Oregon Department of Forestry
2600 State St Salem OR 97310
PART III: EXHIBITS

EXHIBIT B
TIMBER SALE OPERATIONS PLAN

(See page 2 for instructions)

Date Received by State: _____

(1) Contract Number: CS-341-2022-GF8518-01

(2) Sale Name: North Lobster GNA

(3) Contract Expiration Date: 12/31/2027

(4) Purchaser Name: _____

(5) State Brand Information (Complete)

(6) State Representatives:

Name	Circle One	Phone No.	Cell No.	Alt Phone
	Logging Projects All			
	Logging Projects All			
	Logging Projects All			
	Logging Projects All			

(7) Purchaser Representatives:

Name	Circle One	Phone No.	Cell No.	Alt Phone
	Logging Projects All			
	Logging Projects All			
	Logging Projects All			
	Logging Projects All			
	Logging Projects All			
	Logging Projects All			
	Logging Projects All			

(8) Name of Subcontractors and Start Dates:

Project No.	Subcontractor Name.	Start Date	Completion Date	Cell No.	Alt Phone

Subcontractor Name.	Start Date	Cell No.	Alt Phone

(9) Comments:

_____

_____

_____

(10) Operations Map: Attach a copy of timber sale Exhibit A or other suitable map which plainly shows the items listed on the instruction sheet.

Oregon Department of Forestry
2600 State St Salem OR 97310
PART III: EXHIBITS

EXHIBIT B
INSTRUCTION SHEET FOR OPERATIONS PLAN

SUBMIT ONE COPY OF PLAN STATE

Operations shall be limited to the work shown in the plan until a revised plan or supplemental plan is submitted covering additional work. Compliance with this plan is not in lieu of compliance with any federal requirements related to the federal Endangered Species Act. If STATE has prepared a required Forest Practices Act (FPA) "Written Plan" for operations, PURCHASER shall comply with all provisions of the Written Plan.

Explanation of Item No.(from Page 1)

(5) All sales require you to use a brand furnished by STATE. If the State brand has not been assigned when the plan is submitted, it will be furnished and assigned later. Complete drawing. If more than one brand is assigned to the sale, complete both drawings.

(6) The contract requires you to have a designated representative available on the sale area or work location who is authorized to receive in your behalf any notice or instruction given by STATE and to take action in regard to performance under the contract. If logging and project work is widely separated, a representative is required for each.

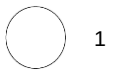
(7) The STATE representative will be designated when your plan is approved and is the person who will inspect and issue instructions regarding performance.

(8) Show names of subcontractors to be used for any or all phases of the operations. If subcontractors are not Known, or are changed later, give notification to the STATE representative prior to commencement of work by subcontractor.

(9) Show projected dates for commencement of both projects and logging. If projected dates need to be changed at a later date, notification must be given to the STATE representative by supplemental plan or otherwise, prior to commencement of such operations.

(10) The STATE representative will furnish extra copies of Exhibit A of the contract for your use in preparing the operations map. The map shall use the following legend and show:

1. Landing locations, approximate setting boundaries, and probable sequence of logging the settings. Number the settings in sequence.
2. Locations of spur roads planned for construction, other than required by the timber sale contract. Provide spur road specifications
3. Locations of proposed tractor yarding roads. Show if and how marked on the ground.
4. Locations of temporary stream crossings.
5. List the sequence of performing project work.
6. Location of rock sources - attach pit development plans.



Cable Landing, with numbers for sequence.

Tractor Landing with alphabetical sequence.

Approximate setting boundary.

Spur truck roads.

Tractor yarding roads.

X

Temporary stream crossings.

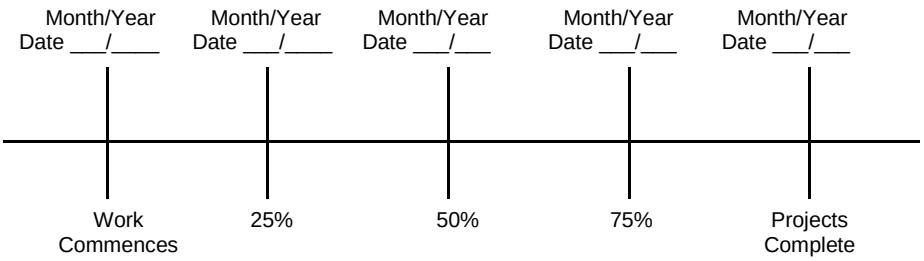
Oregon Department of Forestry
2600 State St Salem OR 97310
PART III: EXHIBITS

EXHIBIT B
OPERATIONS PLAN

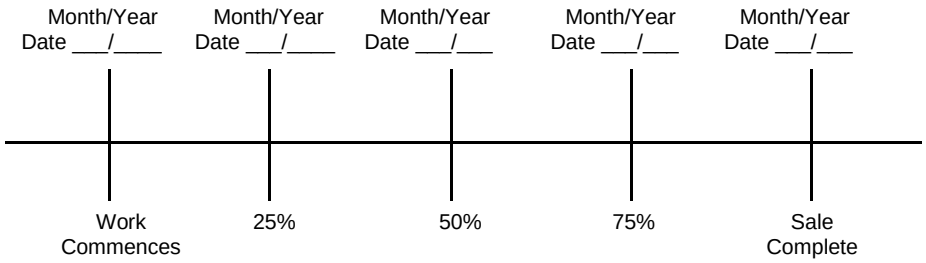
Completion Timeline

Indicate on the appropriate timeline below, the dates by which you plan to complete the work as required under this contract. The purpose of this section is to develop a plan that will ensure you complete the work as required, and meet the interim completion date(s) and contract expiration date. This plan is incorporated and made a part of the contract. When, in the opinion of STATE, operations are not commencing in a manner that meets the intent of this plan, you may be placed in violation of contract and your operations suspended until an amended plan is submitted and approved by STATE.

Projects



Harvest & Other Requirements



The Federal Endangered Species Act (ESA) prohibits a person from taking any federally listed threatened or endangered species. Taking under the federal ESA may include alteration of habitat. STATE's approval of this plan does not certify that PURCHASER's operation under the plan is lawful under the federal ESA. As provided in the timber sale contract, PURCHASER's must comply with all applicable state, federal, and local laws.

PURCHASER's compliance with this plan is not in lieu of compliance with any federal requirements related to the federal Endangered Species Act.

APPROVED; Date: _____

STATE OF OREGON - DEPARTMENT OF FORESTRY

_____

Title _____

SUBMITTED BY:
PURCHASER

_____

Title _____

Oregon Department of Forestry

EXHIBIT C - SAWMILL GRADE (WESTSIDE SCALE)
SCALING INSTRUCTIONS - LOCATION APPROVAL - BRAND INFORMATION
Coos - SOA

(1) ORIGINAL REGISTRATION ☐ Date _____
REVISION NUMBER 000 ☐ Date _____
CANCELLATION ☐ Date _____

(2) TO: _____
(Third Party Scaling Organization)

(3) FROM: Coos Phone (541) 267-4136
(State Forestry District)
Address: 63612 FIFTH RD
COOS BAY,OR 97420

(4) PURCHASER: _____
Mailing Address: _____

Phone Number: _____

(5) **MINIMUM SCALING SPECIFICATIONS**	
SPECIES	MINIMUM NET VOLUME
Conifers	10
Hardwoods	10

*Apply minimum volume test to whole logs over 40' Westside

(6) WESTSIDE SCALE:
Use Region 6 actual taper rule. Logs over 40'.

	YES	NO
(7) Weight Scale Sample	☐	☑

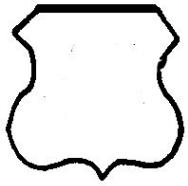
(8) **APPROVED SCALING LOCATIONS** (as shown on the ODF Approved Locations web-site)	**Species**	**Yard**	**Truck**	**Weight**

(9) **SALE NAME:** North Lobster GNA
COUNTY: Curry

(10) **STATE CONTRACT NUMBER:**
CS-341-2022-GF8518-01

(11) STATE BRAND REGISTRATION NUMBER:

(12) **STATE BRAND INFORMATION:**



(13) PAINT REQUIRED: YES ☑
COLOR: Orange

(14) **SPECIAL REQUESTS** (Check applicable)

PEELABLE CULL (all species)..... ☑
NO DEDUCTIONS ALLOWED FOR MECHANICAL DAMAGE..... ☑
ADD-BACK VOLUME - Deductions due to delay... ☑

OTHER :

(15) **REMARKS:** Loads shall be weight scaled in lieu of scaling. Tons shall be short tons or 2,000 lbs. Loads shall have a pink Weight Load and Weight Scale Receipt attached. Weigher shall attach a machine-printed weight ticket, with the ODF weight load number on it, to the ODF Weight Scale Receipt and mail them weekly to the approved Third-Party Scaling Organization for processing.

Operator's Name (Optional inclusion by District): _____

(16)

_____
Purchaser or Authorized Representative Date

_____
State Forester Representative Date

_____
State Forester Representative PRINT NAME

Notify the District within one hour when branding or painting is inadequate for quick identification, the receipts are missing, not correctly or completely filled out, and/or when logs presented for scaling are impossible to scale accurately.
General Distribution: TPSO, Approved Scaling Locations and Purchaser.

Oregon Department of Forestry
EXHIBIT C - SAWMILL GRADE
INSTRUCTIONS FOR EXHIBIT C
Coos - SOA

(1) Check appropriate box. REVISION NUMBER requires comments. CANCELLATION requires logging and hauling to be complete, recall branding hammers.

(2)

Columbia River Log Scaling & Grading Bureau
P.O.Box 7002, Eugene, OR 97401
Phone: (541) 342-6007 Fax: (541) 342-2631
Email: services@crls.com

Mountain Western Log Scaling & Grading Bureau
P.O.Box 580, Roseburg, OR 97470
Phone: (541) 673-5571 Fax: (541) 672-6381
Email: info@mwlsgb.com

Northwest Log Scalers Inc.
6137 NE 63rd St, Vancouver, WA, 98661
Phone: (360) 553-7212 ext. 4 Fax:(360) 553-7213
Email: info@nwlogscalers.com

Pacific Rim Log Scaling Bureau, Inc.
8288 28th Court North East, Lacey, WA 98516
Phone: (360) 528-8710 Fax: (360) 528-8718
Email: office@prlsb.com

Yamhill Log Scaling & Grading Bureau
P.O.Box 709, Forest Grove, OR 97116
Phone: (503) 359-4474 Fax: (503) 359-4476
Email: yamhilllog@frontier.com

(3) State District office, address and phone.

(4) Enter Purchaser's business name, address, and phone number as it appears on the Contract.

(5) Minimum Scaling Specifications.

(6) Westside - Region 6 actual taper segment scale. Check Yes or No. Special Service Rules on file with TPSO. See: Segment Scaling and Grading of Long Logs - All Species - State Forestry Department Scaling Practices (Westside).

(7) Weight Scale Sample - Check box if sale is to be a Weight Scale Sample. All specifies for handling, scaling and processing will be attached or explained in the Remarks section item (15).

(8) Show scaling locations only applicable to TPSO. Location name should appear as it does on the ODF Approved Scaling Location web site: https://apps.odf.oregon.gov/Divisions/management/asset_management/scalinglocation.asp Locations with scaling and processing directions specific to their location should be on a separate form. Species should be identified if not capable of receiving "all" species. Check appropriate box for either: yard, truck scale, or weight. Refer to the web site listed above for the locations approval status.

(9) Enter sale name and county.

(10) Enter sale Contract number.

(11) Enter Oregon's State Brand Registry Number (**REQUIRED**).

(12) Show brand assigned to timber sale. One brand only. If more than one brand is assigned to the sale: (1) make a separate form for each brand and (2) on each form, explain and show other brand(s) in the Remarks section item (15).

(13) Check yes for Paint Required and designate "Orange" for color. Non required removal volumes may sometimes require blue paint.

(14) Special Requests. These are requests that will be applied to ODF timber sales. All boxes applicable to the timber sales designated in the Exhibit C form must be "marked". If "Other" is indicated, it must contain a description and any necessary comments.

(15) Use this space to designate any weight scale sample instructions or any other explanations to clarify scaling, processing and/or mailing requirements. If additional scaling locations are approved, revise original or current form showing all (old and new) locations. Check REVISION box at top of form and explain under remarks. Route as indicated.

(16) Require purchaser to sign and date completed form in addition to State Forester Representative, sign and print name on the form. Signatures not required on revisions.

Oregon Department of Forestry
EXHIBIT C - PULP SORT
PROCESSING INSTRUCTIONS - LOCATION APPROVAL
BRAND INFORMATION

Coos, SOA

(1) ORIGINAL REGISTRATION ☐ Date _____

REVISION NUMBER 000 ☐ Date _____

CANCELLATION

(2)

(Approved Pulp Processing Facility)

(3) FROM: Coos Phone (541) 267-4136
(State Forestry District)

Address: 63612 FIFTH RD

COOS BAY,OR 97420

(4) PURCHASER: _____

(5) Scaling Bureau **(TPSO)** Processing Weight receipts:

_____

Mailing Address: _____

_____,

Phone Number: _____

(6) **STATE Definition of Approved Pulp Sort:**

- Top portion of the tree (tops).
- All logs with a diameter (Big End) greater than 8 inches marked with blue paint.

(7) PULP FACILITY PROCESSING INSTRUCTIONS:

- Pulp loads shall be weighed in lieu of scaling.
- One Ton = 2000 lbs (Short Ton).
- Pulp loads shall have a yellow Log Load Receipt attached.
- Gross weight and truck tare weight for each load shall be machine printed on the weight receipt.
- Weigher shall sign the weight receipt.
- Weigher shall record the Log Load Receipt number on the weight receipt.
- Weigher shall attach the Weight receipt to the Log Load Receipt and mail them weekly to the TPSO processing the Weight receipt.

(8) TPSO PROCESSING INSTRUCTIONS

- Submit data files daily (or each day of activity).
- Mail or deliver scale tickets weekly to ODF Headquarters in Salem.

(9) **SALE NAME:** North Lobster GNA

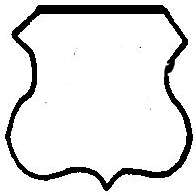
COUNTY: Curry

STATE CONTRACT NUMBER:

CS-341-2022-GF8518-01

(11) STATE BRAND REGISTRATION NUMBER: _____

(12) STATE BRAND INFORMATION:



(13) **REMARKS:**

Operator's Name (Optional inclusion by District):

(14) SIGNATURES:

Purchaser or Authorized Representative Date

State Forester Representative Date

State Forester Representative PRINT NAME

Notify the District within one hour when branding is inadequate for quick identification, the logs are marked with orange paint, the receipts are missing, not correctly or completely filled out, and/or logs do not meet the specifications of the STATE definition of Approved Pulp Sort.

General Distribution: TPSO, Approved Scaling Locations and Purchaser.

Oregon Department of Forestry
EXHIBIT C - PULP SORT
INSTRUCTIONS FOR EXHIBIT C

Coos, SOA

(1) Check appropriate box. REVISION NUMBER requires comments. CANCELLATION requires logging and hauling to be complete, recall branding hammers.

