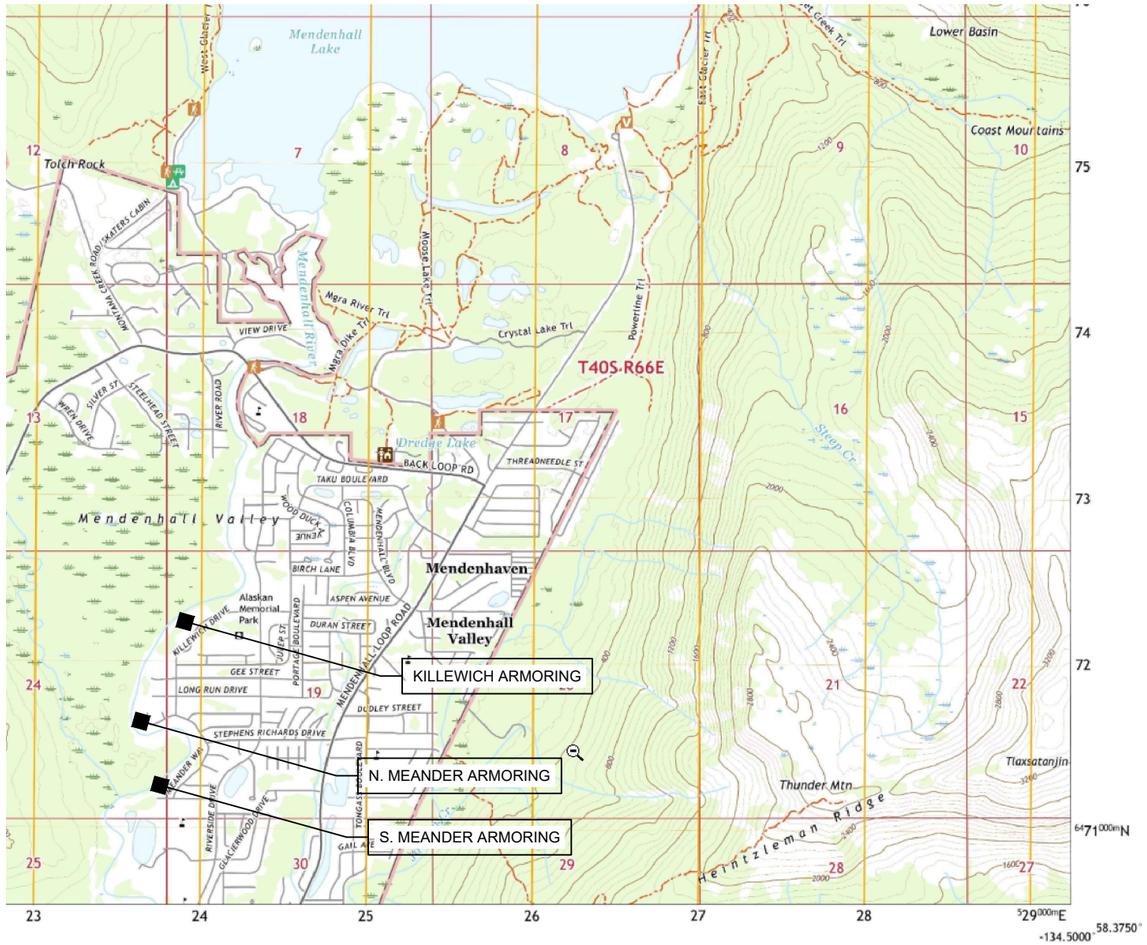
Kate Kanouse

By: Kate Kanouse
Regional Supervisor

Enclosure: 2025 CBJ GLOF Emergency Flood Fighting Mendenhall Riverbank Armoring, Juneau, AK

Email cc:
Al Ott, ADF&G Habitat, Fairbanks
ADF&G Habitat Staff, Douglas
Dan Teske, ADF&G SF, Douglas
Scott Forbes, ADF&G CF, Douglas
Carl Koch, ADF&G WC, Douglas
Forrest Courtney, CBJ, Juneau
Randy Vigil, USACE, Juneau
Andy Stevens, USFWS, Anchorage
Habitat Conservation Division, NMFS, Juneau
Laurel Smith, DNR MWL, Juneau
Sgt. Branden Forst, DPS/AWT, Juneau

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING
MENDENHALL RIVERBANK ARMORING
JUNEAU, AK



PROJECT LOCATION: USGS B-2 NW, AK - 2021

- S. MEANDER: 58.38114 LATITUDE -134.59365 LONGITUDE
  9387 RIVERCOURT WAY AND 3315, 3319, 3323 MEANDER WAY, JUNEAU AK
- N. MEANDER: 58.38544 LATITUDE -134.59597 LONGITUDE
  3491,3495,3499, CBJ(NHN) MEANDER WAY, JUNEAU, AK
- KILLEWICH: 58.39001 LATITUDE -139.59122 LONGITUDE
  3835,3839,3843,3847,3849 KILLEWICH DRIVE, JUNEAU, AK

INDEX:

PROJECT CONTACT:

CBJ ENGINEERING AND PUBLIC WORKS DEPT.
JOHN BOHAN
155 HERITAGE WAY
JUNEAU AK 99801
(907) 586-0800 X-4188 john.bohan@juneau.gov

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

COVER AND LOCATION MAP

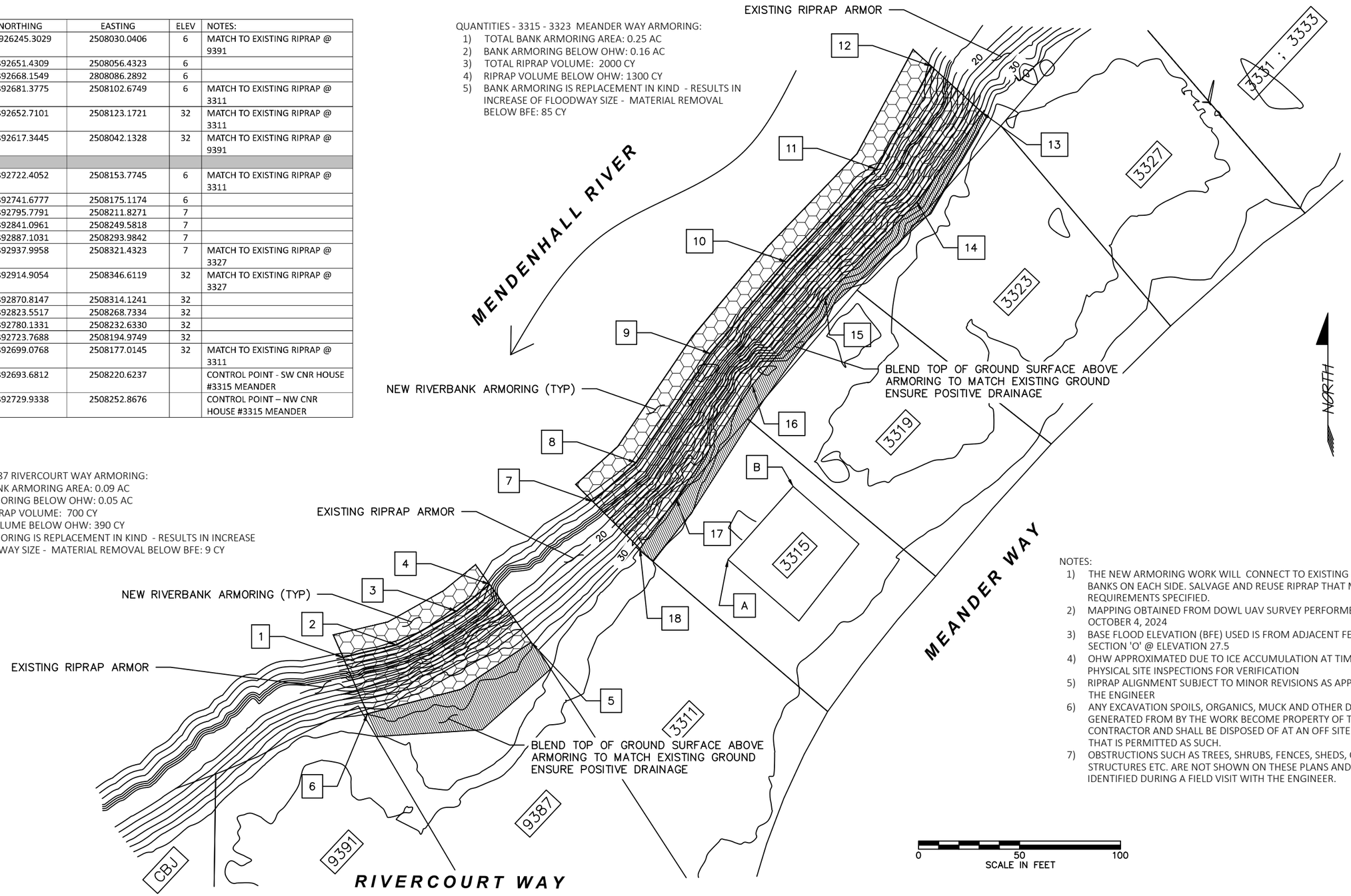
DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 1 of 7

POINT #	NORTHING	EASTING	ELEV	NOTES:
1	23926245.3029	2508030.0406	6	MATCH TO EXISTING RIPRAP @ 9391
2	2392651.4309	2508056.4323	6	
3	2392668.1549	2808086.2892	6	
4	2392681.3775	2508102.6749	6	MATCH TO EXISTING RIPRAP @ 3311
5	2392652.7101	2508123.1721	32	MATCH TO EXISTING RIPRAP @ 3311
6	2392617.3445	2508042.1328	32	MATCH TO EXISTING RIPRAP @ 9391
7	2392722.4052	2508153.7745	6	MATCH TO EXISTING RIPRAP @ 3311
8	2392741.6777	2508175.1174	6	
9	2392795.7791	2508211.8271	7	
10	2392841.0961	2508249.5818	7	
11	2392887.1031	2508293.9842	7	
12	2392937.9958	2508321.4323	7	MATCH TO EXISTING RIPRAP @ 3327
13	2392914.9054	2508346.6119	32	MATCH TO EXISTING RIPRAP @ 3327
14	2392870.8147	2508314.1241	32	
15	2392823.5517	2508268.7334	32	
16	2392780.1331	2508232.6330	32	
17	2392723.7688	2508194.9749	32	
18	2392699.0768	2508177.0145	32	MATCH TO EXISTING RIPRAP @ 3311
A	2392693.6812	2508220.6237		CONTROL POINT - SW CNR HOUSE #3315 MEANDER
B	2392729.9338	2508252.8676		CONTROL POINT – NW CNR HOUSE #3315 MEANDER

QUANTITIES - 3315 - 3323 MEANDER WAY ARMORING:
1) TOTAL BANK ARMORING AREA: 0.25 AC
2) BANK ARMORING BELOW OHW: 0.16 AC
3) TOTAL RIPRAP VOLUME: 2000 CY
4) RIPRAP VOLUME BELOW OHW: 1300 CY
5) BANK ARMORING IS REPLACEMENT IN KIND - RESULTS IN INCREASE OF FLOODWAY SIZE - MATERIAL REMOVAL BELOW BFE: 85 CY

QUANTITIES - 9387 RIVERCOURT WAY ARMORING:
1) TOTAL BANK ARMORING AREA: 0.09 AC
2) BANK ARMORING BELOW OHW: 0.05 AC
3) TOTAL RIPRAP VOLUME: 700 CY
4) RIPRAP VOLUME BELOW OHW: 390 CY
5) BANK ARMORING IS REPLACEMENT IN KIND - RESULTS IN INCREASE OF FLOODWAY SIZE - MATERIAL REMOVAL BELOW BFE: 9 CY



NOTES:
1) THE NEW ARMORING WORK WILL CONNECT TO EXISTING ARMORED BANKS ON EACH SIDE. SALVAGE AND REUSE RIPRAP THAT MEETS THE REQUIREMENTS SPECIFIED.
2) MAPPING OBTAINED FROM DOWL UAV SURVEY PERFORMED OCTOBER 4, 2024
3) BASE FLOOD ELEVATION (BFE) USED IS FROM ADJACENT FEMA FIS SECTION 'O' @ ELEVATION 27.5
4) OHW APPROXIMATED DUE TO ICE ACCUMULATION AT TIME OF PHYSICAL SITE INSPECTIONS FOR VERIFICATION
5) RIPRAP ALIGNMENT SUBJECT TO MINOR REVISIONS AS APPROVED BY THE ENGINEER
6) ANY EXCAVATION SPOILS, ORGANICS, MUCK AND OTHER DEBRIS GENERATED FROM BY THE WORK BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE DISPOSED OF AT AN OFF SITE LOCATION THAT IS PERMITTED AS SUCH.
7) OBSTRUCTIONS SUCH AS TREES, SHRUBS, FENCES, SHEDS, OTHER STRUCTURES ETC. ARE NOT SHOWN ON THESE PLANS AND SHALL BE IDENTIFIED DURING A FIELD VISIT WITH THE ENGINEER.

0 50 100
SCALE IN FEET

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

S. MEANDER ARMORING CONSTRUCTION PLAN

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 7 of 7

DESCRIPTION

The work under this section includes providing all labor, tools and equipment necessary for furnishing and placing a protective covering of stone, as shown on the drawings or as directed by the engineer.

