February 26, 2014

Michael Shannon
2417 Stanmore Drive
Houston, TX 77019

RE: INITIAL DEBRIS FLOW INVESTIGATION AND EMERGENCY MITIGATION, LOT 27 GREENHORN SUBDIVISION, HAILEY, IDAHO

Dear Mr. Shannon:

In early September 2013, a series of rainstorms produced heavy and localized precipitation in the vicinity of the Greenhorn Subdivision, located approximately 7 miles north of Hailey in Blaine County, Idaho. The storms triggered debris flows that began high in the canyon upslope and south of Lot 27. The rainstorms occurred shortly after the Beaver Creek Fire burned most of the vegetation in the adjacent canyon area. As authorized by the owner, Michael Shannon, Womack & Associates, Inc. (WAI), conducted an initial geotechnical investigation of the debris flows that impacted Lot 27, WAI prepared this geotechnical investigation memo to support the application for an emergency permit to reduce the hazard to people and property. The report is intended to:

1. Provide a brief summary of the debris flows.
2. Describe existing mitigation structures constructed in response to the first flow.
3. Evaluate performance of the structures during subsequent flows and recommend improvements to make them safer.
4. Provide alternative approaches for final mitigation.

Existing Mitigation

The initial event reached the canyon mouth and alluvial fan, where the debris lobe impacted the house and surrounding landscaping. Following the first debris flow, an earthworks contractor was directed by the owner of Lot 27 to excavate two diversion channels leading off to the northeast and northwest from the mouth of the natural debris flow channel on BLM land (see ***Exhibit 1***). The eastern channel followed the path that the debris might have taken (i.e., straight down the fan) without mitigation. The western channel redirected much of the flow that would have otherwise gone to the east onto Huffaker's lot and caused greater damage. Some debris also flanked the channels onto Huffaker's property.

Exhibit 1 is a recent topographic survey map that identifies existing conditions and the limits of work completed to date, including locations of photos that are appended to illustrate specific site

conditions. The channelization efforts on ***Exhibit 1*** were performed under emergency conditions and intended to reduce the risk of future debris flows reaching the house. Due to lack of time and the imminent danger of more flows, the initial site alterations were completed without formal design components such as potential debris flow intervals, flow rates, or mass quantities. The trenches were inadvertently initiated south of the property line on BLM land, although the intent was to construct the channels and provide deposition areas within Lot 27. In hindsight, the channels could not have been situated entirely on Lot 27.

A higher intensity storm on September 13 caused larger debris flows which were conveyed and detained by the improvements, without which the home may very well have been severely damaged or destroyed. For the emergency permit application, the size, orientation, and entrance controls of the channel have been evaluated in the context of predicted future debris flows. This report examines the ability of the existing improvements to handle reasonable design debris flows on a short-term basis and suggests additional emergency mitigation work where necessary.

A large amount of unconsolidated colluvium (soil and rock debris) is "stored" on BLM land in the burned source areas in the upper reaches of the watershed. This material is poised to be mobilized during storms and is clearly dangerous.

The diversion channel construction started within the natural channel, approximately 50 feet upstream from the Lot 27 property line. ***Photos 1-3*** illustrate the natural eroded channel. The man-made channels were excavated to convey flow around the Lot 27 developed area. ***Photos 4*** and ***5*** were taken at the confluence of the two man-made channels. The photos provide an indication of the size of site alterations installed to protect Lot 27 from water and debris. ***Photo 6*** shows the terminal end of the northeast trending channel and its deposition area, primarily located on Lot 24 (Huffaker). ***Photo 7*** looks upstream of the northwest trending channel. ***Photos 8*** and ***9*** show its deposition area and debris remnants from the September 13 event.

Emergency Permit Considerations

The existing trenches were demonstrated to be effective during the September 13 storm. For the emergency permit application, the size, orientation, and entrance controls of the channels have been evaluated in the context of predicted future debris flows. Empirical estimates of debris flow volumes have been compared to the conveyance capacity of the channel. The potential need for entrance controls to prevent clogging and flanking has also been evaluated.

Future debris flows will likely follow and enlarge the well-defined trench incised during previous storm events. However, upon reaching the head of the alluvial fan, natural debris flows deflect left or right unpredictably. Ultimately, debris flows will cover the entire surface of the alluvial fan. Mitigation procedures are implemented to deflect, channelize, or stop the debris.

Based on calculations described below, additional emergency improvements are recommended to increase the capacity of the diversion channel and provide a deposition area that reduces the risk of debris reaching the road (***Exhibit 2).*** The proposed emergency improvements are intended to reduce the risk of flows into the eastern side of Lot 27 or Lot 24 and to convey all flows to the dedicated deposition basin on the western portion of Lot 27. From the deposition area, remnants of flows (primarily water) would enter into the Greenhorn Loop Road borrow ditch and flow northward to discharge into Greenhorn Creek. The improvements would require BLM approval to enhance the existing channel and improve the watershed drainage conditions. In general, the proposed improvements within BLM land would include:

1. Remove existing debris and slash piles that are poised to mobilize and increase impacts of future flows (***Photos 2 & 3*** as shown on ***Exhibit 1& 2***).
2. Reclaim the northeast trending man-made channel back to original conditions.
3. Enlarge the channel and the north side berm to resist debris flow runup and erosion, as discussed in more detail below.
4. Enlarge the existing natural channel upstream beyond the apex of the alluvial fan and soften the angle in which the debris will enter the northwest trending channel (shown in ***Exhibit 2***).

BLM approval is likely required prior to moving forward with the improvements. We understand that the existing site alterations were inadvertently performed on BLM land, but under emergency conditions. The existing site alterations should remain intact until engineering is completed.

Debris Flow Prediction and Performance of Existing Trenches

Calculations predict the debris flow parameters summarized below. For the emergency short-term application, the design storm was selected as the 25-year, 6-hour storm. Calculations are presented in Appendix A. For comparison's sake, data from a 100-year storm have also been appended. The entire drainage area was assumed to be steeper than 30% and burned at moderate to high intensity. Design parameters are in metric units per standard practice in the literature.

Design storm:	51 mm
Basin area with slopes>30%:	0.1 km^2
Basin area burned:	0.1 km^2
Debris flow volume:	1,527 m^3.
Debris flow velocity:	4.52 m/sec
Required conveyance:	24 m^3/sec
Required channel area:	9.25 m^2. (100 ft^2)
Runup height:	0.6 m (2.0 ft)
Required berm height:	2.67 m (8.7 ft)