(2) Approved Pulp Processing Facility. Write in as written in the Approved Log Delivery Location
https://apps.odf.oregon.gov/Divisions/management/asset_management/scalinglocation.asp

(3) State District office, address and phone.

(4) Enter Purchaser's business name, address, and phone number as it appears on the Contract.

(5) Third Party Scaling Organization that will be processing the weight tickets, mailing address, and phone number.

Columbia River Log Scaling & Grading Bureau
P.O.Box 7002, Eugene, OR 97401
Phone: (541) 342-6007 Fax: (541) 342-2631
Email: services@crls.com

Pacific Rim Log Scaling Bureau, Inc.
8288 28th Court North East, Lacey, WA 98516
Phone: (360) 528-8710 Fax: (360) 528-8718
Email: office@prlsb.com

Mountain Western Log Scaling & Grading Bureau
P.O.Box 580, Roseburg, OR 97470
Phone: (541) 673-5571 Fax: (541) 672-6381
Email: info@mwlsgb.com

Yamhill Log Scaling & Grading Bureau
P.O.Box 709, Forest Grove, OR 97116
Phone: (503) 359-4474 Fax: (503) 359-4476
Email: yamhilllog@frontier.com

Northwest Log Scalers Inc.
6137 NE 63rd St, Vancouver, WA, 98661
Phone: (360) 553-7212 ext. 4 Fax:(360) 553-7213
Email: info@nwlogscalers.com

Big end of log is not to exceed 2 inches greater than the minimum removal specifications in the contract. Example: Minimum removal specifications 6 inches and 20 board feet, then the Big end of log not to exceed 8 inches. When conifer and hardwood removal specifications are different, use the smaller removal diameter to determine this specification.

(9) Enter sale name and county.

(10) Enter sale Contract number.

(11) Enter Oregon's State Brand Registry Number **(REQUIRED).**

(12) Show brand assigned to timber sale. One brand only, if more than one brand is assigned to the sale: (1) make a separate form for each brand and (2) on each form, explain and show other brand(s) in the Remarks section Item (13).

(13) Use this section to list any special instructions or the reason for any revisions in section item (1).

(14) Require purchaser to sign and date completed form in addition to State Forester Representative, sign and print name on the form. Signatures not required on revisions.

EXHIBIT D

FOREST ROAD SPECIFICATIONS

SPECIFIC ROAD IMPROVEMENT INSTRUCTIONS

Road or Project Points	Work Description
USFS Road #5502, A to X, X to F	Mile 0.0 Leave Elk River Road right onto Forest Service road 5502. Begin light brushing. Cut limbs and brush overhanging road that would impede haul traffic, following Exhibit G. Begin grading the road to remove ruts and drain water off the road. Beware there are patches of pavement remaining, do not grade these areas. Begin light ditch cleaning. Only clean ditches in locations where ditches route water into roadway or have large pieces of wood or rock impeding flow. Leave as much vegetation in ditches as possible. Clean cross drain culvert inlets, remove woody debris from stream crossing culvert inlets. Grass seed and mulch any exposed dirt in ditch line that drains into stream crossing within 100 feet. At completion of the road work place Carsonite lane markers on outside road edge (to be provided by contract administrator) at narrow areas designated by contract administrator. Mile 1.6 Road narrows. Remove brush and ditch ravel to gain width. Mile 2.5 Narrow point. Remove brush, ditch ravel and small conifers < 4” diameter on cutbank to gain width. Mile 3.2 Hole in outside edge of subgrade, creates road hazard. Fill hole with free draining rock, create a channel through the outside edge of the hole that allows the placed rock to drain downslope. Cut alder that is directly below the hole, do not excavate the stump. Mile 9.2 Road widening project. (See project 3) 11.1 Junction right onto FS road number 220
Road #220 F to V	The portions of this road from points F to R are a fire management area. Any slash created during road reconstruction and brushing must be lopped and scattered with material confined to less than 18” from the ground as described in Section 2365. Trees shall be yarded with tops attached. Tops must be end

	hauled and piled at an approved location or utilized for slash covering temporary roads. Root wads may be left in the fire management area. Mile 0.0 Begin moderate brushing remove woody brush from road edges including ditchline. Limb trees overhanging the roadway. Cut trees with diameters less than three inches on road edges and ditches as needed. Blade road to remove ruts and direct water off of the road surface. Mile 1.4 Junction road 223 takes off left toward sale area 2. Road brushing becomes heavy after junction. Remove stobs from road running surface where needed. Mile 3.4 End of drivable road. Remove trees and brush from the road surface and ditchline. Remove trees from cutbank and outside road edge where needed. Remove stobs and stumps from the road surface. Widen road as needed to reconstruct a 14-foot-wide native surface road. Do not sidecast on slopes greater than 45%. End haul material generated by widening to approved locations. Between Points T and V, cut all live Port Orford cedar less than 12" DBH to the top of the cutbank or 25', and 25 – 50' below road to prevent spread of Port Orford cedar root disease. Potential waste area at point U.
O to OA, R to RA, MA to MC (optional)	Reconstruct 14-foot-wide native surface road.
Q to QA	Reconstruct 14-foot-wide native surface road. Potential Waste area.
M to MA (optional), MA to MC (optional)	Reconstruct 14-foot-wide native surface road.
P to PC, V to VD	Reconstruct existing 14 wide native surface road. Remove brush, trees, and stobs from the road surface and cutbanks as needed. Widen and smooth road surface as needed.
G,H,I,K,L,M,O,Q,R, S,T,JC,JD,JE,JF,JG, MB,MC,OA,PA,PB, PC,RA,VA,VC,VD	Remove trees and stumps from old landing locations, smoothing and compacting landing for harvest
Haul Route	Damaged areas shall be repaired as needed during active haul.
USFS Road 3402, Y to X	Mile 1.8 Leave Euchre Creek Road onto Forest Service road 3402. Road is in good condition. Mile 3.6 Approximate location of undercut paved road due to adjacent creek. USFS repairs estimated in 2022 or 2023. Environmental compliance and funding is secured. Mile 4.0 Begin light grading and pothole repair to eliminate rutting, establish proper drainage. Clean any ditches or culvert inlets blocked by organic matter. Mile 14.1

	Begin brushing. Cut limbs and brush overhanging road following Exhibit G. Continue grading the road to remove ruts, potholes, and drain water off the road. Continue light ditch cleaning. Only clean ditches in locations where ditches route water into roadway or have large pieces of wood or rock impeding flow. Leave as much vegetation in ditches as possible. Clean cross drain culvert inlets, remove woody debris from stream crossing culvert inlets. Grass seed and mulch any exposed dirt in ditch line that drains into stream crossing within 100 feet. Mile 15.4 – Point X - Junction right onto FS road number 5502
Project 3, Point E, 5502 Mile 9.2	Road failure. Retaining wall construction. Purchaser will need to obtain a stamped wall design from a welded wire retaining wall manufacturer. See Exhibit I for USFS current and proposed plan views, estimate of quantities and notes, profiles and cross-section drawings. Exhibit J is the USFS *Road 5502 Retaining Wall Foundation Investigation*. Project 3 shall be completed using "Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects FP-14" specifications and will be inspected by USFS engineers during construction. STATE will provide approval of project. Payment by STATE to PURCHASER will be made when the project or portions thereof are completed and approved by STATE and will not follow FP-14 payment schedule. Wall will be constructed in accordance with the plans and standard drawings. Project 3G (560 yards of granular backfill) need is dependent on quality of excavated material. Project 3G may not be needed or reduced if sufficient backfill material is available on-site.
Project 3A	Equipment mobilization – Includes weed washing of off-road equipment, fire protection equipment, fire watch, equipment for completing project. STATE must approve weed washed equipment prior to beginning work.
Project 3B	Survey and stake using method 2 (conventional) per FP-14 Section 152. Prior to excavation and subject to STATE approval, centerline, uphill and downhill clearing limits, and reference stakes must be established with a tolerance of +/- 0.2 feet. Post excavation, and subject to STATE approval, centerline, uphill and downhill clearing limits, and reference stakes must be established with a tolerance of +/- 0.2 feet. Post-excavation, stakes at wall location requires tolerance +/- 0.1 feet.
Project 3C	Soil erosion & Pollution control – Submit written plan to STATE within 30 days prior to construction outlining temporary erosion control measures to minimize erosion during operations. Install and maintain throughout project. Remove temporary measures at end of project.
Project 3D	Clearing and grubbing, disposal of tops and limbs by scattering, logs by decking, and stumps by scattering on stable slopes.
Project 3E	Endhaul waste to disposal site at MM12.0.
Project 3F	Procurement of mechanically stabilized earth wall, excavation, construction, and backfill. Representative from wall manufacturer required during installation. FP-14 Section 257.
Project 3G	Select weed-free granular backfill as specified by wall manufacturer. Need is dependent on quality of excavated material. Project 3G may not be needed or reduced if sufficient backfill material is available on-site. Source of weed-free rock shall be provided to STATE and truck tickets available upon request.
Project 3H	Acquire stamped engineered design for a mechanically stabilized earth wall design consistent with FP-14 section 257. Submit written design to STATE at least 7 days prior to construction. Manufacturer or contractor should be provided Exhibit J, USFS's USFS *Road 5502 Retaining Wall Foundation Investigation.*

	While the USFS performed a preliminary topographic site survey, additional topographic survey data may be needed. Contractor shall provide additional topographic site survey data as needed.
Project 3I	Clean culverts, shape roadway, shape ditches, compact road surface on either side of construction area with compaction method B. FP-14 section 303.
Project 3J	Deliver and apply 150 cubic yards, 1 inch minus for road surfacing using compaction method 1 in FP-14 section 302.
Project 3K	Stake culvert location, verify length, provide 24-inch, aluminized-corrugated steel pipe, 16 gage. Backfill with native material, using compaction method B. FP-14 section 602.
Project 3L	Supply and install geocomposite sheet drain system as per manufacturers design and FP-14 Section 605.
Project 3M	Use of rock hammer as necessary.
Project 3N	On exposed soils as designated by STATE, apply certified weed free straw mulch and weed free seed. Seed will be provided by STATE/USFS at no cost.
Project 3O	Temporary traffic control: Provide and locate signs as directed. Signs shall follow notes in Exhibit I: Traffic Control Detail. • Elk River Road / 5502 Jct: 48” x 48” “ROAD CLOSED 9.2 MILES AHEAD” • 5325 / 5502 Jct: 48” x 48” “ROAD CLOSED AHEAD” • 5502 / 3402 Jct: 48” x 48” “ROAD CLOSED AHEAD” • Both sides of construction site: Type III barricade with R11-2 ROAD CLOSED signs.

EXHIBIT D

SKID ROAD and TEMPORARY ROAD VACATING SPECIFICATIONS

SUBSOILING, WOODY DEBRIS, WATERBARS AND BLOCKING ROADS

(1) Equipment. A track mounted excavator shall be used for all road blocking, waterbarring, and subsoiling unless otherwise approved in writing by STATE.

(2) Dry Conditions. All work shall be performed between June 1st and October 31st during dry conditions acceptable to STATE, or other dry periods as approved by STATE.

SPECIFIC INSTRUCTIONS/SPECIFICATIONS:

Segment	Work Description
Primary skid roads, temporary roads, and landings	Subsoiling: After logging, all temporary roads and the main skid roads, shall be subsoiled to a depth of at least 20 inches. Shape roadbed to the original slope. Subsoiling shall employ a discontinuous “hen scratch” pattern over the ground, and method shall lift and fracture the compacted soil rather than plowed, mixed, or displacement of surface soils. If large tree roots, bedrock or subsurface boulders prevent subsoiling, purchaser shall work around them so as to avoid pulling these to the surface or ripping through them.
Primary skid roads, temporary roads, and landings	Woody Debris Shall be placed on the surface of subsoiled main skid roads and temp roads. Pull slash back across the subsoiled roadbed, for 85% effective ground cover no deeper than 18” over exposed mineral soil.
Unsurfaced roads not subsoiled	Construct Waterbars as directed by STATE and Exhibit E.
Primary skid roads, unsurfaced temporary roads	Block Roads. All unsurfaced temporary roads and skid roads shall be blocked immediately after completion of logging operation, or at the end of logging season to prevent off highway vehicle use. Use excavated material and cull logs to block temporary roads and skid roads from vehicle access, as directed by STATE.

EXHIBIT D

ROCK ACCOUNTABILITY

PURCHASER shall obtain subgrade approval from STATE prior to rocking. Rocking shall be limited to periods when weather conditions are acceptable to STATE and when sediment will not enter streams. Additional surfacing needed because of construction season or construction practice shall be furnished at PURCHASER expense.

Rock accountability shall be determined by the following methods, as directed by STATE. STATE shall be given 24 hours' notice prior to rocking.

All rock shall be from weed-free sources. Written approval of the specific source is required prior to materials (e.g. soil, gravel, sand, aggregate, etc.) being transported onto National Forest System land.

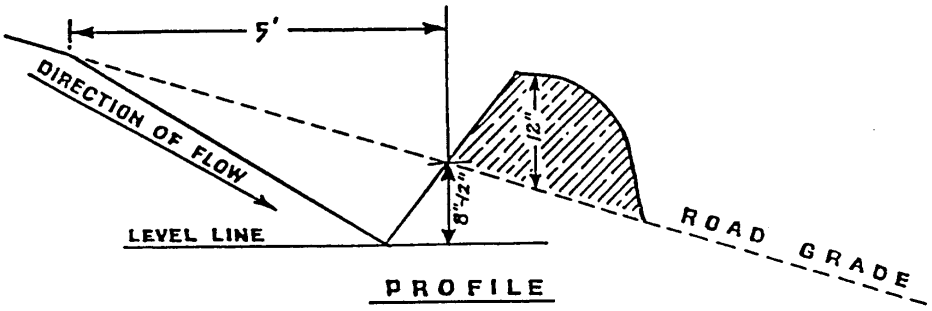
Depth Measurement. Rock shall be spread and compacted according to the depths specified by contract administrator.

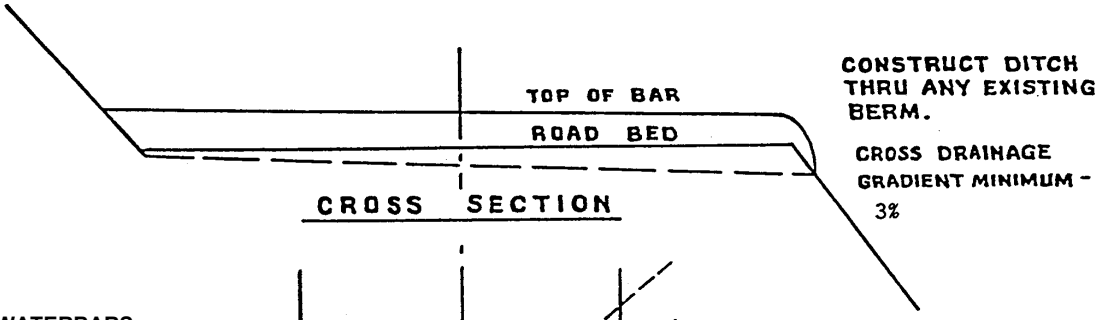
Depth shall be determined in the most compacted area of the surface cross section. The depth of compacted aggregates shall not vary more than 1 inch from the depth specified by contract administrator. The average depth for each road segment shall be the specified depth or greater. If additional rock is required because of insufficient depth, the locations and volumes to be added shall be determined by STATE.

