United States Department of Agriculture

NRCS

Natural Resources Conservation Service
Denver Federal Center
Building 56, Room 2604
P.O. Box 25426
Denver, CO 80225-0426

720-544-2836-OFFICE
dave.wolff@co.usda.gov

Flood Hazard Assessment Report
Buckhorn Creek, Larimer County, Colorado

June 5, 2013

Prepared by: Dave Droullard, and Dave Wolff.

Purpose: The purpose of this report is to summarize the findings of our (NRCS) site evaluation of the Buckhorn Creek Area in relation to potential flooding that could be expected from the Watershed after the High Park fire.

Background: Wildfire burned 259 homes and approximately 87,000 acres of forest land west of Fort Collins, Colorado in June 2012. Larimer County asked NRCS for assistance in evaluating the risk to structures in the Buckhorn Creek area and make recommendations for mitigation of potential losses.

NRCS Evaluation Team: Dave Droullard, and Dave Wolff.

Buckhorn Creek Watershed: Buckhorn Creek drains a large watershed of over 50 square miles. The northern part of the watershed burned resulting in increase in flow volume approximately 2 times the prefire amounts. Buckhorn Creek Watershed flows West to East along CR 44H - Buckhorn Road and then flows to the Southeast along CR 27 – also Buckhorn Road. Major increases in flow volume are expected from Twin Cabin Gulch and Stove Prairie Creek drainages. Along CR 27 Buckhorn Road, the flow is confined in a narrow canyon and stream channel below Ohana Way for approximately 1.6 miles with 4 culverts and 1 concrete bridge crossing the road.

Investigative activities: A reconnaissance of Buckhorn Drainage from BC-1 to BC-18 was conducted. Approximately thirty (30) residences located within the floodplain were identified. With landowner permissions and requests, eleven (11) cross-sectional profiles were measured at homes, a workshop, and potential debris structures locations. Hydrologic data developed using post fire conditions were used to estimate flooding potential along Buckhorn Creek at the profile locations and estimated for the remaining residences. The potential extent of flooding was estimated along the creek and adjacent properties for the 25 year-1 hour flood event, 1.8 inches of rain in 1 hour, estimated to produce a flow between 110-1700 cubic feet per second (cfs) from BC-1 to BC-18.

Assets and Resources at Risk: CR 44H – Buckhorn Road (Gravel) is at risk to potential flooding. Rainfall in excess of a 2 yr–1 hr event of 0.8 inches in one hour will cause many road culverts to be overtopped and cause flooding along the road. Travel would be hazardous with 1 to 2 feet of flow over the road in several locations such as BC-7, BC-9, BC-11, and BC-16 with the potential for the road to be washed out and/or the culverts plugged with debris.

CR 27 - Buckhorn Road (Blacktop) is at risk to potential flooding. In the Buckhorn Canyon area below the intersection with Ohana Way, Rainfall in excess of a 5 yr–1 hr event of 1.2 inches in one hour will cause several road culverts to be overtopped and cause flooding along the road. For a 25 yr – 1hr event of 1.8 in., travel would be hazardous with up to 4 feet of flow over and down the 1.6 mile narrow canyon roadway (40-50 ft floodplain width). The 4 - (8 x 10 CMP) culverts crossing Buckhorn Road have the potential to be washed out and/or plugged with debris.

Approximately 30 properties were identified as having living quarters along the floodplain of Buckhorn Creek between BC-1 and BC-18. Surveys were conducted on 8 properties and all the living quarters were above the 25 yr-1hr event of 1.8 inches. However, the workshop at 30 Snowdrop Lane would need 1.9 feet of flood protection. Estimated cross-section were used on the rest of the properties and all except for 4 locations (21509, 20533, 18984, and 16246 Buckhorn Road) were estimated to be above the 25 yr 1 hr storm event. Letters were left at the above properties for flood protection assistance, but no replies were received. Propane tanks close to the stream and floodplain should be tied down or secured to keep from being washed downstream.

Assessment of the Conditions: It appears a precipitation event has occurred since the fire. At Twin Cabin Gulch and Buckhorn Road, tree debris clogged the culvert causing the road to be overtopped. At 30 Snowdrop Lane, the workshop was flooded and a fence crossing Stove Prairie Creek was washed out along with debris being deposited into the stream channel. Tree and other debris has been deposited through-out the channel of Buckhorn Creek.