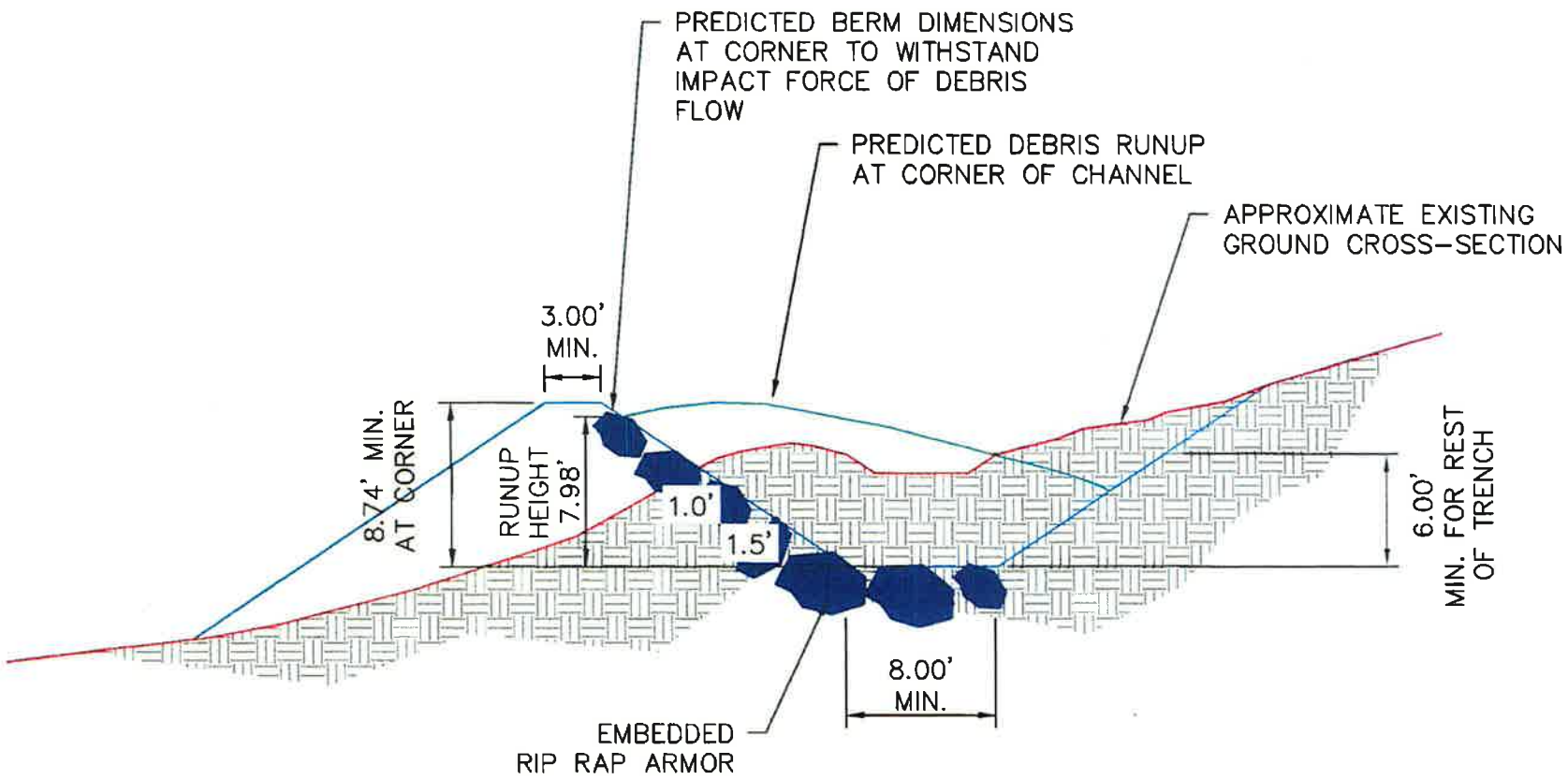
In order for the existing conveyances to be considered adequate for emergency conveyance, the channel dimensions should be at least 8 feet wide at the bottom, 6 feet deep, and 26 feet wide at the top (1.5H:1V side slopes). The downhill faces of the trench should be armored with riprap to reduce the risk of erosion and breaching, particularly in the late stages of debris flows, which tend to consist mostly of water with less solids. Berm height at the corner where the flow is deflected to the northeast is calculated at 8.7 feet to resist impact force. The proposed dimensions are substantially larger than the existing conveyance. Figure 1 illustrates the proposed berm cross-section at the corner.

Emergency Action Alternatives

The conveyance of the existing trench is limited by its low gradient crossing the hillside and the sharp turn required at the entrance. The sharp turn is difficult to alter, given the steep slope uphill of the existing trenches. Alternative approaches might include:

1. Do nothing to the existing channel, which is considerably undersized to accommodate the runoff from a 25-year 6 hr storm. We strongly recommend enlarging the channel according to the dimensions given. It is necessary to abandon and reclaim the northeast channel because it discharges directly onto Lot 24.
2. Debris flow fences, which would be constructed near the existing sharp turn on BLM land. A series of 2 to 3 fences would probably be required, spaced about 100 feet apart. Fences would be roughly 30 feet x 10 feet and constructed of interlocking steel rings supported by posts and cables with slip fittings to allow deflection upon impact. This alternative would probably cost on the order of $300,000 to $450,000. The fences would be colored to blend with natural background and would have the least visual impact.
3. Improve the diversion entrance by reducing curvature and extending the entrance above the apex of the alluvial fan, to reduce the risk of flanking. Riprap armoring would be installed at the entrance to the diversion and along the downhill berm of the channel. The diversion would be located, at least in part, on BLM land. This alternative has obvious aesthetic consequences, but would be safer and more economical to build.
4. Provide a deposition basin at the distal end of the trench on Lot 27. The basin would need to be sized to accommodate the design debris flow volume of 1,527 m^3, or about 2,000 yd^3.

The existing site alterations should remain in place until engineering upgrades to the emergency submittal work are approved or an alternative approach has been selected. The site is located in a geological hazard zone. Be aware that the recommended work is based on a particular level of quantitative risk (25 year storm) intended to reduce the hazard. Larger storms with larger runoff volumes are obviously possible. Calculations for the 100-year storm are included in Appendix A



Debris Flow Barrier Analysis Shannon Residence Greenhorn Gulch Subdivision Blaine County, Idaho	Debris Flow Berm Dimensions	FIGURE 1

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WOMACK AND ASSOCIATES, INC.

for comparison purposes. In any case, quantitative risk assessments of debris flow quantities and return intervals have been shown to be accurate to within perhaps an order of magnitude. Therefore, no warranty of performance is made or implied.

Please feel free to contact our office if you have any questions or concerns regarding this memo.

Respectfully submitted,

WOMACK & ASSOCIATES, INC

PROFESSIONAL ENGINEER
REGISTERED
11949
STATE OF IDAHO
WESLEY RAYMOND WOMACK

Ray Womack 2/25/2014

Ray Womack, P.E., P.G.
Cc: Jim Zarubica
Attached: Exhibits 1 & 2
Photos 1-9
Appendix A (Debris Flow Calculations for 25 and 100-year design storms)

