TECHNICAL MEMORANDUM

PRELIMINARY CONCEPT FOR SNOW DRIFT MANAGEMENT AT THE POLE CANYON NON-TIME-CRITICAL REMOVAL ACTION AT THE SMOKY CANYON MINE

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PREPARED BY:	Lily Vagelatos and Eric Weber, Formation Environmental L.L.C.
DATE:	August 21, 2020

This memorandum was prepared on behalf of the J.R. Simplot Company (Simplot) to describe the preliminary concept for installing a snow fences on the Pole Canyon Overburden Disposal Area (ODA) to reduce the formation of snow drifts and corresponding erosion of the Non-Time-Critical Removal Action (NTCRA) cover (Photos 1 and 2).

Erosion rills and cover damage have been observed on the eastern face of the ODA cover, with the deepest features occurring just downhill from the top slope transition (Photograph 1). This is the same area where blown snow accumulates throughout the winter months (Photograph 2). Simplot is seeking to reduce the accumulation of snow drifting on the east slope of the NTCRA to decrease the amount of snow melt and spring runoff occurring on the face of the pile.

PHOTOGRAPH 1: COVER RILLS AND EROSION FEATURES ON THE EAST SLOPE OF THE NTCRA - VIEW LOOKING TO THE NORTHWEST.

1 BACKGROUND

Snow drifts have a much greater snow water equivalent (SWE) than fallen snow and produce more moisture during snowmelt. This is because blown snow particles are broken down and reduced in size during transport, greatly increasing the density and corresponding SWE of the re-deposited snow (Tabler 2003).

During the winter months, winds in the area generally originate from the west and blow across the top of the pile. There is a runoff control channel around the relatively flat top area of the NTCRA at the transition to the 3:1 slope. As the wind blows over the slope transition the snow particles lose some of their energy,

and deposit as a drift at the top of the slope. Because the ODA is easterly facing, it receives a moderate amount of solar radiation, and in the spring the snow drift melts quickly enough to create high energy run off capable of transporting the finer grained Dinwoody material present in the cover. In addition, due to the snow drift placement at the top of the hill, runoff has over 500 feet to travel before being intercepted by the next runoff control feature (Figure 1).

PHOTOGRAPH 2: PHOTO OF THE SNOW DRIFT ON THE EAST SLOPE OF THE NTCRA PILE - VIEW LOOKING SOUTHEAST FROM THE TOP OF THE PILE.

2 CONCEPT

The proposed snow fencing placed on the top of the ODA is intended to intercept wind-blown snow from the west and control where it accumulates. The snow fence would be installed in an alignment

perpendicular to the predominant snow transport direction (Figure 1), with the intent of reducing snow accumulation on the east face of the ODA. Concentrating drifting snow on the relatively flat top of the pile will reduce the volume and energy of the runoff on the eastern slope.

One 450-foot-long fence is proposed (Figure 1). It would be a 10-foot high horizontal wood slat fence with open areas of approximately 50 percent. The expectation is that turbulence in the open areas would reduce the velocity of the wind enough to allow snow particles entrained in the air to fall out of suspension and deposit on the ground surface on the downwind side of the fence. It is expected that snow would deposit over a distance of 350 feet (35 x fence height [10 feet]) downwind of the fence (Tabler 2003). The fence will also have an upwind deposition distance of approximately 150 feet (Tabler 2003). To account for the deposition distances, the fence will be placed a minimum of 350 feet upwind from the transition into the east-facing slope, and 150 feet from the transition to the west-facing slop and haul road (Figure 1). The proposed fence will have a potential to retain approximately 15,255 tons of snow before reaching capacity for deposition, based on a retention rate of 33.9 tons/foot for a 10-foot tall fence (Tabler 2003). The snow fence will be constructed as per the details provided on Figure 2 from the Wyoming Department of Transportation.