Recommendations: When rainfall exceeds 0.8 inches in 1 hour (2 yr–1 hr event), consider closing traffic along CR 44H – Buckhorn Road (Gravel) between BC-7 and BC-16 due to potential flooding, debris on the roadway, and potential road washouts creating hazardous travel conditions. Signs should be posted in the area to move to higher ground in the event of flash flooding.

When rainfall exceeds 1.2 inches in 1 hour (5 yr–1 hr event), consider closing traffic along CR 27 - Buckhorn Road (Blacktop) in the canyon between Ohana Way (BC-17) and 1.6 miles downsteam due to potential flooding, debris on the roadway, and potential road washouts creating hazardous travel conditions. Signs should be posted in the area to move to higher ground in the event of flash flooding.

Debris Control: Flood flows in Buckhorn Creek are capable of transporting large rocky and woody debris. The construction of debris control structures should be considered to prevent large material from potentially blocking flows and washing out road culverts and bridges. The suggested location for the three (3) debris control structures was identified at (1) Twin Cabin Gulch and Buckhorn Road, (2) Stove Prairie Creek and 30 Snowdrop Lane, and (3) Buckhorn Creek and Ohana Way.

Debris Removal: Considerable debris exists in the Buckhorn Creek flow channel. The specific concern is transported debris will plug downstream culverts causing overtopping and blocking the stream channel resulting in erosion of roadway (CR 27). The proposal is to remove all dead and downed woody debris one inch (1”) in diameter and larger from the Buckhorn Creek channel between Ohana Way and 1.6 miles downstream of Ohana Way.

Structures at Risk: The houses at 21509, 20533, 18984, and 16246 Buckhorn Road have the potential for flooding. Letters were left at the above properties for flood protection assistance, but no replies were received granting permission for an assessment. Sandbag availability should be provided in the area for landowners seeking flood protection.

Seven (7) propane tanks are recommended to be tied down or secured to keep from being washed downstream. (31459, 25653, 25455, 17426, 16140, 16136 Buckhorn Road, and 30 Snowdrop Lane).

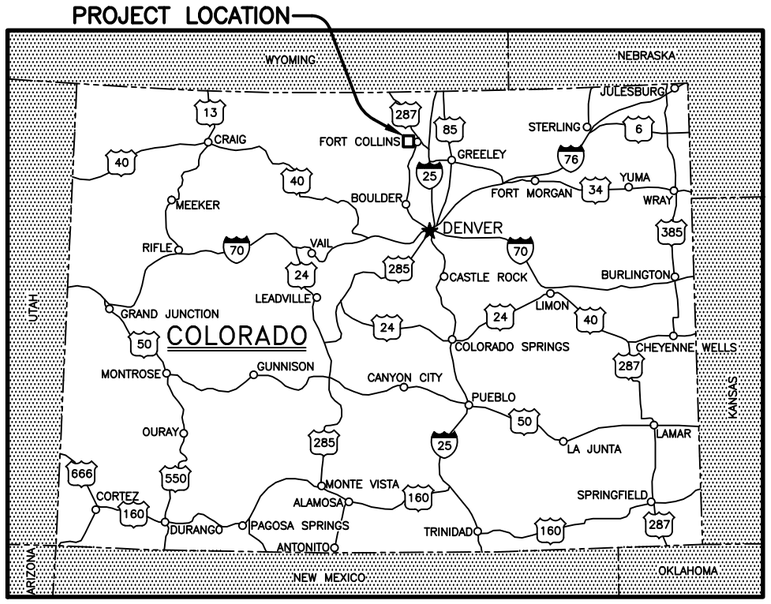
Cost Estimate: A summary of recommended flood protection measures and cost estimates is listed below. These figures are based on prevailing contract costs.