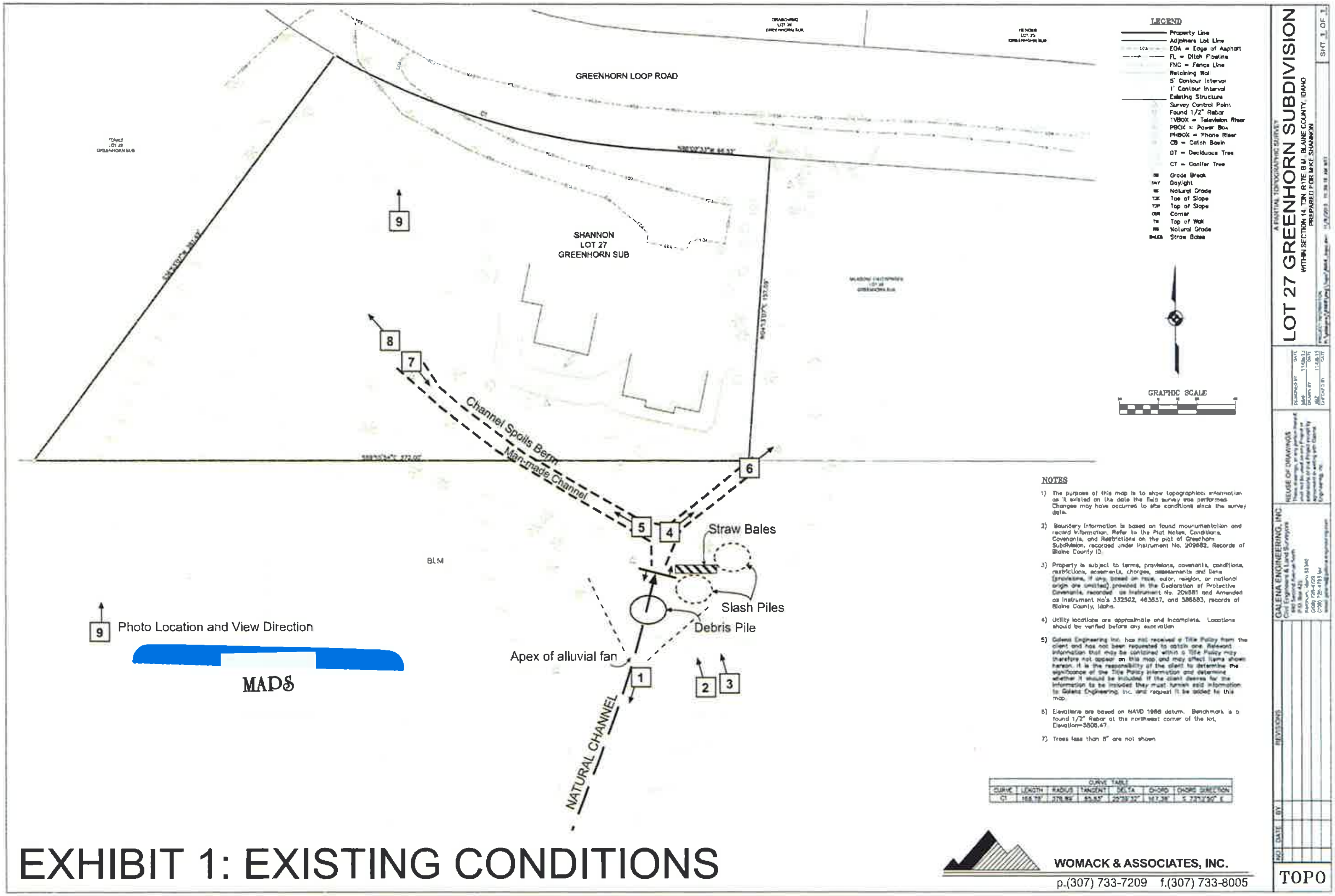
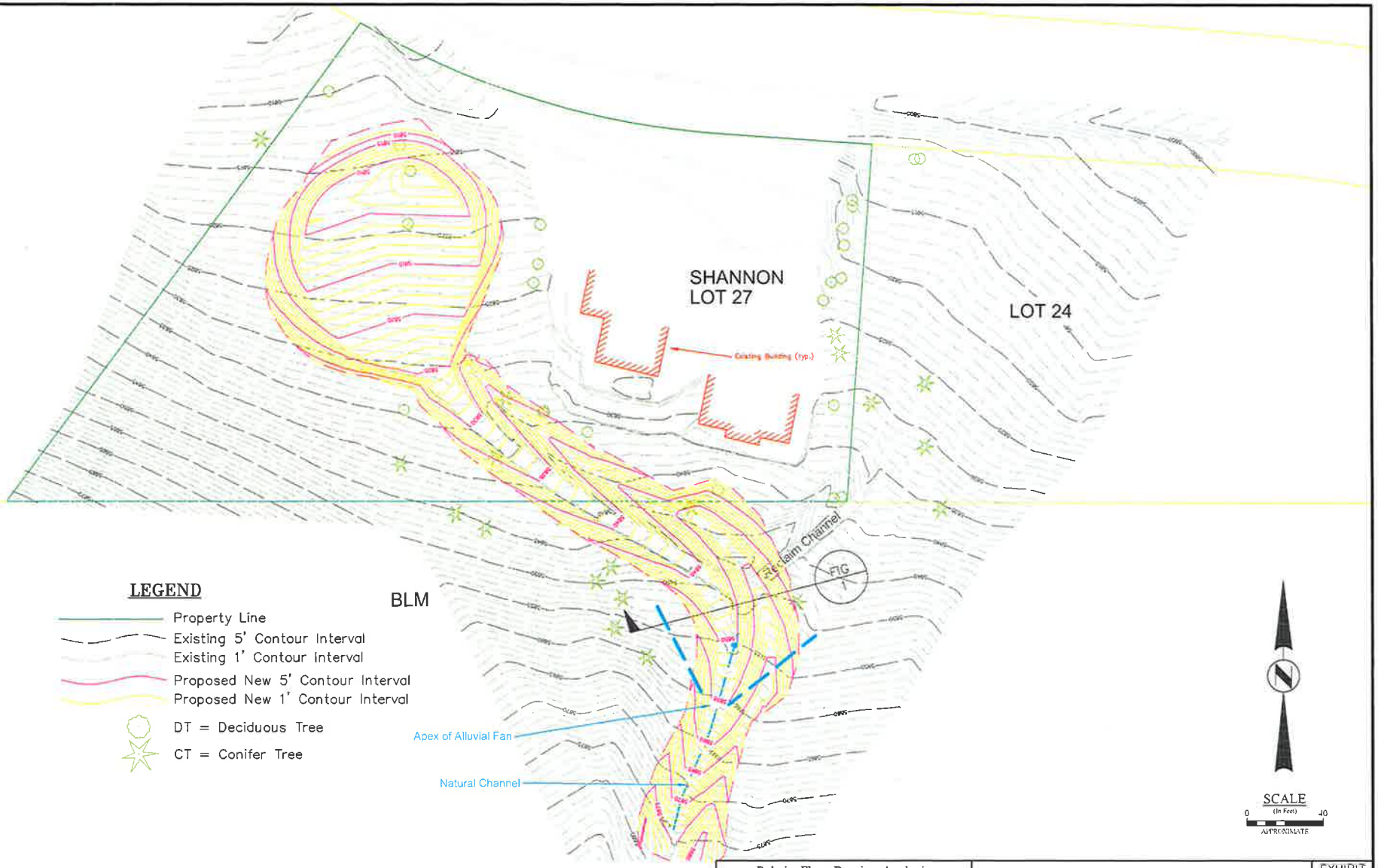


EXHIBIT 1: EXISTING CONDITIONS



Debris Flow Barrier Analysis Shannon Residence Greenhorn Gulch Subdivision Blaine County, Idaho	Proposed Site Alterations	EXHIBIT 2