Load Records. Notify STATE before spreading the rock and maintain a record of all rock delivered for spreading. Make the record available for STATE inspection. A report listing the amount of rock delivered the prior month must be submitted weekly.

EXHIBIT E

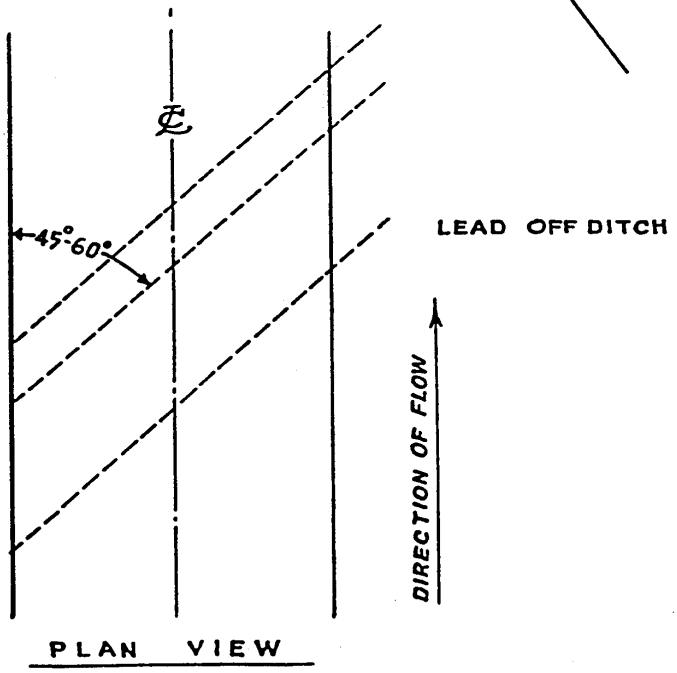
WATERBAR SPECIFICATIONS





SPACING OF WATERBARS

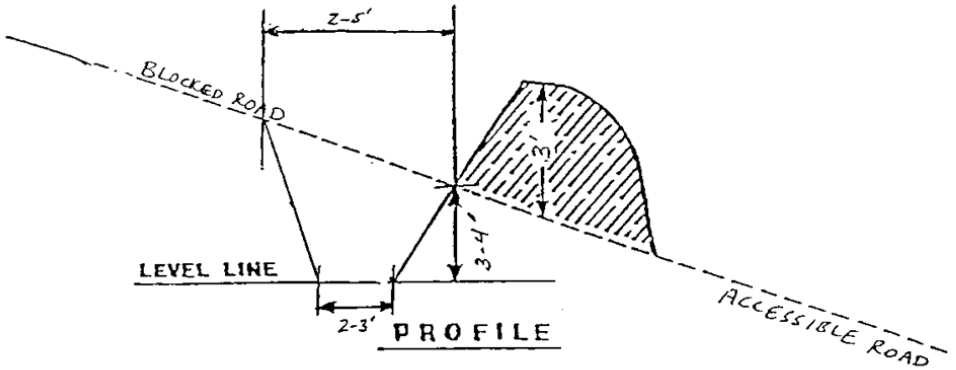
ROAD GRADE	DISTANCE
≤ 5%	400'
6-10%	200'
11-15%	150'
16-20% or greater	100'



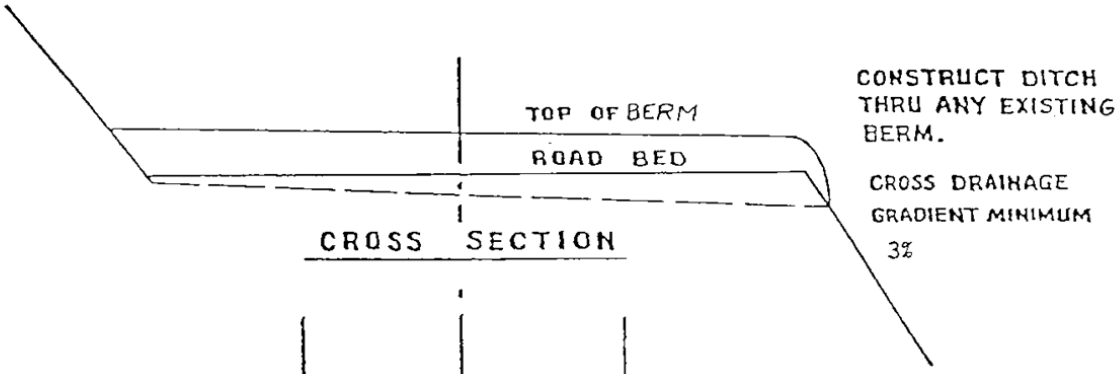
WATERBAR SPECIFICATIONS
FOR CROSS DITCHING #298

EXHIBIT F

TANK TRAP SPECIFICATIONS

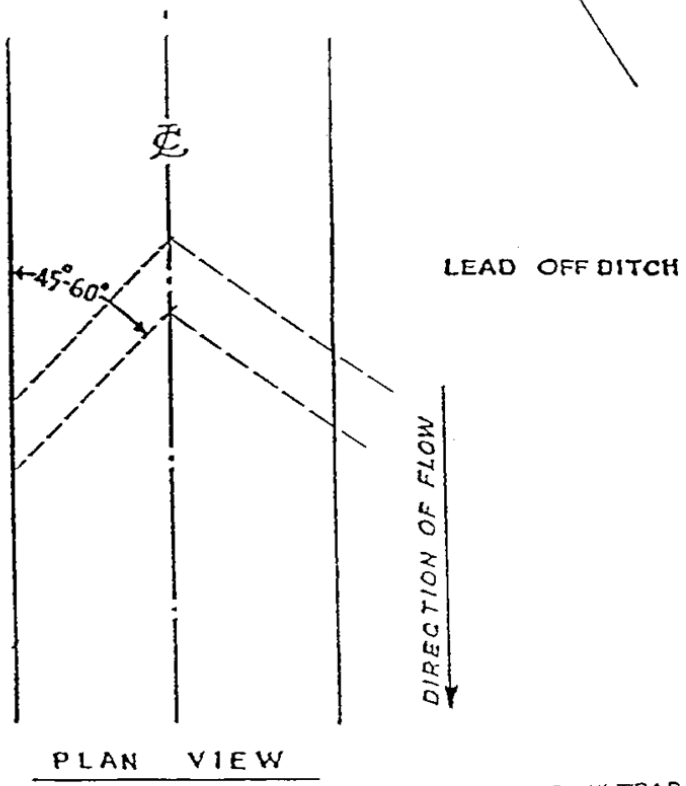


ng



ıds as

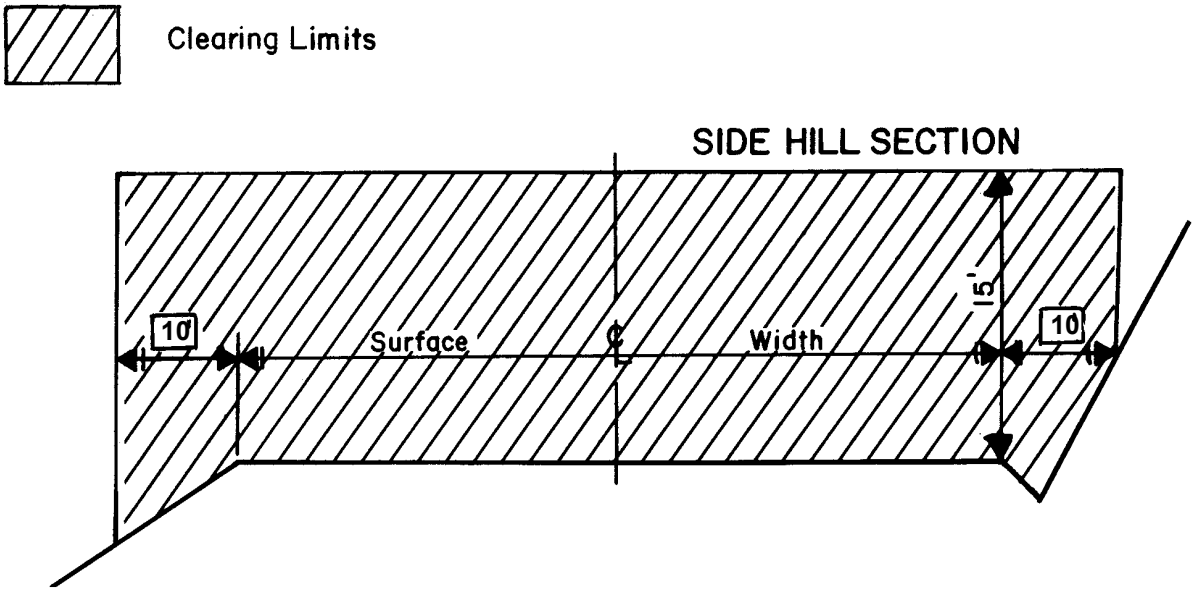
Tank trap shall be installed in a "V" shape. It should be sloped to drain with a relief ditch through the down slope edge of the road. The trench shall be behind the berm for approaching traffic.



TANK TRAP
SPECIFICATIONS

EXHIBIT G

ROAD BRUSHING SPECIFICATIONS



REQUIREMENTS

The minimum height of clearing shall be 15 feet from the road surface, and the minimum width of clearing on the cutslope side(s) of the road shall be 10 feet horizontal distance from the shoulder of the road and 10 feet horizontal on the down slope side from the road shoulder.

Brush and trees shall be cut to a maximum height of 6 inches above the ground surface or obstructions such as rocks or existing stumps.

Debris resulting from the brushing operation shall be removed from the roadway, cutslope, ditches, water courses, culvert inlets and outlets and sediment catching basins. Debris shall be mulched or scattered downslope from the road or placed in other stable locations. Large debris, 6 inches or larger in diameter, shall be mulched or cut into lengths 6 feet or less to facilitate rapid decay, unless otherwise approved by STATE.

EXHIBIT H

BLEACH MIXING INFORMATION

Clorox (bleach) Information

The following information is provided from the Clorox Service Bulletin is pertinent to POC root disease and sudden oak death control.

ULTRA CLOROX ® BRAND REGULAR BLEACH, Sodium Hypochlorite 6% (EPA Reg. No. 5813-50)

When used as directed, this product is effective in controlling the spread of the fatal fungus *Phytophthora lateralis* (Port Orford cedar root disease) and *Phytophthora ramorum* (sudden oak death) in areas of California and Oregon where Port Orford cedar and tanoak grows.

Water is commonly drafted from streams and fire ponds within forested areas to use in dust abatement on forest roads, equipment cleaning, and for fire suppression. The water source can spread the root disease fungus to uninfested areas. Treating water prior to use helps control the spread of the fungus.

Directions for Use: Add 1 gallon regular 5% - 6.5% Sodium Hypochlorite bleach to 1000 gallons (~50 parts per million available chlorine) of drafted water. Prepare the mixture at least 5 minutes prior to application for dust abatement; fire suppression; and cleaning trucks, and logging, road building, and maintenance equipment. DO NOT allow bleach to enter lakes, streams, storm drains, or other bodies of water.

Dilution Table			
Approximate ppm available Chlorine	Volume of regular bleach (Sodium Hypochlorite 5% - 6.5%)	Volume of concentrated bleach (Sodium Hypochlorite 7.5% - 8.5%)	Volume of Water
50	16 drops	12 drops	1 quart
	3/4 tsp.	1/2 tsp.	1 gallon
	1 gallon	3/4 gallon	1000 gallons

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PROJECT NAME

FSR 5502 NORTH LOBSTER TIMBER SALE

ROGUE RIVER- SISKIYOU NATIONAL FOREST

POWERS DISTRCIT

DRAWING TITLE

EXISTING PLAN VIEW

DATE 11/10/2021	ARCHIVE NO.
DESIGNER C. SMITH	DRAWING SHEET NO. T-01
DRAWN C. SMITH	
CHECKED P. PODESTA	
PROJECT NO.	SHEET 1 OF 7

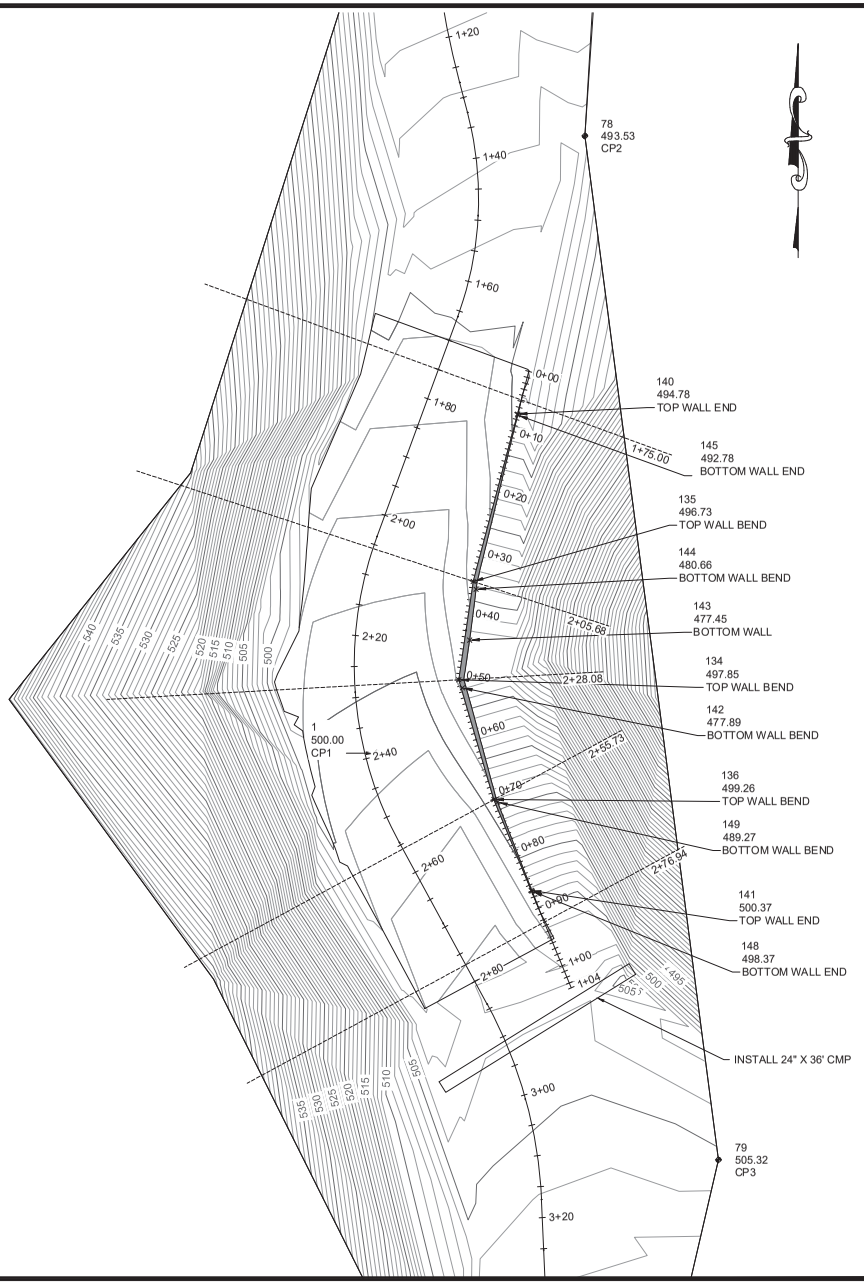
POINT	MATERIAL	REMARKS
CP-1		ROCKLINE PROJECTED 2 FEET HD TOWARDS THE CUT BOTTOM OF CUT 13-FEET HD TOWARDS CUT
A	RU-10	POSSIBLE ROCK-LINE 58 DEGREES TO POINT F AND 50 DEGREES TO POINT G
B	RU-10	
C	RU-10	POSSIBLE ROCK-LINE 50 DEGREES TO POINT F AND 50 DEGREES TO POINT G
D	SU-F	8-10 FEET HD TO HINGE BEFORE FAILURE AND FILLSLOPE ABOUT 100% ROCKLINE PROJECTED 6-8 FEET HD TOWARDS CUT
E	RU-10	
F	RU-10	
G	RU-10	
TOP OF CUTSLOPE SCARP		SU-A DOWN TO POINT B

