

ELEVATION CERTIFICATE

IMPORTANT: Follow the instructions on pages 1-9.

OMB No. 1660-0008
 Expiration Date: July 31, 2015

SECTION A - PROPERTY INFORMATION		FOR INSURANCE COMPANY USE
A1. Building Owner's Name Highwest Energy	Policy Number:	
A2. Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or PO. Route and Box No. 6270 County Road 212	Company NAIC Number:	
City Pine Bluffs - Laramie County	State Wyoming	ZIP Code 82082
A3. Property Description (Lot and Block Numbers, Tax Parcel Number, Legal Description, etc.) A parcel located in the SE 1/4 of Section 16 T14N R66W of the 6th PM in the unincorporated areas of Laramie County, Wyoming.		
A4. Building Use (e.g., Residential, Non-Residential, Addition, Accessory, etc.) Commercial - Office Building		
A5. Latitude/Longitude: Lat. 41D 10' 24.6" Long. 104D 05' 15.0" Horizontal Datum: <input type="checkbox"/> NAD 1927 <input checked="" type="checkbox"/> NAD 1983		
A6. Attach at least 2 photographs of the building if the Certificate is being used to obtain flood insurance.		
A7. Building Diagram Number .1B		
A8. For a building with a crawlspace or enclosure(s):		A9. For a building with an attached garage:
a) Square footage of crawlspace or enclosure(s) _____ sq ft	b) No. of permanent flood openings in the crawlspace or enclosure(s) within 1.0 foot above adjacent grade _____	a) Square footage of attached garage _____ sq ft
c) Total net area of flood openings in A8.b _____ sq in	d) Engineered flood openings? <input type="checkbox"/> Yes <input type="checkbox"/> No	b) Number of permanent flood openings in the attached garage within 1.0 foot above adjacent grade _____
		c) Total net area of flood openings in A9.b _____ sq in
		d) Engineered flood openings? <input type="checkbox"/> Yes <input type="checkbox"/> No

SECTION B - FLOOD INSURANCE RATE MAP (FIRM) INFORMATION					
B1. NFIP Community Name & Community Number Laramie County - 560029		B2. County Name Laramie County		B3. State Wyoming	
B4. Map/Panel Number 56021C1237F	B5. Suffix F	B6. FIRM Index Date January 17, 2007	B7. FIRM Panel Effective/Revised Date none	B8. Flood Zone(s) Zone A	B9. Base Flood Elevation(s) (Zone AO, use base flood depth) 100-year BFE - 5064.68
B10. Indicate the source of the Base Flood Elevation (BFE) data or base flood depth entered in Item B9: <input type="checkbox"/> FIS Profile <input type="checkbox"/> FIRM <input type="checkbox"/> Community Determined <input checked="" type="checkbox"/> Other/Source: Floodplain Assessment September 13, 2012 by Benchmark Engineers PC					
B11. Indicate elevation datum used for BFE in Item B9: <input type="checkbox"/> NGVD 1929 <input checked="" type="checkbox"/> NAVD 1988 <input type="checkbox"/> Other/Source: _____					
B12. Is the building located in a Coastal Barrier Resources System (CBRS) area or Otherwise Protected Area (OPA)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Designation Date: _____ / _____ / _____ <input type="checkbox"/> CBRS <input type="checkbox"/> OPA					

SECTION C - BUILDING ELEVATION INFORMATION (SURVEY REQUIRED)			
C1. Building elevations are based on: <input type="checkbox"/> Construction Drawings* <input type="checkbox"/> Building Under Construction* <input checked="" type="checkbox"/> Finished Construction *A new Elevation Certificate will be required when construction of the building is complete.			
C2. Elevations - Zones A1-A30, AE, AH, A (with BFE), VE, V1-V30, V (with BFE), AR, AR/A, AR/AE, AR/A1-A30, AR/AH, AR/AO. Complete Items C2.a-h below according to the building diagram specified in Item A7. In Puerto Rico only, enter meters. Benchmark Utilized: Pine Bluffs Control Network Vertical Datum: NAVD 1988			
Indicate elevation datum used for the elevations in items a) through h) below. <input type="checkbox"/> NGVD 1929 <input checked="" type="checkbox"/> NAVD 1988 <input type="checkbox"/> Other/Source: _____ Datum used for building elevations must be the same as that used for the BFE.			
a) Top of bottom floor (including basement, crawlspace, or enclosure floor)	<u>5064.35</u>	<input checked="" type="checkbox"/> feet <input type="checkbox"/> meters	Check the measurement used.
b) Top of the next higher floor	<u>5067.85</u>	<input checked="" type="checkbox"/> feet <input type="checkbox"/> meters	
c) Bottom of the lowest horizontal structural member (V Zones only)	_____	<input type="checkbox"/> feet <input type="checkbox"/> meters	
d) Attached garage (top of slab)	_____	<input type="checkbox"/> feet <input type="checkbox"/> meters	
e) Lowest elevation of machinery or equipment servicing the building (Describe type of equipment and location in Comments)	_____	<input type="checkbox"/> feet <input type="checkbox"/> meters	
f) Lowest adjacent (finished) grade next to building (LAG)	<u>5062.45</u>	<input checked="" type="checkbox"/> feet <input type="checkbox"/> meters	
g) Highest adjacent (finished) grade next to building (HAG)	<u>5064.25</u>	<input checked="" type="checkbox"/> feet <input type="checkbox"/> meters	
h) Lowest adjacent grade at lowest elevation of deck or stairs, including structural support	<u>5064.25</u>	<input checked="" type="checkbox"/> feet <input type="checkbox"/> meters	

SECTION D - SURVEYOR, ENGINEER, OR ARCHITECT CERTIFICATION				
This certification is to be signed and sealed by a land surveyor, engineer, or architect authorized by law to certify elevation information. I certify that the information on this Certificate represents my best efforts to interpret the data available. I understand that any false statement may be punishable by fine or imprisonment under 18 U.S. Code, Section 1001.				
<input type="checkbox"/> Check here if comments are provided on back of form.		Were latitude and longitude in Section A provided by a licensed land surveyor? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
<input type="checkbox"/> Check here if attachments.				
Certifier's Name Kelly Hafner	License Number 10514			
Title Project Engineer	Company Name Benchmark Engineers, PC			
Address 1920 Thomas Ave., Ste. 620	City Cheyenne	State Wyoming		ZIP Code 82001
Signature <i>Kelly Hafner</i>	Date _____	Telephone 307-634-9064		

ELEVATION CERTIFICATE, page 2

IMPORTANT: In these spaces, copy the corresponding information from Section A.	FOR INSURANCE COMPANY USE		
Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No. 6270 County Road 212	Policy Number:		
City Pine Bluffs - Laramie County	State Wyoming	ZIP Code 82082	Company NAIC Number:

SECTION D – SURVEYOR, ENGINEER, OR ARCHITECT CERTIFICATION (CONTINUED)

Copy both sides of this Elevation Certificate for (1) community official, (2) insurance agent/company, and (3) building owner.

Comments **Included with this certification is the Flood Plain Assessment completed September 13, 2012 for The High West Energy Office Complex.**

Signature *Kelly to. Hafner* Date **8-29-13**

SECTION E – BUILDING ELEVATION INFORMATION (SURVEY NOT REQUIRED) FOR ZONE AO AND ZONE A (WITHOUT BFE)

For Zones AO and A (without BFE), complete Items E1–E5. If the Certificate is intended to support a LOMA or LOMR-F request, complete Sections A, B, and C. For Items E1–E4, use natural grade, if available. Check the measurement used. In Puerto Rico only, enter meters.

- E1. Provide elevation information for the following and check the appropriate boxes to show whether the elevation is above or below the highest adjacent grade (HAG) and the lowest adjacent grade (LAG).
 - a) Top of bottom floor (including basement, crawlspace, or enclosure) is _____ . _____ feet meters above or below the HAG.
 - b) Top of bottom floor (including basement, crawlspace, or enclosure) is _____ . _____ feet meters above or below the LAG.
- E2. For Building Diagrams 6–9 with permanent flood openings provided in Section A Items 8 and/or 9 (see pages 8–9 of Instructions), the next higher floor (elevation C2.b in the diagrams) of the building is _____ . _____ feet meters above or below the HAG.
- E3. Attached garage (top of slab) is _____ . _____ feet meters above or below the HAG.
- E4. Top of platform of machinery and/or equipment servicing the building is _____ . _____ feet meters above or below the HAG.
- E5. Zone AO only: If no flood depth number is available, is the top of the bottom floor elevated in accordance with the community's floodplain management ordinance? Yes No Unknown. The local official must certify this information in Section G.