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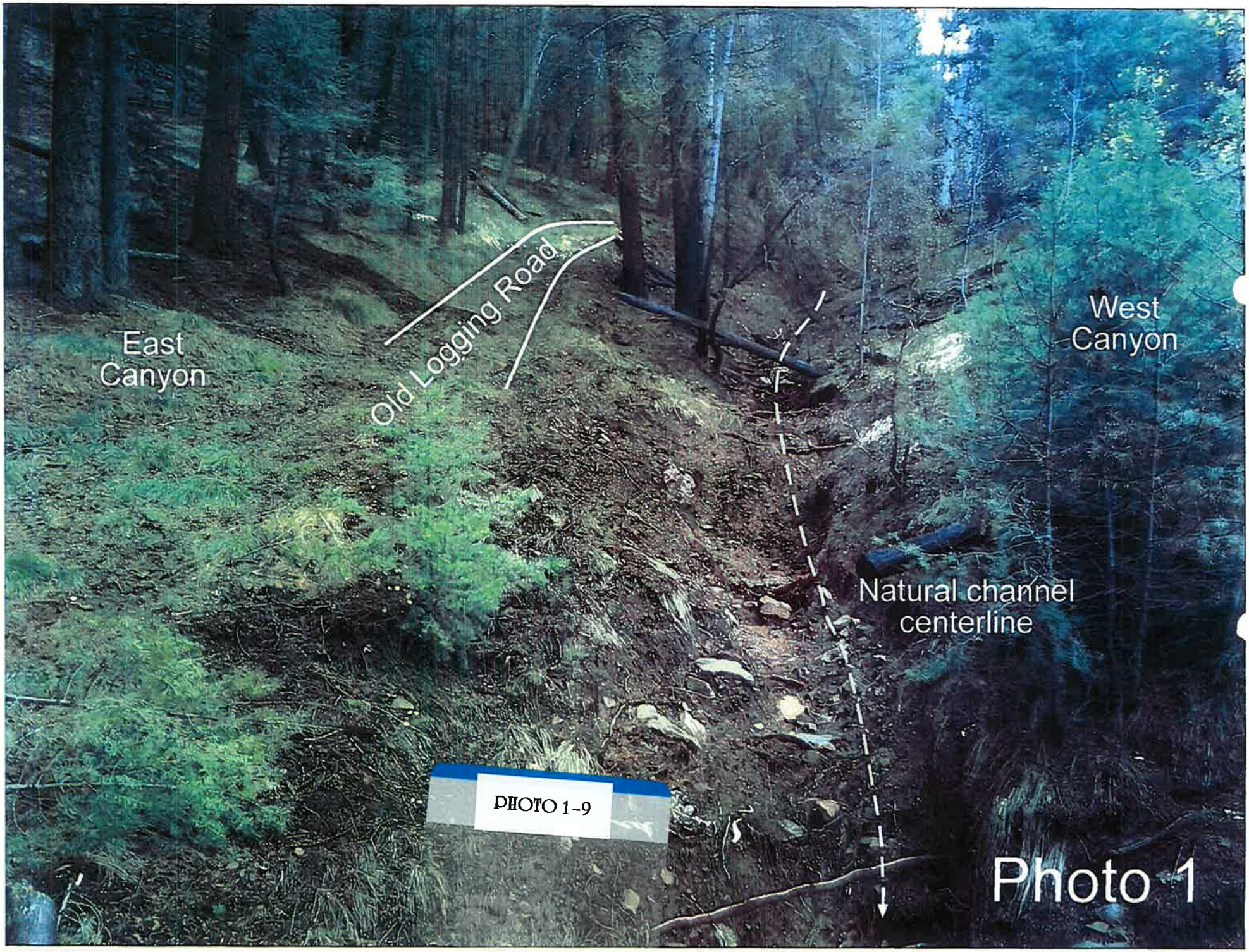

East
Canyon
Old Logging Road
West
Canyon
Natural channel
centerline
PHOTO 1-9
Photo 1


Shannon House
West Canyon
Limits of Debris Flow
Apex of Alluvial Fan
Channel Centerline
Large Debris Deposit
Slash Pile
Limits of Debris Flow
East Canyon
Photo 2


Shannon House
Young Growth at
Apex of Alluvial Fan
Slash Pile
Slash Pile
Limits of Debris Flow
Straw Bale
Erosional Control
Barrier
(By Shannon)
East
Canyon
Photo 3

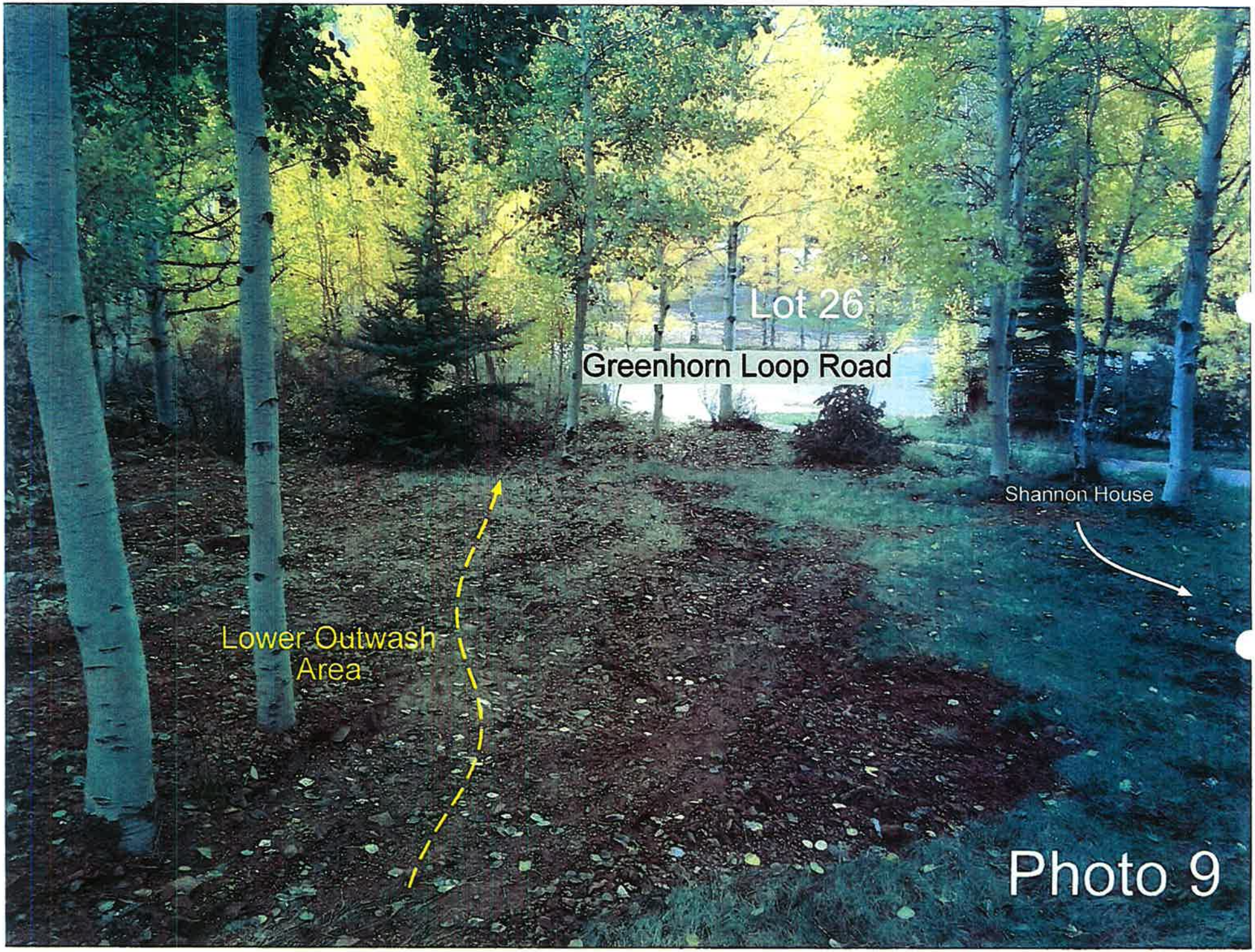

Shannon House
Greenhorn Loop Road
Man-made Channel
Photo 4


Shannon House
Man-made
Channel
Photo 5


Shannon House
(Beyond)
Greenhorn Loop Road
Lot 24
Natural Channel
Photo 6


Natural Channel
Shannon House
Man-made
Channels
Photo 7


Shannon House
Greenhorn Loop Road
Man-made
Channel
Outwash Area
Photo 8


Lot 26
Greenhorn Loop Road
Shannon House
Lower Outwash
Area
Photo 9

APPENDIX A

Debris Flow Calculations: 25 and 100-year Design Storms

Shannon Debris Calculations - 25yr 6hr

Area =	1,062,500	ft^2
	98,709.48	m^2
	0.099	km^2

Precipitation =	2	in
	50.8	mm

* Idaho Figure 22, isopluvials of 25-yr 6-hr precipitation in tenths of an inch
* NOAA ATLAS 2, Volume V