*OTHER SURVEY NOTES:
TOP WIDTH OF CUTSLOPE FAILURE ABOUT 20-FEET HD

TOP WIDTH OF FAILURE BELOW THE ROAD AT POINT G ABOUT 30-FEET HD

DEPTH TO RU-10 AT FAILURE EDGE AT HINGE POINT 5-FEET VD

NORTH FAILURE EDGE AT HINGE: ROCKLINE PROJECTED 8-FEET HD TOWARDS THE CUT



POINT TABLE

POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1	5000.00	10000.00	500.00	CP1
78	5099.36	10033.48	493.53	CP2
79	4934.50	10054.99	505.32	CP3
95	4777.43	10041.68	517.36	CP4
134	5011.81	10013.19	497.85	TOP WALL BEND
135	5027.64	10015.52	496.73	TOP WALL BEND
136	4992.52	10018.83	499.26	TOP WALL BEND
140	5054.59	10022.63	494.78	TOP WALL END
141	4977.88	10024.86	500.37	TOP WALL END
142	5010.51	10013.79	477.89	BOTTOM WALL BEND
143	5018.19	10014.94	477.45	BOTTOM WALL
144	5026.39	10015.98	480.66	BOTTOM WALL BEND
145	5054.44	10022.67	492.78	BOTTOM WALL END
148	4977.78	10024.99	498.37	BOTTOM WALL END
149	4992.12	10019.43	489.27	BOTTOM WALL BEND

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PROJECT NAME

FSR 5502 NORTH LOBSTER TIMBER SALE

ROGUE RIVER- SISKIYOU NATIONAL FOREST

POWERS DISTRCIT

DRAWING TITLE

PROPOSED PLAN VIEW

DATE 11/10/2021	ARCHIVE NO.
DESIGNER C. SMITH	DRAWING SHEET NO. T-02
DRAWN C. SMITH	
CHECKED P. PODESTA	
PROJECT NO.	SHEET 2 OF 7

North Lobster Creek Timber Sale

Estimate of Quantities

Mile Post/ Station		FP-14 Pay Items	Mobilization	Construction survey and staking, method 2, tolerance C	Soil erosion & pollution control	Clearing and grubbing, disposal of tops and limbs (f), logs (i), stumps (f)	EndHaul Waste to Disposal site	Mechanically stabilized earth wall (welded wire face), with drainage features	Select granular backfill	Contractor furnished mechanically stabilized earth wall design	Road reconditioning, roadbed, compaction method B	Aggregate base, grading 1 inch minus, method 1	24-inch pipe culvert, aluminized-corrugated steel pipe, 16 gage, compaction method B	Geocomposite sheet drain system, complete with collector and outlet pipe	Seeding and mulching, dry method	Temporary traffic control
		Item Number:	15101	15211	15713	20105	20429	25501	25502	25701	30310	30207	60201	60504	62530	63501
		Unit of Measure:	LSQ	LSQ	LSQ	LSQ	CY	SY	CY	LSQ	LSQ	CY	FT	SY	LSQ	LSQ
		Contract Quantity							*			*	*	*		
Begin	End	Description of Work														
		FSR 5502000														
1+60	2+80	Beginning of Project	1	1	1	1	560	880	560	1	1	150	36	300	1	1
TOTAL FOR ROAD			All	All	All	All	560	880	560	1	All	150	36	300	All	All

*DESIGN NOTES:

DESIGN WALLS ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.
INSTALL WALL DRAINAGE SYSTEMS ACCORDING TO SECTION 605

FLEXIBLE DELINEATORS TO BE INCLUDE IN DESIGN

A DRAINAGE SYSTEM BEHIND WALL SHALL BE DESIGNED

MAXIMUM PARTICLE SIZE FOR BACKFILL SHALL NOT BE LARGER THAN 1.5INCHES PER FP-14 704.03(B).

DESIGN USING AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS 9th EDITION USING SITE CLASS B AND PGA=0.5g

SHORTER REINFORCEMENT LENGTHS MAY BE CONSIDERED IF USING THE TRAPEZOIDAL DESIGN METHOD

*GENERAL NOTES:

DISPOSAL SITE: HAUL WASTE AND EXCESS WASTE TO FSR 5502 MP 12.0

ALL EXCAVATION IS UNCLASSIFIED MATERIAL; ESTIMATE INCLDES 40 HR WITH ROCK-HAMMER.

PERFORM TRAFFIC CONTROL ACCORDING TO SECTION 156. ROAD 5502 MAY BE CLOSE AT THE WORK SITE FOR **30 DAYS**.

INSTALL ADVANCED SIGNING "ROAD CLOSED 9.17 MILES AHEAD". ALL SIGNS SHALL CONFORM TO MUTCD. NOTIFY THE FOREST SERVICE 10 DAYS PRIOR TO CLOSING THE ROAD

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PROJECT NAME
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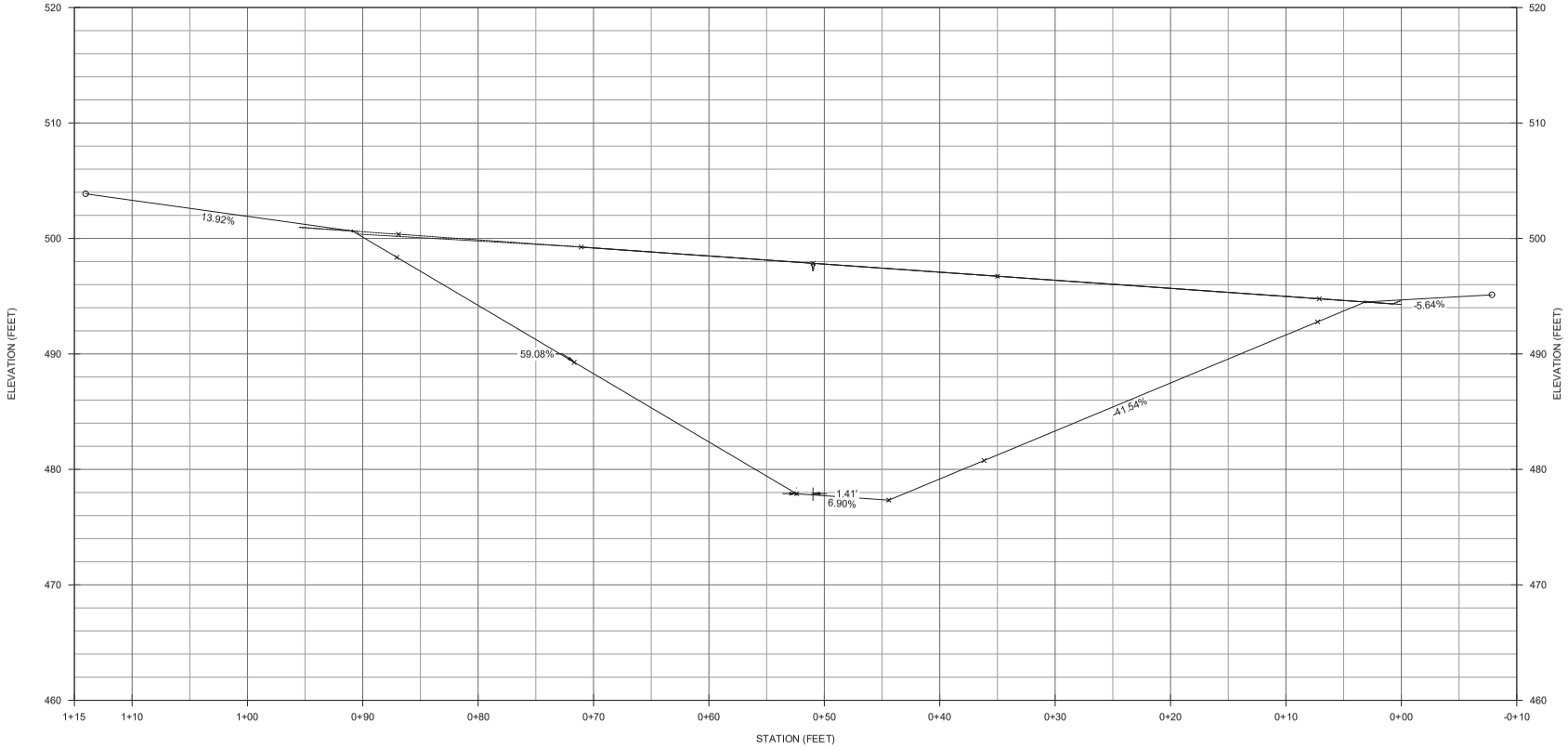
ROGUE RIVER- SISKIYOU NATIONAL FOREST

POWERS DISTRCIT

DRAWING TITLE
ESTIMATE OF QUANTITIES & NOTES

DATE 11/10/2021	ARCHIVE NO.
DESIGNER C. SMITH	DRAWING SHEET NO. T-03
DRAWN C. SMITH	
CHECKED P. PODESTA	
PROJECT NO.	SHEET 3 OF 7



EXCAVATION PROFILE

United States Department of Agriculture
Forest Service

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PROJECT NAME

FSR 5502
NORTH LOBSTER
TIMBER SALE

ROGUE RIVER- SISKIYOU
NATIONAL FOREST

POWERS DISTRCIT

DRAWING TITLE

PROFILE
EXCAVATION

DATE: 11/10/2021	ARCHIVE NO.
DESIGNER: C. SMITH	DRAWING SHEET NO.
DRAWN: C. SMITH	**T-04**
CHECKED: P. PODESTA	
PROJECT NO.	SHEET 4 OF 7

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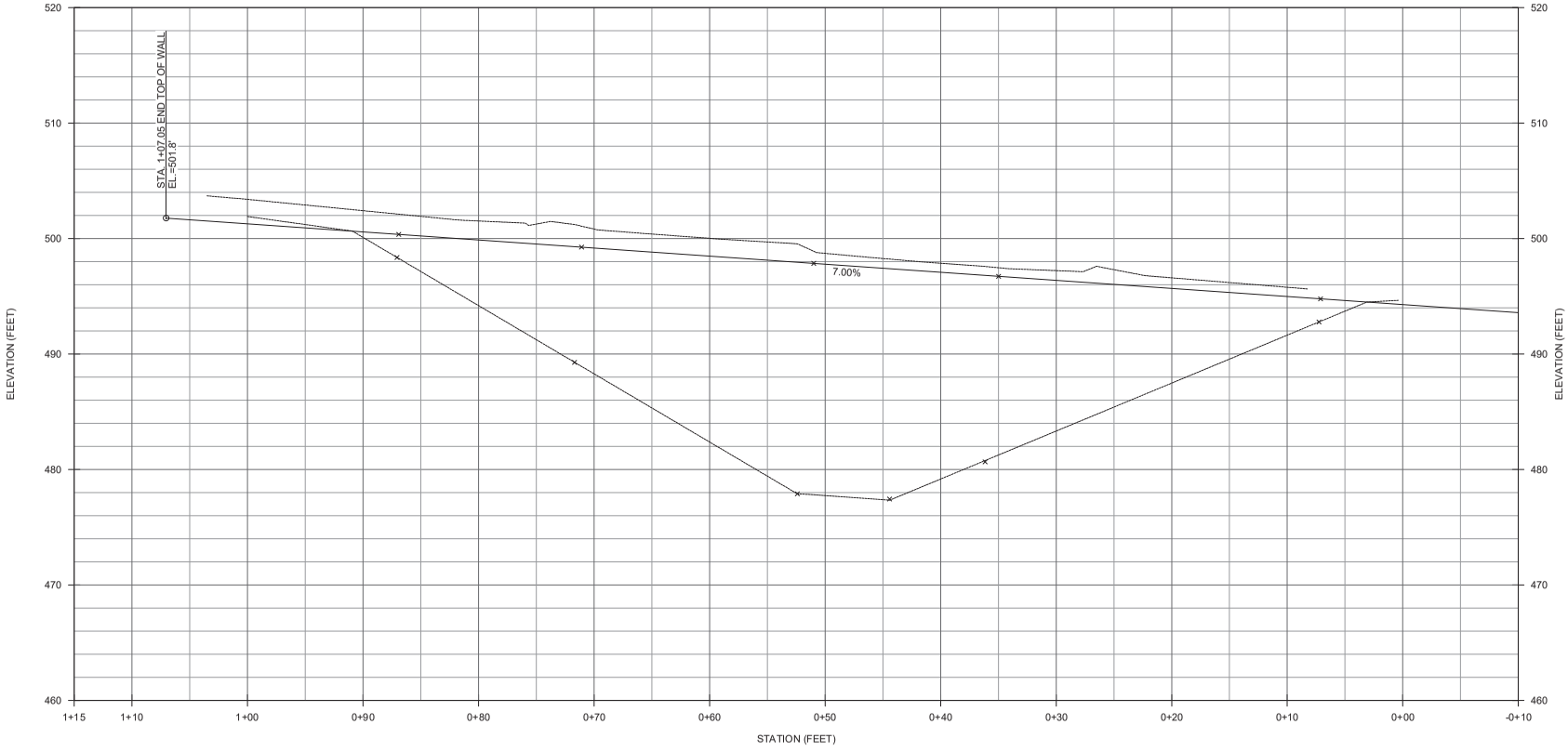

TOP OF WALL PROFILE

USDA FOREST SERVICE

United States Department of Agriculture
Forest Service

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PACIFIC NORTHWEST REGION

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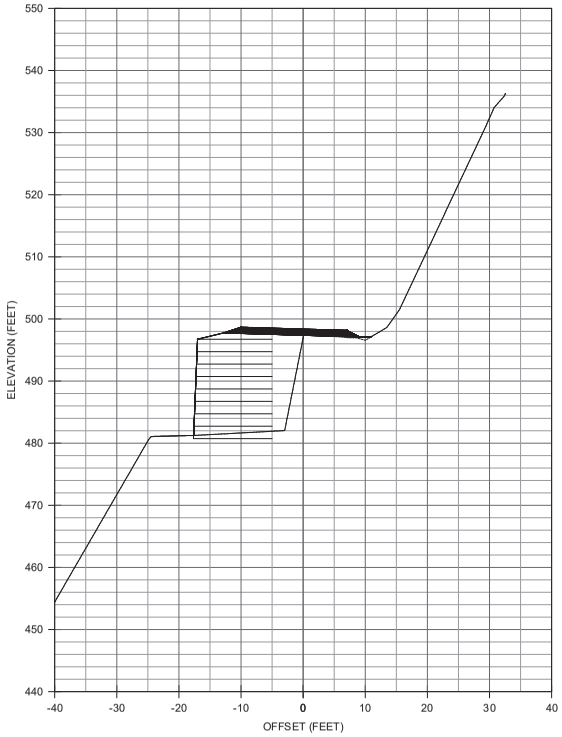
DRAWING TITLE