SECTION F – PROPERTY OWNER (OR OWNER'S REPRESENTATIVE) CERTIFICATION

The property owner or owner's authorized representative who completes Sections A, B, and E for Zone A (without a FEMA-issued or community-issued BFE) or Zone AO must sign here. The statements in Sections A, B, and E are correct to the best of my knowledge.

Property Owner or Owner's Authorized Representative's Name
Owner - Highwest Energy Representative - Kelly Hafner, Benchmark Engineers P.C.

Address
6270 County Road 212 P.O. Box 519

City
Pine Bluffs

State
Wyoming

ZIP Code
82001

Signature _____ Date _____ Telephone
307-245-4300

Comments **Included with this certification is the Flood Plain Assessment completed September 13, 2012 for The High West Energy Office Complex.**

Check here if attachments.

SECTION G – COMMUNITY INFORMATION (OPTIONAL)

The local official who is authorized by law or ordinance to administer the community's floodplain management ordinance can complete Sections A, B, C (or E), and G of this Elevation Certificate. Complete the applicable item(s) and sign below. Check the measurement used in Items G8–G10. In Puerto Rico only, enter meters.

- G1. The information in Section C was taken from other documentation that has been signed and sealed by a licensed surveyor, engineer, or architect who is authorized by law to certify elevation information. (Indicate the source and date of the elevation data in the Comments area below.)
- G2. A community official completed Section E for a building located in Zone A (without a FEMA-issued or community-issued BFE) or Zone AO.
- G3. The following information (Items G4–G9) is provided for community floodplain management purposes.

G4. Permit Number	G5. Date Permit Issued	G6. Date Certificate Of Compliance/Occupancy Issued
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- G7. This permit has been issued for: New Construction Substantial Improvement
- G8. Elevation of as-built lowest floor (including basement) of the building: _____ . _____ feet meters Datum _____
- G9. BFE or (in Zone AO) depth of flooding at the building site: _____ . _____ feet meters Datum _____
- G10. Community's design flood elevation: _____ . _____ feet meters Datum _____

Local Official's Name _____ Title _____

Community Name _____ Telephone _____

Signature _____ Date _____

Comments _____

Check here if attachments.

See Instructions for Item A6.

IMPORTANT: In these spaces, copy the corresponding information from Section A.			FOR INSURANCE COMPANY USE
Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or PO. Route and Box No. 6270 County Road 212			Policy Number:
City Pine Bluffs	State Wyoming	ZIP Code 82082	Company NAIC Number:

If using the Elevation Certificate to obtain NFIP flood insurance, affix at least 2 building photographs below according to the instructions for Item A6. Identify all photographs with date taken; "Front View" and "Rear View"; and, if required, "Right Side View" and "Left Side View." When applicable, photographs must show the foundation with representative examples of the flood openings or vents, as indicated in Section A8. If submitting more photographs than will fit on this page, use the Continuation Page.



AERIAL VIEW



FRONT VIEW

IMPORTANT: In these spaces, copy the corresponding information from Section A.	FOR INSURANCE COMPANY USE
Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.	Policy Number:
City State ZIP Code	Company NAIC Number:

If submitting more photographs than will fit on the preceding page, affix the additional photographs below. Identify all photographs with: date taken; "Front View" and "Rear View"; and, if required, "Right Side View" and "Left Side View." When applicable, photographs must show the foundation with representative examples of the flood openings or vents, as indicated in Section A8.

Floodplain Assessment
High West Energy
Office Complex
September 13, 2012

A floodplain analysis and elevation assessment
for an existing facility at 6270 County Road 212
Laramie County, Wyoming

Prepared for:

High West Energy
6270 County Rd. 212 P.O. Box 519
Pine Bluffs, WY 82082
307.245.4300

Prepared by:

BenchMark Engineers, P.C.
1920 Thomes Avenue, Suite 620
Cheyenne, WY 82001
307.634.9064

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APPENDICES

- Appendix A: Mapping
- Appendix B: Hydrological Analysis
- Appendix C: Hydraulic Analysis

I. Introduction

An existing facility for the High West Energy utility company is located within the SFHA of Laramie County, WY. The site is located at 6270 County Rd. 212 in the SE1/4 of Section 16 T14N R66W of the 6th P.M. in the unincorporated areas of Laramie County. The entire property in question is located in an A-Zone as shown on FEMA FIRM Community 560029 Panel 1237F, dated January 17, 2007.

The purpose of this report is to assess the flood hazard and estimate a base flood elevation of the existing floodplain for elevation certification. The project is located along the main stem of the Lodgepole Creek drainage way upstream of the Muddy Creek confluence (see Figure 2). The estimated drainage tributary area to this location is 476 square miles.