Gartner et al. (2007) model based on 50 debris flow events in Colorado, Utah, and California

$$\ln V = 0.59(\ln S_{30}) + 0.65(B)^{1/2} + 0.18(R)^{1/2} + 7.21$$

S_{30} =	0.10	* basin area with slopes greater than or equal to 30 percent (km^2) - assume total area
B =	0.10	* basin area burned at moderate to high severity (km^2), assume total area
R =	50.80	* total storm runoff (mm)
ln V =	7.33	
V =	1,527	* debris flow volume (m^3)

Existing flow characteristics

$Q_{peak} = 0.135\ V^{0.780}$ - ***Granular debris flows in Japan (Mizuyama et al. 1992)**

$Q_{peak} = 0.0188\ V^{0.790}$ - ***Muddy debris flows in Japan (Mizuyama et al. 1992)**

Q_{peak} =	41.09	m^3/s - Granular
Q_{peak} =	6.16	m^3/s - Muddy
$Q_{peak\ average}$ =	23.62	m^3/s - average

Empirical Relationships for Debris Flows, Dieter Rickenmann, Swiss Federal Institute for Forest, Snow and Landscape Research, CH-8903 Birmensdorf, Switzerland

$V = 2.1\ Q^{0.33}\ S^{0.33}$

$Q_{peak\ average}$ =	23.62	m^3/s - average
S =	0.43	m/m
V =	4.52	m/s
A_{req} =	5.22	m^2
A_{req} =	56.24	ft^2

Q_{peak} =	41.09	m^3/s - Granular
S =	0.43	m/m
V =	5.43	m/s
A_{req} =	7.57	m^2
A_{req} =	81.48	ft^2

Q_{peak} =	6.16	m^3/s - Muddy
S =	0.43	m/m
V =	2.90	m/s
A_{req} =	2.12	m^2
A_{req} =	22.84	ft^2

Uphill Data from topo

* Uphill topography on topo shows the following data:

$A_{calculated}$ =	6.5	ft^2
	0.60	m^2
$S_{calculated}$ =	0.24	m/m
V =	4.44	m/s - * Q_{peak} for granular flow
$A_{required}$ =	9.25	m^2
	99.61	ft^2

Possible debris flow configurations

$A_{required}$ =	9.25	m^2
	99.61	ft^2

* calculations based on sideslope = 1.5:1

bottom (ft)	top (ft)	Depth (ft)	Area (ft2)
8	26	6	102

Runup Height caculations

(Chu et al. 1995) - $\Delta h = (v^2 \cos^2(\Theta_o+\Theta) \tan\Theta / g(S_f + \tan\Theta))*(1+(g\ h \cos\Theta_o/2v^2)^2$

v =	4.44	m/s
Θ_0 =	0.23	rad
Θ =	0.59	rad
g =	9.78045	m/s^2
S_f =	0.58	
h =	1.8288	m
Δh =	0.60	m
	1.98	ft

Debris Impact Force

(Hungr et al., 1984; VanDine, 1996; and Lo, 2000)

$F_d = (h * \rho * v^2 * \sin\delta) * 3$

h =	1.8288	m
ρ =	1920	kg/m^3
v =	4.44	m/s
δ =	1.30899	rad
F_d =	200,572.95	N/m
	13,743.84	lb/ft

Required berm height

h =	8.74	ft

***$p = 1/2\ k_p * h^2 * \gamma$**

Shannon Debris Calculations - 100yr 24hr

Area =	1,062,500	ft^2
	98,709.48	m^2
	0.099	km^2

Precipitation =	4	in
	101.6	mm

* Idaho Figure 22, isopluvials of 25-yr 6-hr precipitation in tenths of an inch

* NOAA ATLAS 2, Volume V

Gartner et al. (2007) model based on 50 debris flow events in Colorado, Utah, and California

$$\ln V = 0.59(\ln S_{30}) + 0.65(B)^{1/2} + 0.18(R)^{1/2} + 7.21$$

S_{30} =	0.10	* basin area with slopes greater than or equal to 30 percent (km^2) - assume total area
B =	0.10	* basin area burned at moderate to high severity (km^2), assume total area
R =	101.60	* total storm runoff (mm)
ln V =	7.86	
V =	2,598	* debris flow volume (m^3)

Existing flow characteristics

$Q_{peak} = 0.135\ V^{0.780}$ - ***Granular debris flows in Japan (Mizuyama et al. 1992)**

$Q_{peak} = 0.0188\ V^{0.790}$ - ***Muddy debris flows in Japan (Mizuyama et al. 1992)**

Q_{peak} =	62.19	m^3/s - Granular
Q_{peak} =	9.37	m^3/s - Muddy
$Q_{peak\ average}$ =	35.78	m^3/s - average

Empirical Relationships for Debris Flows, Dieter Rickenmann, Swiss Federal Institute for Forest, Snow and Landscape Research, CH-8903 Birmensdorf, Switzerland

$V = 2.1\ Q^{0.33}\ S^{0.33}$

$Q_{peak\ average}$ =	35.78	m^3/s - average
S =	0.43	m/m
V =	5.19	m/s
A_{req} =	6.90	m^2
A_{req} =	74.27	ft^2

Q_{peak} =	62.19	m^3/s - Granular
S =	0.43	m/m
V =	6.22	m/s
A_{req} =	9.99	m^2
A_{req} =	107.57	ft^2

Q_{peak} =	9.37	m^3/s - Muddy
S =	0.43	m/m
V =	3.33	m/s
A_{req} =	2.81	m^2
A_{req} =	30.26	ft^2

Uphill Data from topo

* Uphill topography on topo shows the following data:

$A_{calculated}$ =	6.5	ft^2
	0.60	m^2
$S_{calculated}$ =	0.24	m/m
V =	5.09	m/s - * Q_{peak} for granular flow
$A_{required}$ =	12.22	m^2
	131.49	ft^2

Possible debris flow configurations

$A_{required}$ =	12.22	m^2
	131.49	ft^2

* calculations based on sideslope = 1.5:1

bottom (ft)	top (ft)	Depth (ft)	Area (ft2)
8	26	6	102

Runup Height caculations

(Chu et al. 1995) - $\Delta h = (v^2 \cos^2(\Theta_o+\Theta) \tan\Theta / g(S_f + \tan\Theta))*(1+(g\ h \cos\Theta_o/2v^2)^2$

v =	5.09	m/s
Θ_0 =	0.23	rad
Θ =	0.59	rad
g =	9.78045	m/s^2
S_f =	0.58	
h =	1.8288	m
Δh =	0.74	m
	2.42	ft

Debris Impact Force

(Hungr et al., 1984; VanDine, 1996; and Lo, 2000)

$F_d = (h * \rho * v^2 * \sin\delta) * 3$

h =	1.8288	m
ρ =	1920	kg/m^3
v =	5.09	m/s
δ =	1.30899	rad
F_d =	263,682.90	N/m
	18,068.32	lb/ft

Required berm height

h =	10.02	ft

***$p = 1/2\ k_p * h^2 * \gamma$**

SHANNON RESIDENCE DEBRIS FLOW PROTECTION
LOT 27 GREENHORN GULCH SUBDIVISION
BLAINE COUNTY, IDAHO

DEBRIS FLOW BARRIERS

OWNER:
Michael Shannon
2417 Stanmore Drive
Houston, TX 77019

ENGINEERING:
JA Womack, P.C.
PO Box 9550
Jackson, WY 83001
(307) 733-5150

PROJECT LOCATION:
Greenhorn Gulch, Lot 27
Blaine County, Idaho

PURPOSE OF WORK:
NATURAL EROSION UPHILL OF THE PROPERTY IS LIKELY AND THIS PROJECT SEEKS TO REDUCE THE RISK OF DAMAGE FROM SUCH MOVEMENT OF MATERIAL.