PROFILE
TOP OF WALL

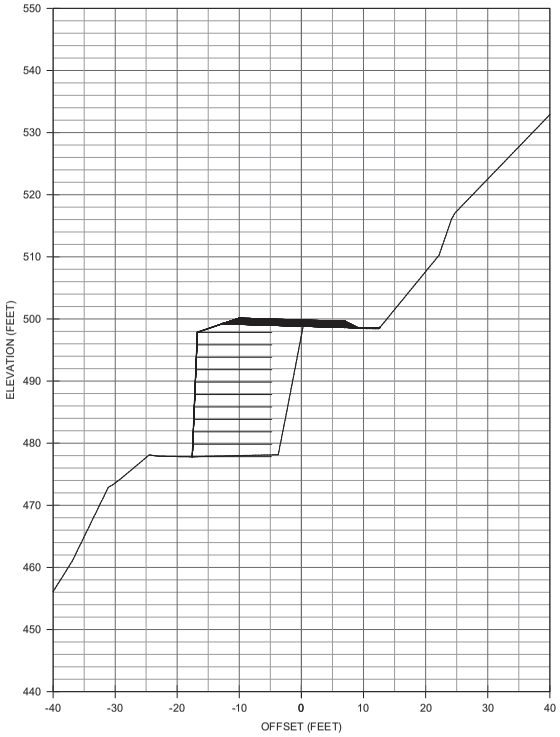
DATE: 11/10/2021	ARCHIVE NO.
DESIGNER: C. SMITH	DRAWING SHEET NO.
DRAWN: C. SMITH	**T-05**
CHECKED: P. PODESTA	
PROJECT NO.	SHEET 5 OF 7

11/10/21 14:25 COLTONSMITH C:\USERS\COLTONSMITH\DESKTOP\SURVEY\5502\5502 ROAD RECONSTRUCTION 9-17-21.DWG;

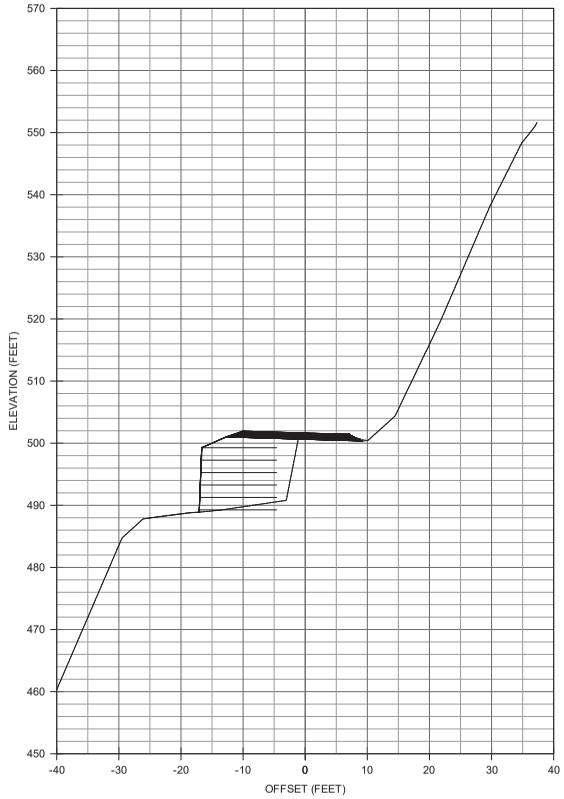
2+05.68



2+28.08



2+55.73



11/10/21 14:25 COLTONSMITH C:\USERS\COLTONSMITH\DESKTOP\SURVEY\5502\5502 ROAD RECONSTRUCTION 9-17-21.DWG;

United States Department of Agriculture
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ROGUE RIVER- SISKIYOU NATIONAL FOREST

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DRAWING TITLE

CROSS-SECTIONS AT BENDS

DATE: 11/10/2021	ARCHIVE NO.
DESIGNER: C. SMITH	DRAWING SHEET NO.
DRAWN: C. SMITH	**T-06**
CHECKED: P. PODESTA	
PROJECT NO.	SHEET 6 OF 7

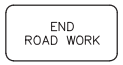
R11–2
48" X 30"

LW21–15
48" X 48" MIN.

W3–4
48" X 48" MIN.

W20–1
48" X 48" MIN.

W23–1
48" X 24" MIN.



G20–2
36" X 18" MIN.

W20–2d
36" X 36" MIN.

W20–2
36" X 36" MIN.

M4–10
48" X 18"
RIGHT or LEFT

R1–1

W21–1a
48" x 48" MIN.

W21–7
48" X 48" MIN.

W8–8
30" X 30" MIN.

W5–3
36" X 36" MIN.

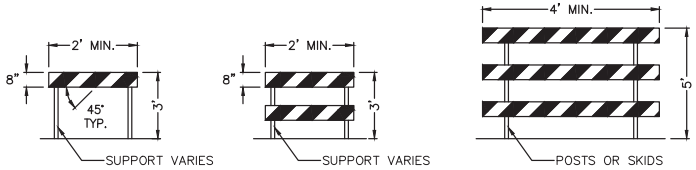
W8–6
30" X 30" MIN.

W8–7
30" X 30" MIN.

W21–2
30" X 30" MIN.

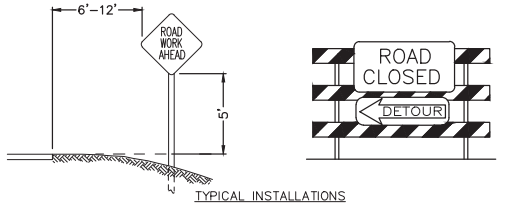
NOTES:

1. ALL TRAFFIC CONTROL DEVICES SHALL BE CONSTRUCTED, LOCATED, INSTALLED, AND MAINTAINED ACCORDING TO THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS" (MUTCD) LATEST EDITION.
2. SIGNS SHALL BE MADE FROM SUITABLE MATERIALS WHICH ARE IN ACCORDANCE WITH ALL STATE AND FEDERAL SPECIFICATIONS.
3. ALL WARNING SIGNS SHALL BE BLACK LEGEND WITH ORANGE TYPE III, VII, VIII, IX RETROREFLECTIVE BACKGROUND SHEETING..
4. SIGN SUBSTRATE MAY BE WOOD, METAL, POLYPLATE, FABRIC OR MATERIAL APPROVED BY THE CONTRACTING OFFICER.
5. SIGNS SHALL BE LOCATED WHERE THEY WILL BE CONSPICUOUSLY VISIBLE DAY AND NIGHT ALONG THE RIGHT HAND SIDE OF APPROACHING TRAFFIC.
6. WHEN A SIGN IS REQUIRED FOR AN EXTENDED PERIOD, IT SHALL BE FASTENED TO 4 X 4 POSTS WITH 2–3/8" CARRIAGE BOLTS. PORTABLE SUPPORTS ARE PERMITTED FOR SHORT PERIODS PROVIDED THE CONSTRUCTION IS SUCH THAT WIND OR OTHER AGENTS CANNOT READILY UPSET THE SIGN.
7. SIGNS WARNING OF CONSTRUCTION SHALL BE PLACED ON ALL MAJOR INTERSECTIONS ACCESSING THE WORK AREA.
8. SELECTION AND PLACEMENT OF ALL SIGNS SHALL BE SUBJECT TO APPROVAL OF THE CONTRACTING OFFICER. SIGNS OTHER THAN THOSE PICTURED MAY BE USED PROVIDED THEY ARE IN CONFORMANCE WITH MUTCD STANDARDS AND APPROVED IN WRITING BY THE CONTRACTING OFFICER.
9. IF REQUIRED BY THE CONTRACTING OFFICER, LIGHTING DEVICES SUCH AS FLASHERS, TORCHES, LANTERNS AND ELECTRIC LIGHTS SHALL BE PLACED AND MAINTAINED FROM SUNSET TO SUNRISE AT ALL POINTS OF HAZARD AND AT ALL SIGNS INDICATING CAUTION.
10. ADDITIONAL SIGNS MAY BE REQUIRED AS DIRECTED BY THE CONTRACTING OFFICER.
11. ALL SIGNS ARE TEMPORARY. ALL TEMPORARY SIGNS SHALL BE REMOVED WITHIN TWO WEEKS OF FINAL ACCEPTANCE.
12. TYPE III BARRICADES SHALL BE PLACED ON EITHER SIDE OF UNCOMPLETED CONSTRUCTION SITES WHEN NO CONSTRUCTION ACTIVITIES ARE IN PROGRESS AS APPROVED BY THE CONTRACTING OFFICER.



NOTE: STRIPES ARE 6" WIDE, ALTERNATING ORANGE AND WHITE

TYPE I BARRICADE | TYPE II BARRICADE | TYPE III BARRICADE



TYPICAL INSTALLATIONS

DRAWINGS
NOT TO SCALE

USDA FOREST SERVICE

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PACIFIC NORTHWEST REGION

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PROJECT NAME

**FSR 5502
NORTH LOBSTER
TIMBER SALE**

**ROGUE RIVER- SISKIYOU
NATIONAL FOREST**

POWERS DISTRCIT

DRAWING TITLE

**TRAFFIC CONTROL
DETAIL**

DATE 11/10/2021	ARCHIVE NO.
DESIGNER C. SMITH	DRAWING SHEET NO. T-07
DRAWN C. SMITH	
CHECKED P. PODESTA	
PROJECT NO.	SHEET 7 OF 7

11/10/21 14:25 COLTONSMITH C:\USERS\COLTONSMITH\DESKTOP\SURVEY\5502\5502 ROAD RECONSTRUCTION 9-17-21.DWG;

Road 5502 Retaining Wall Foundation Investigation

Forest Development Road (FDR) 5502, Mile Post 9.17

Siskiyou National Forest

Curry County, Oregon

(Legal: T34S, R13S, Section 6, NE Quarter – Coordinates: 42.66653,-124.28401)

By Peter W. Bolander

October 25th, 2021

(Proposed Retaining Wall Site looking north)

General

The Road 5502 Retaining Wall Foundation Investigation covers the foundation conditions you can expect at the proposed retaining wall site on Forest Development Road 5502 at Mile Post 9.17 (0.75 miles east of FDR 5502/5544 junction). The retaining wall site is location in the Siskiyou National Forest, see Figure 1 and 2.

Setting

The proposed retaining wall site, at an elevation of approximately 2400 feet, is on a gravel surfaced single-lane road which traverses mid-slope but is close to the top of the hill (approximately 200 feet vertical to top of the hill). The objective and operational maintenance level for this section of road are both a Level 3. Natural slopes at the site are very close to 100 percent and the easterly facing slope drains into a tributary of Panther Creek. The cut slope in the vicinity of the retaining wall site is bedrock (marine sedimentary rock – Elk Subterrane Formation). The road construction method appears to be cut and fill with the fill slope material a mix of native soil and excavated rock from the cut. The need for the retaining wall stems from the failure of the fill slope reducing the road width and imposing a potential safety concern with a narrow road and vertical outside edge of road.

Observations

On May 12th and 14th, 2021 a subsurface investigation of the site was performed with you and Tim Merten. Various photographs were taken, the general topography and surface conditions noted, various points surveyed, and exposed bedrock locations noted as well.

Photos – Select photos are attached in Appendix A.

Slope Failure – The slope failure's scarp is at the edge of the current road (see cover photograph) and deposits from the slope failure can be observed about 150-feet slope distance downhill. It appears that the cause of failure is due to a sequence of events. First the cut slope failed and blocked the ditch. Water up-road in the ditch was then blocked and consequentially crossed the road. This water then saturated and eroded the fill slope. This ultimately lead to the fill slope failing. From looking at past Google Earth air photos it appears the likely time of the fill slope failure was somewhere between 2005 and 2013.

Survey – Various points were surveyed during our site visit to compliment the survey performed by your team in early spring 2021. It was noted during the analysis that there was a limited number of points included in your survey so the AutoCAD used to determine the preliminary wall location with the "existing ground" might not truly represent actual ground conditions. Table 1 lists the points we surveyed and pertinent information for each of those survey points.

Surface and Subsurface Materials – Generally two soil types and one rock type were encountered at the site. Soil Unit A (a silty gravel, GM) is the surface soil, Soil Unit F (a silty gravel, GM) is the sidecast fill slope material, and Rock Unit 10 (BBE/CB) is the in-place bedrock. Details of all encountered soil and rock units can be found in Appendix B.

Figure 3 shows a sematic of the subsurface conditions.

Preliminary Wall Location

The following assumptions were used in determining the wall location:

1 – a wall geometry as shown in Figure 4 using 2-foot by 8-foot welded wire "panels"

2 – locating foundation of wall completely on Rock Unit 10 in that Soil Unit A and F are very loose and are not considered sufficiently competent to hold the weight of the wall or to prevent overturning of the wall
3 – placing a 5-foot minimum bench in front of the toe of the wall (need 3-feet for the 2-foot high berm, placed at 1.5H to 1V, at the toe and an additional 2-feet to account for inaccurate survey and sloughing of the slope in front of the wall)

Preliminary Wall Location - Discussion

Road Structure Dimensions – A horizontal road alignment was determined by members of your staff (Steven Weisner and Colton Smith) and resulted in a horizontal curve in the wall area with a radius of 60-feet and a Central/Delta angle of 49 degrees.

Using the above horizontal alignment according to Forest Service Handbook (FSH) 7709.56, Chapter 42.45 (Curve Widening) for the design vehicle (log truck) an additional 4.8-feet would be necessary for the log-truck to stay within the roadway beyond the standard travel way. Using a standard travel way with of 12-feet (travel speeds less than 20 Miles per Hour) the total road way would need to be 16.8-feet, so rounded up to 17-feet. Checking the additional curve width beyond the standard travel way for a low boy (the critical vehicle) an additional 9-feet would be necessary for the lowboy to stay within the roadbed so a roadbed of at least 22-feet would be required. Note we have planned a 17-feet travel way plus 2-feet aggregate taper on the cut side and 3-feet of aggregate taper on the wall side for a total road bed width of 22-feet and a minimum toe to cut to top of wall distance of 26-feet, see Figure 4.

Based on my observations, prior to failure, the critical section was 23-feet from the bottom of cut to hinge point of the fill.

The final wall layout has the following:

1 – a 12-foot travel way with an additional 5-feet for curve widening for a total travel way/roadway width of 17-feet
2 – a 2-foot wide inside shoulder of aggregate (2H to 1V) and a 3-foot wide outside shoulder of aggregate (3H to 1V) so a total road bed width of 22-feet
3 – an in-slope of 3 percent
4 – a distance from the bottom of the cut to the top of the wall of 27-feet (increased from above to meet the wall foundation conditions described below).