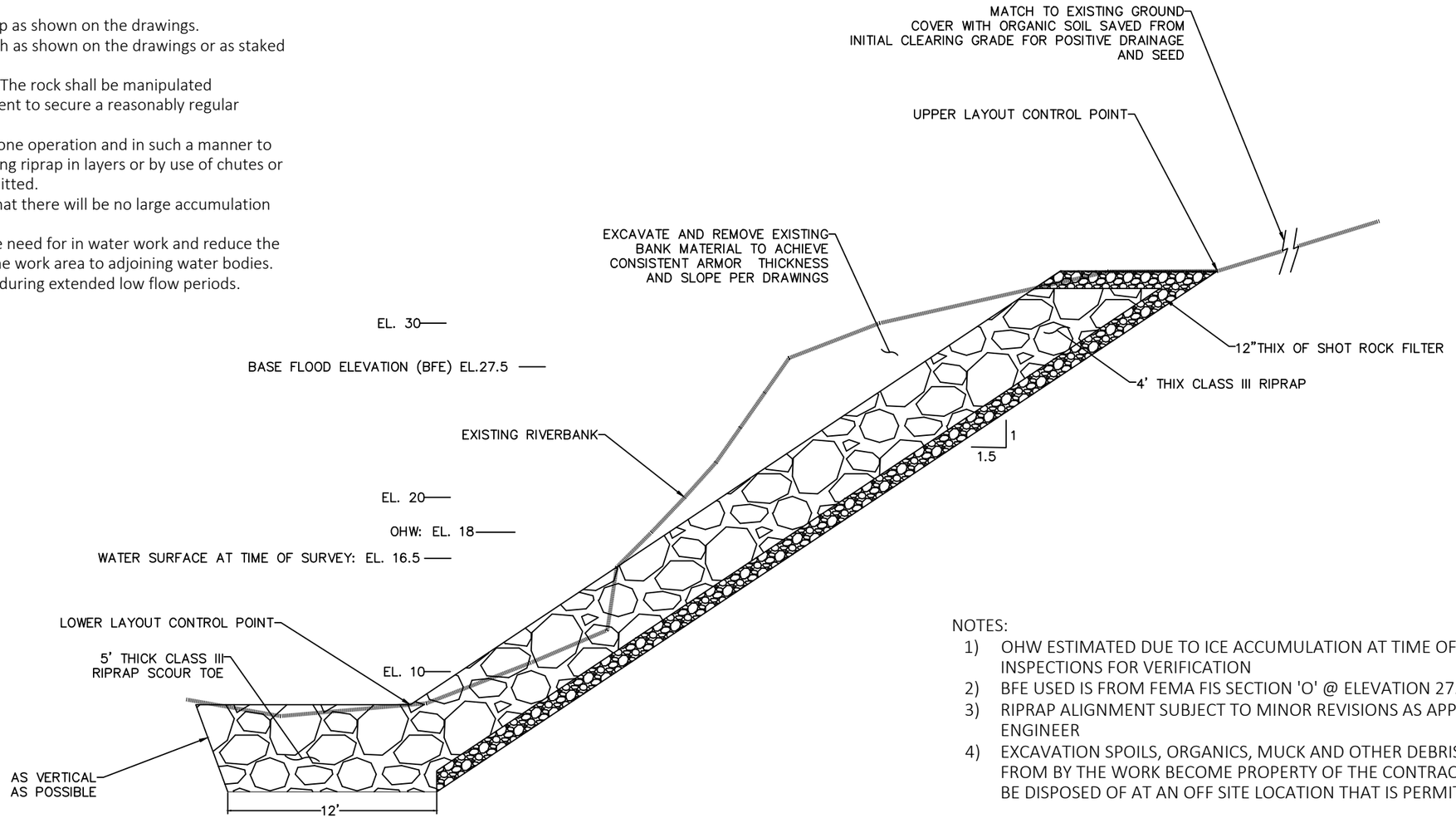
MATERIALS

SHOT ROCK BORROW: shall consist of 10" minus shot rock and shall contain no organics or other deleterious matter. The shot rock shall be evenly graded with at least 10% by weight retained on the 8" screen. Shot rock will be obtained from quarry rock unless otherwise approved by the engineer.

CLASS III RIPRAP: shall consist of no more than 10% total by weight more than 1400 pounds each, and no more than 15% of stones by weight shall weigh less than 25 pounds each. A minimum of 50% by weight shall weigh greater than 700 pounds.

CONSTRUCTION

A. Slopes to be protected with riprap shall be free of brush, trees stumps and other objectional material and shall be graded to a relative smooth surface.
B. The shot rock filter layer shall be place prior to placing riprap as shown on the drawings.
C. The riprap shall be placed to the thickness, height and length as shown on the drawings or as staked with a minimum of voids.
D. Undesirable voids shall be filled with small stones or spalls. The rock shall be manipulated sufficiently by means of excavator or other suitable equipment to secure a reasonably regular surface and mass stability.
E. Riprap protection shall be placed to full course thickness in one operation and in such a manner to avoid damaging the filter layer or underlying material. Placing riprap in layers or by use of chutes or similar activities likely to cause segregation will not be permitted.
F. Riprap shall be placed with a fair distribution of sizes such that there will be no large accumulation or area of mainly large or small stones.
G. The contractor shall phase the work as such to minimize the need for in water work and reduce the potential for sediment discharge or other pollutants from the work area to adjoining water bodies. Ideally, the work below mean high water will be performed during extended low flow periods.



NOTES:

1) OHW ESTIMATED DUE TO ICE ACCUMULATION AT TIME OF PHYSICAL SITE INSPECTIONS FOR VERIFICATION
2) BFE USED IS FROM FEMA FIS SECTION 'O' @ ELEVATION 27.5
3) RIPRAP ALIGNMENT SUBJECT TO MINOR REVISIONS AS APPROVED BY THE ENGINEER
4) EXCAVATION SPOILS, ORGANICS, MUCK AND OTHER DEBRIS GENERATED FROM BY THE WORK BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE DISPOSED OF AT AN OFF SITE LOCATION THAT IS PERMITTED AS SUCH.

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

S. MEANDER ARMORING TYPICAL SECTION

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: NOT TO SCALE

THE STATE of ALASKA
GOVERNOR MIKE DUNLEAVY

Department of Fish and Game

HABITAT SECTION
Southeast Region Office

802 3rd Street
Douglas, Alaska
P.O. Box 110024
Juneau, Alaska 99811-0024
Main: 907.465.4105
Email: dfg.hab.infodou@alaska.gov

FISH HABITAT PERMIT FH25-I-0025

ISSUED: March 11, 2025
EXPIRES: Life of Structure

John and Alyson Cooper
3495 Meander Way
Juneau, Alaska 99801

RE: Bank Stabilization
Mendenhall River (Stream Number 111-50-10500)
Section 24, T 40S, R 65E, CRM (Juneau B-2)
Location: 58.38478 N, 134.59575 W

Dear John and Alyson Cooper:

Pursuant to the Anadromous Fish Act at AS 16.05.871(b), the Alaska Department of Fish and Game (ADF&G) Habitat Section reviewed your proposal to stabilize your streambank on your property along the Mendenhall River. Since 2011, the glacial-dammed lake at Suicide Basin in the Mendenhall Glacier has burst annually, causing the waters of Mendenhall Lake to rise and subsequent flooding of the Mendenhall River.[a]

Project Description
You will notify the Habitat Section three days prior to construction. During low water, your contractor will use heavy equipment to stabilize the riverbank with clean class III riprap and shot rock material according to specifications outlined in the project design provided by the City and Borough of Juneau Engineering and Public Works Department (enclosed). The revetment will be constructed at a 1.5:1 slope and a 5 ft riprap keyway will be constructed at the toe of the slope. End-dumping into the actively flowing river is not allowed.

Anadromous Fish Act
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[a] National Weather Service. 2024. Juneau/Mendenhall River Flooding Suicide Basin Glacier Dammed Lake Release. National Oceanic and Atmospheric Administration, Juneau Weather Forecast Office.

In accordance with AS 16.05.871(d), your project is approved subject to the project description and permit terms.

Permit Terms
This letter constitutes a permit issued under the authority of AS 16.05.871 and must be retained on site during project activities. Please be advised that this determination applies only to Habitat Section regulated activities; other agencies also may have jurisdiction under their respective authorities. This determination does not relieve you of your responsibility to secure other state, federal, or local permits. You are still required to comply with all other applicable laws.

You are responsible for the actions of contractors, agents, or other persons who perform work to accomplish the approved project. Prior to engaging in any activity that significantly deviates from the approved plan, you shall notify the Habitat Section and obtain written approval in the form of a permit amendment. Any action that increases the project's overall scope or that negates, alters, or minimizes the intent or effectiveness of any provision contained in this permit will be deemed a significant deviation from the approved plan. The final determination as to the significance of any deviation and the need for a permit amendment is a Habitat Section responsibility. Therefore, it is recommended the Habitat Section be consulted immediately when a deviation from the approved plan is being considered.

You shall give an authorized representative of the state free and unobstructed access to the permit site, at safe and reasonable times, for the purpose of inspecting or monitoring compliance with any provision of this permit. You shall furnish whatever assistance and information the authorized representative reasonably requires for monitoring and inspection purposes.

In addition to the penalties provided by law, this permit may be terminated or revoked for failure to comply with its provisions or failure to comply with applicable statutes and regulations. You shall mitigate any adverse effect upon fish or wildlife, their habitats, or any restriction or interference with public use that the commissioner determines was a direct result of your failure to comply with this permit or any applicable law.

You shall indemnify, save harmless, and defend the department, its agents, and its employees from any and all claims, actions, or liabilities for injuries or damages sustained by any person or property arising directly or indirectly from permitted activities or your performance under this permit. However, this provision has no effect if, and only if, the sole proximate cause of the injury is the department's negligence.

You may appeal this permit decision relating to AS 16.05.871 in accordance with the provisions of AS 44.62.330–630.

Please direct questions about this permit to Habitat Biologist Nicholas Jensen at (907) 465-6646 or nicholas.jensen@alaska.gov.

Sincerely,
Doug Vincent-Lang
Commissioner

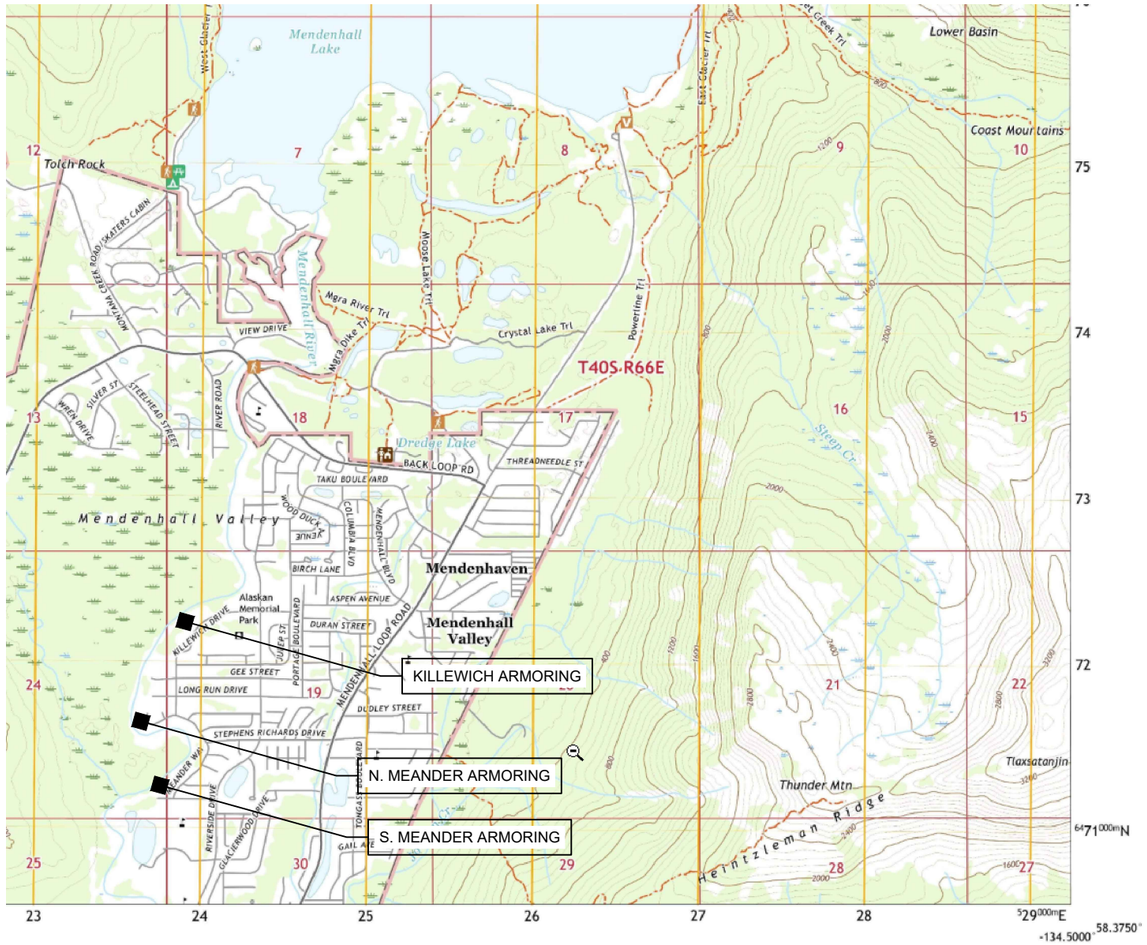
Kate Kanouse

By: Kate Kanouse
Regional Supervisor

Enclosure: 2025 CBJ GLOF Emergency Flood Fighting Mendenhall Riverbank Armoring, Juneau, AK

Email cc:
Al Ott, ADF&G Habitat, Fairbanks
ADF&G Habitat Staff, Douglas
Dan Teske, ADF&G SF, Douglas
Scott Forbes, ADF&G CF, Douglas
Carl Koch, ADF&G WC, Douglas
Forrest Courtney, CBJ, Juneau
John Bohan, CBJ, Juneau
Randy Vigil, USACE, Juneau
Andy Stevens, USFWS, Anchorage
Habitat Conservation Division, NMFS, Juneau
Laurel Smith, DNR MWL, Juneau
Sgt. Branden Forst, DPS/AWT, Juneau

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING
MENDENHALL RIVERBANK ARMORING
JUNEAU, AK



PROJECT LOCATION: USGS B-2 NW, AK - 2021

- S. MEANDER: 58.38114 LATITUDE -134.59365 LONGITUDE
  9387 RIVERCOURT WAY AND 3315, 3319, 3323 MEANDER WAY, JUNEAU AK
- N. MEANDER: 58.38544 LATITUDE -134.59597 LONGITUDE
  3491,3495,3499, CBJ(NHN) MEANDER WAY, JUNEAU, AK
- KILLEWICH: 58.39001 LATITUDE -139.59122 LONGITUDE
  3835,3839,3843,3847,3849 KILLEWICH DRIVE, JUNEAU, AK

INDEX:

PROJECT CONTACT:

CBJ ENGINEERING AND PUBLIC WORKS DEPT.
JOHN BOHAN
155 HERITAGE WAY
JUNEAU AK 99801
(907) 586-0800 X-4188 john.bohan@juneau.gov

Revisions		
Date	Description	Intls.