SUMMARY OF WORK:
CLEARING AND GRUBBING OF TREES AND VEGETATION WITHIN CONSTRUCTION AREA OF DEBRIS FLOW TRENCH AND BERM. EXCAVATION OF TRENCH AND CONSTRUCTION OF TRAINING WALLS AND DEFLECTION BERM. PLACEMENT OF AGGREGATE RIP RAP ARMORING OF TRENCH BOTTOM, TRAINING WALLS, AND DEFLECTION BERM. REVEGETATION OF NON-ARMORED SURFACES OF BERM AND TRAINING WALLS. IMPROVEMENTS WILL BE AT OR BELOW GRADE.

SOURCE OF MAPPING:
Galena Engineering, Inc.
317 N. River St.
Hailey, Idaho 83333

BENCHMARK AND BASIS OF BEARING:
HORIZONTAL DATUM: 1/2" REBAR BENCHMARK FOUND AT NW CORNER OF LOT
VERTICAL DATUM: NGVD 1988

Approx. Scale: 1" = 100 ft

INDEX OF FIGURES:

NOTE: RECOMMENDATIONS IN THIS DOCUMENT ARE CONTINGENT UPON OBSERVATION AND INSPECTION DURING CONSTRUCTION BY AN REPRESENTATIVE OF THE DESIGN ENGINEER

PROFESSIONAL ENGINEER REGISTERED STATE OF IDAHO WESLEY RAYMOND WOMACK 11948

W R Womack 11948 7/2014

DEBRI-FLOW MADS & PLATS

PLAN VERSION | DATE | DRAFTER | APPROVED

SHEET TITLE: TITLE SHEET, NOTES, AND VICINITY MAP

PROJECT TITLE: Debris Flow Mitigation
SHANNON RESIDENCE
LOT 27 GREENHORN
GULCH SUBDIVISION
BLAINE COUNTY, IDAHO

JORGENSEN ASSOCIATES, P.C.
Engineering • Land Surveying • Planning
PO Box 9550 • 170 S. Main St., Suite 1100 • Jackson, Wyoming 83002
(307) 733-5150 FAX (307) 733-5197
E-mail: jae@jorgensenassociates.com

PROJECT NUMBER

SHEET S1.0

RIP RAP NOTES:

1.1 AGGREGATE MATERIAL USED FOR RIP RAP WILL MEET THE FOLLOWING STANDARDS:

- HARD, DURABLE, AND ANGULAR IN SHAPE (ROUNDED STONES ARE NOT ACCEPTABLE)
- RESISTANT TO WEATHERING AND TO WATER ACTION
- FREE FROM OVERBURDEN SPOIL, SHALE, AND ORGANIC MATERIAL
- THE LEAST DIMENSION OF ANY STONE SHOULD NOT BE LESS THAN 1/3 OF THE GREATEST DIMENSION
- MINIMUM WEIGHT OF AGGREGATE WILL BE 165 PCF (SPECIFIC GRAVITY = 2.65 OR GREATER)

1.2 THE SOURCE OF THE STONE USED FOR RIP RAP WILL BE SELECTED AT LEAST 7 DAYS IN ADVANCE OF THE TIME WHEN THE STONE WILL BE REQUIRED IN THE WORK IN ORDER TO BE APPROVED. ACCEPTABILITY OF THE STONE WILL BE DETERMINED BY SERVICE RECORDS AND/OR BY SUITABILITY TESTS.

1.3 RIP RAP AGGREGATE WILL MEET THE FOLLOWING GRADATION REQUIREMENTS:

- NO MORE THAN 10% OF THE STONES BY TOTAL WEIGHT WILL WEIGH MORE THAN 1,400 POUNDS PER PIECE
- NO MORE THAN 15% OF THE STONES BY TOTAL WEIGHT WILL WEIGH LESS THAN 25 POUNDS PER PIECE
- STONES WILL BE EVENLY GRADED WITH A MEAN STONE WEIGHT OF 700 POUNDS PER PIECE
- CONTROL OF GRADATION WILL BE BY VISUAL INSPECTION

CONSTRUCTION NOTES:

2.1 CONSTRUCTION OF THE BASIN AND TRENCH SHOULD OCCUR FROM THE TOP DOWN AND ACCESS TO UPPER REACHES OF TRENCH BE MADE IN THE PLANNED CORRIDOR OF THE TRENCH TO MINIMIZE DISTURBANCE OF THE SOIL OUTSIDE THE CONSTRUCTION AREA. PLACEMENT OF THE RIP-RAP SHOULD BE IN CONJUNCTION WITH CONSTRUCTION OF THE TRENCH AND BERM.

2.2 PLACEMENT OF STONES:

- RIP RAP SHOULD BE PLACED TO ITS FULL THICKNESS AT ONE OPERATION AND IN SUCH A MANNER AS TO AVOID DISPLACEMENT OF UNDERLYING SOIL.
- STONES SHOULD BE HANDLED OR PLACED WITH NECESSARY EQUIPMENT AS TO SECURE A STONE MASS 3-FT THICK AS SHOWN IN THE CROSS SECTION DETAILS.
- UNDESIRABLE VOIDS WILL BE FILLED WITH SMALL STONES TO CREATE A REASONABLY REGULAR SURFACE AND MASS STABILITY.
- ALL RIP RAP WILL BE PLACED AND DISTRIBUTED SO AS TO CREATE A WELL-GRADED LAYER. PLACING OF RIP RAP IN LAYERS OR BY DUMPING INTO CHUTES OR BY SIMILAR METHODS LIKELY TO CAUSE SEGREGATION OF MATERIAL WILL NOT BE ALLOWED.

2.3 DISTURBED SOIL ON TRENCH, RETENTION BASIN, AND DEFLECTION BERM SURFACES NOT ARMORED BY RIP-RAP WILL BE REVEGETATED WITH AN APPROVED MIX OF NATIVE VEGETATION.

2.4 CONSTRUCTION WILL BE PERFORMED AND THE AREA MAINTAINED TO MINIMIZE EROSION AND POLLUTION. EXISTING VEGETATION SHOULD BE PROTECTED TO THE MAXIMUM POSSIBLE EXTENT.

2.5 THE AREA OF THE PROPOSED CATCHMENT BASIN, AS SHOWN ON THE DRAWINGS, MAY BE UTILIZED FOR CONSTRUCTION STAGING OF THE PROJECT. NO ENVIRONMENTALLY HAZARDOUS MATERIALS WILL BE STORED AT THIS SITE.

2.6 THE CONTRACTOR WILL REMOVE ALL DEBRIS FROM THE AREA BEFORE THE COMPLETION OF THE PROJECT. THE CONTRACTOR SHOULD ALSO RESTORE ANY AREA OF THE SITE DISTURBED DURING CONSTRUCTION ACTIVITIES BY SEEDING WITH NATIVE VEGETATION TO RESTORE THE CONDITION OF THE EXISTING SITE PRIOR TO THE CONTRACTOR'S USE.

SUMMARY OF MATERIAL QUANTITIES

ITEM	QUANTITY	UNIT
RIP RAP ARMORING	900	CY
TOTAL CUT	5250	CY
TOTAL FILL	850	CY
NET EXCESS MATERIAL	4400	CY

*Excess material may be stockpiled or used in the construction of landscaping on site thus avoiding the cost of hauling it off site.