Wall Foundation – To determine the location of Rock Unit 10 below the existing ground surface Rock Unit 10 "rock lines" were projected from known Rock Unit 10 points above and below the road. The projected Rock Unit 10 lines used are as follows:

Perpendicular to the slope along the center of the failed slope (aka the "critical section")

1 – Projected a rock line from Survey Point B to Survey Point "Bottom Rock Chute" down to below the failure, approximate angle of 45 degrees
2 – Projected a rock line from Survey Point E to Survey Point G, approximate angle of 38 degrees
3 – Projected a rock line from Survey Point G to Survey Point "Bottom Rock Chute" approximate angle of 40 degrees

Perpendicular to the slope approximately 10-feet north of the edge of failure

1 – Projected a rock line from Survey Point A to Survey Point F, approximate angle of 58 degrees
2 – Projected a rock line from Survey Point A to Survey Point G, approximate angle of 50 degrees

Perpendicular to the slope approximately 30-feet south of the edge of failure

1 – Projected a rock line from Survey Point C to Survey Point F, approximate angle of 50 degrees

2 – Projected a rock line from Survey Point C to Survey Point G, approximate angle of 43 degrees

Figure 3 shows the expected rock line along the critical section.

Wall Height – The wall geometry was transposed onto the critical section and the toe of the inside aggregate slope adjusted to match the toe of the cut up and down road of the failure. Then using the above noted assumptions it was found that a 20-foot high wall would be needed to meet the above road geometry and toe bench requirements. At the critical section the toe bench in front of the wall would be approximately 5-feet. Note due to the limited number of survey points and the discrepancy between our and the Forest Service team survey points this distance might be a low as 3-feet, thus the importance of ensuring a complete survey by the designer of the wall and a verification by you that an adequate bench in front of the wall is provided.

Wall Length – End points of wall chosen by transitioning the wall up every half panel and bending the wall as needed to closely match the centerline of the road and provide a minimum 4-foot horizontal distance from the outside edge of the road bed to the top of the wall. Note the panels for each lift are stagger to provide an integral wall face. Bending of the panels would be accomplished by cutting the reinforcement layer and bending the wall layer (see *Hilfiker Welded Wire M.S.E. Retaining Walls – Construction Guide*, page 6.)

Nominal Bearing Capacity – With the retaining wall completely founded on Rock Unit 10 (competent foundation material) the lengths of the welded wires reinforcement lengths can be adjusted using the trapezoidal wall geometry as recommended by the *LRFD Bridge Design Specifications*. Using this trapezoidal wall geometry for external stability the minimum base length, L_o, would be 15.4-feet (0.70 * the height of the wall so 0.70 * [20-feet + 2-feet] as recommended by *LRFD Bridge Design Specifications*). The nominal bearing resistance of the foundation, based on bearing capacity of a continuous footing at the top of the slope, would be 40,000 pounds per square foot (psf). Note the design should still perform a slope stability analysis checking both global and compound failure planes using the final L_o as recommended by *LRFD Bridge Design Specifications*. Appendix C provides the foundation design calculations for the above recommendation.

Description of Foundation Conditions at Base of Retaining Wall – The retaining wall should be completely set on Rock Unit 10. Rock Unit 10 is gray competent rock with no open planes of separation greater than 1 mm (1/32-inch) and dents to pits when struck with a ball-peen hammer; note the rock may also break into smaller pieces when struck by the ball-peen hammer but the pieces should not disintegrate when soaked in water.

Preliminary Recommendations

Figure 5 shows the recommended wall layout with the wall location and heights shown in Table 2.

It is recommended when designing the wall to:

1 – perform an adequate survey capturing the ground on the downhill hill of the road

2 – adjust length of reinforcement layers according to the *LRFD AASHTO Bridge Design Specifications* (Trapezoidal Walls) since the wall is founded on competent rock

3 – when excavating in rock cost the excavation using an impact hammer

4 – place a cross-drain culvert approximately 120 to 140-feet up road from the wall site

5 – since there isn't a ditch along the inside edge of the roadway provide a drainage system behind the wall and exit it in a location that will not erode the toe of the wall

6 – place a 4-inch minimum depth leveling course under the bottom of the entire first reinforcing mat since the wall will be mostly on rock (see subsection 208.08(a))

7 – in lieu of guardrail place frequent flexible delineators along the outside edge of the roadbed to direct traffic away from the top of the wall

Disclaimer

The above recommendations are based on what was observed on the surface and extrapolating bedrock based on surface observations. Subsurface conditions naturally vary. If different subsurface conditions are observed during construction then the above recommendations may not be correct and the recommendations should be reconsidered.

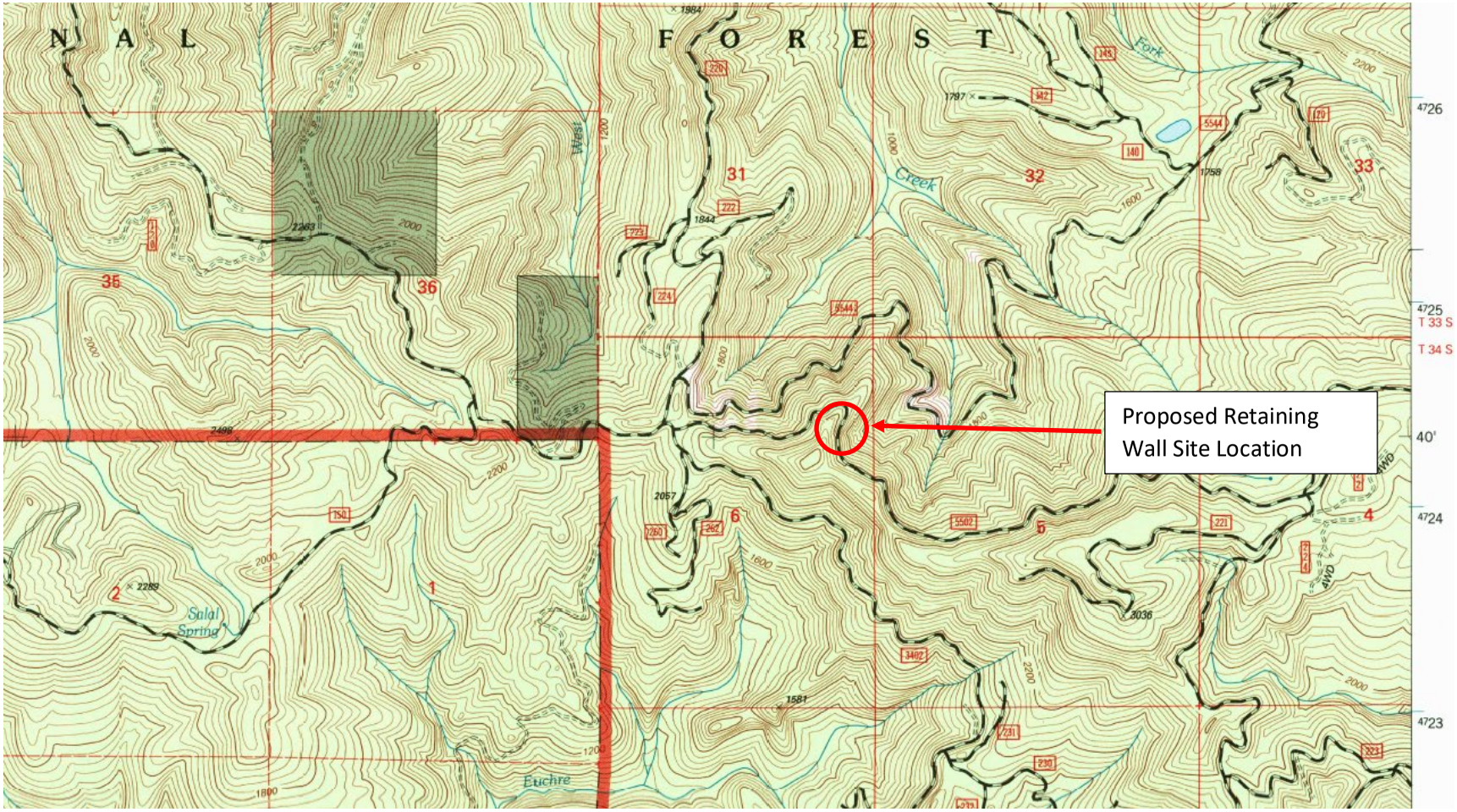


Figure One – Proposed Retaining Wall Location (source: USGS 1996 Topographic Map, Father Mountain Quad)

Figure Two – Proposed Retaining Wall Location (source: Google Maps)