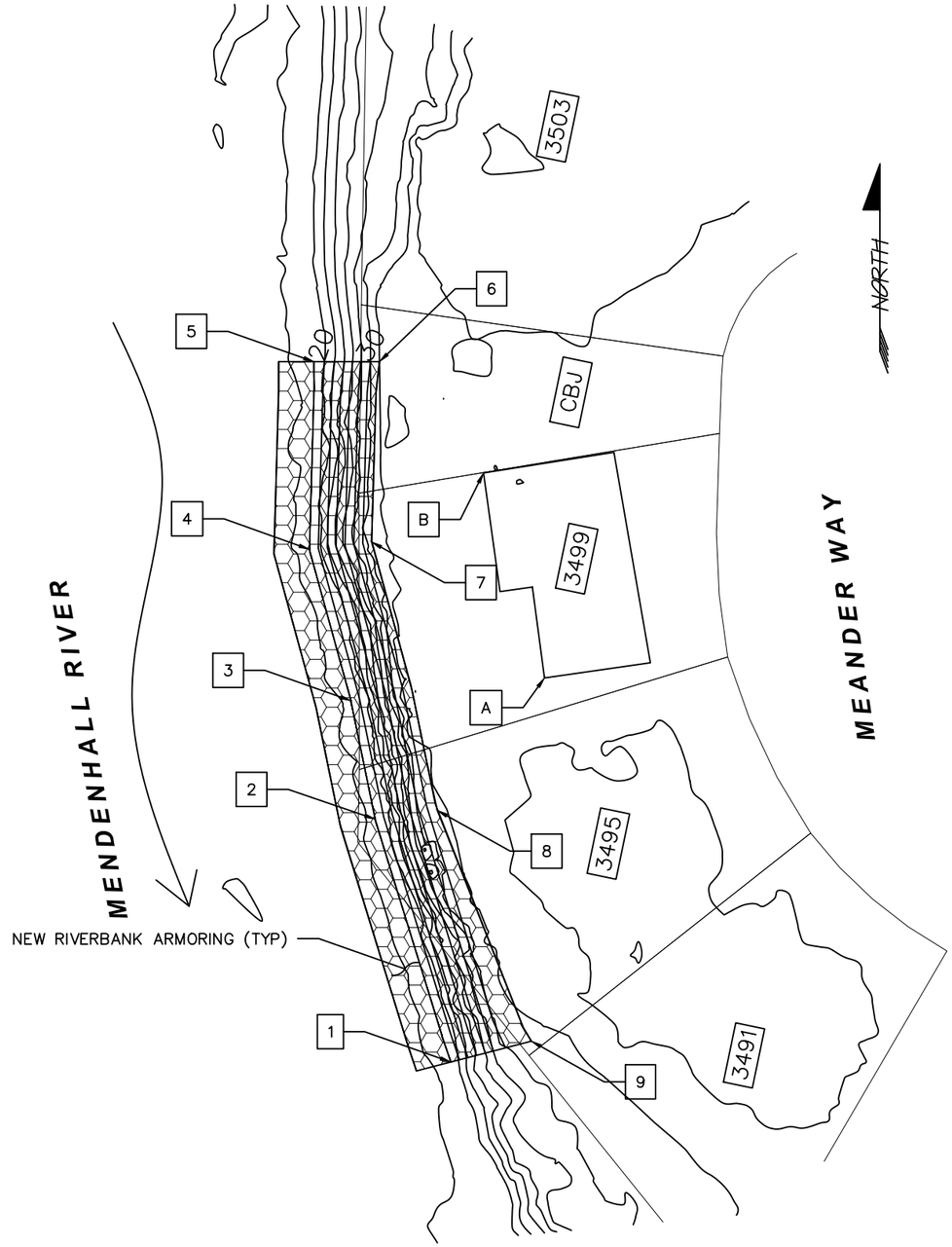
Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

COVER AND LOCATION MAP

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 1 of 7



QUANTITIES:

1) TOTAL BANK ARMORING AREA: 0.19 AC
2) BANK ARMORING BELOW OHW: 0.10 AC
3) TOTAL RIPRAP VOLUME: 1540 CY
4) RIPRAP VOLUME BELOW OHW: 770 CY
5) BANK ARMORING IS REPLACEMENT IN KIND - RESULTS IN INCREASE OF FLOODWAY SIZE - MATERIAL REMOVAL BELOW BFE: 7 CY

POINT #	NORTHING	EASTING	ELEV	NOTES:
1	2393896.5525	2507610.8681	18.0	Match TO EXISTING BANK
2	2393978.9938	2507585.2101	18.0	
3	2394019.0284	2507577.0045	18.0	
4	2394070.3146	2507562.9437	18.0	
5	2394133.9212	2507564.5190	18.0	MATCH TO EXISTING RIPRAP
6	2394133.9212	2507586.6734	32.0	MATCH TO EXISTING RIPRAP
7	2394072.8377	2507584.0270	32.0	
8	2393981.8148	2507606.2823	32.0	
9	2393903.6179	2507638.1839	32.0	MATCH TO EXISTING BANK
A	2394026.7173	2507642.6270		CONTROL POINT - SW CNR HOUSE #3499
B	2394096.2090	2507621.9639		CONTROL POINT – NW CNR HOUSE #3499

NOTES:

1) THIS WORK WILL BE TO RECONSTRUCT AN EXISTING RIPRAP ARMORED BANK. SALVAGE AND REUSE RIPRAP THAT MEETS THE REQUIREMENTS SPECIFIED.
2) MAPPING OBTAINED FROM DOWL UAV SURVEY PERFORMED OCTOBER 4, 2024
3) BASE FLOOD ELEVATION (BFE) USED IS ELEVATION 30.4. THIS HAS BEEN INTERPOLATED BETWEEN FEMA SECTIONS 'Q' AND 'R'
4) OHW APPROXIMATED DUE TO ICE ACCUMULATION AT TIME OF PHYSICAL SITE INSPECTIONS FOR VERIFICATION
5) RIPRAP ALIGNMENT SUBJECT TO MINOR REVISIONS AS APPROVED BY THE ENGINEER
6) ANY EXCAVATION SPOILS, ORGANICS, MUCK AND OTHER DEBRIS GENERATED FROM BY THE WORK BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE DISPOSED OF AT AN OFF SITE LOCATION THAT IS PERMITTED AS SUCH.
7) OBSTRUCTIONS SUCH AS TREES, SHRUBS, FENCES, SHEDS, OTHER STRUCTURES ETC. ARE NOT SHOWN ON THESE PLANS AND SHALL BE IDENTIFIED DURING A FIELD VISIT WITH THE ENGINEER.

0 50 100
SCALE IN FEET

Revisions			
Date	Description	Intls.	

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

N. MEANDER ARMORING CONSTRUCTION PLAN

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 5 of 7

DESCRIPTION

The work under this section includes providing all labor, tools and equipment necessary for furnishing and placing a protective covering of stone, as shown on the drawings or as directed by the engineer.

MATERIALS

SHOT ROCK BORROW: shall consist of 10" minus shot rock and shall contain no organics or other deleterious matter. The shot rock shall be evenly graded with at least 10% by weight retained on the 8" screen. Shot rock will be obtained from quarry rock unless otherwise approved by the engineer.

CLASS III RIPRAP: shall consist of no more than 10% total by weight more than 1400 pounds each, and no more than 15% of stones by weight shall weigh less than 25 pounds each. A minimum of 50% by weight shall weigh greater than 700 pounds.

CONSTRUCTION

A. Slopes to be protected with riprap shall be free of brush, trees stumps and other objectional material and shall be graded to a relative smooth surface.
B. The shot rock filter layer shall be place prior to placing riprap as shown on the drawings.
C. The riprap shall be placed to the thickness, height and length as shown on the drawings or as staked with a minimum of voids.
D. Undesirable voids shall be filled with small stones or spalls. The rock shall be manipulated sufficiently by means of excavator or other suitable equipment to secure a reasonably regular surface and mass stability.
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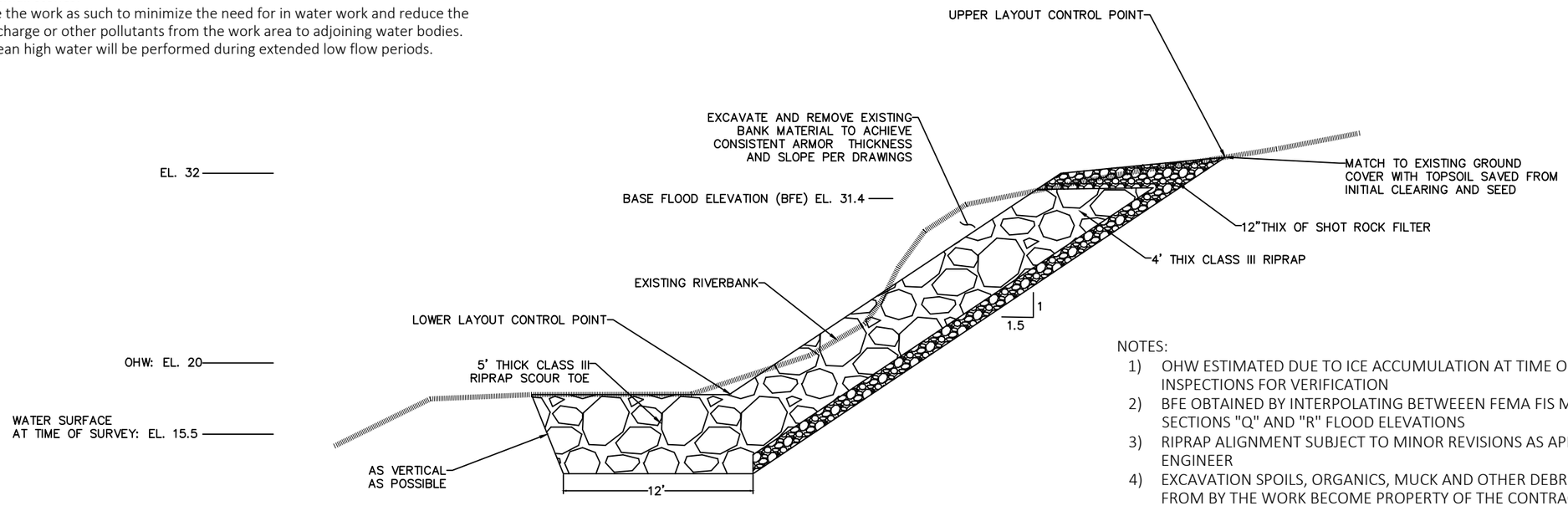
G. The contractor shall phase the work as such to minimize the need for in water work and reduce the potential for sediment discharge or other pollutants from the work area to adjoining water bodies. Ideally, the work below mean high water will be performed during extended low flow periods.



NOTES:

1) OHW ESTIMATED DUE TO ICE ACCUMULATION AT TIME OF PHYSICAL SITE INSPECTIONS FOR VERIFICATION
2) BFE OBTAINED BY INTERPOLATING BETWEEEN FEMA FIS MAPPING SECTIONS "Q" AND "R" FLOOD ELEVATIONS
3) RIPRAP ALIGNMENT SUBJECT TO MINOR REVISIONS AS APPROVED BY THE ENGINEER
4) EXCAVATION SPOILS, ORGANICS, MUCK AND OTHER DEBRIS GENERATED FROM BY THE WORK BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE DISPOSED OF AT AN OFF SITE LOCATION THAT IS PERMITTED AS SUCH.

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

N. MEANDER ARMORING TYPICAL SECTION

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: NOT TO SCALE

THE STATE of ALASKA
GOVERNOR MIKE DUNLEAVY

Department of Fish and Game

HABITAT SECTION
Southeast Region Office

802 3rd Street
Douglas, Alaska
P.O. Box 110024
Juneau, Alaska 99811-0024
Main: 907.465.4105
Email: dfg.hab.infodou@alaska.gov

FISH HABITAT PERMIT FH25-I-0024

ISSUED: March 11, 2025
EXPIRES: Life of Structure

Kevin and Gabriella Tillotson
3499 Meander Way
Juneau, Alaska 99801

RE: Bank Stabilization
Mendenhall River (Stream Number 111-50-10500)
Section 24, T 40S, R 65E, CRM (Juneau B-2)
Location: 58.38506 N, 134.59593 W

Dear Kevin and Gabriella Tillotson:

Pursuant to the Anadromous Fish Act at AS 16.05.871(b), the Alaska Department of Fish and Game (ADF&G) Habitat Section reviewed your proposal to stabilize your streambank on your property along the Mendenhall River. Since 2011, the glacial-dammed lake at Suicide Basin in the Mendenhall Glacier has burst annually, causing the waters of Mendenhall Lake to rise and subsequent flooding of the Mendenhall River.[a]

Project Description
You will notify the Habitat Section three days prior to construction. During low water, your contractor will use heavy equipment to stabilize the riverbank with clean class III riprap and shot rock material according to specifications outlined in the project design provided by the City and Borough of Juneau Engineering and Public Works Department (enclosed). The revetment will be constructed at a 1.5:1 slope and a 5 ft riprap keyway will be constructed at the toe of the slope. End-dumping into the actively flowing river is not allowed.

Anadromous Fish Act
Stream Number 111-50-10500 has been specified as being important for the spawning, rearing, or migration of anadromous fishes pursuant to AS 16.05.871(a). The Mendenhall River provides habitat for Chinook, chum, coho, pink, and sockeye salmon, Dolly Varden, and cutthroat and steelhead trout; all species migrate through the project area.

[a] National Weather Service. 2024. Juneau/Mendenhall River Flooding Suicide Basin Glacier Dammed Lake Release. National Oceanic and Atmospheric Administration, Juneau Weather Forecast Office.

In accordance with AS 16.05.871(d), your project is approved subject to the project description and permit terms.

Permit Terms

This letter constitutes a permit issued under the authority of AS 16.05.871 and must be retained on site during project activities. Please be advised that this determination applies only to Habitat Section regulated activities; other agencies also may have jurisdiction under their respective authorities. This determination does not relieve you of your responsibility to secure other state, federal, or local permits. You are still required to comply with all other applicable laws.

You are responsible for the actions of contractors, agents, or other persons who perform work to accomplish the approved project. Prior to engaging in any activity that significantly deviates from the approved plan, you shall notify the Habitat Section and obtain written approval in the form of a permit amendment. Any action that increases the project's overall scope or that negates, alters, or minimizes the intent or effectiveness of any provision contained in this permit will be deemed a significant deviation from the approved plan. The final determination as to the significance of any deviation and the need for a permit amendment is a Habitat Section responsibility. Therefore, it is recommended the Habitat Section be consulted immediately when a deviation from the approved plan is being considered.

You shall give an authorized representative of the state free and unobstructed access to the permit site, at safe and reasonable times, for the purpose of inspecting or monitoring compliance with any provision of this permit. You shall furnish whatever assistance and information the authorized representative reasonably requires for monitoring and inspection purposes.

In addition to the penalties provided by law, this permit may be terminated or revoked for failure to comply with its provisions or failure to comply with applicable statutes and regulations. You shall mitigate any adverse effect upon fish or wildlife, their habitats, or any restriction or interference with public use that the commissioner determines was a direct result of your failure to comply with this permit or any applicable law.

You shall indemnify, save harmless, and defend the department, its agents, and its employees from any and all claims, actions, or liabilities for injuries or damages sustained by any person or property arising directly or indirectly from permitted activities or your performance under this permit. However, this provision has no effect if, and only if, the sole proximate cause of the injury is the department's negligence.

You may appeal this permit decision relating to AS 16.05.871 in accordance with the provisions of AS 44.62.330–630.

Please direct questions about this permit to Habitat Biologist Nicholas Jensen at (907) 465-6646 or nicholas.jensen@alaska.gov.