_____

John Andrews
State Conservation Engineer

Buckhorn Creek – Summary of Recommended Flood Protection Measures		
Location	**Recommendations**	**Estimated Cost**
CR 44H – Buckhorn Road (Gravel)	Potential Flash Flooding Signs – 2 in both directions between BC-7 and BC-16	4 signs @ $400 each Total Cost - $1,600
CR 27 – Buckhorn Road (Blacktop)	Potential Flash Flooding Signs – 1 in both directions between Ohana Way (BC-17) and 1.6 miles downstream	2 signs @ $400 each Total Cost - $800
Twin Cabin Gulch and Buckhorn Road Stove Prairie Creek and 30 Snowdrop Lane Buckhorn Creek and Ohana Way	Debris Control Structures	35 feet@ $600/ft Total Cost - $21,000 70 feet@ $600/ft Total Cost - $42,000 50 feet@ $600/ft Total Cost - $30,000
In Buckhorn Canyon Area Between Ohana Way and 1.6 miles downstream of Ohana Way.	Debris Removal from stream channel	1.6 miles @ $30,000/mile Total Cost - $48,000
Landowners throughout Buckhorn Watershed	Plastic & Sandbags to protect structures from flooding	4000 bags @ $1.50 Total Cost - $6,000
(31459, 25653, 25455, 17426, 16140, 16136 Buckhorn Road, and 30 Snowdrop Lane)	Cable down propane tank	Total Cost - $700
		Total Cost - $150,100

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
BUCKHORN CREEK PROTECTION RECOMMENDATIONS



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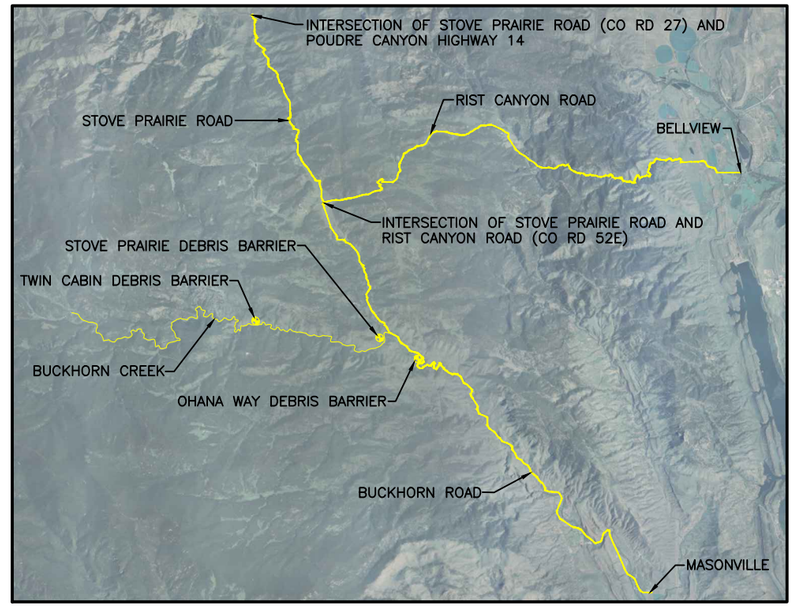
COLORADO STATE MAP
NOT TO SCALE



PROJECT VICINITY MAP
NOT TO SCALE

INDEX OF DRAWINGS

TITLE	SHEET NO.
COVER SHEET	1
SITE PLAN	2
DEBRIS BARRIER CROSS SECTIONS	3
CHANNEL DEBRIS BARRIER	4

GENERAL NOTES

CONSTRUCTION SPECIFICATIONS

NO.	TITLE

CONSTRUCTION QUANTITIES

COOPERATOR AGREEMENT

THIS PLAN HAS BEEN DISCUSSED WITH ME BY THE NRCS AND I AM IN AGREEMENT WITH THE CALCULATIONS AND DESIGN. I WILL PROVIDE NRCS WITH THE UTILITY NOTIFICATION CENTER OF COLORADO (UNCC) TICKET NUMBER MY CONTRACTOR HAS ACQUIRED PRIOR TO START OF CONSTRUCTION.

_____ DATE: _____
COOPERATOR

UTILITY NOTIFICATION

NOTICE TO THE COOPERATOR AND CONTRACTOR

NO REPRESENTATION IS MADE BY THE NATURAL RESOURCES CONSERVATION SERVICE AS TO THE EXISTENCE OR NONEXISTENCE OF UNDERGROUND UTILITIES. **CALL 2 BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.** CALL UTILITY NOTIFICATION CENTER OF COLORADO AT 1-800-922-1987 OR 811. IN THE METRO DENVER AREA CALL 303-232-0491 OR 811.