PROFESSIONAL ENGINEER REGISTERED 11949 STATE OF IDAHO WESLEY RAYMOND WOMACK

2014

PLAN VERSION	DATE	DRAFTER	APPROVED

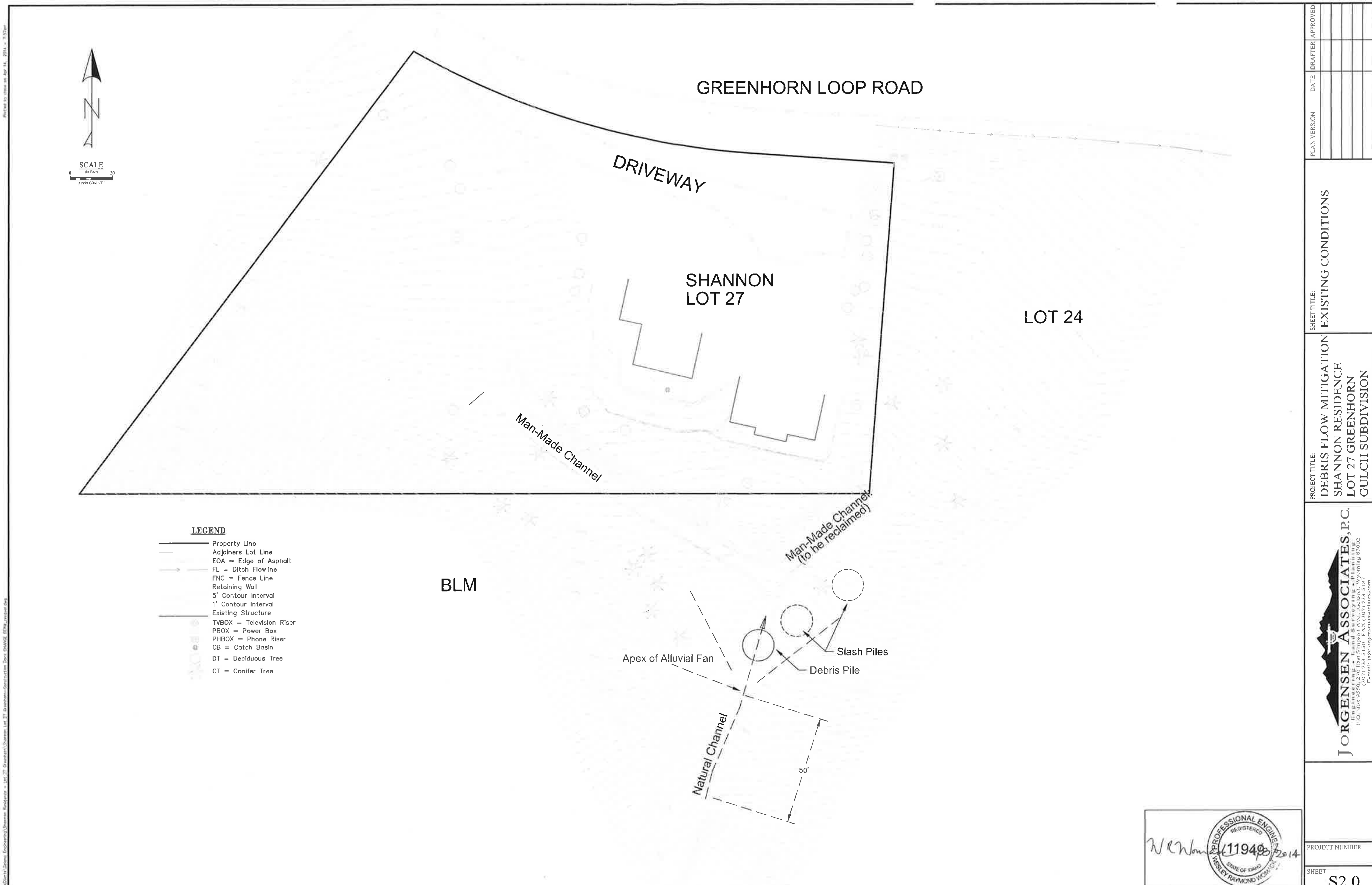
SHEET TITLE: CONSTRUCTION NOTES

PROJECT TITLE: DEBRIS FLOW MITIGATION SHANNON RESIDENCE LOT 27 GREENHORN GULCH SUBDIVISION BLAINE COUNTY, IDAHO

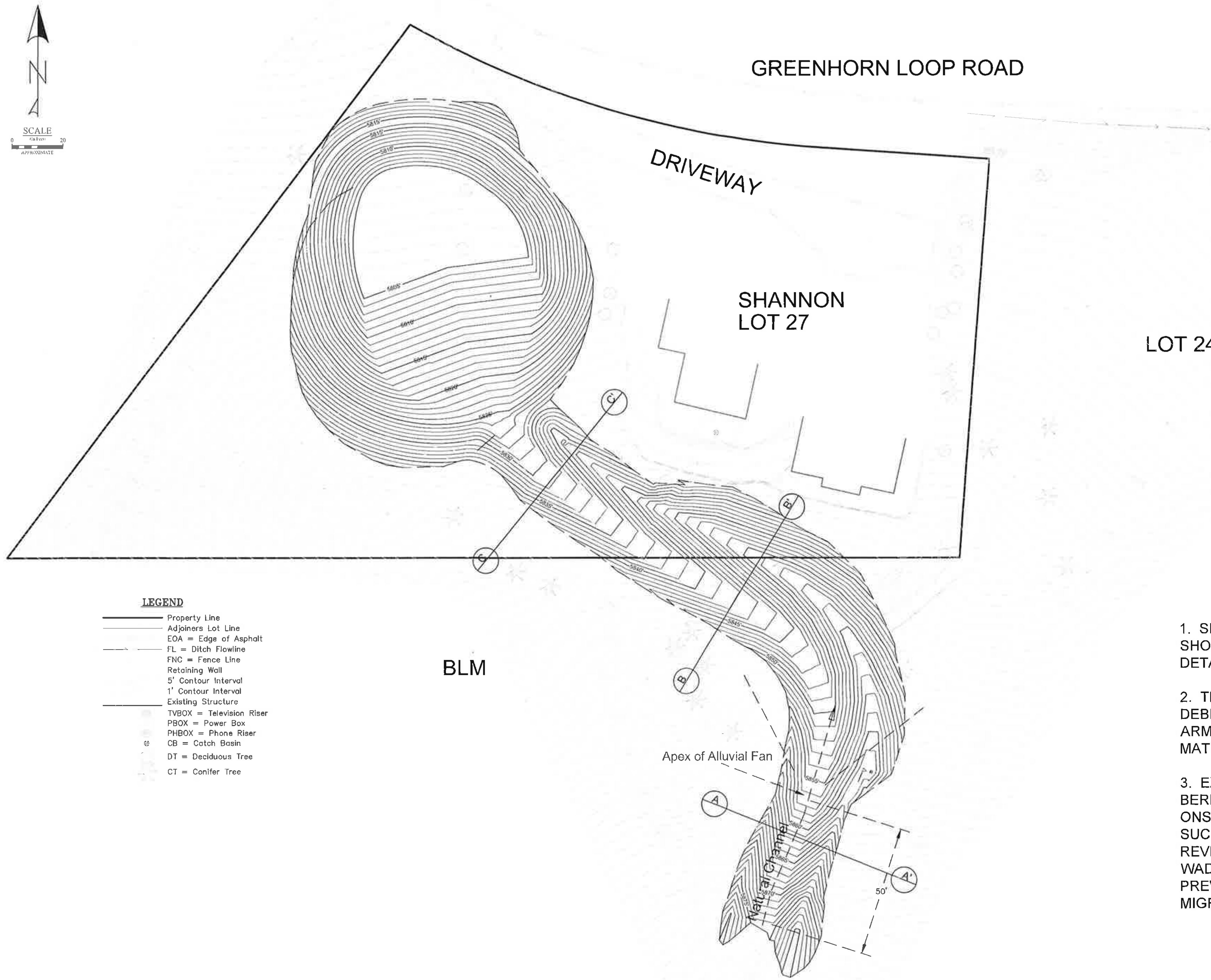
JORGENSEN ASSOCIATES, P.C.
Engineering • Land Surveying • Planning
P.O. Box 9550, 270 East Simpson Ave., Jackson, Wyoming 83002
(307) 733-5150 FAX (307) 733-5187
E-mail ja@jorgensenassociates.com