Sincerely,
Doug Vincent-Lang
Commissioner

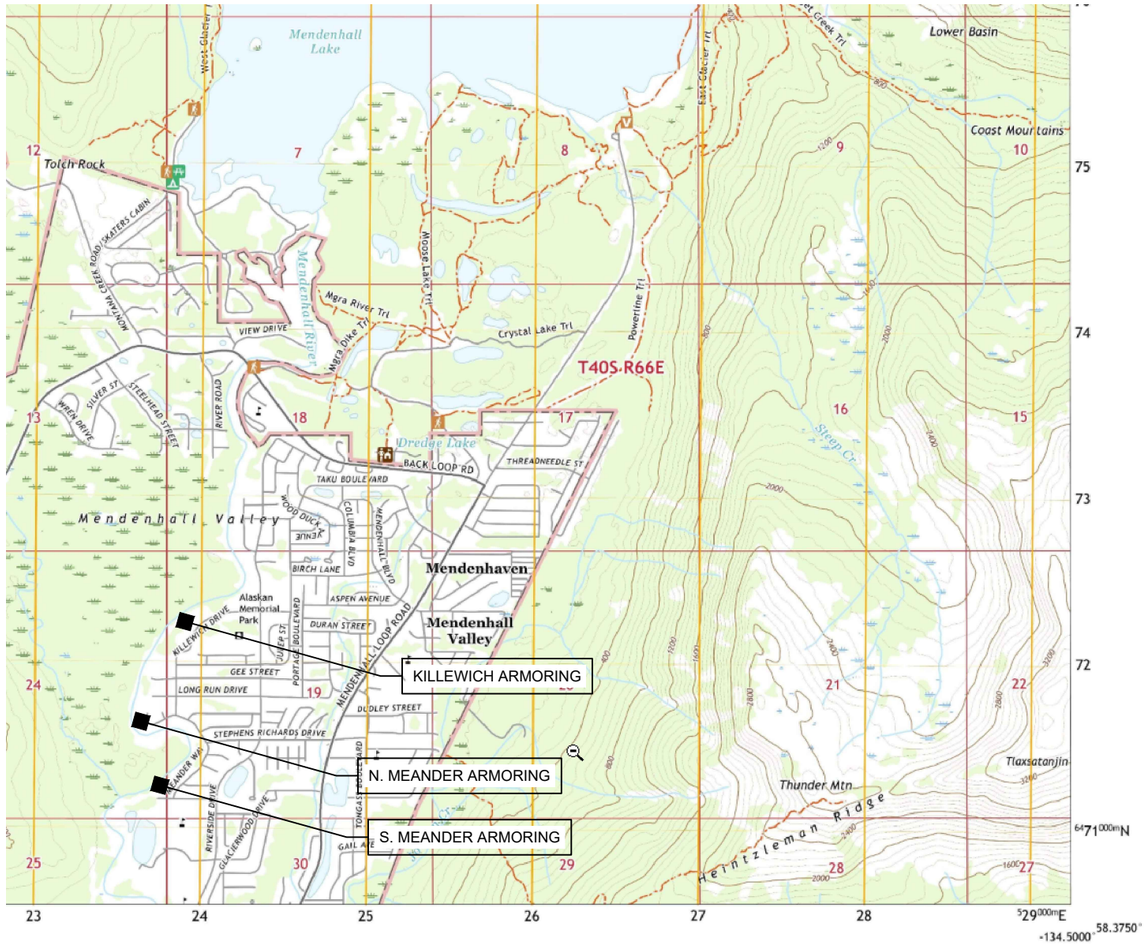
Kate Kanouse

By: Kate Kanouse
Regional Supervisor

Enclosure: 2025 CBJ GLOF Emergency Flood Fighting Mendenhall Riverbank Armoring, Juneau, AK

Email cc:
Al Ott, ADF&G Habitat, Fairbanks
ADF&G Habitat Staff, Douglas
Dan Teske, ADF&G SF, Douglas
Scott Forbes, ADF&G CF, Douglas
Carl Koch, ADF&G WC, Douglas
Forrest Courtney, CBJ, Juneau
Randy Vigil, USACE, Juneau
Andy Stevens, USFWS, Anchorage
Habitat Conservation Division, NMFS, Juneau
Laurel Smith, DNR MWL, Juneau
Sgt. Branden Forst, DPS/AWT, Juneau

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING
MENDENHALL RIVERBANK ARMORING
JUNEAU, AK



PROJECT LOCATION: USGS B-2 NW, AK - 2021

- S. MEANDER: 58.38114 LATITUDE -134.59365 LONGITUDE
  9387 RIVERCOURT WAY AND 3315, 3319, 3323 MEANDER WAY, JUNEAU AK
- N. MEANDER: 58.38544 LATITUDE -134.59597 LONGITUDE
  3491,3495,3499, CBJ(NHN) MEANDER WAY, JUNEAU, AK
- KILLEWICH: 58.39001 LATITUDE -139.59122 LONGITUDE
  3835,3839,3843,3847,3849 KILLEWICH DRIVE, JUNEAU, AK

INDEX:

PROJECT CONTACT:

CBJ ENGINEERING AND PUBLIC WORKS DEPT.
JOHN BOHAN
155 HERITAGE WAY
JUNEAU AK 99801
(907) 586-0800 X-4188 john.bohan@juneau.gov

Revisions		
Date	Description	Intls.

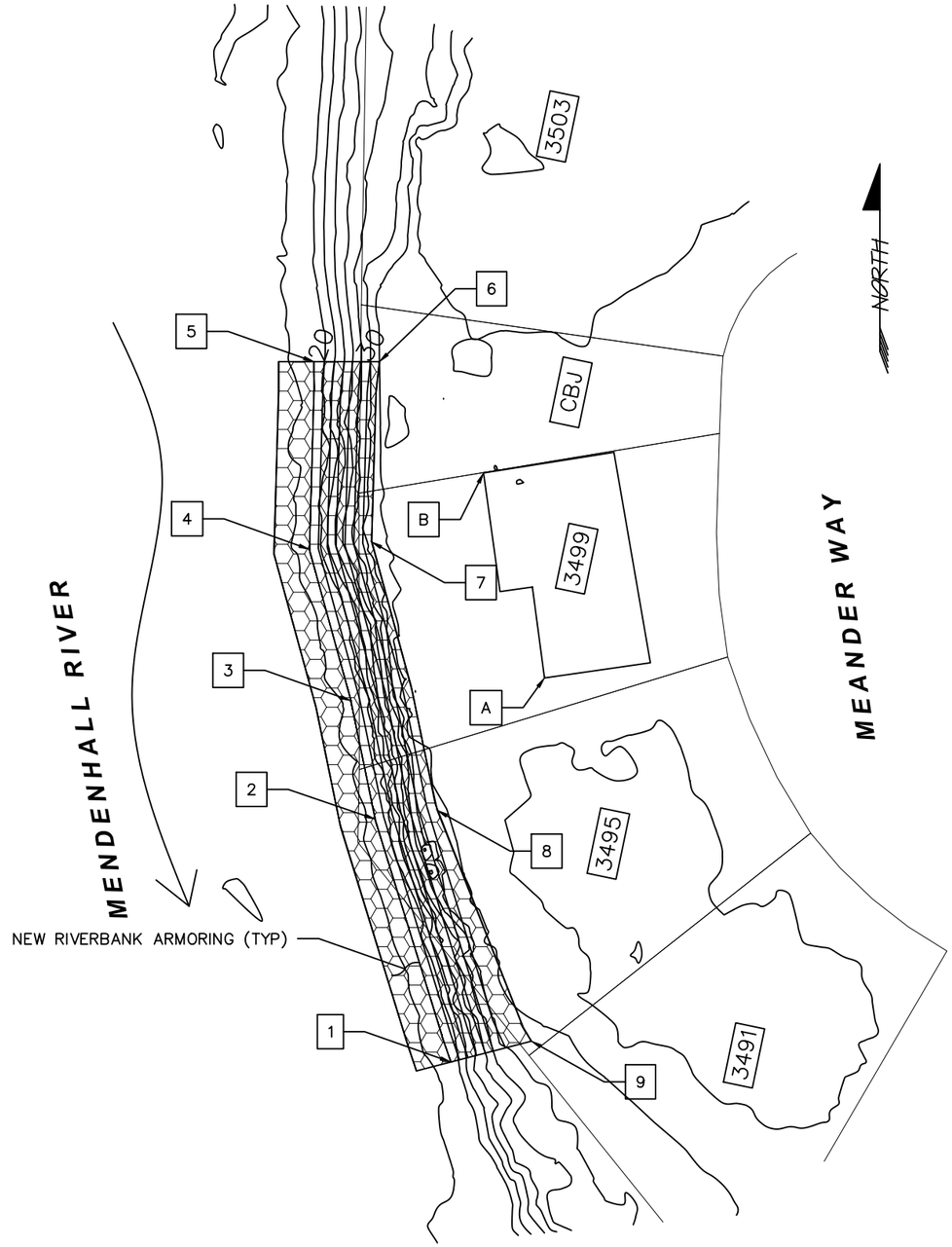
Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

COVER AND LOCATION MAP

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 1 of 7



QUANTITIES:

1) TOTAL BANK ARMORING AREA: 0.19 AC
2) BANK ARMORING BELOW OHW: 0.10 AC
3) TOTAL RIPRAP VOLUME: 1540 CY
4) RIPRAP VOLUME BELOW OHW: 770 CY
5) BANK ARMORING IS REPLACEMENT IN KIND - RESULTS IN INCREASE OF FLOODWAY SIZE - MATERIAL REMOVAL BELOW BFE: 7 CY

POINT #	NORTHING	EASTING	ELEV	NOTES:
1	2393896.5525	2507610.8681	18.0	Match TO EXISTING BANK
2	2393978.9938	2507585.2101	18.0	
3	2394019.0284	2507577.0045	18.0	
4	2394070.3146	2507562.9437	18.0	
5	2394133.9212	2507564.5190	18.0	MATCH TO EXISTING RIPRAP
6	2394133.9212	2507586.6734	32.0	MATCH TO EXISTING RIPRAP
7	2394072.8377	2507584.0270	32.0	
8	2393981.8148	2507606.2823	32.0	
9	2393903.6179	2507638.1839	32.0	MATCH TO EXISTING BANK
A	2394026.7173	2507642.6270		CONTROL POINT - SW CNR HOUSE #3499
B	2394096.2090	2507621.9639		CONTROL POINT – NW CNR HOUSE #3499

NOTES:

1) THIS WORK WILL BE TO RECONSTRUCT AN EXISTING RIPRAP ARMORED BANK. SALVAGE AND REUSE RIPRAP THAT MEETS THE REQUIREMENTS SPECIFIED.
2) MAPPING OBTAINED FROM DOWL UAV SURVEY PERFORMED OCTOBER 4, 2024
3) BASE FLOOD ELEVATION (BFE) USED IS ELEVATION 30.4. THIS HAS BEEN INTERPOLATED BETWEEN FEMA SECTIONS 'Q' AND 'R'
4) OHW APPROXIMATED DUE TO ICE ACCUMULATION AT TIME OF PHYSICAL SITE INSPECTIONS FOR VERIFICATION
5) RIPRAP ALIGNMENT SUBJECT TO MINOR REVISIONS AS APPROVED BY THE ENGINEER
6) ANY EXCAVATION SPOILS, ORGANICS, MUCK AND OTHER DEBRIS GENERATED FROM BY THE WORK BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE DISPOSED OF AT AN OFF SITE LOCATION THAT IS PERMITTED AS SUCH.
7) OBSTRUCTIONS SUCH AS TREES, SHRUBS, FENCES, SHEDS, OTHER STRUCTURES ETC. ARE NOT SHOWN ON THESE PLANS AND SHALL BE IDENTIFIED DURING A FIELD VISIT WITH THE ENGINEER.

0 50 100
SCALE IN FEET

Revisions			
Date	Description	Intls.	

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

N. MEANDER ARMORING CONSTRUCTION PLAN

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 5 of 7

DESCRIPTION

The work under this section includes providing all labor, tools and equipment necessary for furnishing and placing a protective covering of stone, as shown on the drawings or as directed by the engineer.

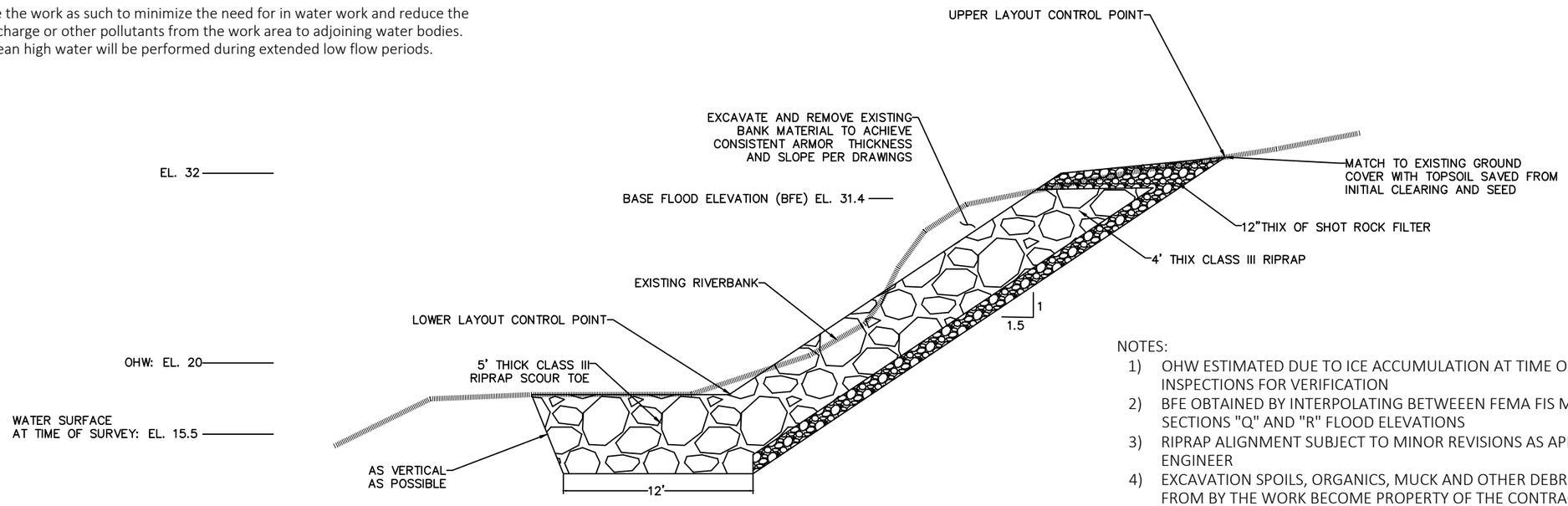
MATERIALS

SHOT ROCK BORROW: shall consist of 10" minus shot rock and shall contain no organics or other deleterious matter. The shot rock shall be evenly graded with at least 10% by weight retained on the 8" screen. Shot rock will be obtained from quarry rock unless otherwise approved by the engineer.

CLASS III RIPRAP: shall consist of no more than 10% total by weight more than 1400 pounds each, and no more than 15% of stones by weight shall weigh less than 25 pounds each. A minimum of 50% by weight shall weigh greater than 700 pounds.

CONSTRUCTION

A. Slopes to be protected with riprap shall be free of brush, trees stumps and other objectional material and shall be graded to a relative smooth surface.
B. The shot rock filter layer shall be place prior to placing riprap as shown on the drawings.
C. The riprap shall be placed to the thickness, height and length as shown on the drawings or as staked with a minimum of voids.
D. Undesirable voids shall be filled with small stones or spalls. The rock shall be manipulated sufficiently by means of excavator or other suitable equipment to secure a reasonably regular surface and mass stability.
E. Riprap protection shall be placed to full course thickness in one operation and in such a manner to avoid damaging the filter layer or underlying material. Placing riprap in layers or by use of chutes or similar activities likely to cause segregation will not be permitted.
F. Riprap shall be placed with a fair distribution of sizes such that there will be no large accumulation or area of mainly large or small stones.
G. The contractor shall phase the work as such to minimize the need for in water work and reduce the potential for sediment discharge or other pollutants from the work area to adjoining water bodies. Ideally, the work below mean high water will be performed during extended low flow periods.



NOTES:

1) OHW ESTIMATED DUE TO ICE ACCUMULATION AT TIME OF PHYSICAL SITE INSPECTIONS FOR VERIFICATION
2) BFE OBTAINED BY INTERPOLATING BETWEEEN FEMA FIS MAPPING SECTIONS "Q" AND "R" FLOOD ELEVATIONS
3) RIPRAP ALIGNMENT SUBJECT TO MINOR REVISIONS AS APPROVED BY THE ENGINEER
4) EXCAVATION SPOILS, ORGANICS, MUCK AND OTHER DEBRIS GENERATED FROM BY THE WORK BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE DISPOSED OF AT AN OFF SITE LOCATION THAT IS PERMITTED AS SUCH.