UNCC TICKET NUMBER: _____

CONSTRUCTION DATA & AS-BUILT DRAWINGS

LAYOUT BY:

_____ DATE: _____

CONTRACTOR NAME AND ADDRESS:

_____

_____

_____

CONSTRUCTION COMPLETED _____ DATE: _____

PRACTICE (DOES) (DOES NOT) MEET STANDARDS AND SPECIFICATIONS.

_____ DATE: _____

_____
TITLE:

AS-BUILT DRAWINGS REVIEWED AND APPROVED BY:

_____ DATE: _____
TITLE:

	DATE
DESIGNED D. WOLFF	06/13
DRAWN D.D. DROULLARD	06/13
CHECKED D. WOLFF	06/13
APPROVED	

COVER SHEET
BUCKHORN CREEK
HIGH PARK BURN AREA
JOB CLASS _____
LARIMER COUNTY
COLORADO

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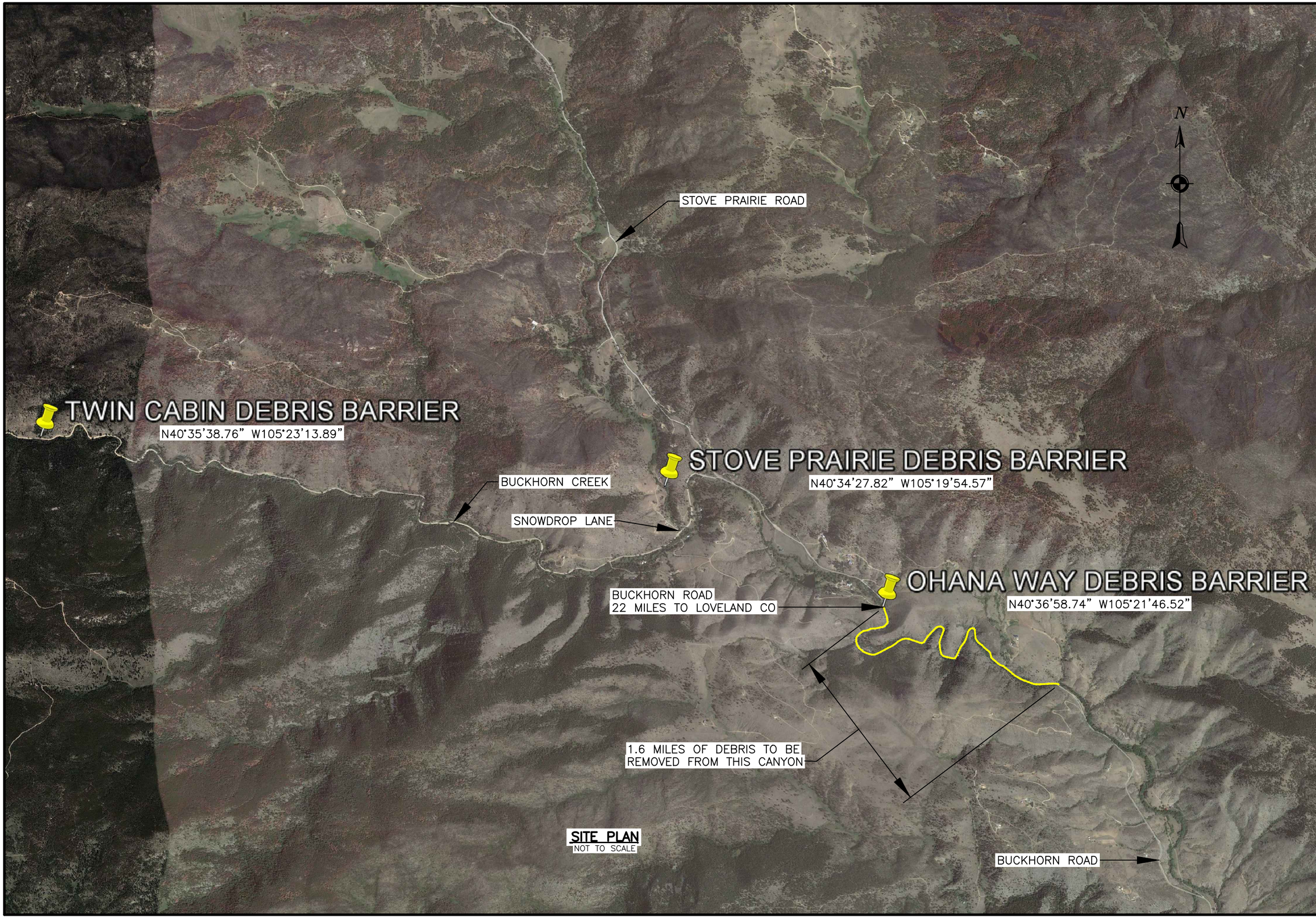
FILE NO.