The ground-surface slope will be modified only as necessary to convey snow melt to the nearest existing runoff-control ditches. The existing control ditches are graded to facilitate flow and limit the potential for stagnant water. The existing control ditches are also designed for long-term stability based on estimated peak flow from a 100-year, 24-hour storm event with a 1- foot freeboard.

Monitoring posts will be placed in the deposition zones and on the slope of the pile to measure snow-drift depths and assess the effect of the snow fence (Figure 1). Daily photo documentation will be implemented using trail cameras installed to the north of the snow management area (Figure 1). The posts will be constructed of 2-foot x 0.5-foot x 10-foot boards to facilitate monitoring of the snow-drift depth using the trail cameras. Each board will be painted in alternating foot-long black and red paint segments and fastened to two T-posts. The results of these observations will be summarized in a memorandum to USFS in summer 2021.

The quantity of available water captured behind the snow fences and prevented from depositing on the eastern slope of the NTCRA pile will be calculated to evaluate the effectiveness of the snow fence. The amount of available water captured by the snow fence will be estimated using the following equations:

$$q_{lee} = 6.9H^{2.18}$$

$$q_{upwind} = 0.9H^{2.18}$$

where H is the height of the fence in meters (Tabler, 1980). Captured available water will be proportionally estimated if the fence does not reach snow capture capacity. The available water capture

value for the snow fence will be compared to its maximum available water capture capacity to assess overall effectiveness.

3 POTENTIAL ADMINISTRATIVE MECHANISM

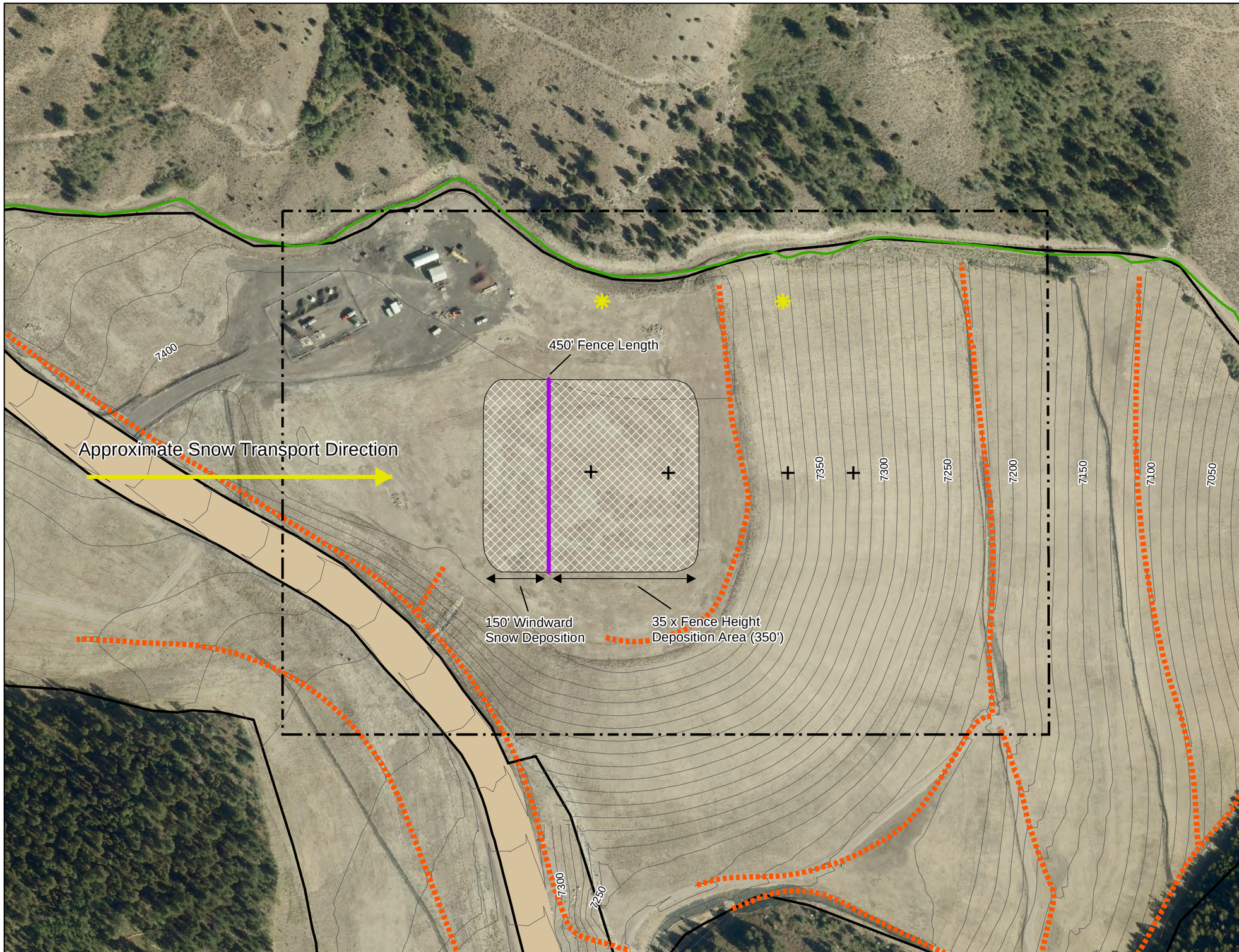
The Post Removal Site Control (PRSC) plan for the NTCRA requires that routine inspections be performed to identify any issues that require correction, maintenance, and/or contingency actions (Section 2.0, Formation 2016). The accumulation of snow drifts and resultant erosion is an issue that has required maintenance actions more than once since the construction of the NTCRA. The objective of placing the proposed snow fence on top of the pile is to reduce erosion of the cover due to runoff during the spring melt by using an O&M action to move the placement of the snow drift. If approved, the fence will be installed early fall 2020.