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

N. MEANDER ARMORING TYPICAL SECTION

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: NOT TO SCALE

THE STATE of ALASKA
GOVERNOR MIKE DUNLEAVY

Department of Fish and Game

HABITAT SECTION
Southeast Region Office

802 3rd Street
Douglas, Alaska
P.O. Box 110024
Juneau, Alaska 99811-0024
Main: 907.465.4105
Email: dfg.hab.infodou@alaska.gov

FISH HABITAT PERMIT FH25-I-0027

ISSUED: March 11, 2025
EXPIRES: Life of Structure

Harvey and Pamela Hergett
3319 Meander Way
Juneau, Alaska 99801

RE: Bank Stabilization
Mendenhall River (Stream Number 111-50-10500)
Section 19, T 40S, R 66E, CRM (Juneau B-2)
Location: 58.38162 N, 134.59228 W

Dear Harvey and Pamela Hergett:

Pursuant to the Anadromous Fish Act at AS 16.05.871(b), the Alaska Department of Fish and Game (ADF&G) Habitat Section reviewed your proposal to stabilize your streambank on your property along the Mendenhall River. Since 2011, the glacial-dammed lake at Suicide Basin in the Mendenhall Glacier has burst annually, causing the waters of Mendenhall Lake to rise and subsequent flooding of the Mendenhall River.[a]

Project Description
You will notify the Habitat Section three days prior to construction. During low water, your contractor will use heavy equipment to stabilize the riverbank with clean class III riprap and shot rock material according to specifications outlined in the project design provided by the City and Borough of Juneau Engineering and Public Works Department (enclosed). The revetment will be constructed at a 1.5:1 slope and a 5 ft riprap keyway will be constructed at the toe of the slope. End-dumping into the actively flowing river is not allowed.

Anadromous Fish Act
Stream Number 111-50-10500 has been specified as being important for the spawning, rearing, or migration of anadromous fishes pursuant to AS 16.05.871(a). The Mendenhall River provides habitat for Chinook, chum, coho, pink, and sockeye salmon, Dolly Varden, and cutthroat and steelhead trout; all species migrate through the project area.

[a] National Weather Service. 2024. Juneau/Mendenhall River Flooding Suicide Basin Glacier Dammed Lake Release. National Oceanic and Atmospheric Administration, Juneau Weather Forecast Office.

In accordance with AS 16.05.871(d), your project is approved subject to the project description and permit terms.

Permit Terms

This letter constitutes a permit issued under the authority of AS 16.05.871 and must be retained on site during project activities. Please be advised that this determination applies only to Habitat Section regulated activities; other agencies also may have jurisdiction under their respective authorities. This determination does not relieve you of your responsibility to secure other state, federal, or local permits. You are still required to comply with all other applicable laws.

You are responsible for the actions of contractors, agents, or other persons who perform work to accomplish the approved project. Prior to engaging in any activity that significantly deviates from the approved plan, you shall notify the Habitat Section and obtain written approval in the form of a permit amendment. Any action that increases the project's overall scope or that negates, alters, or minimizes the intent or effectiveness of any provision contained in this permit will be deemed a significant deviation from the approved plan. The final determination as to the significance of any deviation and the need for a permit amendment is a Habitat Section responsibility. Therefore, it is recommended the Habitat Section be consulted immediately when a deviation from the approved plan is being considered.

You shall give an authorized representative of the state free and unobstructed access to the permit site, at safe and reasonable times, for the purpose of inspecting or monitoring compliance with any provision of this permit. You shall furnish whatever assistance and information the authorized representative reasonably requires for monitoring and inspection purposes.

In addition to the penalties provided by law, this permit may be terminated or revoked for failure to comply with its provisions or failure to comply with applicable statutes and regulations. You shall mitigate any adverse effect upon fish or wildlife, their habitats, or any restriction or interference with public use that the commissioner determines was a direct result of your failure to comply with this permit or any applicable law.

You shall indemnify, save harmless, and defend the department, its agents, and its employees from any and all claims, actions, or liabilities for injuries or damages sustained by any person or property arising directly or indirectly from permitted activities or your performance under this permit. However, this provision has no effect if, and only if, the sole proximate cause of the injury is the department's negligence.

You may appeal this permit decision relating to AS 16.05.871 in accordance with the provisions of AS 44.62.330–630.

Please direct questions about this permit to Habitat Biologist Nicholas Jensen at (907) 465-6646 or nicholas.jensen@alaska.gov.

Sincerely,
Doug Vincent-Lang
Commissioner

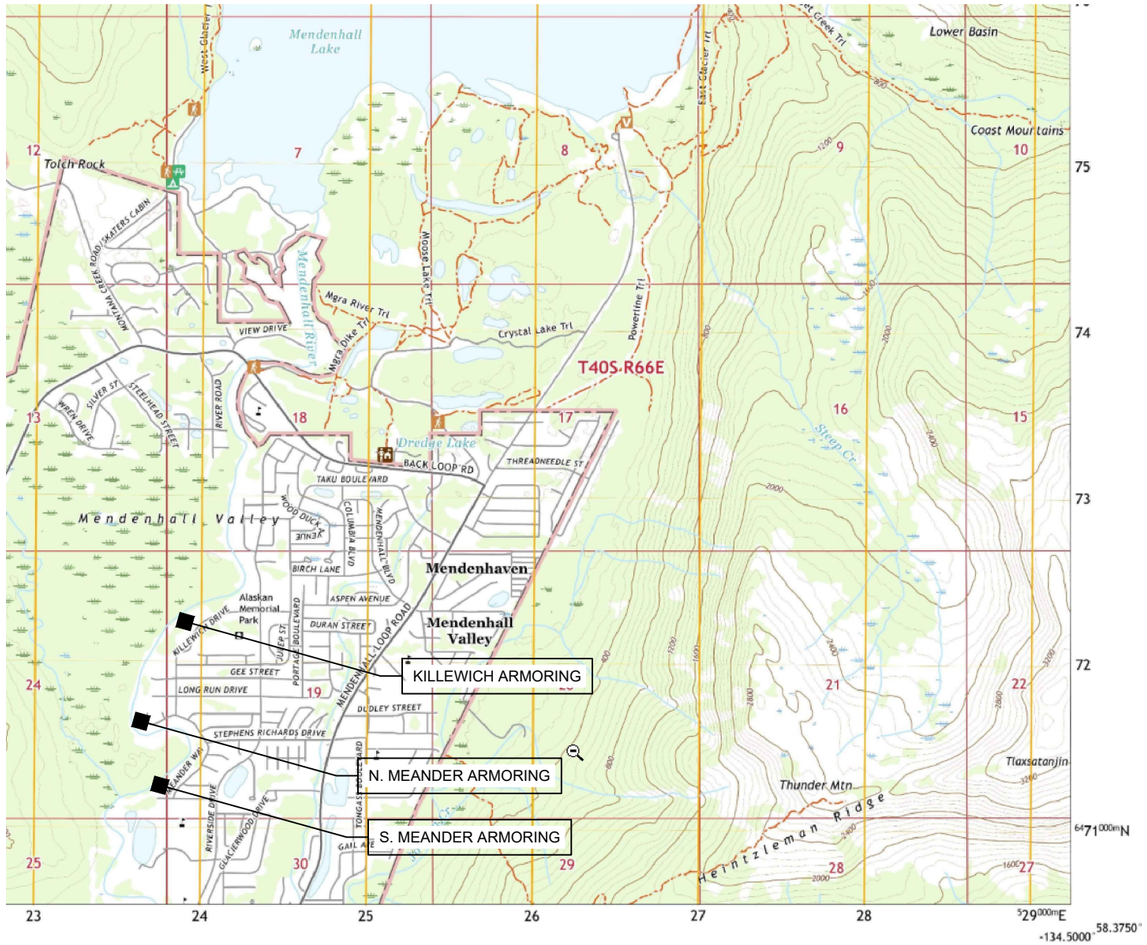
Kate Kanouse

By: Kate Kanouse
Regional Supervisor

Enclosure: 2025 CBJ GLOF Emergency Flood Fighting Mendenhall Riverbank Armoring, Juneau, AK

Email cc:
Al Ott, ADF&G Habitat, Fairbanks
ADF&G Habitat Staff, Douglas
Dan Teske, ADF&G SF, Douglas
Scott Forbes, ADF&G CF, Douglas
Carl Koch, ADF&G WC, Douglas
Forrest Courtney, CBJ, Juneau
Randy Vigil, USACE, Juneau
Andy Stevens, USFWS, Anchorage
Habitat Conservation Division, NMFS, Juneau
Laurel Smith, DNR MWL, Juneau
Sgt. Branden Forst, DPS/AWT, Juneau

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING
MENDENHALL RIVERBANK ARMORING
JUNEAU, AK



PROJECT LOCATION: USGS B-2 NW, AK - 2021

- S. MEANDER: 58.38114 LATITUDE -134.59365 LONGITUDE
  9387 RIVERCOURT WAY AND 3315, 3319, 3323 MEANDER WAY, JUNEAU AK
- N. MEANDER: 58.38544 LATITUDE -134.59597 LONGITUDE
  3491,3495,3499, CBJ(NHN) MEANDER WAY, JUNEAU, AK
- KILLEWICH: 58.39001 LATITUDE -139.59122 LONGITUDE
  3835,3839,3843,3847,3849 KILLEWICH DRIVE, JUNEAU, AK

INDEX:

PROJECT CONTACT:

CBJ ENGINEERING AND PUBLIC WORKS DEPT.
JOHN BOHAN
155 HERITAGE WAY
JUNEAU AK 99801
(907) 586-0800 X-4188 john.bohan@juneau.gov

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

COVER AND LOCATION MAP

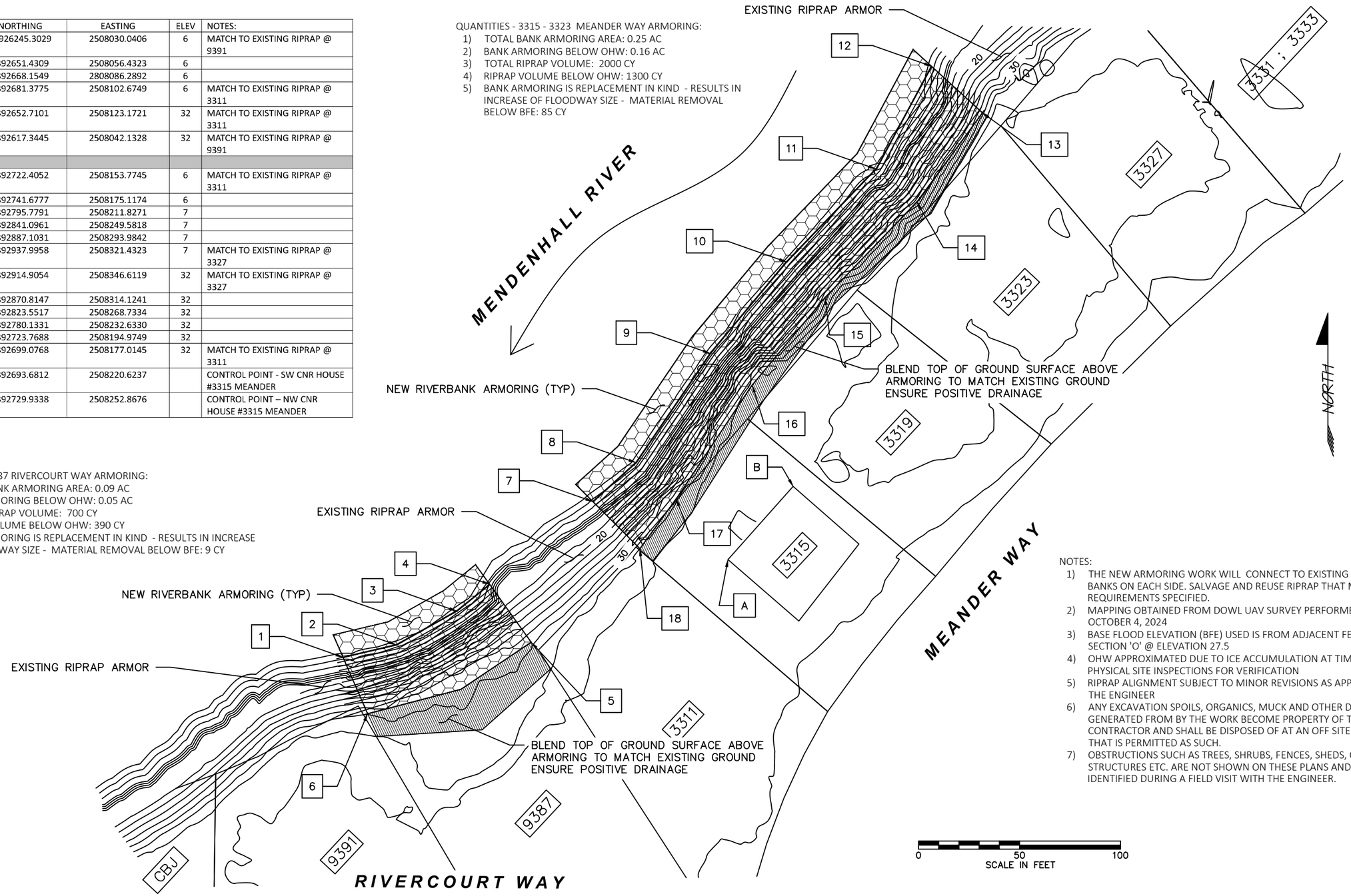
DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 1 of 7

POINT #	NORTHING	EASTING	ELEV	NOTES:
1	23926245.3029	2508030.0406	6	MATCH TO EXISTING RIPRAP @ 9391
2	2392651.4309	2508056.4323	6	
3	2392668.1549	2808086.2892	6	
4	2392681.3775	2508102.6749	6	MATCH TO EXISTING RIPRAP @ 3311
5	2392652.7101	2508123.1721	32	MATCH TO EXISTING RIPRAP @ 3311
6	2392617.3445	2508042.1328	32	MATCH TO EXISTING RIPRAP @ 9391
7	2392722.4052	2508153.7745	6	MATCH TO EXISTING RIPRAP @ 3311
8	2392741.6777	2508175.1174	6	
9	2392795.7791	2508211.8271	7	
10	2392841.0961	2508249.5818	7	
11	2392887.1031	2508293.9842	7	
12	2392937.9958	2508321.4323	7	MATCH TO EXISTING RIPRAP @ 3327
13	2392914.9054	2508346.6119	32	MATCH TO EXISTING RIPRAP @ 3327
14	2392870.8147	2508314.1241	32	
15	2392823.5517	2508268.7334	32	
16	2392780.1331	2508232.6330	32	
17	2392723.7688	2508194.9749	32	
18	2392699.0768	2508177.0145	32	MATCH TO EXISTING RIPRAP @ 3311
A	2392693.6812	2508220.6237		CONTROL POINT - SW CNR HOUSE #3315 MEANDER
B	2392729.9338	2508252.8676		CONTROL POINT – NW CNR HOUSE #3315 MEANDER

QUANTITIES - 3315 - 3323 MEANDER WAY ARMORING:
1) TOTAL BANK ARMORING AREA: 0.25 AC
2) BANK ARMORING BELOW OHW: 0.16 AC
3) TOTAL RIPRAP VOLUME: 2000 CY
4) RIPRAP VOLUME BELOW OHW: 1300 CY
5) BANK ARMORING IS REPLACEMENT IN KIND - RESULTS IN INCREASE OF FLOODWAY SIZE - MATERIAL REMOVAL BELOW BFE: 85 CY

QUANTITIES - 9387 RIVERCOURT WAY ARMORING:
1) TOTAL BANK ARMORING AREA: 0.09 AC
2) BANK ARMORING BELOW OHW: 0.05 AC
3) TOTAL RIPRAP VOLUME: 700 CY
4) RIPRAP VOLUME BELOW OHW: 390 CY
5) BANK ARMORING IS REPLACEMENT IN KIND - RESULTS IN INCREASE OF FLOODWAY SIZE - MATERIAL REMOVAL BELOW BFE: 9 CY



NOTES:
1) THE NEW ARMORING WORK WILL CONNECT TO EXISTING ARMORED BANKS ON EACH SIDE. SALVAGE AND REUSE RIPRAP THAT MEETS THE REQUIREMENTS SPECIFIED.
2) MAPPING OBTAINED FROM DOWL UAV SURVEY PERFORMED OCTOBER 4, 2024
3) BASE FLOOD ELEVATION (BFE) USED IS FROM ADJACENT FEMA FIS SECTION 'O' @ ELEVATION 27.5
4) OHW APPROXIMATED DUE TO ICE ACCUMULATION AT TIME OF PHYSICAL SITE INSPECTIONS FOR VERIFICATION
5) RIPRAP ALIGNMENT SUBJECT TO MINOR REVISIONS AS APPROVED BY THE ENGINEER
6) ANY EXCAVATION SPOILS, ORGANICS, MUCK AND OTHER DEBRIS GENERATED FROM BY THE WORK BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE DISPOSED OF AT AN OFF SITE LOCATION THAT IS PERMITTED AS SUCH.
7) OBSTRUCTIONS SUCH AS TREES, SHRUBS, FENCES, SHEDS, OTHER STRUCTURES ETC. ARE NOT SHOWN ON THESE PLANS AND SHALL BE IDENTIFIED DURING A FIELD VISIT WITH THE ENGINEER.