DRAWING NO.

SHEET 1 OF 4



DESIGNED D. WOLFF DATE 06/13
DRAWN D.D. DROUILLARD 06/13
CHECKED D. WOLFF 06/13
APPROVED

SITE PLAN
BUCKHORN CANYON DEBRIS MITIGATION

BUCKHORN CREEK
HIGH PARK BURN AREA

LARIMER COUNTY COLORADO

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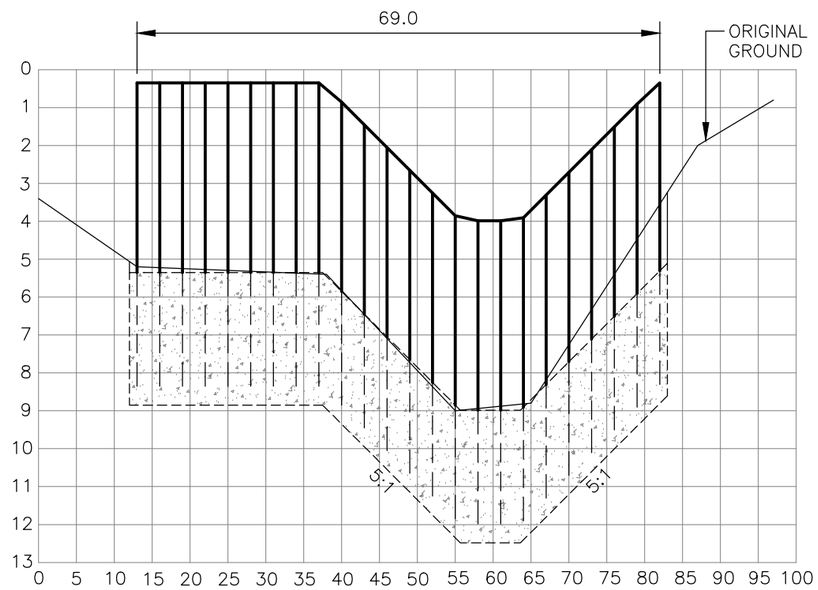
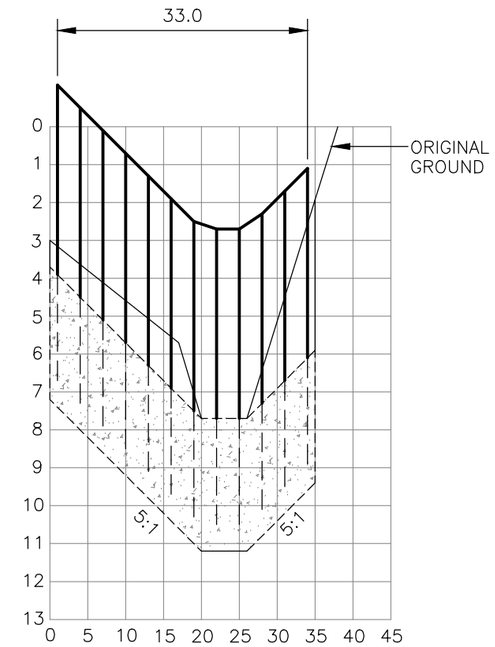
FILE NO.

DRAWING NO.