4 REFERENCES

Tabler, R. D. Controlling Blowing and Drifting Snow with Snow Fences and Road Design. NCHRP Project 20-7(147), National Cooperative Highway Research Program, Transportation Research Board of the National Academies, Niwot, Colorado, 2003.

Tabler, R. D. Geometry and Density of Drifts Formed by Snow Fences. Journal of Glaciology, Vol. 26, No. 94, 1980.

Formation Environmental. Pole Canyon Overburden Disposal Area 2013 Non-Time-Critical Removal Action, Post-Removal Site Control Plan, Smoky Canyon Mine. J.R. Simplot Company, September 2016

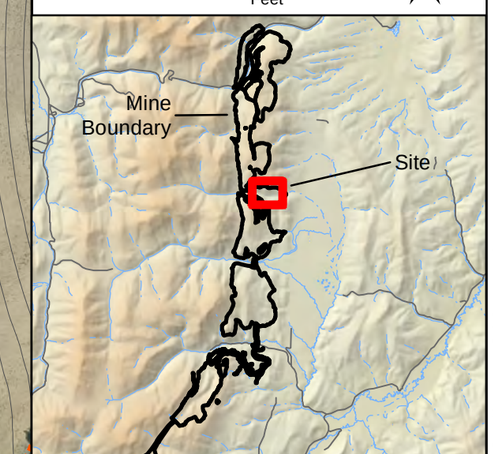


Snow Management Area
10-foot Snow Fence
Estimated Snow Fence Deposition Area
Monitoring Camera
Snow Depth Measurement Posts
Approximate Channel Locations
2006 NTCRA Run-on Control Channel
Haul Road
Index Contour (10-ft)
Pole Canyon ODA Cover Area Boundary