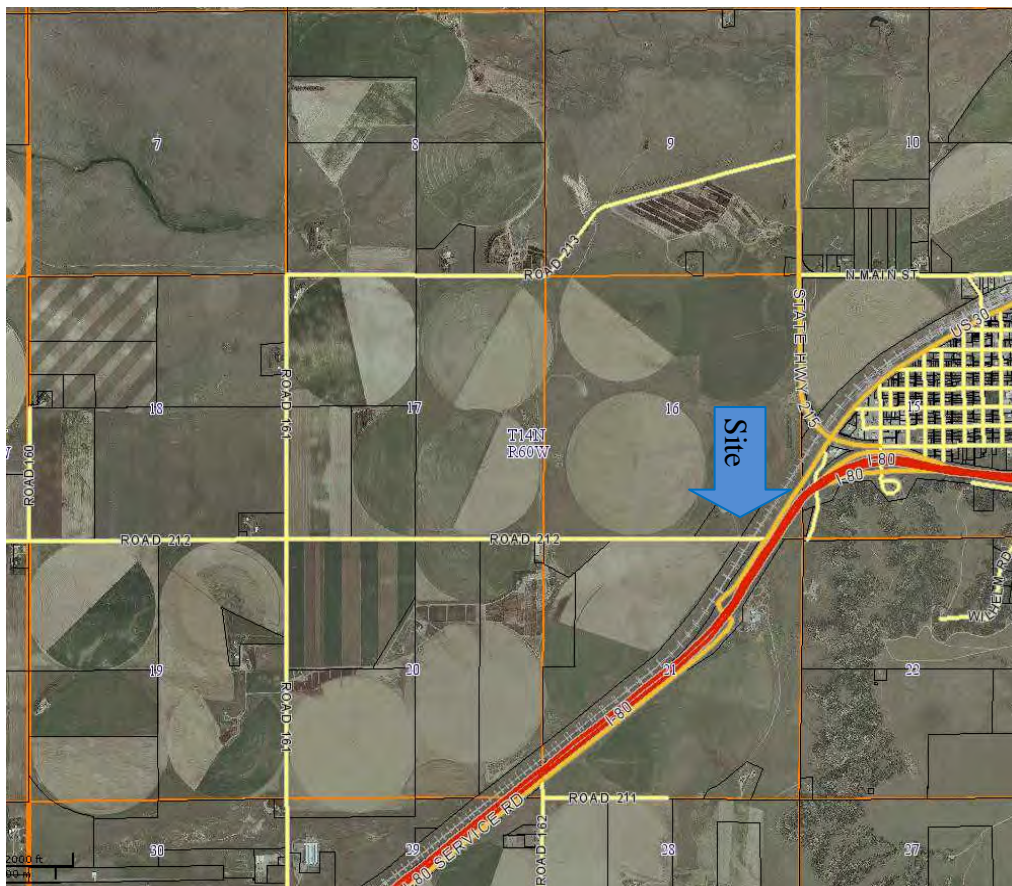


Figure I.1 Vicinity Map

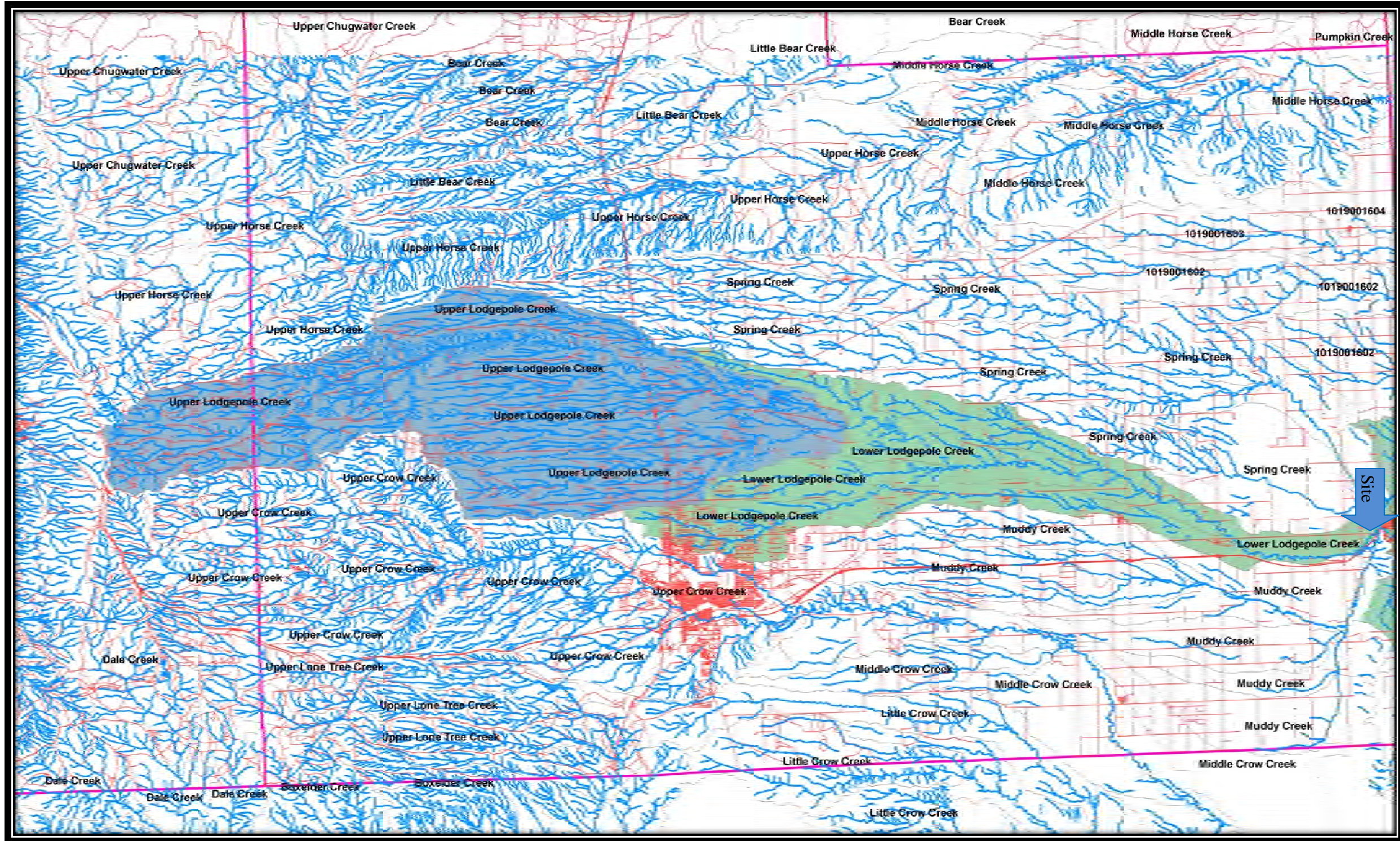


Figure I.2 Drainage Basin and Project Location Map

2. Mapping

2.1 Horizontal and Vertical Control

Horizontal and vertical control adheres to the following coordinates and datum elevations:

- 1) State Plane Coordinates (NAD 1983-92)
- 2) Vertical Elevations are in NAVD 88.

The existing site floodplain survey information was gathered for this project by BenchMark Engineers, PC (BME) in September 2012. Mapping information is located in Appendix A.

Basin delineation and major basin characteristics were derived from GIS geospatial analysis by BME. Data sources were downloaded from the WyGISC Data Server (Level 5 and 6 watershed boundaries) National Hydrography Dataset (NHD). Geospatial analysis was completed using ArcMap (ver 10.0) by ESRI. GIS projected coordinate system used the WyLam (Lambert Conformal Conic) projection.

3. Hydrological Analysis

3.1 Basin Characteristics

The Lodgepole Creek tributary area is estimated at 477 sq. mi. at this location. The characteristics estimated with the GIS analysis estimated a maximum reach length of 74.6 miles to the area of study. Estimates for basin lag time and time of concentration are as follows:

Average reach velocity (fps)	Time of Concentration (hr)	Basin Lag Time (hr)
5.0	21.9	13.1
6.0	18.2	10.9

The existing basin is largely rural with small areas of low density urban residential development in the central and eastern portions of the basin. Baseflow is intermittent with infrequent flow observed in the eastern portions of the basin. For this analysis, baseflow is assumed negligible based on field observations.

3.2 USGS Regression

The current U.S. Geological Survey (USGS) regression equations for this region are utilized to estimate basin peak flow characteristics for this basin. The most current USGS regression analysis for this area is outlined in the “Peak-Flow Characteristics of Wyoming Streams’ Water-Resources Investigations Report 03-4107 (USGS, 2003). This regression analysis is integrated into the ‘National Streamflow Statistics’ (NSS) program, version 5.12. The NSS program supersedes the National Flood Frequency or NFF program previously available from the USGS.

Basin analysis required use of Region 3 and Region 4 regression equations with the weighted peak sum calculated as outlined in the referenced USGS report. GIS analysis estimated approximately 250 square miles (or 53% of area of study) of basin drainage in Region 3 and 226 square miles (or 47% of Area of Study) in Region 4.

Mean average March precipitation is estimated at 1.7” for the portion of the basin in Region 4. The initial analyses estimated the Mean Basin Hydrologic Soils Index of 2.3 for the area of study of Lodgepole Creek. It was also noted that the total basin area, 477 square miles is slightly above the regression equation limits for Region 4 but used since the differences in area (6 sq. mi. and peak 10 cfs) was very small. A summary of the estimated hydrological conditions at the High West Site are summarized in Table I.

Printouts of the USGS NSS program output is placed in Appendix B. The Base Flood is the 1% annual chance event (i.e. 100-Year) storm and a flow rate of **6,300 cfs** was used for this analysis.

Table 4.1 Mannings 'n' High West Floodplain			
Station	Left Overbank Manning's 'n'	Channel Manning's 'n'	Right Overbank Manning's 'n'
	0.035 Overland floodplain w/moderate grass	0.035 Grass Unmaintained	0.04 Overland floodplain w/moderate grass
	0.035 Overland floodplain w/moderate grass	0.035 Grass Unmaintained	0.04 Overland floodplain w/moderate grass

The estimated BFE for the upstream and downstream locations on the property are estimated at Section 5+00.47 as shown in Table 4.2.

Table 4.2 Estimated Base Flood Elevation (BFE) Table Station 500.47 (High West Bldg.)		
Return Period	Peak Inflow (cfs)	BFE (ft)
10% Annual Chance Event (10-Year)	1,500	5063.84
2% Annual Chance Event (50-Year)	4,250	5064.42
1% Annual Chance Event (100-Year)	6,300	5064.68
0.2% Annual Chance Event (500-Year)	14,200	5065.41

The existing main level of the High West Building was measured at 5064.35' and the loading dock at 5067.85'. All new facilities are recommended to be above 5064.7'. For insurance purposes, however, it is generally recommended that all structures are located at least one (1) foot above the BFE for the 1% Annual Chance Event.

It should be noted that channelization of the existing floodplain appears feasible to reduce the BFE for this location.

Detailed printouts of the hydraulic analysis are located in Appendix C.

5. Engineer's Certification

I hereby attest that this report for the Floodplain Assessment – High West Energy Office Complex was prepared by me (or under my direct supervision) for the responsible parties thereof and that I am a duly registered Professional Engineer under the laws of the State of Wyoming. The submitted mapping represents, to the best of my knowledge, true conditions found in the field as of the date of this investigation. The hydrological and hydraulic analysis completed with this report was completed in accordance with sound engineering practices.