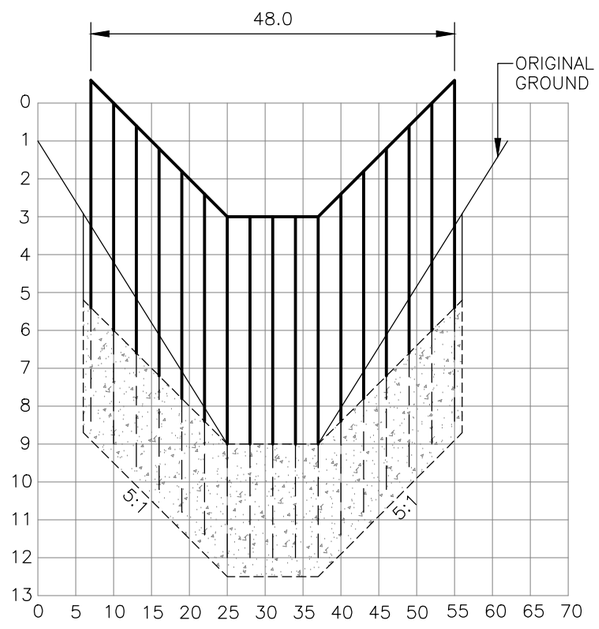
SHEET 2 OF 4



STOVE PRAIRIE DEBRIS BARRIER
(30 SNOWDROP LANE)



TWIN CABIN GULCH DEBRIS BARRIER



OHANA DEBRIS BARRIER

CROSS SECTIONS
10 0 10 20
SCALE IN FEET

DESIGNED D. WOLFF DATE 06/13
DRAWN D.D. DROUILLARD 06/13
CHECKED D. WOLFF 06/13
APPROVED

DEBRIS BARRIER CROSS SECTIONS

BUCKHORN CREEK
HIGH PARK BURN AREA
LARIMER COUNTY
COLORADO

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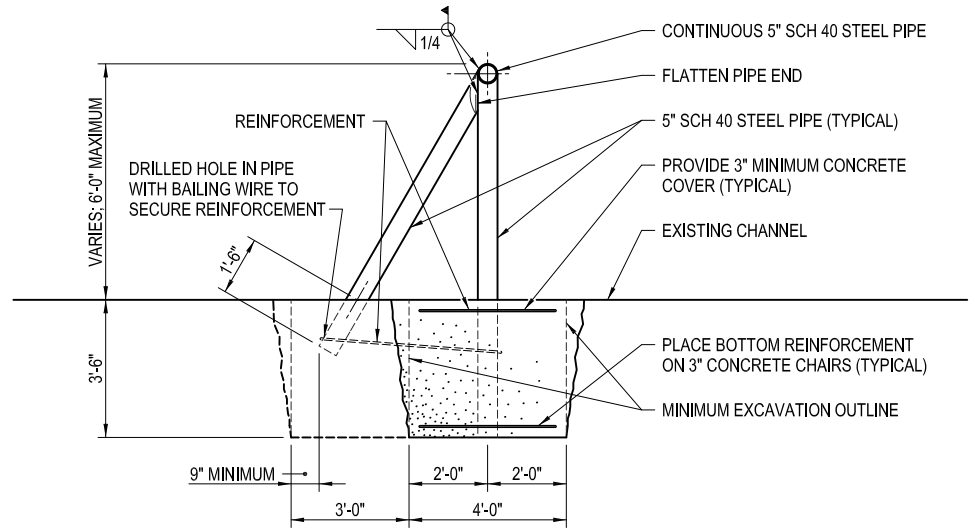
FILE NO.
DRAWING NO.
SHEET 3 OF 4