DRAFT

0 125 250
Feet

N



J.R. SIMPLOT COMPANY
SMOKY CANYON MINE
POLE CANYON SNOW DRIFT MANAGEMENT AREA

FIGURE 1

PROPOSED POLE CANYON SNOW FENCE LAYOUT

DATE: AUG 19, 2020
BY: EEW
FOR: LLV

FORMATION ENVIRONMENTAL

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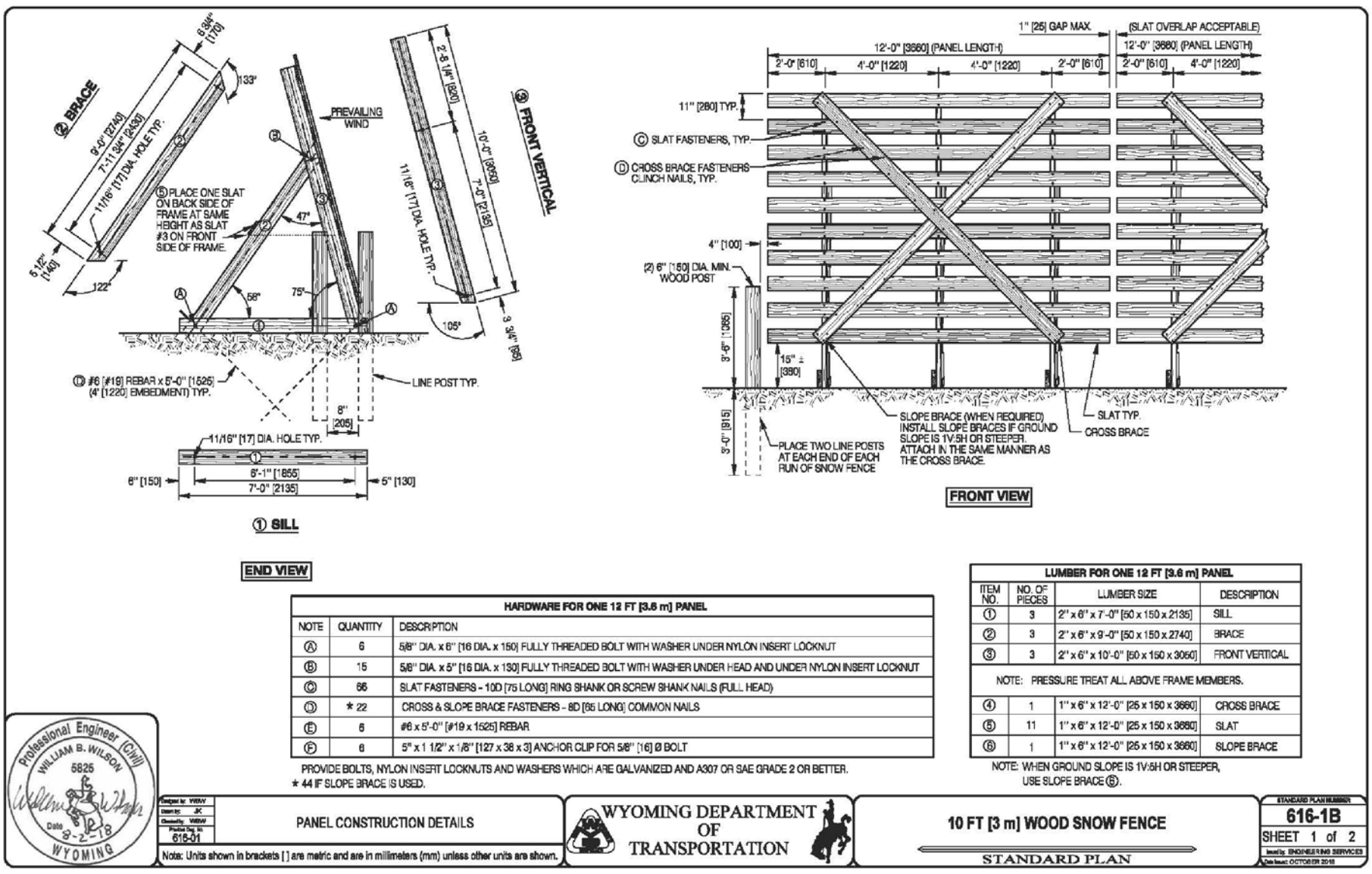