Registered Professional Engineer (Civil)
State of Wyoming No. 10514

6. References

- U.S.A.C.E. 2010: U. S. Army Corps of Engineers Hydrological Engineering Center; HEC-RAS River Analysis System Hydraulic Reference Manual; dated January 2010.
- CH2M HILL 1988: CH2M HILL & States West Water Resources Corporation: Drainage Master Plan – Crow Creek, dated November 1988.
- ANDERSON 2003: Allison Draw Floodplain and Map Modernization Project, Laramie County Wyoming, by Anderson Consulting Engineers, Inc., dated April 23, 2003.
- WyDOT 2002: Childs Draw North Cheyenne Detailed Floodplain Study: by the Wyoming Department of Transportation; dated April 29, 2002.
- HAESTAD 2003: Floodplain Modeling Using HEC-RAS (First Edition); Haestad Methods, Gary Dyhouse, Jennifer Hatchett, Jeremy Benn; published by Haestad Press, 2003.
- UDFCD 2001: Criteria Manuals Volume 1-3; Urban Drainage and Flood Control District Denver, Colorado, June, 2001 (as currently amended).
- U.S.G.S 1988: U. S. Geological Survey: Precipitation Records and Flood-Producing Storms in Cheyenne, Wyoming, Water-Resources Investigations Report 87-4225, 1988.
- U.S.G.S 2003: U. S. Geological Survey: Peak-Flow Characteristics of Wyoming Streams' Water-Resources Investigations Report 03-4107; 2003.
- FIRM, 2007: Flood Insurance Rate Map, number 1237F, dated January 2007.