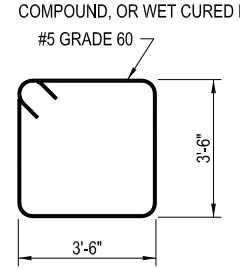


SECTION - A

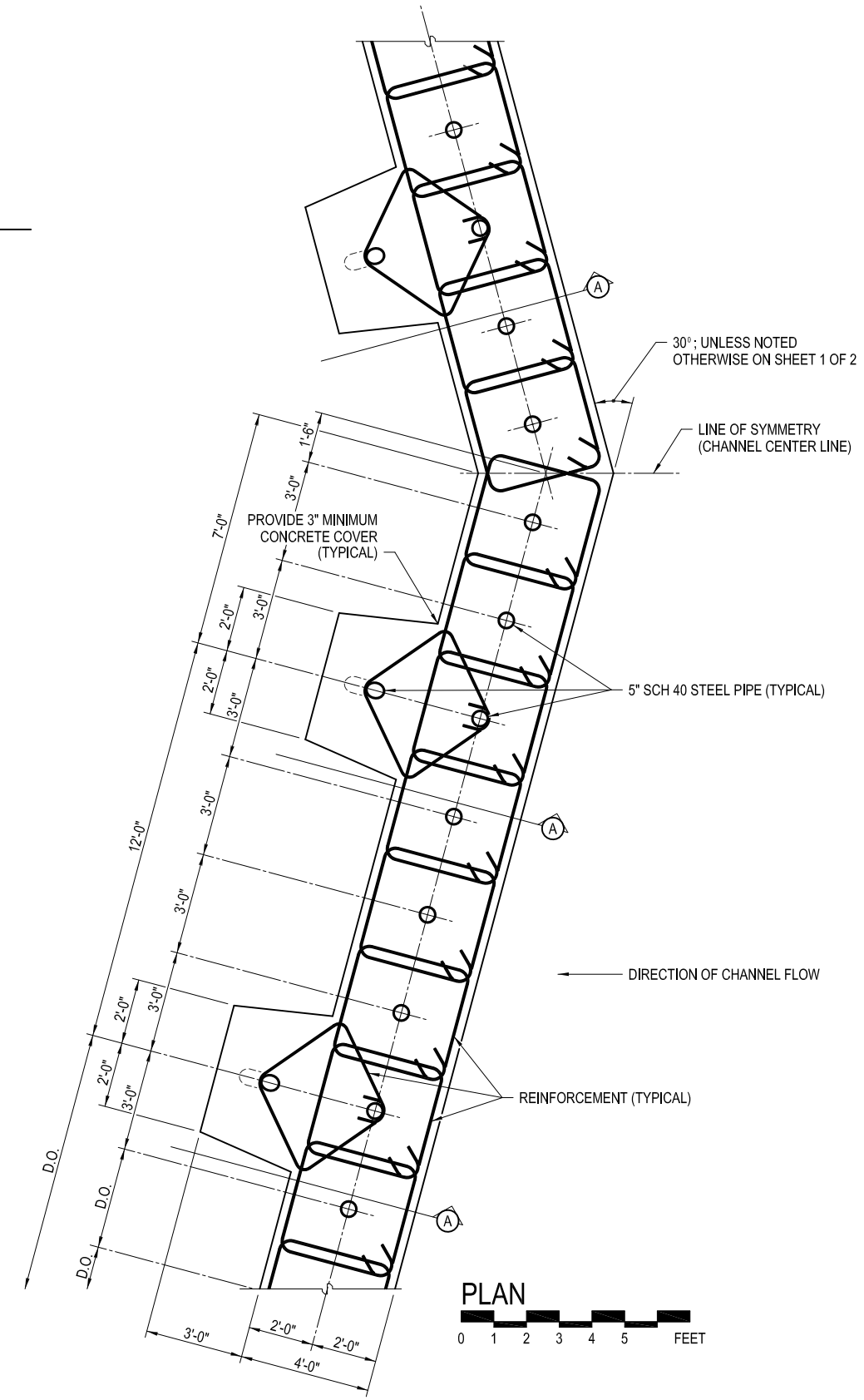
0 1 2 3 4 5 FEET

NOTES

1. LENGTH AND ALIGNMENT OF STRUCTURE TO BE DETERMINED ON A SITE SPECIFIC BASIS. SEE SHEET 1 OF 2 FOR DIMENSIONS AND ELEVATIONS.
2. IN LIEU OF 5" SCH 40 STEEL PIPE; STRUCTURAL STEEL TUBE SHAPES HAVING A SECTION MODULUS OF AT LEAST 4.5 IN^3 MAY BE USED, OR 'W' OR 'I' SHAPES HAVING A SECTION MODULUS OF AT LEAST 4.9 IN^3 MAY BE USED.
3. CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3000 LB/IN^2, AND SHALL HAVE A SLUMP BETWEEN 3 AND 5 INCHES. ALL CONCRETE SHALL BE VIBRATED. EXPOSED CONCRETE SURFACES SHALL BE COATED WITH CURING COMPOUND, OR WET CURED FOR 28 DAYS.



TYPICAL REINFORCEMENT



PLAN

0 1 2 3 4 5 FEET

		Date
Designed	Stambaugh	AUG 2012
Drawn	Stambaugh	AUG 2012
Checked	Marine	AUG 2012
Approved	Andrews	AUG 2012

CHANNEL DEBRIS BARRIER

DETAILS, REINFORCEMENT, AND SECTION
6-FOOT MAXIMUM HEIGHT

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File Name
XXXXXXXX

Drawing No.
XX - X -XXXX

Sheet 2 of 2