HARDWARE FOR ONE 12 FT [3.6 m] PANEL		
NOTE	QUANTITY	DESCRIPTION
Ⓐ	6	5/8" DIA. x 6" [16 DIA. x 150] FULLY THREADED BOLT WITH WASHER UNDER NYLON INSERT LOCKNUT
Ⓑ	15	5/8" DIA. x 5" [16 DIA. x 130] FULLY THREADED BOLT WITH WASHER UNDER HEAD AND UNDER NYLON INSERT LOCKNUT
Ⓒ	66	SLAT FASTENERS - 10D [75 LONG] RING SHANK OR SCREW SHANK NAILS (FULL HEAD)
Ⓓ	* 22	CROSS & SLOPE BRACE FASTENERS - 8D [65 LONG] COMMON NAILS
Ⓔ	6	#6 x 5'-0" [#19 x 1525] REBAR
Ⓕ	6	5" x 1 1/2" x 1/8" [127 x 38 x 3] ANCHOR CLIP FOR 5/8" [16] Ø BOLT

PROVIDE BOLTS, NYLON INSERT LOCKNUTS AND WASHERS WHICH ARE GALVANIZED AND A307 OR SAE GRADE 2 OR BETTER.
* 44 IF SLOPE BRACE IS USED.

LUMBER FOR ONE 12 FT [3.6 m] PANEL			
ITEM NO.	NO. OF PIECES	LUMBER SIZE	DESCRIPTION
①	3	2" x 6" x 7'-0" [50 x 150 x 2135]	SILL
②	3	2" x 6" x 9'-0" [50 x 150 x 2740]	BRACE
③	3	2" x 6" x 10'-0" [50 x 150 x 3050]	FRONT VERTICAL
NOTE: PRESSURE TREAT ALL ABOVE FRAME MEMBERS.			
④	1	1" x 6" x 12'-0" [25 x 150 x 3660]	CROSS BRACE
⑤	11	1" x 6" x 12'-0" [25 x 150 x 3660]	SLAT
⑥	1	1" x 6" x 12'-0" [25 x 150 x 3660]	SLOPE BRACE

NOTE: WHEN GROUND SLOPE IS 1V:5H OR STEEPER, USE SLOPE BRACE Ⓔ.