APPENDIX A

High West Energy – Site Plan

Mapping

- I. Figure 4.1 Site Survey and HEC-RAS Alignments and Section Layout
-

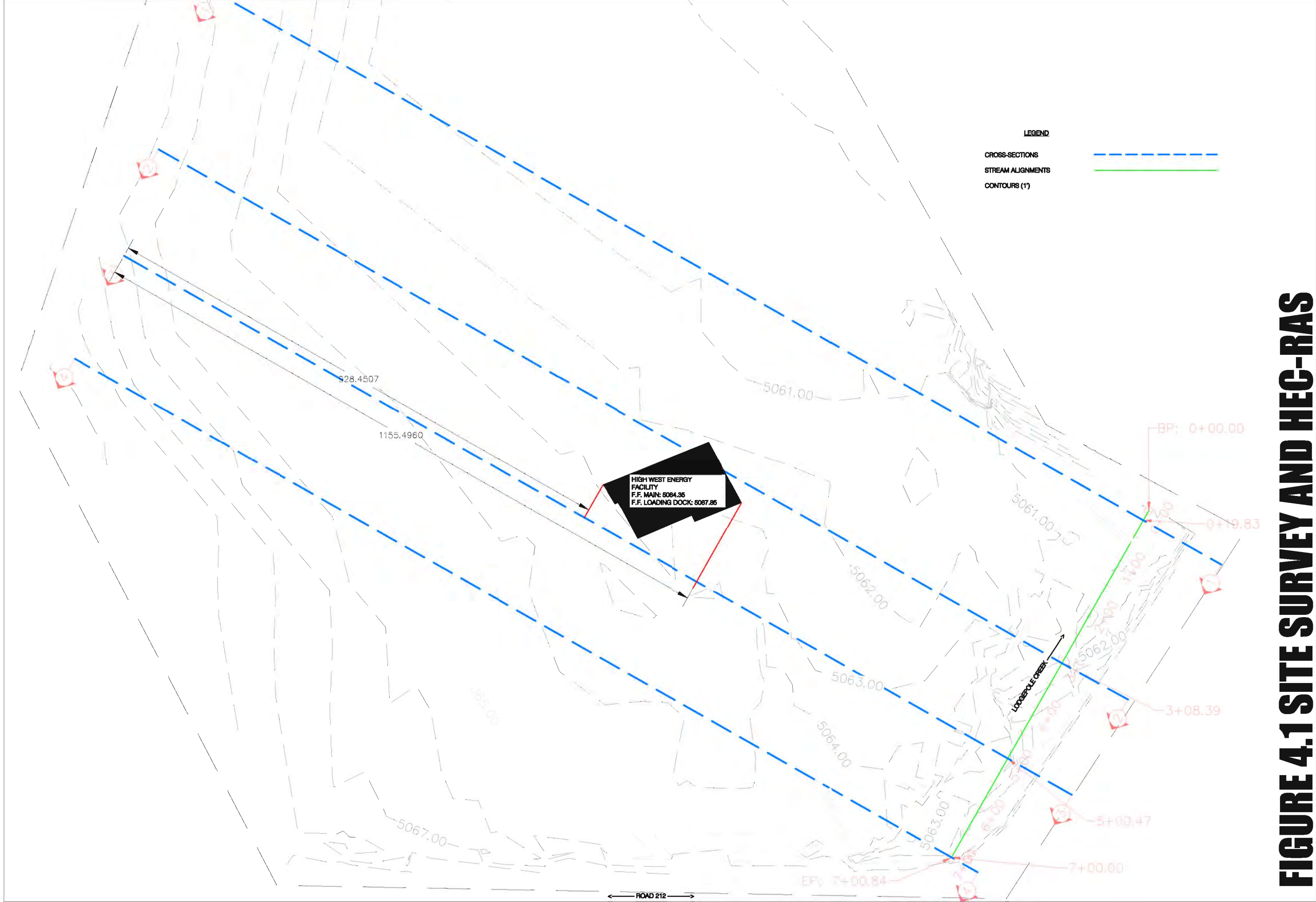


FIGURE 4.1 SITE SURVEY AND HEC-RAS

ALIGNMENTS AND SECTION LAYOUT

SEPTEMBER 2012



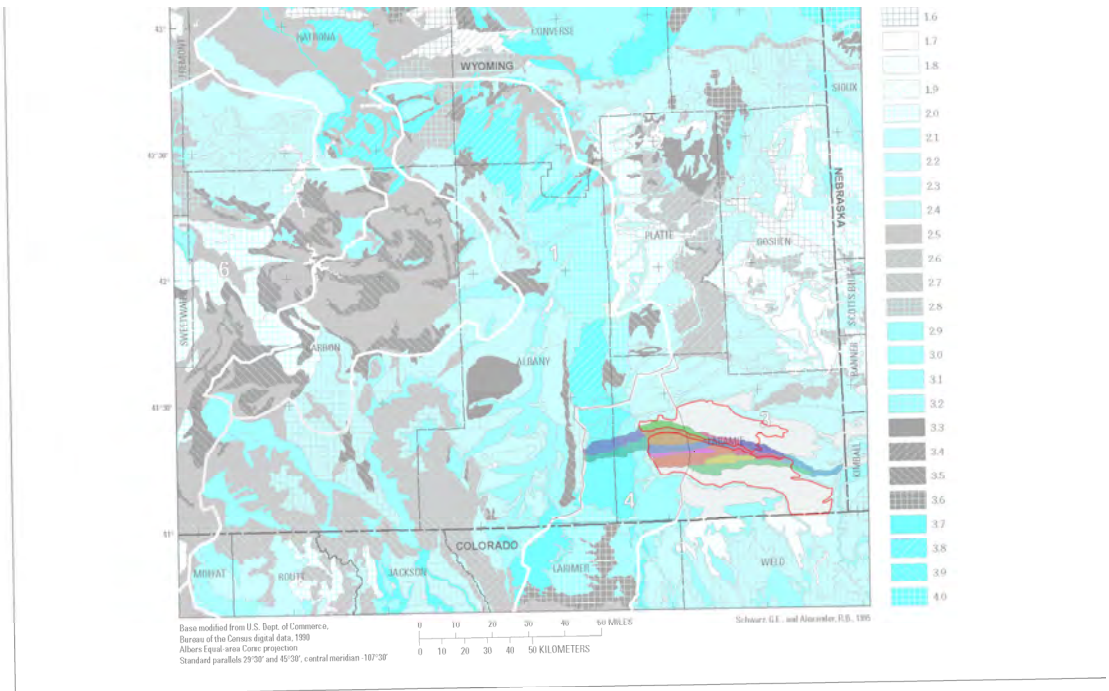


APPENDIX B

Flood Plain Assessment – High West Energy Office Complex

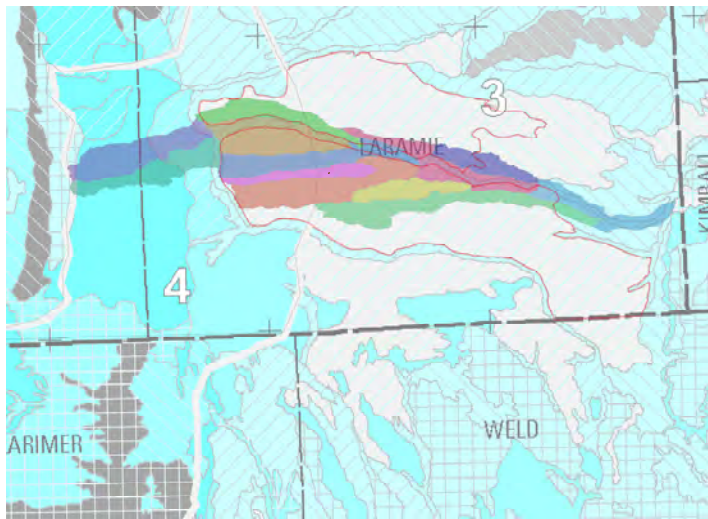
Hydrologic Analysis

1. Lodgepole Creek – Highest Floodplain
2. Support Information – Regression Analysis
3. NSS program Output File

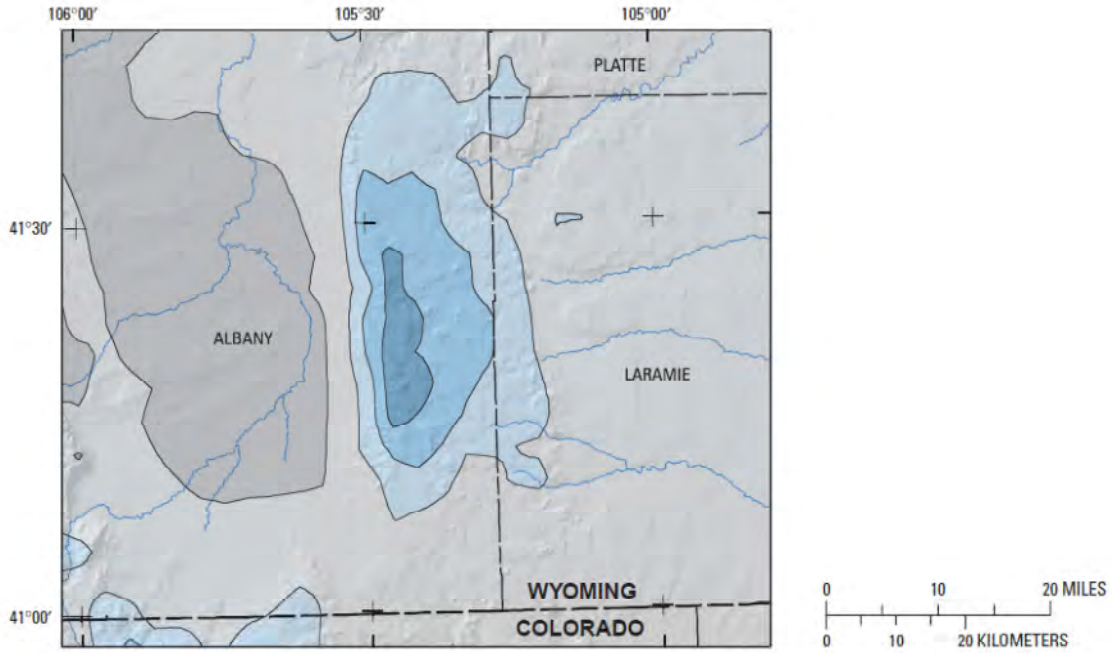


SOILS HYDROLOGIC INDEX DATA

by
Kirk A. Miller
2003

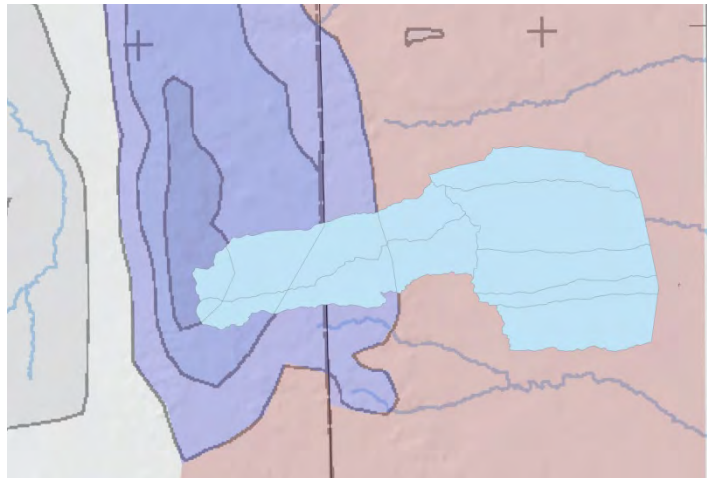
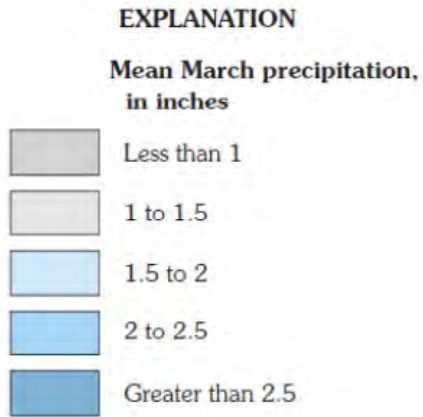


Support information – Regression Analysis



Base modified from U.S. Dept. of Commerce,
Bureau of the Census digital data, 1990
Shaded relief map modified from U.S. Geological
Survey National Elevation Dataset digital data, 1999
Albers Equal-area Conic projection
Standard parallels 29°30' and 45°30', central meridian -107°30'

Oregon Climate Service, 1998b



GIS overlay operation – average March Precip = 1.7"

National Streamflow Statistics Program

Version 5

Based on Techniques and Methods Book 4-A6

Equations from database C:\Program Files (x86)\NSS\NSS_v5_2011-03-24.mdb

Updated by tkoenig 5/2/2011 at 2:38:45 PM Corrections to min/max values for OK Reg2 precip

Site: Laramie County, Wyoming

User: kellyh

Date: Thursday, September 13, 2012 10:10 AM

Equations for Wyoming developed using English units

Rural Estimate: LOWER LODGEPOLE

Basin Drainage Area: 477 square miles

I Region

Region: Region_3_Eastern_Basins_and_Eastern_Plains

Drainage_Area = 477 square miles

Mean_Basin_Hydrologic_Soils_Index = 2.3 dimensionless

Crippen & Bue Region II

Results for: LOWER LODGEPOLE

Equations used:

$$PK1_5 = 1.12 * (DRNAREA)^{(0.401)} * (SOILINDEX)^{(3.01)}$$

$$PK2 = 2.28 * (DRNAREA)^{(0.402)} * (SOILINDEX)^{(2.9)}$$

$$PK2_33 = 3.1 * (DRNAREA)^{(0.403)} * (SOILINDEX)^{(2.84)}$$

$$PK5 = 10.1 * (DRNAREA)^{(0.407)} * (SOILINDEX)^{(2.6)}$$

$$PK10 = 21.9 * (DRNAREA)^{(0.41)} * (SOILINDEX)^{(2.44)}$$

$$PK25 = 48.8 * (DRNAREA)^{(0.416)} * (SOILINDEX)^{(2.27)}$$

$$PK50 = 80.9 * (DRNAREA)^{(0.423)} * (SOILINDEX)^{(2.16)}$$

$$PK100 = 127 * (DRNAREA)^{(0.432)} * (SOILINDEX)^{(2.05)}$$

$$PK200 = 193 * (DRNAREA)^{(0.441)} * (SOILINDEX)^{(1.94)}$$

$$PK500 = 323 * (DRNAREA)^{(0.454)} * (SOILINDEX)^{(1.8)}$$

Statistic	Value, cfs	Pred. Intervals Low	Prediction High	Equivalent Error, %	Years
PK1_5	163	22.3	1190	130	2
PK2	305	57.5	1610	98	2.6
PK2_33	396	84.8	1850	89	3.1

PK5	1080	347	3390	61	7.7
PK10	2100	794	5530	51	14
PK25	4210	1710	10300	46	24
PK50	6640	2650	16600	48	28
PK100	10100	3780	26800	51	30
PK200	14700	5050	43000	56	29
PK500	23800	7010	80700	66	27

maximum: 138000 (for C&B region 11)

Rural Estimate: UPPER LODGEPOLE

Basin Drainage Area: 477 square miles

I Region

Region: Region_4_Eastern_Mountains

Drainage_Area = 477 square miles (above max value 471)