0 50 100
SCALE IN FEET

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

S. MEANDER ARMORING CONSTRUCTION PLAN

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 7 of 7

DESCRIPTION

The work under this section includes providing all labor, tools and equipment necessary for furnishing and placing a protective covering of stone, as shown on the drawings or as directed by the engineer.

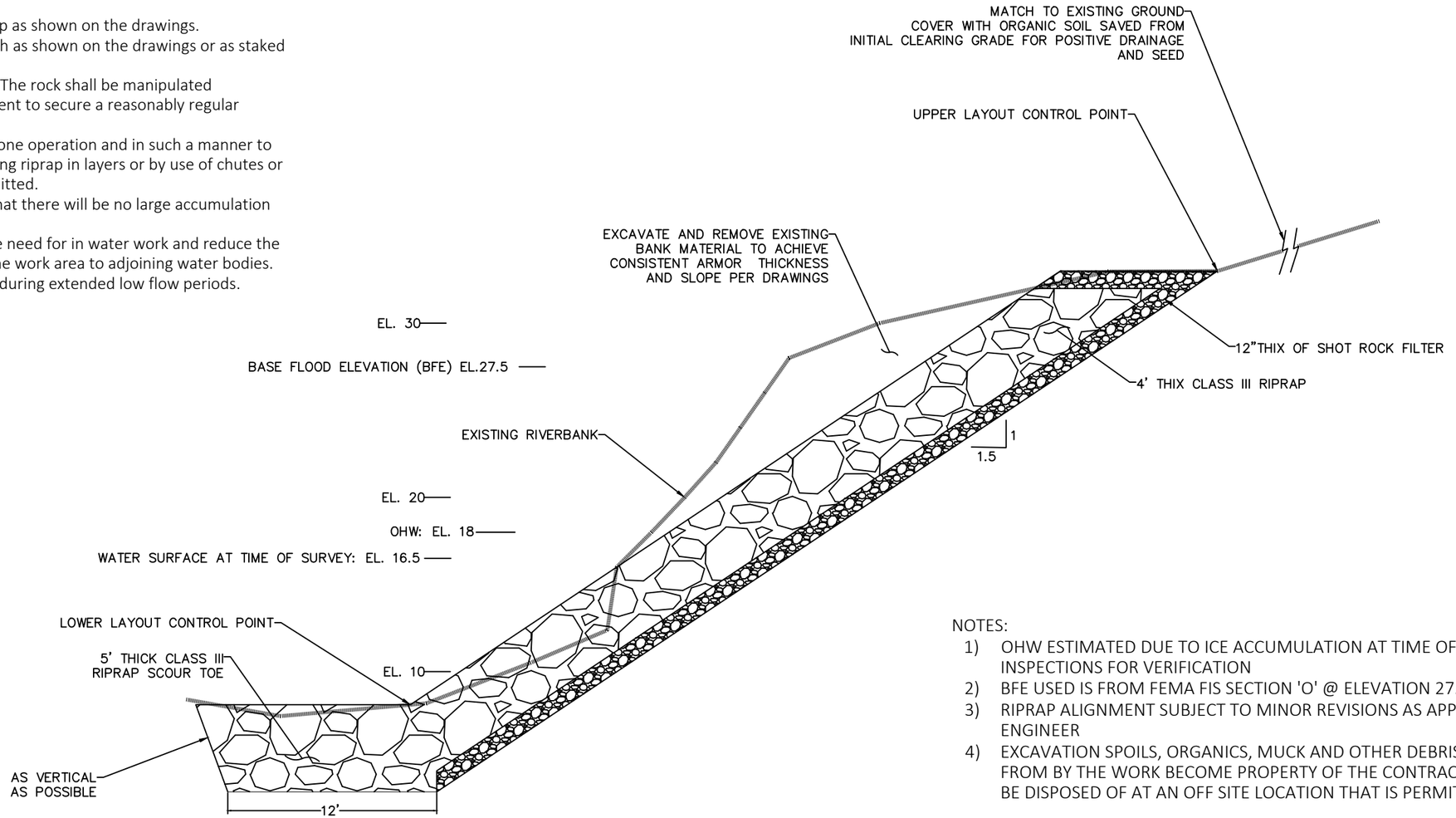
MATERIALS

SHOT ROCK BORROW: shall consist of 10" minus shot rock and shall contain no organics or other deleterious matter. The shot rock shall be evenly graded with at least 10% by weight retained on the 8" screen. Shot rock will be obtained from quarry rock unless otherwise approved by the engineer.

CLASS III RIPRAP: shall consist of no more than 10% total by weight more than 1400 pounds each, and no more than 15% of stones by weight shall weigh less than 25 pounds each. A minimum of 50% by weight shall weigh greater than 700 pounds.

CONSTRUCTION

A. Slopes to be protected with riprap shall be free of brush, trees stumps and other objectional material and shall be graded to a relative smooth surface.
B. The shot rock filter layer shall be place prior to placing riprap as shown on the drawings.
C. The riprap shall be placed to the thickness, height and length as shown on the drawings or as staked with a minimum of voids.
D. Undesirable voids shall be filled with small stones or spalls. The rock shall be manipulated sufficiently by means of excavator or other suitable equipment to secure a reasonably regular surface and mass stability.
E. Riprap protection shall be placed to full course thickness in one operation and in such a manner to avoid damaging the filter layer or underlying material. Placing riprap in layers or by use of chutes or similar activities likely to cause segregation will not be permitted.
F. Riprap shall be placed with a fair distribution of sizes such that there will be no large accumulation or area of mainly large or small stones.
G. The contractor shall phase the work as such to minimize the need for in water work and reduce the potential for sediment discharge or other pollutants from the work area to adjoining water bodies. Ideally, the work below mean high water will be performed during extended low flow periods.



NOTES:

1) OHW ESTIMATED DUE TO ICE ACCUMULATION AT TIME OF PHYSICAL SITE INSPECTIONS FOR VERIFICATION
2) BFE USED IS FROM FEMA FIS SECTION 'O' @ ELEVATION 27.5
3) RIPRAP ALIGNMENT SUBJECT TO MINOR REVISIONS AS APPROVED BY THE ENGINEER
4) EXCAVATION SPOILS, ORGANICS, MUCK AND OTHER DEBRIS GENERATED FROM BY THE WORK BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE DISPOSED OF AT AN OFF SITE LOCATION THAT IS PERMITTED AS SUCH.

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

S. MEANDER ARMORING TYPICAL SECTION

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: NOT TO SCALE

THE STATE of ALASKA
GOVERNOR MIKE DUNLEAVY

Department of Fish and Game

HABITAT SECTION
Southeast Region Office

802 3rd Street
Douglas, Alaska
P.O. Box 110024
Juneau, Alaska 99811-0024
Main: 907.465.4105
Email: dfg.hab.infodou@alaska.gov

FISH HABITAT PERMIT FH25-I-0028

ISSUED: March 11, 2025
EXPIRES: Life of Structure

Christine and Adam Shaw
3315 Meander Way
Juneau, Alaska 99801

RE: Bank Stabilization
Mendenhall River (Stream Number 111-50-10500)
Section 19, T 40S, R 66E, CRM (Juneau B-2)
Location: 58.38143 N, 134.59258 W

Dear Christine and Adam Shaw:

Pursuant to the Anadromous Fish Act at AS 16.05.871(b), the Alaska Department of Fish and Game (ADF&G) Habitat Section reviewed your proposal to stabilize your streambank on your property along the Mendenhall River. Since 2011, the glacial-dammed lake at Suicide Basin in the Mendenhall Glacier has burst annually, causing the waters of Mendenhall Lake to rise and subsequent flooding of the Mendenhall River.[a]

Project Description
You will notify Habitat Section three days prior to construction. During low water, your contractor will use heavy equipment to stabilize the riverbank with clean class III riprap and shot rock material according to specifications outlined in the project design provided by the City and Borough of Juneau Engineering and Public Works Department (enclosed). The revetment will be constructed at a 1.5:1 slope and a 5 ft riprap keyway will be constructed at the toe of the slope. End-dumping into the actively flowing river is not allowed.

Anadromous Fish Act
Stream Number 111-50-10500 has been specified as being important for the spawning, rearing, or migration of anadromous fishes pursuant to AS 16.05.871(a). The Mendenhall River provides habitat for Chinook, chum, coho, pink, and sockeye salmon, Dolly Varden, and cutthroat and steelhead trout; all species migrate through the project area.

[a] National Weather Service. 2024. Juneau/Mendenhall River Flooding Suicide Basin Glacier Dammed Lake Release. National Oceanic and Atmospheric Administration, Juneau Weather Forecast Office.

In accordance with AS 16.05.871(d), your project is approved subject to the project description and permit terms.

Permit Terms
This letter constitutes a permit issued under the authority of AS 16.05.871 and must be retained on site during project activities. Please be advised that this determination applies only to Habitat Section regulated activities; other agencies also may have jurisdiction under their respective authorities. This determination does not relieve you of your responsibility to secure other state, federal, or local permits. You are still required to comply with all other applicable laws.

You are responsible for the actions of contractors, agents, or other persons who perform work to accomplish the approved project. Prior to engaging in any activity that significantly deviates from the approved plan, you shall notify the Habitat Section and obtain written approval in the form of a permit amendment. Any action that increases the project's overall scope or that negates, alters, or minimizes the intent or effectiveness of any provision contained in this permit will be deemed a significant deviation from the approved plan. The final determination as to the significance of any deviation and the need for a permit amendment is a Habitat Section responsibility. Therefore, it is recommended the Habitat Section be consulted immediately when a deviation from the approved plan is being considered.

You shall give an authorized representative of the state free and unobstructed access to the permit site, at safe and reasonable times, for the purpose of inspecting or monitoring compliance with any provision of this permit. You shall furnish whatever assistance and information the authorized representative reasonably requires for monitoring and inspection purposes.

In addition to the penalties provided by law, this permit may be terminated or revoked for failure to comply with its provisions or failure to comply with applicable statutes and regulations. You shall mitigate any adverse effect upon fish or wildlife, their habitats, or any restriction or interference with public use that the commissioner determines was a direct result of your failure to comply with this permit or any applicable law.

You shall indemnify, save harmless, and defend the department, its agents, and its employees from any and all claims, actions, or liabilities for injuries or damages sustained by any person or property arising directly or indirectly from permitted activities or your performance under this permit. However, this provision has no effect if, and only if, the sole proximate cause of the injury is the department's negligence.

You may appeal this permit decision relating to AS 16.05.871 in accordance with the provisions of AS 44.62.330–630.

Please direct questions about this permit to Habitat Biologist Nicholas Jensen at (907) 465-6646 or nicholas.jensen@alaska.gov.

Sincerely,
Doug Vincent-Lang
Commissioner

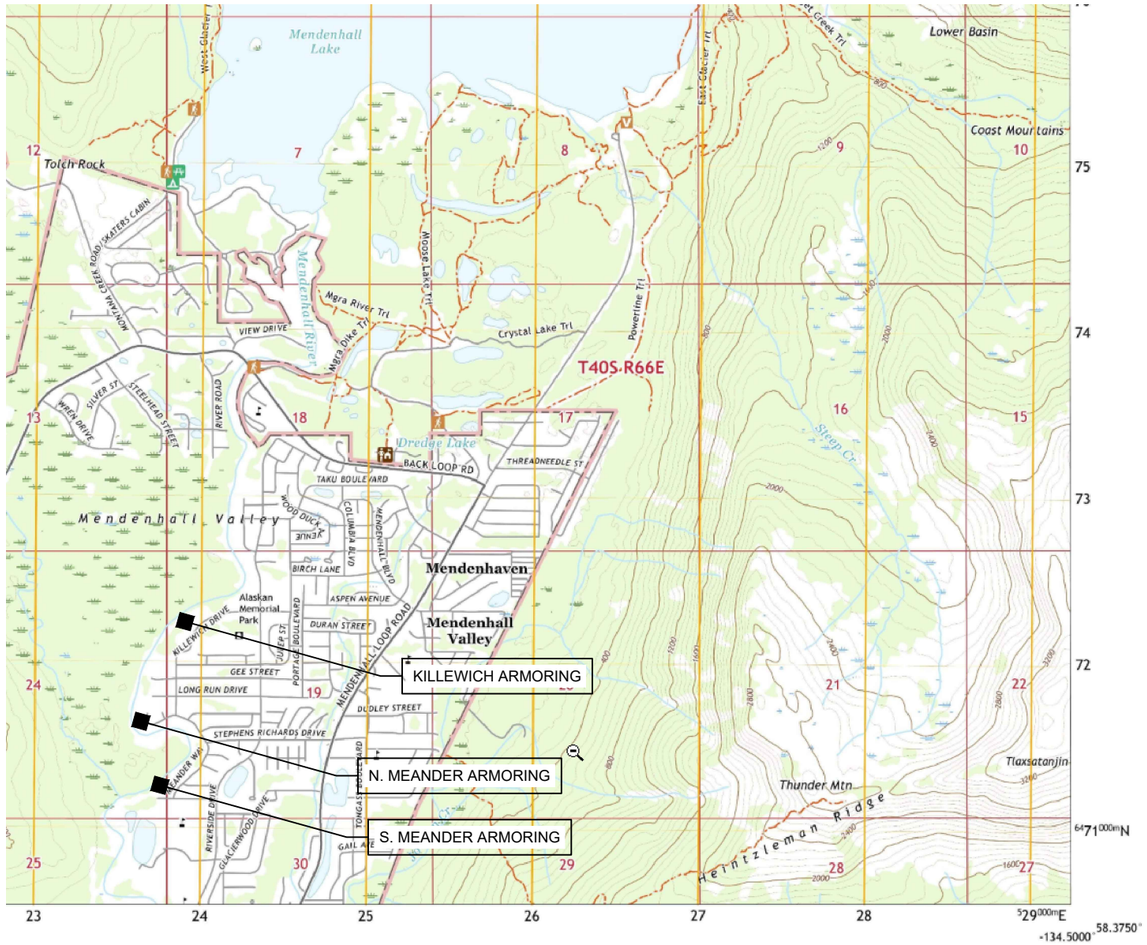
Kate Kanouse

By: Kate Kanouse
Regional Supervisor

Enclosure: 2025 CBJ GLOF Emergency Flood Fighting Mendenhall Riverbank Armoring, Juneau, AK