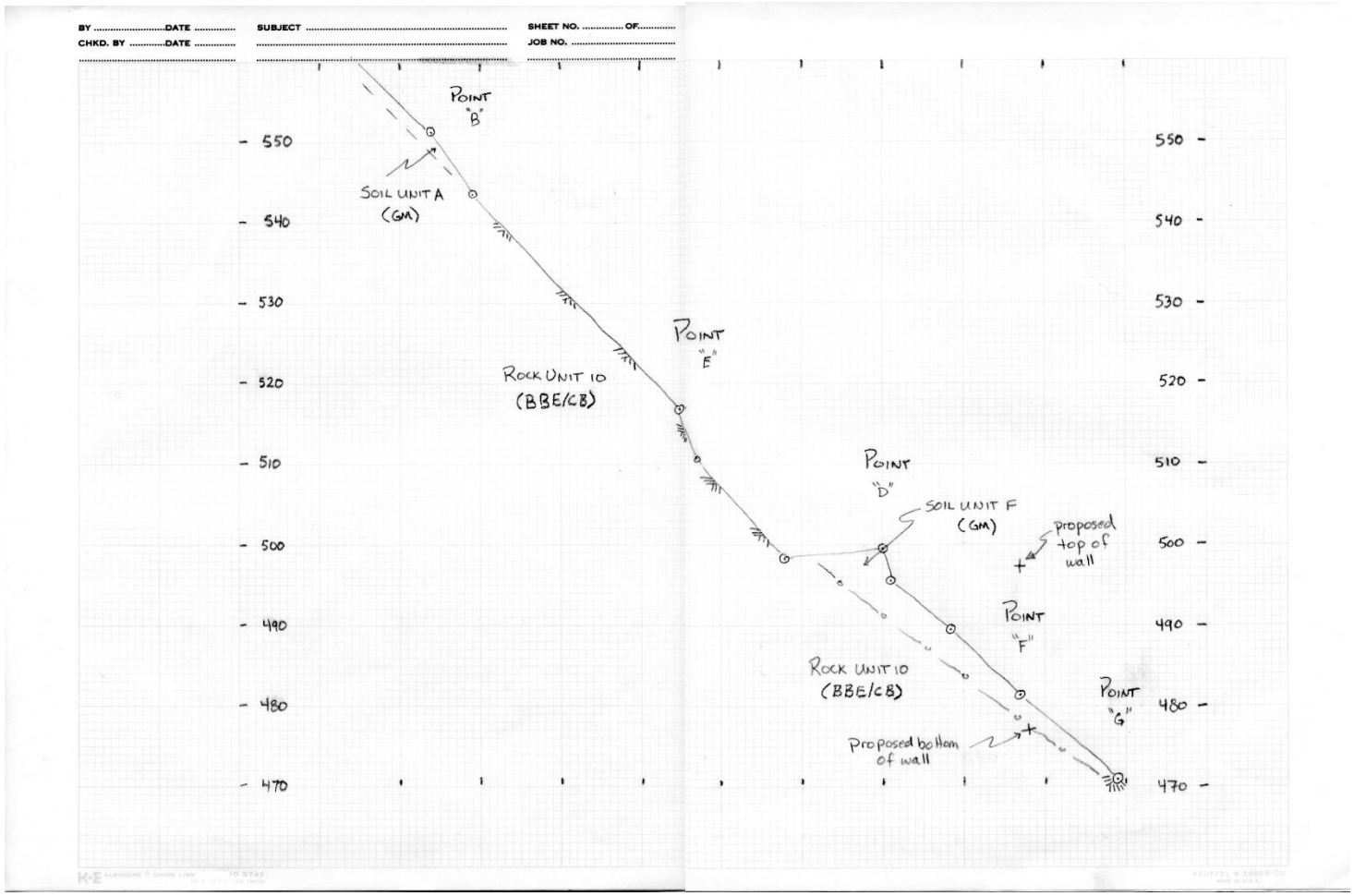


Figure Three – Profile At Critical Section

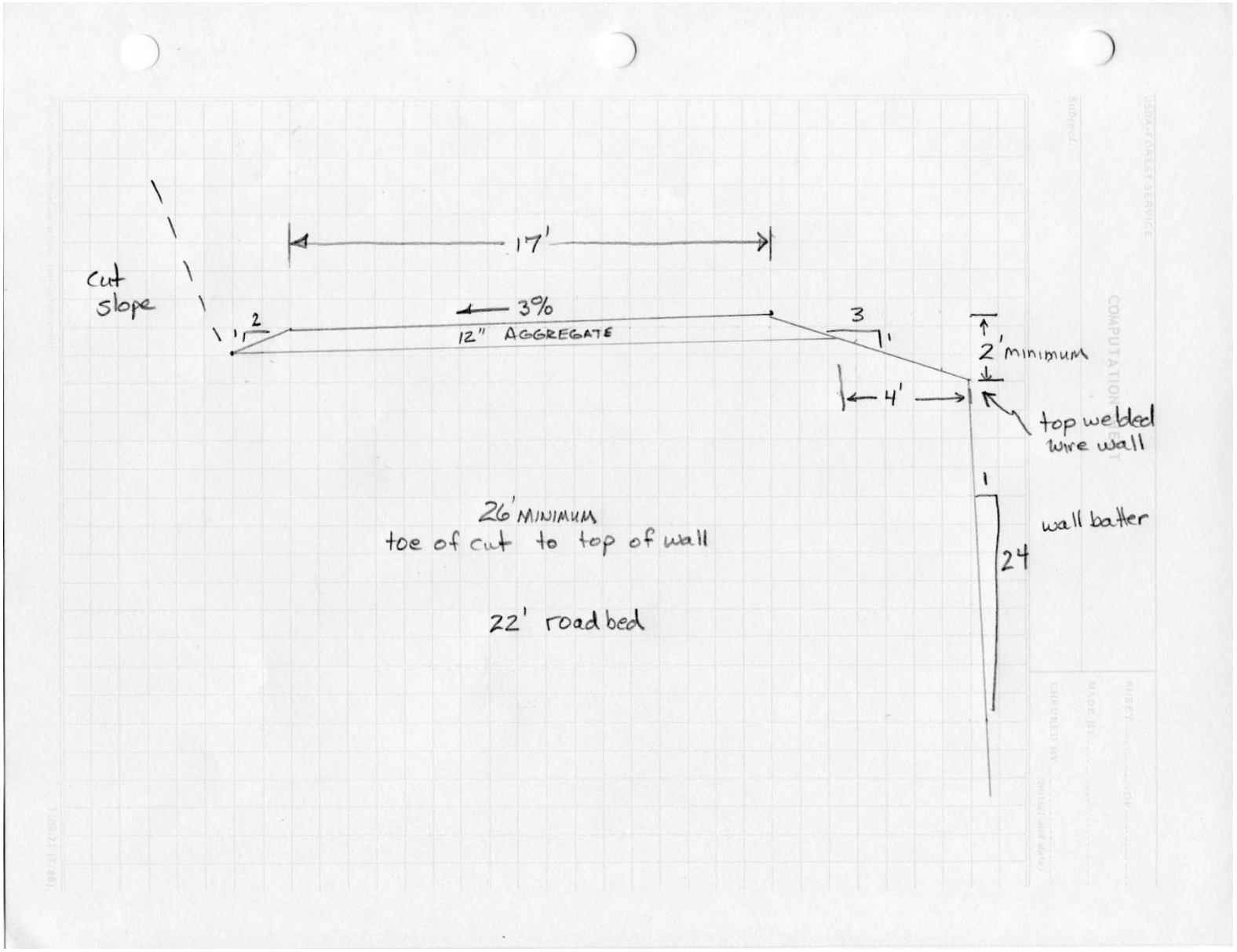


Figure Four – Proposed Wall Geometry

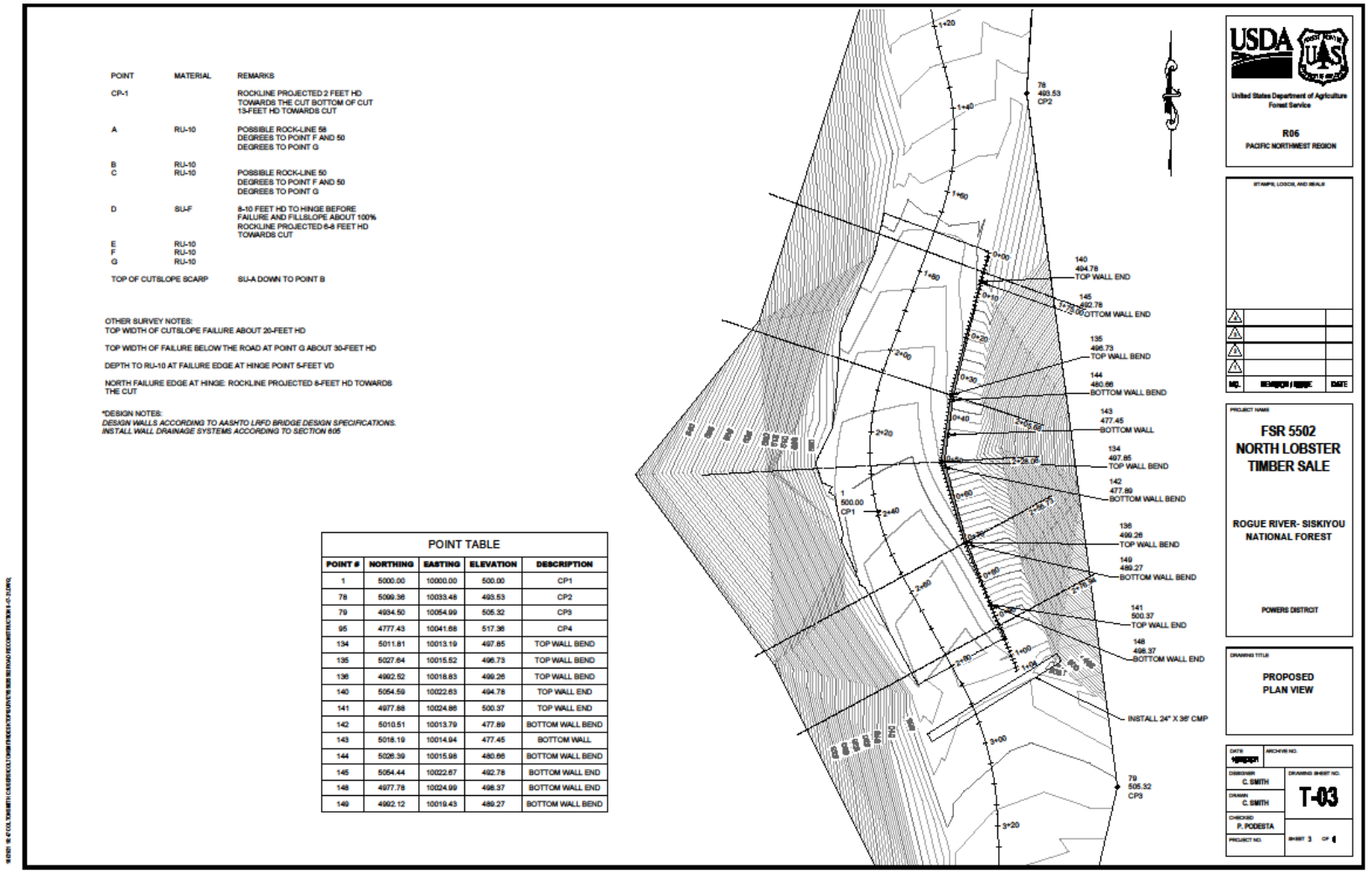


Figure Five – Recommended Wall Layout

Table One – Survey Points and Description (survey performed by cloth tape. Clinometer, and Brunton on May 12th and 14th, 2021)

From Point Name	From Point Elev	To Point Name	SD, ft	Angle, ^{0}	HD, ft	VD, ft	To Point Elev	Azmith, 20^o east declination	Remarks
CP-1	500	CP-2	105	-3	105	-5.5	494.5	16	from survey CP-2 Elev= 493.5
CP-1	500	CP-3	86	3	86	4.5	504.5	135	from survey CP-3 Elev= 505.3
CP-1	500	Est. North End Wall	36.5	1	36.5	0.6	500.6	14	
CP-1	500	Est. South End Wall	21.5	5	21.4	1.9	501.9	137	
CP-1	500	D	13	-3	13	-0.7	499.3	345	
D	499.3	bottom of cut	12	-5	12	-1	498.3	est 264	at Point D RW = 9.5'
CP-1	500	A	64.5	31	55	33.2	533.2	333	
Est. North End Wall	500.6	A	53	41	40	34.8	535.4	284	
CP-1	500	B	68	39	53	42.8	542.8	282	
D	499.3	B	67	41	51	44	543.3	266	
B	543.3	Top of Cutslope Scarp	---	---	5	8	551.3	est 264	slope above top of cutslope scarp about 90%
Est. South End Wall	501.9	C	68	47	46	49.7	551.6	243	
D	499.3	E	26	26	23	11.4	510.7	264	
E	510.7	bottom rock chute	---	---	2	6	516.7	est 264	chute above point at 45^0
D	499.3	F	25	-46	17	-18	481.3	85	
D	499.3	G	41	-44	29	-28.5	470.8	85	
D	499.3	est. CL wall	13	-49	8.5	-9.8	489.5	85	
D	499.3	bottom road scarp	---	---	0	-4	495.3	85	
CP-1	500	top culvert inlet	52	-5	52	-4.5	495.5	350	
CP-1	500	top culvert outlet	65	-9	64	-10.2	489.8	25	

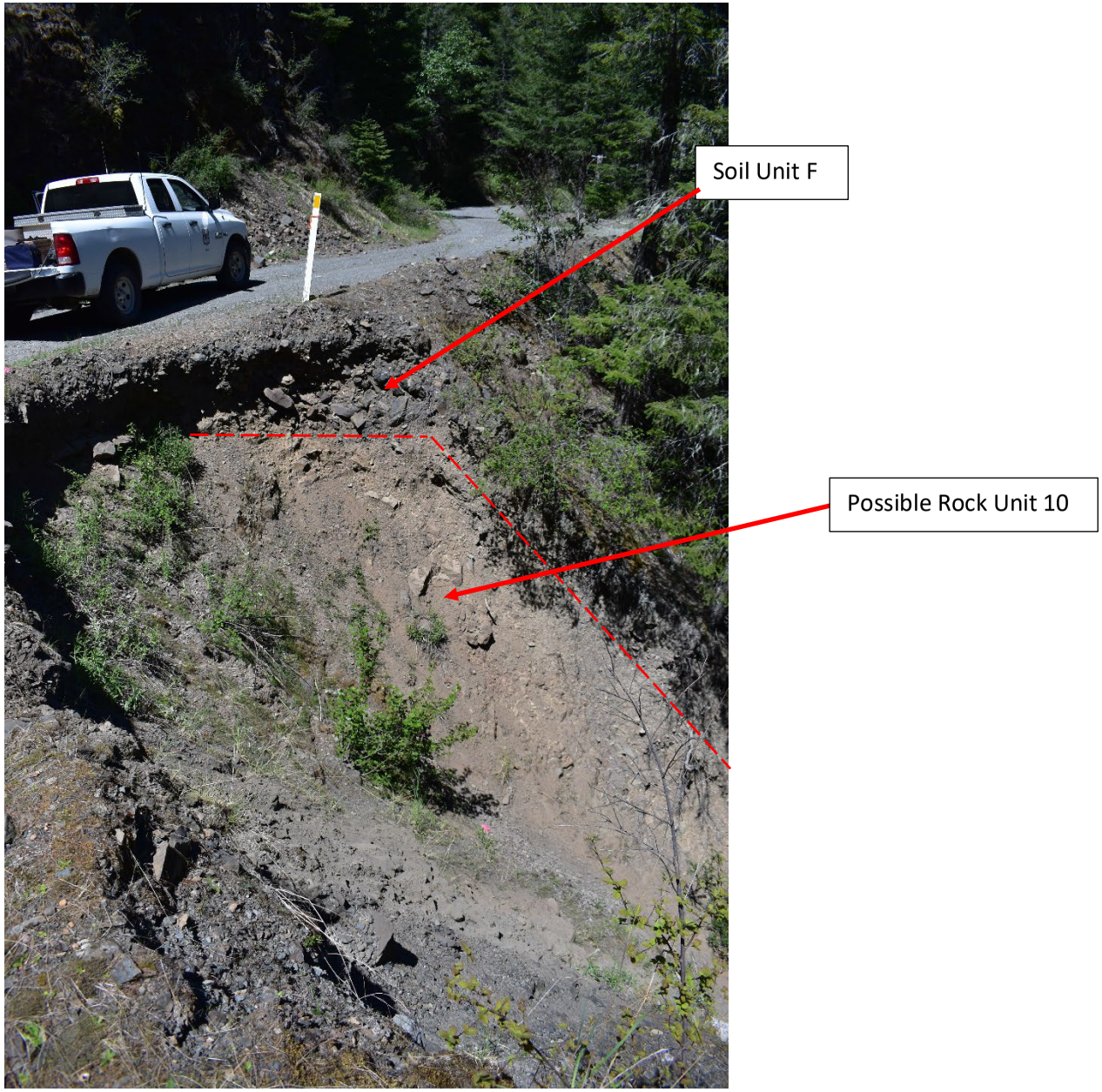
Point	Material	Remarks
CP-1		rockline projected 2-feet HD towards the cutbottom of cut 13-feet HD towards the cut
A	on RU-10	Possible rock-line 58^0 to Point F and 50^0 to Point G
B	on RU-10	top of rock chute and bottom of cutslope scarp
C	on RU-10	Possible rock-line 50^0 to Point F and 43^0 to Point G
D	SU-F to Bottom Road Scarp	about 8 to 10-feet HD to hinge before failure and fillslope was about 100%; rockline projected 6 to 8-feet HD towards the cut
E	on RU-10	
F	possibly on RU-10	
G	on RU-10	
Top of Cutslope Scarp	SU-A down to Point B	

Other survey notes
Top width of cutslope failure about 20-feet HD
Top width of failure below the road at point G about 30-feet HD
Depth to RU-10 at failure edge at hinge point about 5-feet VD
north failure edge at hinge: rockline projected 8-feet HD towards the cut

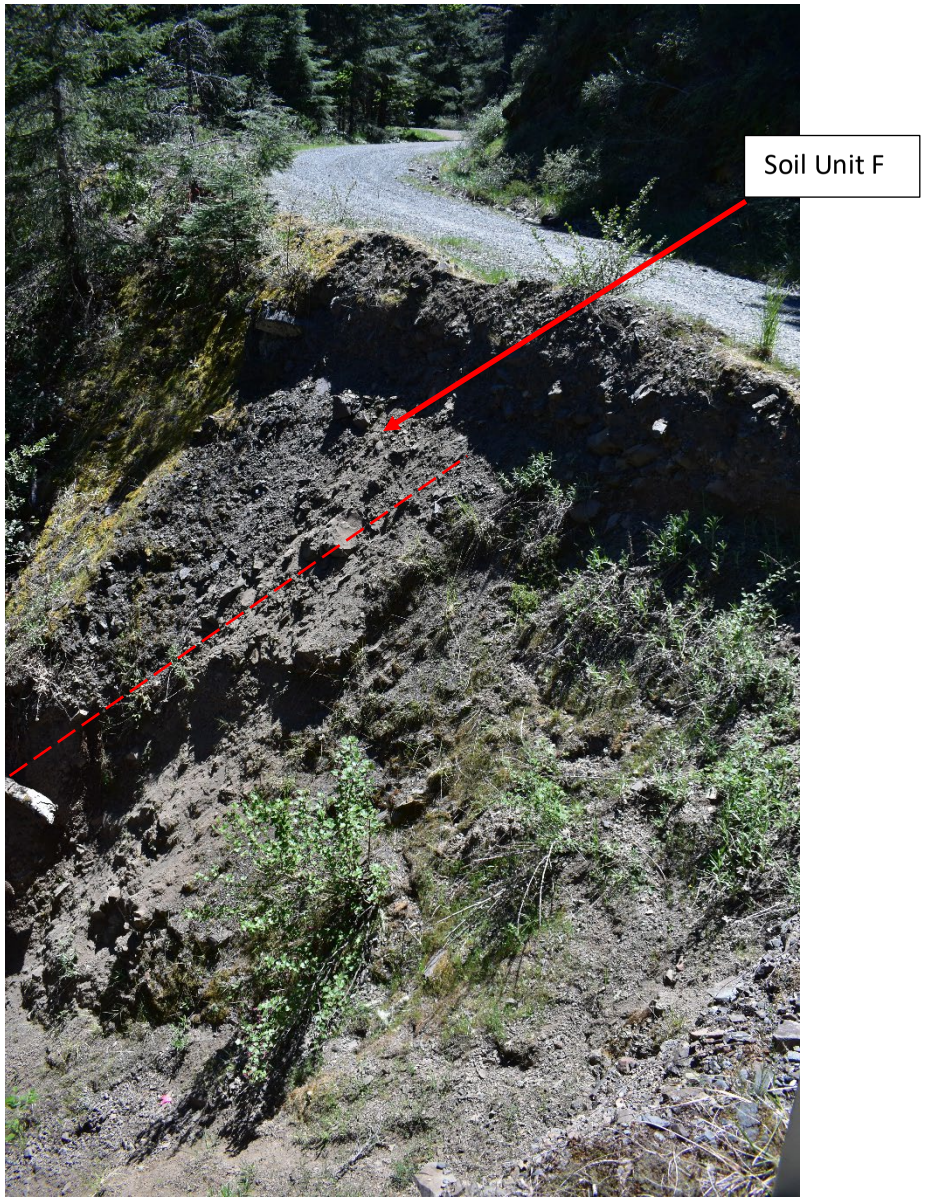
Table Two – Coordinates of Control Points and Key Top/Bottom of Wall Locations