Mean_March_Precipitation = 1.7 inches

Latitude_of_Basin_Outlet = 41.2 degrees

Crippen & Bue Region 11

Results for: UPPER LODGEPOLE

Equations used:

$$PK1_5 = 4.27 * (DRNAREA)^{(0.518)} * (MARAVPRE)^{(1.42)} * (LAT_OUT-40)^{(-0.435)}$$

$$PK2 = 6.26 * (DRNAREA)^{(0.506)} * (MARAVPRE)^{(1.33)} * (LAT_OUT-40)^{(-0.315)}$$

$$PK2_33 = 7.27 * (DRNAREA)^{(0.503)} * (MARAVPRE)^{(1.3)} * (LAT_OUT-40)^{(-0.262)}$$

$$PK5 = 12.2 * (DRNAREA)^{(0.506)} * (MARAVPRE)^{(1.19)} * (LAT_OUT-40)^{(-0.048)}$$

$$PK10 = 16.9 * (DRNAREA)^{(0.518)} * (MARAVPRE)^{(1.12)} * (LAT_OUT-40)^{(0.107)}$$

$$PK25 = 23.5 * (DRNAREA)^{(0.536)} * (MARAVPRE)^{(1.05)} * (LAT_OUT-40)^{(0.283)}$$

$$PK50 = 29.1 * (DRNAREA)^{(0.549)} * (MARAVPRE)^{(1.01)} * (LAT_OUT-40)^{(0.403)}$$

$$PK100 = 35.3 * (DRNAREA)^{(0.562)} * (MARAVPRE)^{(0.963)} * (LAT_OUT-40)^{(0.517)}$$

$$PK200 = 42.2 * (DRNAREA)^{(0.573)} * (MARAVPRE)^{(0.922)} * (LAT_OUT-40)^{(0.626)}$$

$$PK500 = 52.5 * (DRNAREA)^{(0.585)} * (MARAVPRE)^{(0.873)} * (LAT_OUT-40)^{(0.766)}$$

Statistic	Value, cfs
PK1_5	205
PK2	271
PK2_33	307
PK5	515

PK10	762
PK25	1180
PK50	1580
PK100	2070
PK200	2640
PK500	3540

maximum: 138000 (for C&B region II)