PROJECT NUMBER

SHEET S1.1



GREENHORN LOOP ROAD
DRIVEWAY
SHANNON
LOT 27
LOT 24
Man-Made Channel
Man-Made Channel
(to be reclaimed)
BLM
SCALE
LEGEND
Property Line
Adjoiners Lot Line
EOA = Edge of Asphalt
FL = Ditch Flowline
FNC = Fence Line
Retaining Wall
5' Contour Interval
1' Contour Interval
Existing Structure
TVBOX = Television Riser
PBOX = Power Box
PHBOX = Phone Riser
CB = Catch Basin
DT = Deciduous Tree
CT = Conifer Tree
Slash Piles
Debris Pile
Apex of Alluvial Fan
Natural Channel
50'
PLAN VERSION
DATE
DRAFTER
APPROVED
SHEET TITLE:
EXISTING CONDITIONS
PROJECT TITLE:
DEBRIS FLOW MITIGATION
SHANNON RESIDENCE
LOT 27 GREENHORN
GULCH SUBDIVISION
BLAINE COUNTY, IDAHO
JORGENSEN ASSOCIATES, P.C.
P.O. Box 9550, 270 East Simpson Ave, Jackson, Wyoming 83002
(307) 733-5150 FAX (307) 733-5187
E-mail: ja@jorgensenassociates.com
PROFESSIONAL ENGINEER
REGISTERED
11949
STATE OF IDAHO
WESLEY RAYMOND WOMACK
2014
PROJECT NUMBER
SHEET
S2.0



GENERAL NOTES:

1. SLOPES OF TRENCH AND BERM WALLS SHOULD BE 1.5:1 (SEE SECTION VIEW DETAILS, SHEET S2.2).

2. THE BOTTOM AND SIDES OF THE DEBRIS FLOW TRENCH WILL BE ARMORED WITH APPROVED RIP-RAP MATERIAL (SEE SECTION VIEW DETAILS).

3. EXCAVATED TOPSOIL NOT USED IN BERM CONSTRUCTION MAY BE STORED ONSITE TO AID IN FUTURE RECLAMATION. SUCH SOIL SHOULD BE PROTECTED BY REVEGETATION, SILT FENCES, STRAW WADDLES, AND/OR OTHER MEANS TO PREVENT EROSION AND FINES MIGRATION.

PROFESSIONAL ENGINEER REGISTERED 11949 STATE OF IDAHO WESLEY RAYMOND WOMACK
/2014

PLAN VERSION	DATE	DRAFTER	APPROVED

SHEET TITLE: PROPOSED TRENCH AND RETENTION BASIN

PROJECT TITLE: DEBRIS FLOW MITIGATION SHANNON RESIDENCE LOT 27 GREENHORN GULCH SUBDIVISION BLAINE COUNTY, IDAHO

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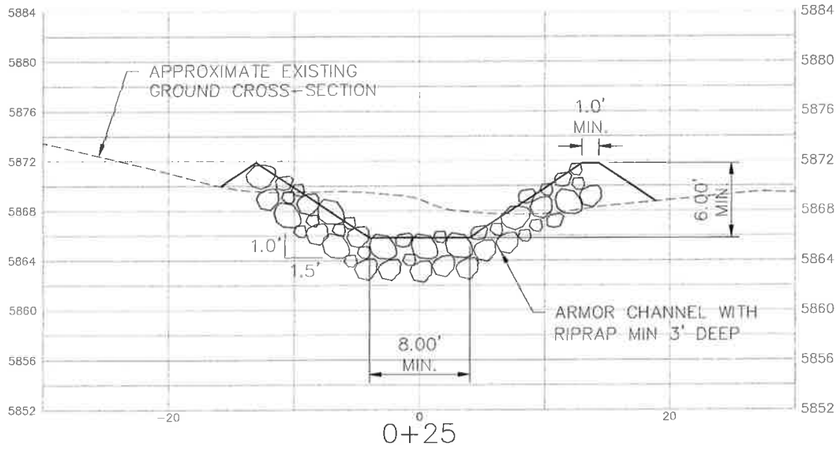
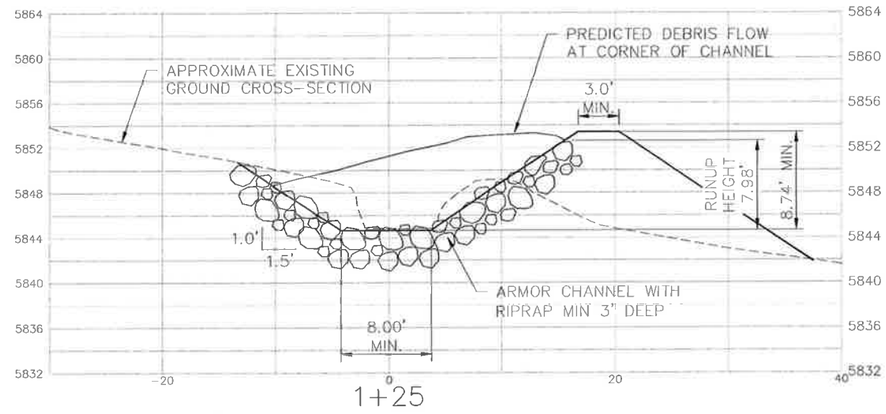
PROJECT NUMBER

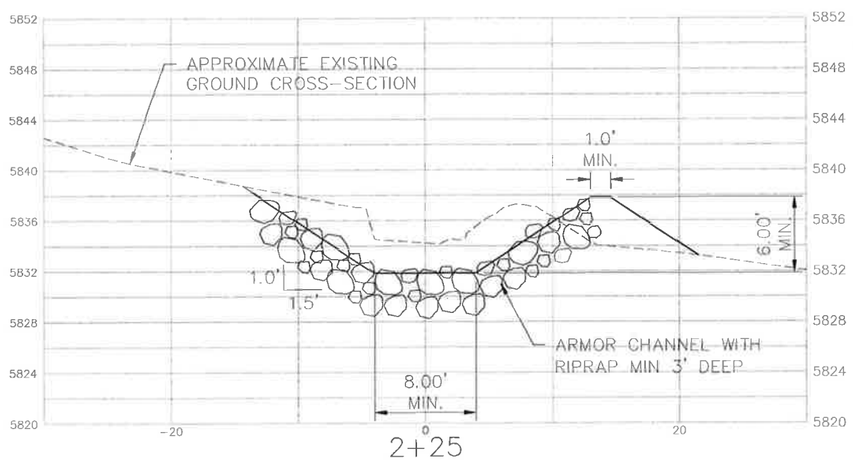
SHEET S2.1



Section A-A' Typ.



Section B-B' Typ.



Section C-C' Typ.

W R Wom 11948 5/8/2014

PROFESSIONAL ENGINEER REGISTERED STATE OF IDAHO WESLEY RAYMOND WOMACK

PROJECT TITLE:
DEBRIS FLOW MITIGATION
SHANNON RESIDENCE
LOT 27 GREENHORN
GULCH SUBDIVISION
BLAINE COUNTY, IDAHO

SHEET TITLE:
SECTION DETAILS

PLAN VERSION	DATE	DRAFTER	APPROVED

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PROJECT NUMBER

SHEET
S2.2