Professional Engineer (Civil) WILLIAM B. WILSON 5825 Date 8-2-18 WYOMING

PANEL CONSTRUCTION DETAILS

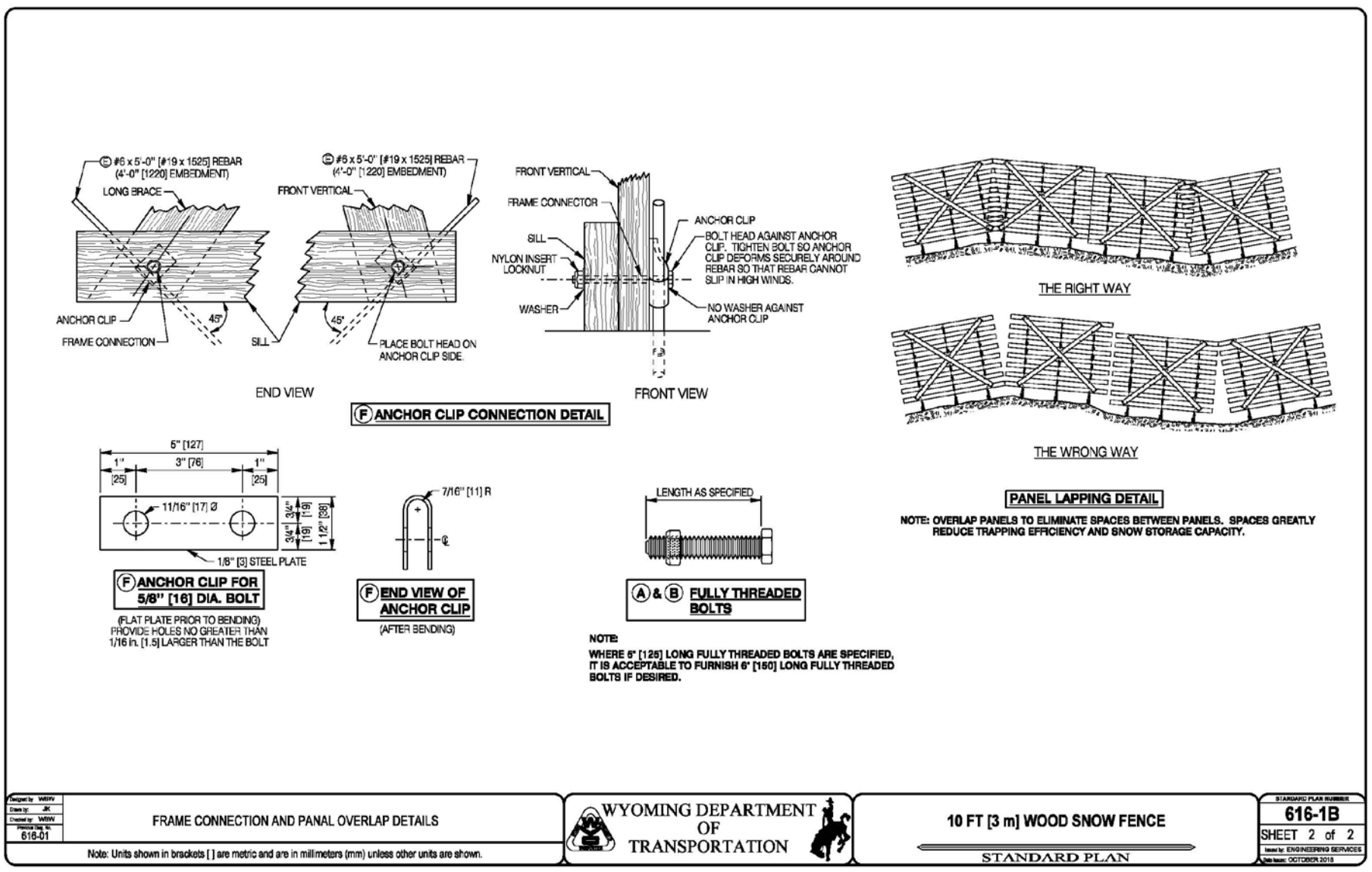
WYOMING DEPARTMENT OF TRANSPORTATION

10 FT [3 m] WOOD SNOW FENCE

STANDARD PLAN

STANDARD PLAN NUMBER 616-1B SHEET 1 of 2

Note: Units shown in brackets [ ] are metric and are in millimeters (mm) unless other units are shown.



FRAME CONNECTION AND PANAL OVERLAP DETAILS

WYOMING DEPARTMENT OF TRANSPORTATION

10 FT [3 m] WOOD SNOW FENCE

STANDARD PLAN

STANDARD PLAN NUMBER 616-1B SHEET 2 of 2

Note: Units shown in brackets [ ] are metric and are in millimeters (mm) unless other units are shown.

DRAFT

Note:
1. Figures obtained from Tabler, R. D. Controlling Blowing and Drifting Snow with Snow Fences and Road Design. NCHRP Project 20-7(147), National Cooperative Highway Research Program, Transportation Research Board of the National Academies, Niwot, Colorado, 2003.

J.R. SIMPLOT COMPANY
SMOKY CANYON MINE
POLE CANYON SNOW DRIFT MANAGEMENT AREA

FIGURE 2

10-FOOT SNOW FENCE DESIGN GUIDANCE

DATE: AUG 20, 2020
BY: EEW FOR: LLV

FORMATION ENVIRONMENTAL

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