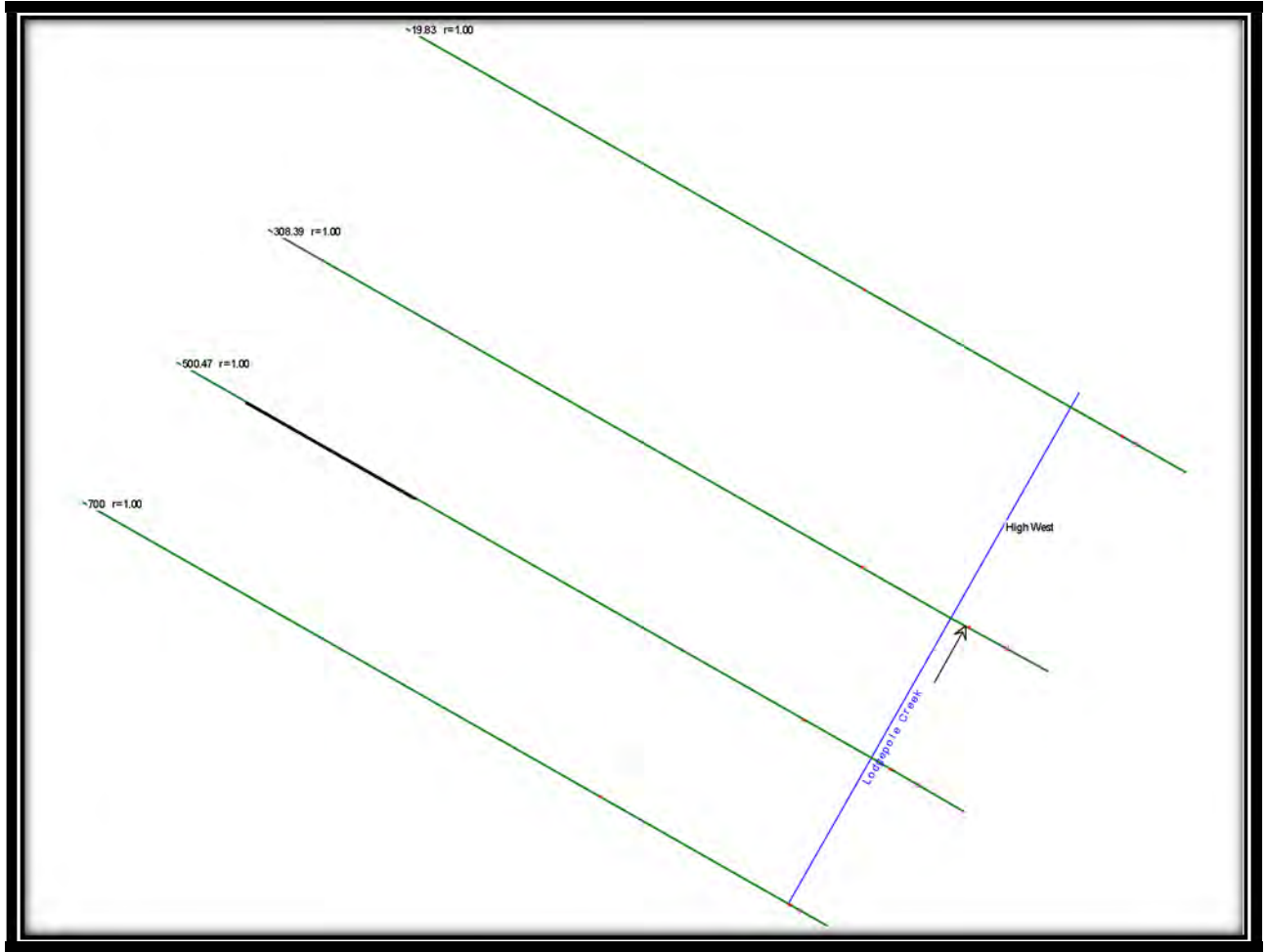


APPENDIX C

Flood Plain Assessment – High West Energy Office Complex

Hydraulic Analysis

1. HEC-RAS – Model Schematic
 2. HEC-RAS – Cross-Section Output
 3. HEC-RAS – Detailed Output Tables
-

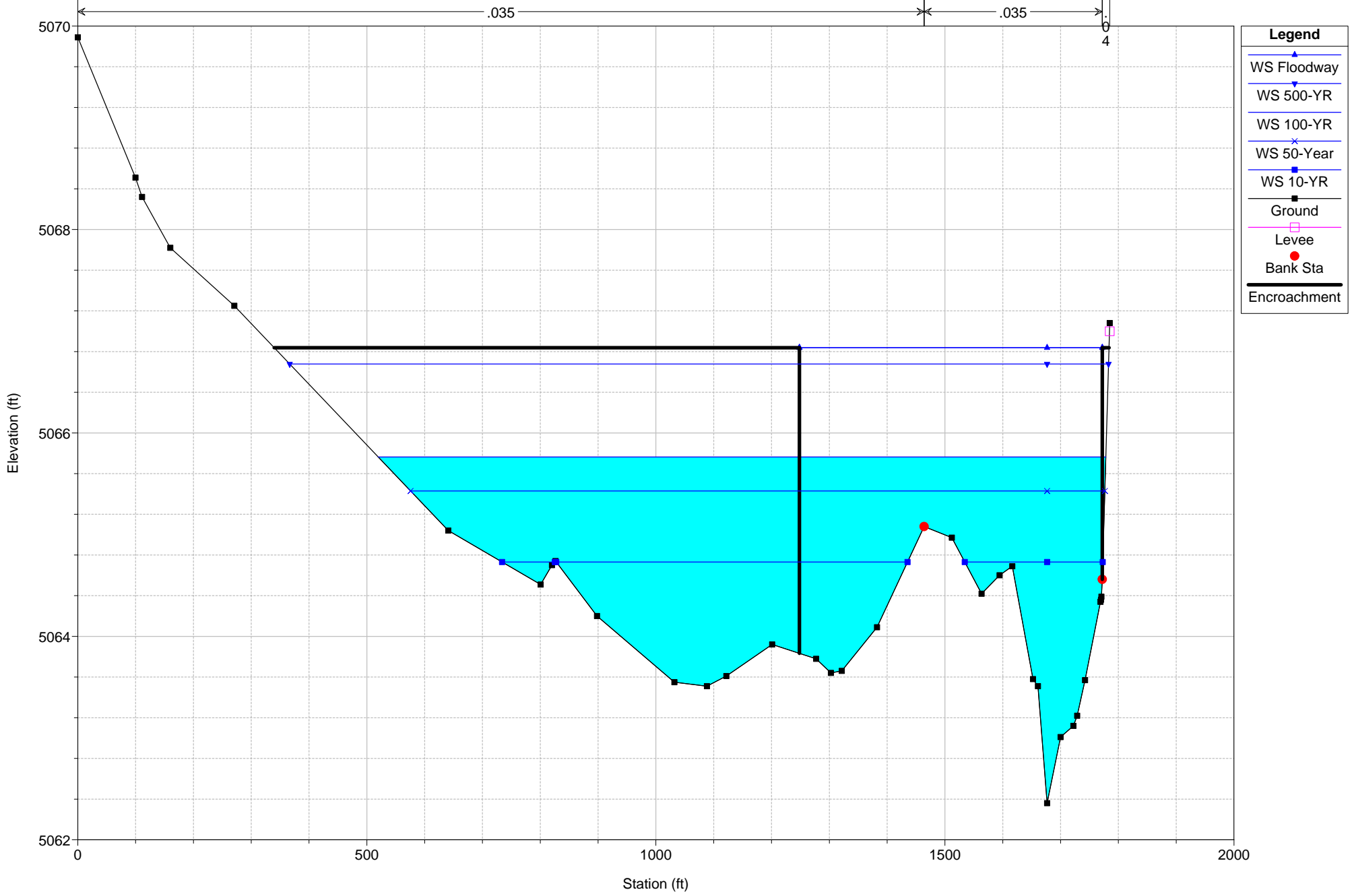


3 HEC-RAS Model - Schematic

HIGHWEST_LODGEPOLE Plan: HIGH WEST LODGEPOLE - GROUND REVISED 9/17/2012 4:32:21 PM

Geom: FINAL DATA Flow: USGS ESTIMATES

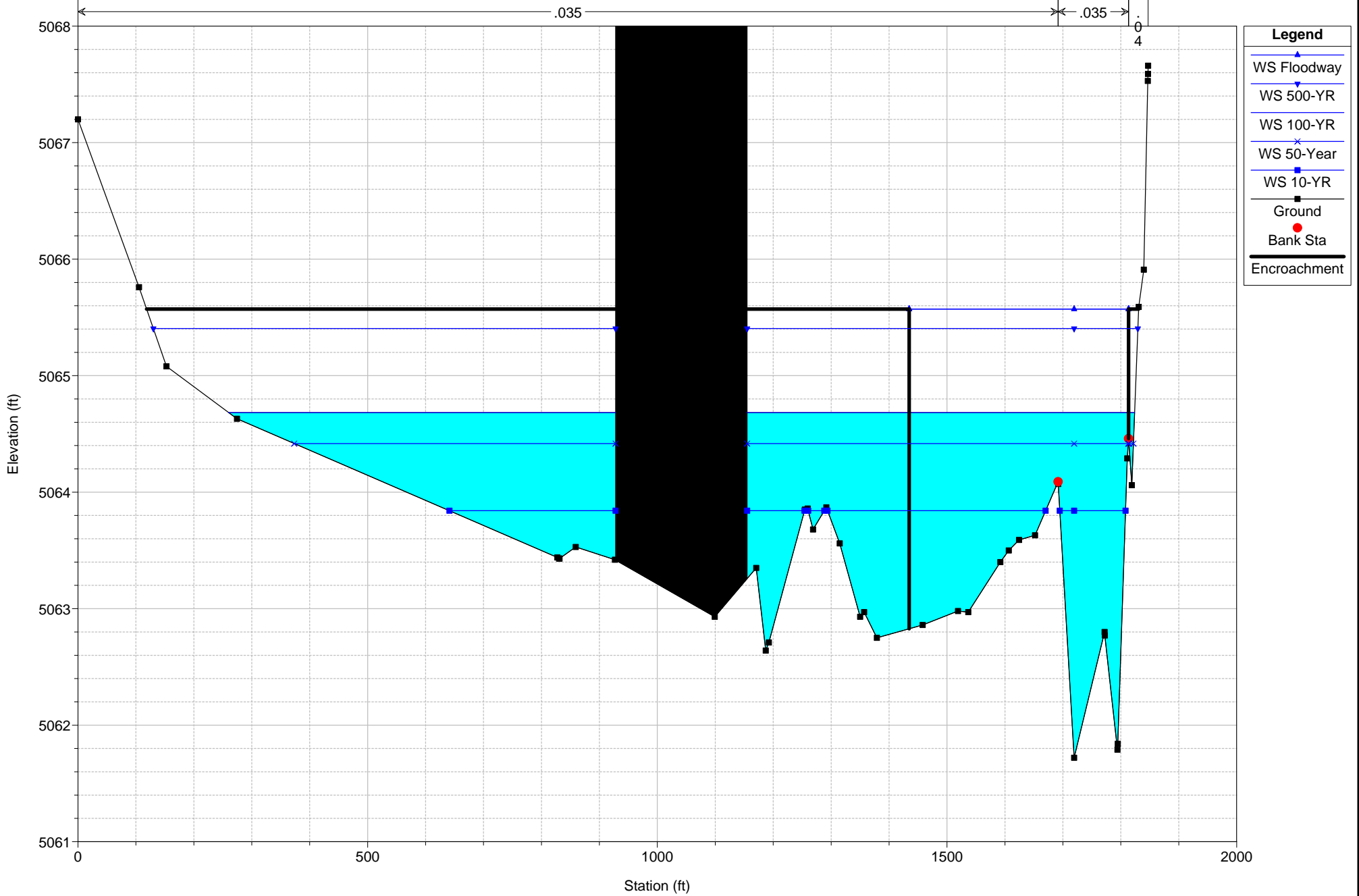
River = Lodgepole Creek Reach = High West RS = 700 Revised March 2012