Email cc:
Al Ott, ADF&G Habitat, Fairbanks
ADF&G Habitat Staff, Douglas
Dan Teske, ADF&G SF, Douglas
Scott Forbes, ADF&G CF, Douglas
Carl Koch, ADF&G WC, Douglas
Forrest Courtney, CBJ, Juneau
Randy Vigil, USACE, Juneau
Andy Stevens, USFWS, Anchorage
Habitat Conservation Division, NMFS, Juneau
Laurel Smith, DNR MWL, Juneau
Sgt. Branden Forst, DPS/AWT, Juneau

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING
MENDENHALL RIVERBANK ARMORING
JUNEAU, AK



PROJECT LOCATION: USGS B-2 NW, AK - 2021

- S. MEANDER: 58.38114 LATITUDE -134.59365 LONGITUDE
  9387 RIVERCOURT WAY AND 3315, 3319, 3323 MEANDER WAY, JUNEAU AK
- N. MEANDER: 58.38544 LATITUDE -134.59597 LONGITUDE
  3491,3495,3499, CBJ(NHN) MEANDER WAY, JUNEAU, AK
- KILLEWICH: 58.39001 LATITUDE -139.59122 LONGITUDE
  3835,3839,3843,3847,3849 KILLEWICH DRIVE, JUNEAU, AK

INDEX:

PROJECT CONTACT:

CBJ ENGINEERING AND PUBLIC WORKS DEPT.
JOHN BOHAN
155 HERITAGE WAY
JUNEAU AK 99801
(907) 586-0800 X-4188 john.bohan@juneau.gov

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

COVER AND LOCATION MAP

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 1 of 7

POINT #	NORTHING	EASTING	ELEV	NOTES:
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B	2392729.9338	2508252.8676		CONTROL POINT – NW CNR HOUSE #3315 MEANDER

QUANTITIES - 3315 - 3323 MEANDER WAY ARMORING:
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2) BANK ARMORING BELOW OHW: 0.16 AC
3) TOTAL RIPRAP VOLUME: 2000 CY
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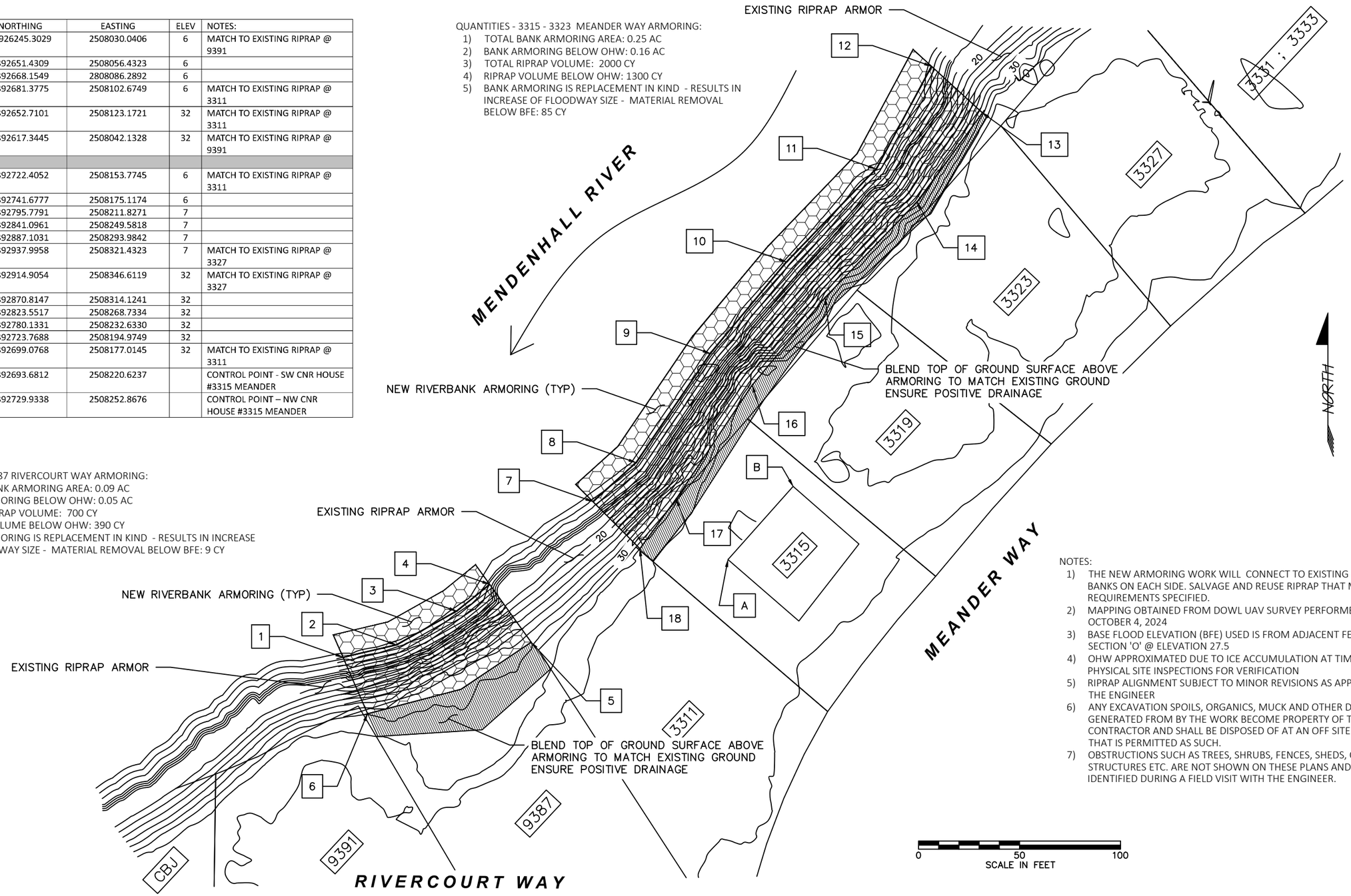

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7) OBSTRUCTIONS SUCH AS TREES, SHRUBS, FENCES, SHEDS, OTHER STRUCTURES ETC. ARE NOT SHOWN ON THESE PLANS AND SHALL BE IDENTIFIED DURING A FIELD VISIT WITH THE ENGINEER.

0 50 100
SCALE IN FEET

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

S. MEANDER ARMORING CONSTRUCTION PLAN

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 7 of 7

DESCRIPTION

The work under this section includes providing all labor, tools and equipment necessary for furnishing and placing a protective covering of stone, as shown on the drawings or as directed by the engineer.

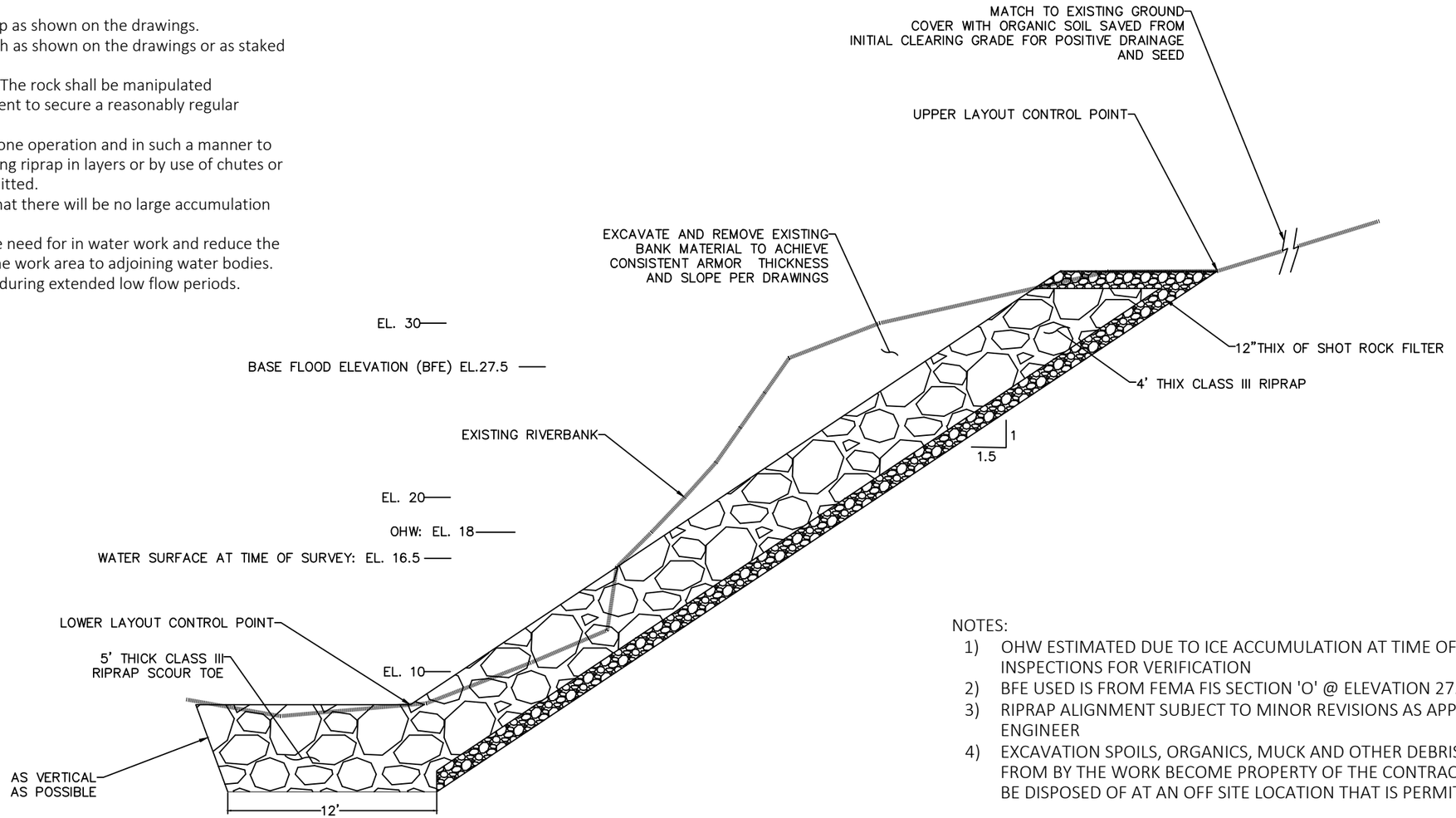
MATERIALS

SHOT ROCK BORROW: shall consist of 10" minus shot rock and shall contain no organics or other deleterious matter. The shot rock shall be evenly graded with at least 10% by weight retained on the 8" screen. Shot rock will be obtained from quarry rock unless otherwise approved by the engineer.

CLASS III RIPRAP: shall consist of no more than 10% total by weight more than 1400 pounds each, and no more than 15% of stones by weight shall weigh less than 25 pounds each. A minimum of 50% by weight shall weigh greater than 700 pounds.

CONSTRUCTION

A. Slopes to be protected with riprap shall be free of brush, trees stumps and other objectional material and shall be graded to a relative smooth surface.
B. The shot rock filter layer shall be place prior to placing riprap as shown on the drawings.
C. The riprap shall be placed to the thickness, height and length as shown on the drawings or as staked with a minimum of voids.
D. Undesirable voids shall be filled with small stones or spalls. The rock shall be manipulated sufficiently by means of excavator or other suitable equipment to secure a reasonably regular surface and mass stability.
E. Riprap protection shall be placed to full course thickness in one operation and in such a manner to avoid damaging the filter layer or underlying material. Placing riprap in layers or by use of chutes or similar activities likely to cause segregation will not be permitted.
F. Riprap shall be placed with a fair distribution of sizes such that there will be no large accumulation or area of mainly large or small stones.
G. The contractor shall phase the work as such to minimize the need for in water work and reduce the potential for sediment discharge or other pollutants from the work area to adjoining water bodies. Ideally, the work below mean high water will be performed during extended low flow periods.



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Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

S. MEANDER ARMORING TYPICAL SECTION

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: NOT TO SCALE

THE STATE of ALASKA
GOVERNOR MIKE DUNLEAVY

Department of Fish and Game

HABITAT SECTION
Southeast Region Office

802 3rd Street
Douglas, Alaska
P.O. Box 110024
Juneau, Alaska 99811-0024
Main: 907.465.4105
Email: dfg.hab.infodou@alaska.gov

FISH HABITAT PERMIT FH25-I-0029

ISSUED: March 11, 2025
EXPIRES: Life of Structure

Loretta Neal
9387 Rivercourt Way
Juneau, Alaska 99801

RE: Bank Stabilization
Mendenhall River (Stream Number 111-50-10500)
Section 19, T 40S, R 66E, CRM (Juneau B-2)
Location: 58.38107 N, 134.59315 W

Dear Loretta Neal:

Pursuant to the Anadromous Fish Act at AS 16.05.871(b), the Alaska Department of Fish and Game (ADF&G) Habitat Section reviewed your proposal to stabilize your streambank on your property along the Mendenhall River. Since 2011, the glacial-dammed lake at Suicide Basin in the Mendenhall Glacier has burst annually, causing the waters of Mendenhall Lake to rise and subsequent flooding of the Mendenhall River.[a]

Project Description
You will notify Habitat Section three days prior to construction. During low water, your contractor will use heavy equipment to stabilize the riverbank with clean class III riprap and shot rock material according to specifications outlined in the project design provided by the City and Borough of Juneau Engineering and Public Works Department (enclosed). The revetment will be constructed at a 1.5:1 slope and a 5 ft riprap keyway will be constructed at the toe of the slope. End-dumping into the actively flowing river is not allowed.

Anadromous Fish Act
Stream Number 111-50-10500 has been specified as being important for the spawning, rearing, or migration of anadromous fishes pursuant to AS 16.05.871(a). The Mendenhall River provides habitat for Chinook, chum, coho, pink, and sockeye salmon, Dolly Varden, and cutthroat and steelhead trout; all species migrate through the project area.

[a] National Weather Service. 2024. Juneau/Mendenhall River Flooding Suicide Basin Glacier Dammed Lake Release. National Oceanic and Atmospheric Administration, Juneau Weather Forecast Office.

In accordance with AS 16.05.871(d), your project is approved subject to the project description and permit terms.