	Top of Wall			Bottom of Wall		
Point	**Northing**	**Easting**	**Elevation**	**Northing**	**Easting**	**Elevation**
CP-1	5,000.00	10,000.00	500.00	---	---	---
CP-2	5099.36	10033.48	493.53	---	---	---
CP-3	4934.50	10054.99	505.32	---	---	---
Start of Top of Wall (Wall Station 0+07)	5054.59	10022.63	494.78	5054.44	10022.67	492.78
Bend in Wall (Wall Station 0+35; wall height - 16-feet)	5027.64	10015.52	496.73	5026.39	10015.98	480.66
Bend in Wall (Wall Station 0+51; wall height = 20-feet)	5011.81	10013.19	497.85	5010.51	10013.79	477.45
Bend in Wall (Wall Station 0+71; wall height = 10-feet)	4992.52	10018.83	499.26	4992.12	10019.43	489.27
End of Wall (Wall Station 0+87)	4977.88	10024.86	500.37	4977.78	10024.99	498.37

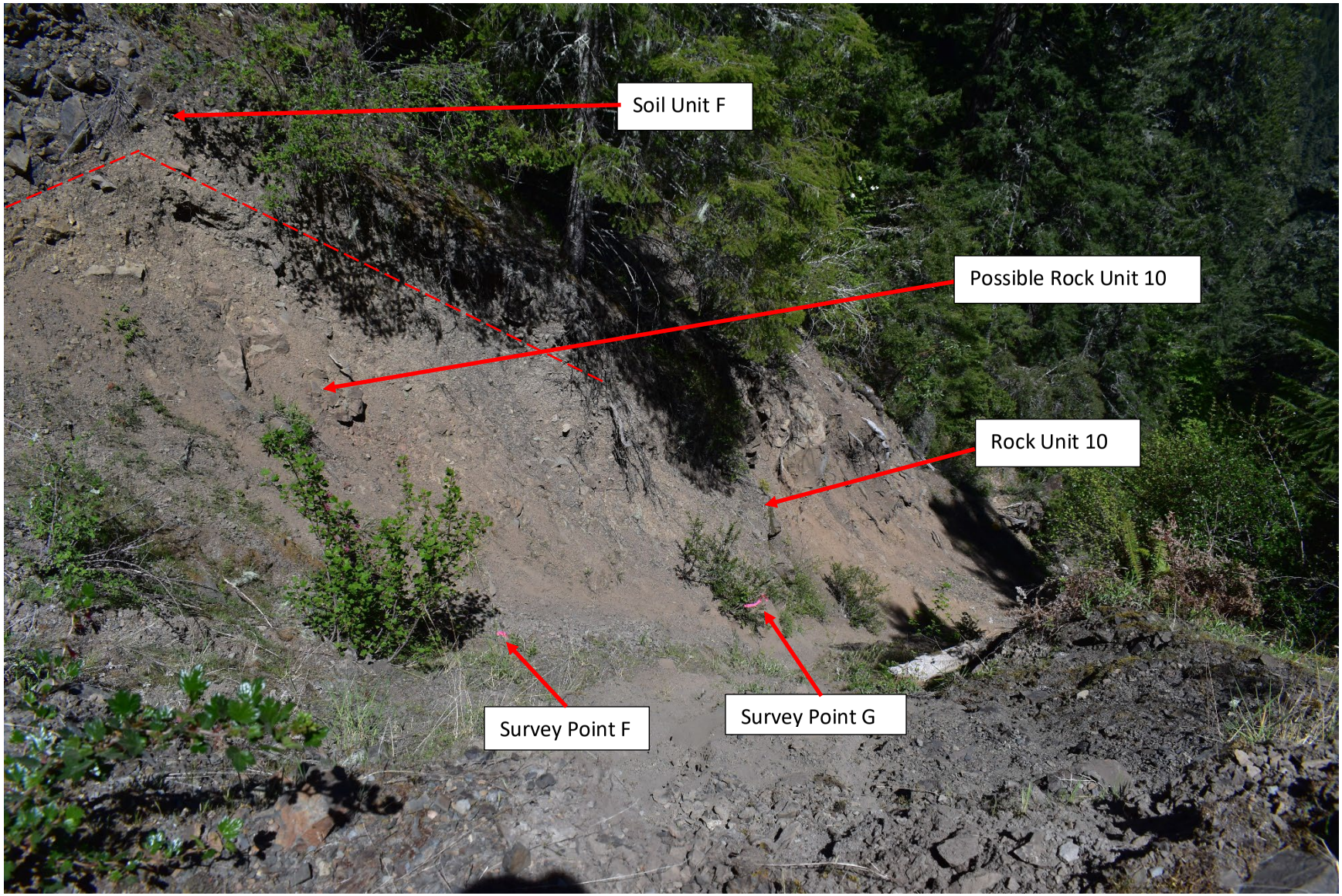
Appendix A – Photos (May 12th and 14th, 2021)



Looking north at proposed retaining wall site



Looking south at proposed retaining wall site



Looking northeast, down from road surface

Looking north at cut slope just north of fill slope failure

Looking west at cut slope directly above fill slope failure along critical section (depression made by failure of cut slope prior to fill slope failure)

Appendix B – Soil and Rock Unit Description

Soil Unit A

Location: Native soil above the native bedrock material
Description: dry, loose, brown-gray, GM, typical max size 4 to 18-inches
Estimated Properties: Not determined

Soil Unit F

Location: Found as sidecast/excavated material in the fill material
Description: dry, loose, brown-gray, GM, typical max size 8 to 12-inches
Estimated Properties: Not determined

Rock Unit 10

Location: Found under the surface above the top of the cut, in the face of the cut slope, and at the toe of the fill slope within the fill slope failure
Description:

- Weathering: Visually fresh state but on planes of separation stained state
- Strength: Visually fresh state is likely pit quality (8,000 to 15,000 psi unconfined strength) and stained state is likely dent quality (3,000 to 8,000 psi unconfined strength); difficult to determine reaction to hammer since the rock breaks easily along the latent planes of separation; for bearing capacity assume an unconfined compressive strength of 3000 psi
- Discontinuities: 3-D planes of separation to latent planes of separation, 2-inch to 2-foot planes of separation
- Unit Weight: estimated to be between 140 to 160 pcf; for bearing capacity assume 150 pcf
- Unified Rock Classification: BBE/CB
- Drill Core Quality: unknown since not drilled; for bearing capacity assume 50%
- Condition of Discontinuities: as noted above stained state along planes of separation and slightly rough to rough surfaces with < 1mm in separation
- Orientation of Discontinuities: estimated to be horizontal

Estimated Properties: the Rock Mass Rating System (RMR) would have a rating bewteen 62 and 75 which equates to a cohesion of the rock mass of 7500 psf and a friction angle of 42 degrees (from Bieniawski, 1989 and Bhawani and Goel, 2011)
Nominal Bearing Resistance: Using NAVFAC DM 7.2, Chapter 4 assume a continuous footing at the top of slope, b = 3-feet, B = 15.4-feet D= 0-feet, H> B, dry unit weight = 150 pcf, angle of internal friction (phi), degrees = 42, apparent cohesion = 7500 psf the ultimate bearing capacity (nominal bearing resistance) would then be 40,000 psf

Appendix C – Design Calculations

10/24/2021
PWB

Road 5502 Retaining Wall Foundation
- Estimate of Rock Unit 10 Geomechanics Classification

- based on Bieniawski (1976) 1989 ⇒ Rock Mass Rating (RMR) System
- six parameters
  1) uniaxial compressive strength of rock material
  2) Rock Quality Designation (RQD)
  3) Spacing of discontinuities
  4) condition of discontinuities
  5) ground water conditions
  6) orientation of discontinuities
- use attached Table 4 which gives rating for each designation; ratings are summed to obtain RMR
- Uniaxial compressive strength of rock material
  - from reaction to ball peen hammer

    VFS pit quality ⇒ 8,000 to 15,000 psi 55 to 103 MPa
    STS dent quality ⇒ 3000 to 8,000 psi 21 to 55 MPa

    for VFS rating = 7
    STS rating = 4

2/3
10/24/21
PWB

Estimate of RMR

- Rock Quality Designation (RQD)
  not drilled but a professional estimate of 50%
  rating = 13

- Spacing of discontinuities
  from cut 2" to 2'
  50 mm to 0.6m
  rating = 5 to 10

- Condition of discontinuities
  VFS to STS slightly rough to rough
  separation < 1mm
  rating = 25 to 30

- Ground water condition
  none so rating = 15

- Orientation of discontinuities
  most appear to be horizontal, assume very favorable
  so rating = 0

- Sum of ratings
  4 to 7 + 13 + 5 to 10 + 25 to 30 + 15 + 0 = 62 low
  = 75 high

3/3
10/24/21
PW13

Estimate of RMR

- shear strength parameters c & ϕ

from Table 4

RMR 62/75 $c = 300$ to $400 kPa = 6300$ to $8400 psf$

$\phi = 35$ to 45°

62 $\quad$ 75 $\Rightarrow 42^\circ$

(Eng Rock Mass Classification)

from Mehrotra, 1992 & Shear Strength of Rock Masses in Slopes by Bhawani & Goel in 2011 (Fig 16.1)

$\phi \doteq 50^\circ$ for RMR 60^+ } non-saturated

$c \doteq 400 kPa$ for RMR 60^+ } non-saturated

use $\phi = 42^\circ$ $\quad c = 7500 psf$ for foundation design

1/2
PWB
10/24/21

Road 5502 Retaining Wall Foundation
- Estimate of ultimate bearing capacity -

- based on NAVFAC DM 7.2 chapter 4, Sept 1986
- parameters

on slope $b = 3'$ $D = 0'$

$B = 15.4'$ $\frac{b}{B} \doteq 0.2$

$\beta = 45°$

$\gamma_{dry} = 150\ pcf$

$\phi = 42°$

$c = 7500\ psf$

continuous ftg at top of slope

$$q_{ult} = cN_c + \gamma D N_q + \frac{\gamma B}{2} N_\gamma \qquad \text{no GWT}$$

$$= 7500\ psf * N_c + 0 + \frac{150\ pcf * 15.4'}{2} * N_\gamma \qquad (D=0)$$

$$= 7500 N_c + 1155 N_\gamma$$

from Figure 4a of NAVFAC, $B \leq H$
&
4b

2/2
PWB
10/24/21

Estimate of Ultimate Bearing Capacity

$N_c \doteq 4$ w/ $N_0 = 0$

$N_\gamma \doteq 10$ used $\phi = 40°$ & $\beta = 40°$

$q_{ult} = 7500psf(4) + 1155(10)$
$= 41{,}550psf$
say $40{,}000psf$

Table 4: Rock Mass Rating System (After Bieniawski 1989).

A. CLASSIFICATION PARAMETERS AND THEIR RATINGS									
Parameter			Range of values						
1	Strength of intact rock material	Point-load strength index	>10 MPa	4 - 10 MPa	2 - 4 MPa	1 - 2 MPa	For this low range - uniaxial compressive test is preferred		
		Uniaxial comp. strength	>250 MPa	100 - 250 MPa	50 - 100 MPa	25 - 50 MPa	5 - 25 MPa	1 - 5 MPa	< 1 MPa
	Rating		15	12	7	4	2	1	0
2	Drill core Quality *RQD*		90% - 100%	75% - 90%	50% - 75%	25% - 50%	< 25%		
	Rating		20	17	13	8	3		
3	Spacing of		> 2 m	0.6 - 2 . m	200 - 600 mm	60 - 200 mm	< 60 mm		
	Rating		20	15	10	8	5		
4	Condition of discontinuities (See E)		Very rough surfaces Not continuous No separation Unweathered wall rock	Slightly rough surfaces Separation < 1 mm Slightly weathered walls	Slightly rough surfaces Separation < 1 mm Highly weathered walls	Slickensided surfaces or Gouge < 5 mm thick or Separation 1-5 mm Continuous	Soft gouge >5 mm thick or Separation > 5 mm Continuous		
	Rating		30	25	20	10	0		
5	Groundwater	Inflow per 10 m tunnel length (l/m)	None	< 10	10 - 25	25 - 125	> 125		
		(Joint water press)/ (Major principal σ)	0	< 0.1	0.1, - 0.2	0.2 - 0.5	> 0.5		
		General conditions	Completely dry	Damp	Wet	Dripping	Flowing		
	Rating		15	10	7	4	0		

B. RATING ADJUSTMENT FOR DISCONTINUITY ORIENTATIONS (See F)						
Strike and dip orientations		Very favourable	Favourable	Fair	Unfavourable	Very Unfavourable
Ratings	Tunnels & mines	0	-2	-5	-10	-12
	Foundations	0	-2	-7	-15	-25
	Slopes	0	-5	-25	-50	

C. ROCK MASS CLASSES DETERMINED FROM TOTAL RATINGS					
Rating	100 ← 81	80 ← 61	60 ← 41	40 ← 21	< 21
Class number	I	II	III	IV	V
Description	Very good rock	Good rock	Fair rock	Poor rock	Very poor rock

D. MEANING OF ROCK CLASSES					
Class number	I	II	III	IV	V
Average stand-up time	20 yrs for 15 m span	1 year for 10 m span	1 week for 5 m span	10 hrs for 2.5 m span	30 min for 1 m span
Cohesion of rock mass (kPa)	> 400	300 - 400	200 - 300	100 - 200	< 100
Friction angle of rock mass (deg)	> 45	35 - 45	25 - 35	15 - 25	< 15

E. GUIDELINES FOR CLASSIFICATION OF DISCONTINUITY conditions					
Discontinuity length (persistence) Rating	< 1 m 6	1 - 3 m 4	3 - 10 m 2	10 - 20 m 1	> 20 m 0
Separation (aperture) Rating	None 6	< 0.1 mm 5	0.1 - 1.0 mm 4	1 - 5 mm 1	> 5 mm 0
Roughness Rating	Very rough 6	Rough 5	Slightly rough 3	Smooth 1	Slickensided 0
Infilling (gouge) Rating	None 6	Hard filling < 5 mm 4	Hard filling > 5 mm 2	Soft filling < 5 mm 2	Soft filling > 5 mm 0
Weathering Ratings	Unweathered 6	Slightly weathered 5	Moderately weathered 3	Highly weathered 1	Decomposed 0

F. EFFECT OF DISCONTINUITY STRIKE AND DIP ORIENTATION IN TUNNELLING**			
Strike perpendicular to tunnel axis		Strike parallel to tunnel axis	
Drive with dip - Dip 45 - 90°	Drive with dip - Dip 20 - 45°	Dip 45 - 90°	Dip 20 - 45°
Very favourable	Favourable	Very unfavourable	Fair
Drive against dip - Dip 45-90°	Drive against dip - Dip 20-45°	Dip 0-20 - Irrespective of strike°	
Fair	Unfavourable	Fair	

* Some conditions are mutually exclusive . For example, if infilling is present, the roughness of the surface will be overshadowed by the influence of the gouge. In such cases use A.4 directly.

** Modified after Wickham et al (1972).