Permit Terms
This letter constitutes a permit issued under the authority of AS 16.05.871 and must be retained on site during project activities. Please be advised that this determination applies only to Habitat Section regulated activities; other agencies also may have jurisdiction under their respective authorities. This determination does not relieve you of your responsibility to secure other state, federal, or local permits. You are still required to comply with all other applicable laws.

You are responsible for the actions of contractors, agents, or other persons who perform work to accomplish the approved project. Prior to engaging in any activity that significantly deviates from the approved plan, you shall notify the Habitat Section and obtain written approval in the form of a permit amendment. Any action that increases the project's overall scope or that negates, alters, or minimizes the intent or effectiveness of any provision contained in this permit will be deemed a significant deviation from the approved plan. The final determination as to the significance of any deviation and the need for a permit amendment is a Habitat Section responsibility. Therefore, it is recommended the Habitat Section be consulted immediately when a deviation from the approved plan is being considered.

You shall give an authorized representative of the state free and unobstructed access to the permit site, at safe and reasonable times, for the purpose of inspecting or monitoring compliance with any provision of this permit. You shall furnish whatever assistance and information the authorized representative reasonably requires for monitoring and inspection purposes.

In addition to the penalties provided by law, this permit may be terminated or revoked for failure to comply with its provisions or failure to comply with applicable statutes and regulations. You shall mitigate any adverse effect upon fish or wildlife, their habitats, or any restriction or interference with public use that the commissioner determines was a direct result of your failure to comply with this permit or any applicable law.

You shall indemnify, save harmless, and defend the department, its agents, and its employees from any and all claims, actions, or liabilities for injuries or damages sustained by any person or property arising directly or indirectly from permitted activities or your performance under this permit. However, this provision has no effect if, and only if, the sole proximate cause of the injury is the department's negligence.

You may appeal this permit decision relating to AS 16.05.871 in accordance with the provisions of AS 44.62.330–630.

Please direct questions about this permit to Habitat Biologist Nicholas Jensen at (907) 465-6646 or nicholas.jensen@alaska.gov.

Sincerely,
Doug Vincent-Lang
Commissioner

Kate Kanouse

By: Kate Kanouse
Regional Supervisor

Enclosure: 2025 CBJ GLOF Emergency Flood Fighting Mendenhall Riverbank Armoring, Juneau, AK

Email cc:
Al Ott, ADF&G Habitat, Fairbanks
ADF&G Habitat Staff, Douglas
Dan Teske, ADF&G SF, Douglas
Scott Forbes, ADF&G CF, Douglas
Carl Koch, ADF&G WC, Douglas
Forrest Courtney, CBJ, Juneau
Randy Vigil, USACE, Juneau
Andy Stevens, USFWS, Anchorage
Habitat Conservation Division, NMFS, Juneau
Laurel Smith, DNR MWL, Juneau
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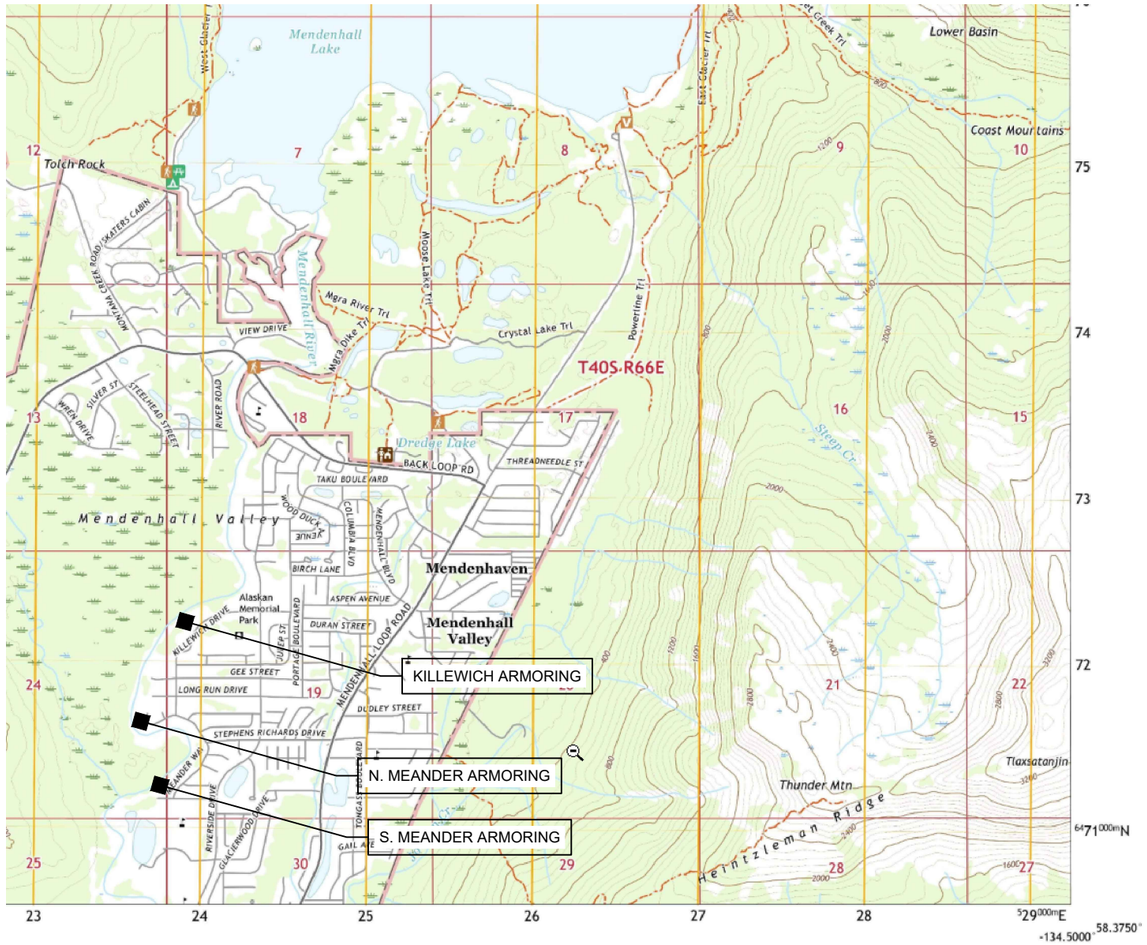
2025 CBJ GLOF EMERGENCY FLOOD FIGHTING
MENDENHALL RIVERBANK ARMORING
JUNEAU, AK



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CBJ ENGINEERING AND PUBLIC WORKS DEPT.
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155 HERITAGE WAY
JUNEAU AK 99801
(907) 586-0800 X-4188 john.bohan@juneau.gov

Revisions		
Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

COVER AND LOCATION MAP

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 1 of 7

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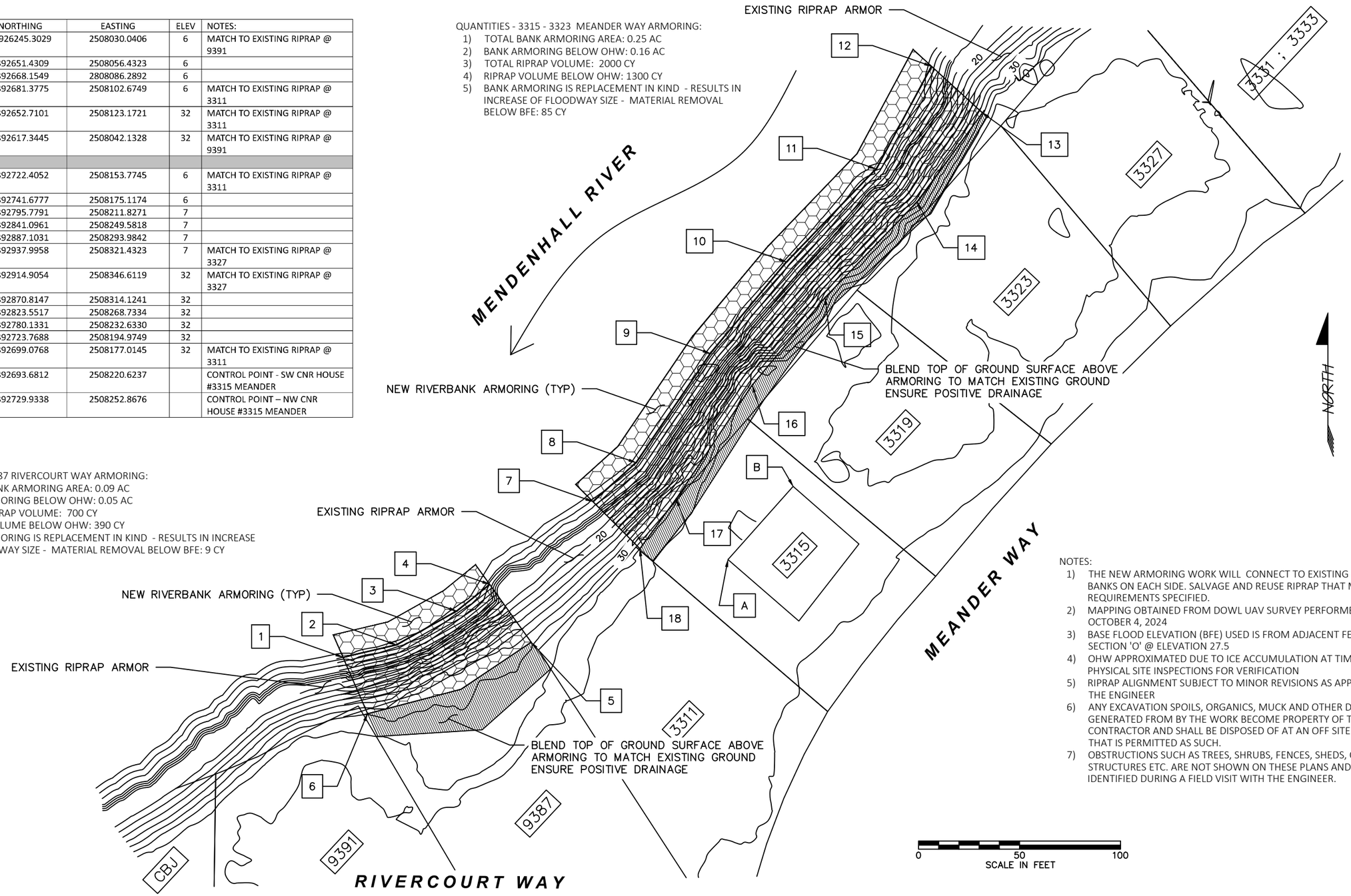

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0 50 100
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Date	Description	Intls.

Prepared by:
CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

S. MEANDER ARMORING CONSTRUCTION PLAN

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: As Shown

SHEET: 7 of 7

DESCRIPTION

The work under this section includes providing all labor, tools and equipment necessary for furnishing and placing a protective covering of stone, as shown on the drawings or as directed by the engineer.

MATERIALS

SHOT ROCK BORROW: shall consist of 10" minus shot rock and shall contain no organics or other deleterious matter. The shot rock shall be evenly graded with at least 10% by weight retained on the 8" screen. Shot rock will be obtained from quarry rock unless otherwise approved by the engineer.

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CONSTRUCTION

A. Slopes to be protected with riprap shall be free of brush, trees stumps and other objectional material and shall be graded to a relative smooth surface.
B. The shot rock filter layer shall be place prior to placing riprap as shown on the drawings.
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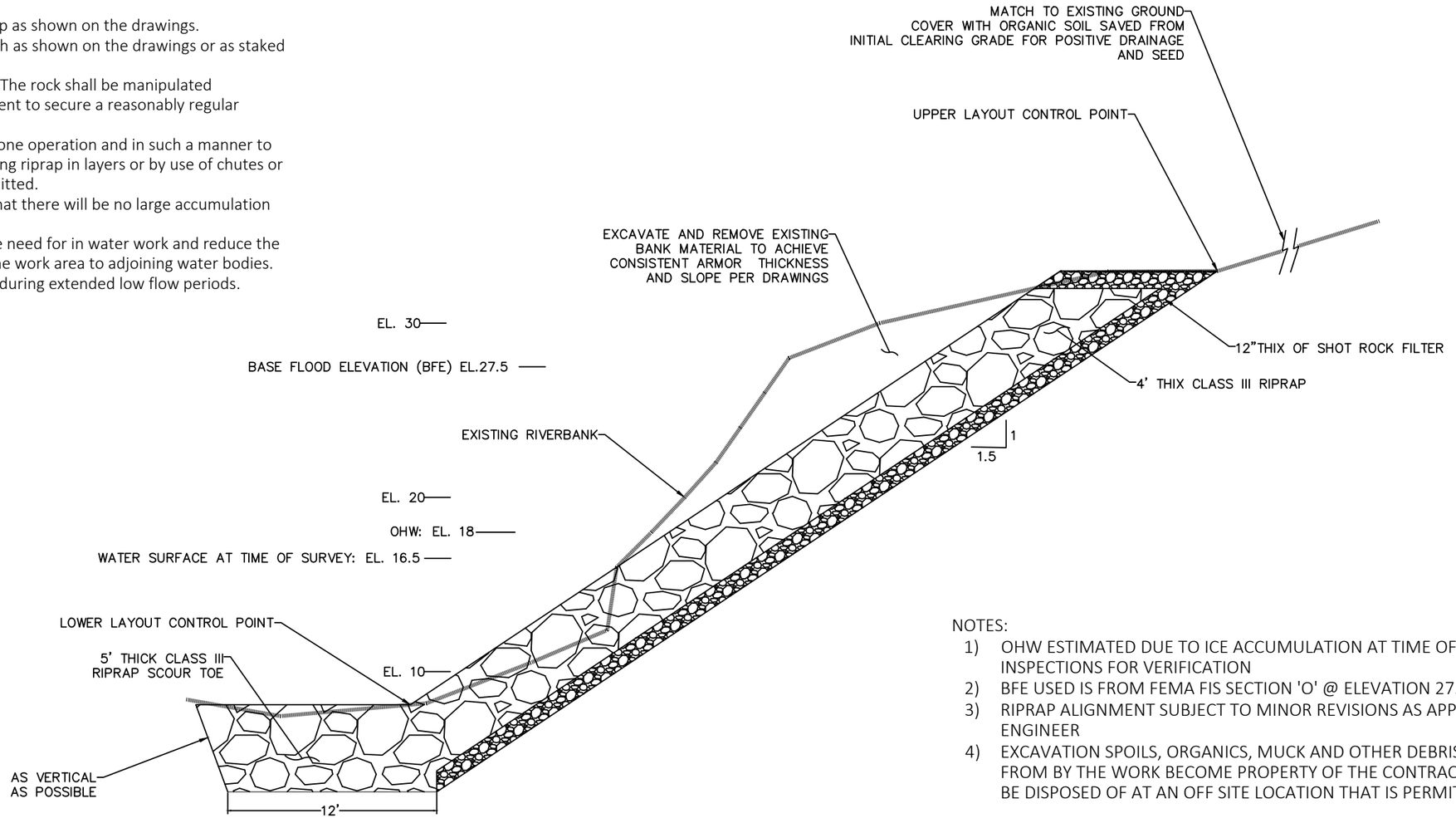

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ALASKA'S CAPITAL CITY
ENGINEERING DEPARTMENT

2025 CBJ GLOF EMERGENCY FLOOD FIGHTING RIVERBANK ARMORING

S. MEANDER ARMORING TYPICAL SECTION

DATE: Feb 2025 | DRAWN BY: STAFF | SCALE: NOT TO SCALE