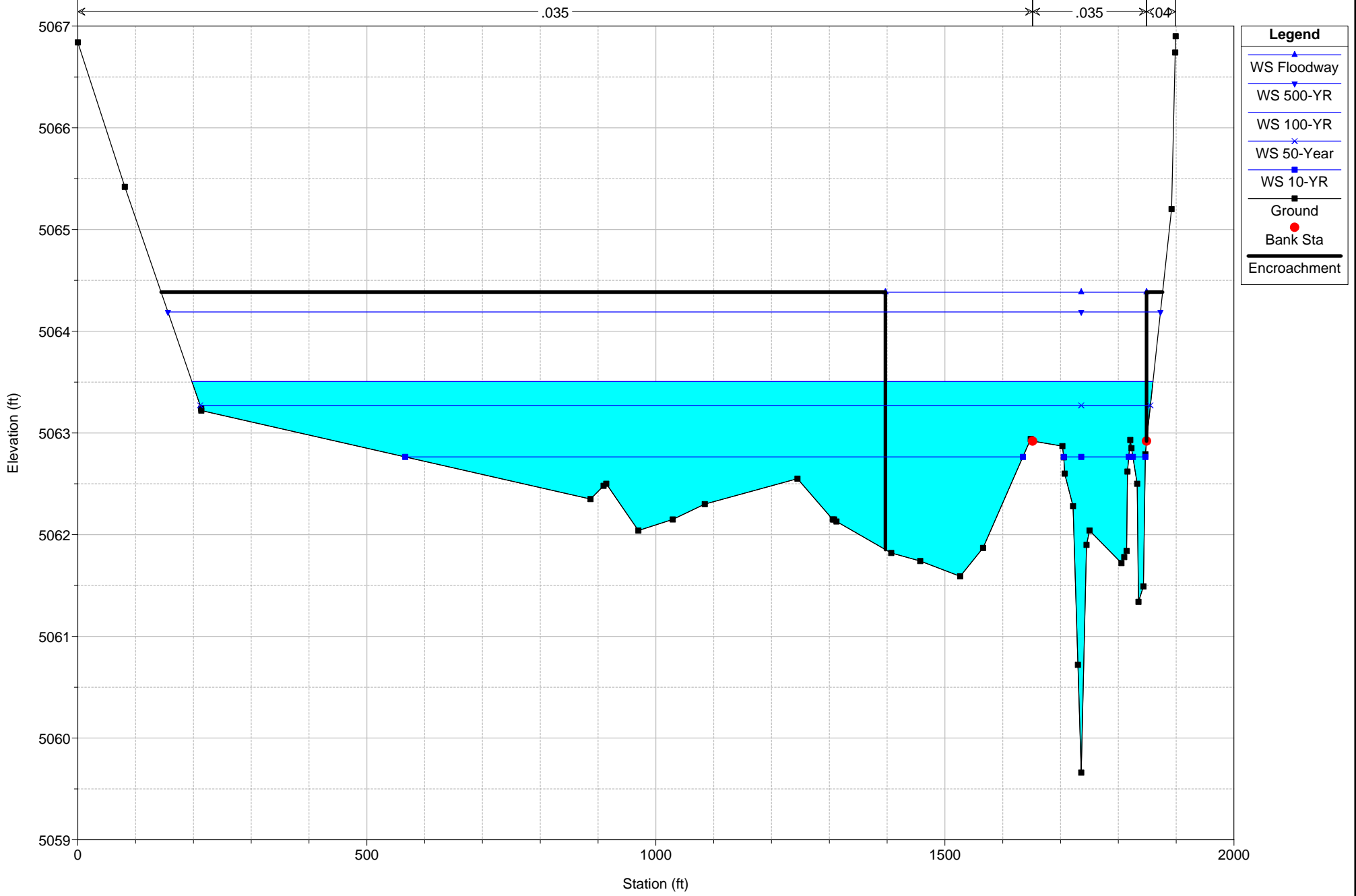


HIGHWEST_LODGEPOLE Plan: HIGH WEST LODGEPOLE - GROUND REVISED 9/17/2012 4:32:21 PM

Geom: FINAL DATA Flow: USGS ESTIMATES

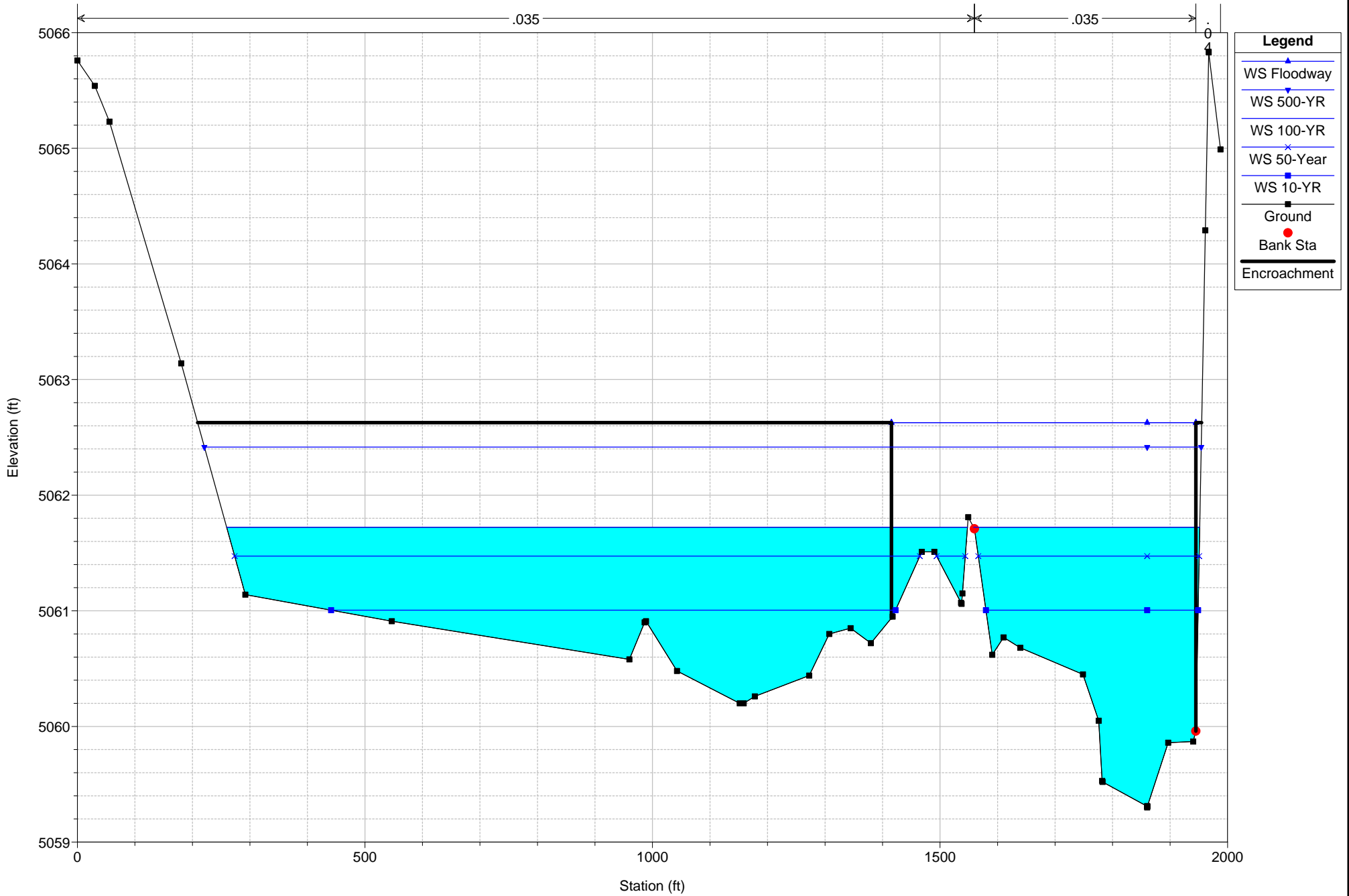
River = Lodgepole Creek Reach = High West RS = 500.47 Revised March 2012





HIGHWEST_LODGEPOLE Plan: HIGH WEST LODGEPOLE - GROUND REVISED 9/17/2012 4:32:21 PM

Geom: FINAL DATA Flow: USGS ESTIMATES
 River = Lodgepole Creek Reach = High West RS = 19.83 Revised March 2012



HEC-RAS Plan: HW-REV River: Lodgepole Creek Reach: High West

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
High West	19.83	100-YR	6300.00	5059.30	5061.72	5061.44	5061.93	0.005999	4.38	1784.00	1681.13	0.62
High West	19.83	Floodway	6300.00	5059.30	5062.63	5062.18	5063.14	0.006000	5.94	1125.99	529.18	0.67
High West	19.83	500-YR	14200.00	5059.30	5062.42	5062.00	5062.79	0.006001	5.62	2972.65	1733.26	0.66
High West	19.83	50-Year	4250.00	5059.30	5061.47	5061.27	5061.64	0.006000	3.95	1369.73	1625.35	0.61
High West	19.83	10-YR	1500.00	5059.30	5061.01	5060.78	5061.11	0.006007	3.04	651.55	1350.24	0.57
High West	308.39	100-YR	6300.00	5059.66	5063.51	5063.18	5063.70	0.006231	4.07	1783.32	1662.54	0.62
High West	308.39	Floodway	6300.00	5059.66	5064.39		5064.94	0.006436	5.76	1056.83	451.86	0.68
High West	308.39	500-YR	14200.00	5059.66	5064.19	5063.75	5064.56	0.006265	5.37	2939.24	1716.95	0.66
High West	308.39	50-Year	4250.00	5059.66	5063.27	5062.96	5063.42	0.006298	3.61	1395.85	1643.89	0.60
High West	308.39	10-YR	1500.00	5059.66	5062.76	5062.53	5062.86	0.006091	3.18	655.66	1202.51	0.58
High West	500.47	100-YR	6300.00	5061.72	5064.68		5064.98	0.006771	5.77	1518.66	1336.89	0.70
High West	500.47	Floodway	6300.00	5061.72	5065.57		5066.26	0.006911	7.31	958.88	378.61	0.74
High West	500.47	500-YR	14200.00	5061.72	5065.41		5065.92	0.007549	7.40	2544.53	1472.32	0.77
High West	500.47	50-Year	4250.00	5061.72	5064.42		5064.65	0.006264	5.09	1176.55	1220.19	0.66
High West	500.47	10-YR	1500.00	5061.72	5063.84	5063.66	5063.98	0.005458	3.91	558.49	903.44	0.58
High West	700	100-YR	6300.00	5062.36	5065.76	5065.11	5065.94	0.003525	3.52	1896.87	1258.65	0.48
High West	700	Floodway	6300.00	5062.36	5066.84	5065.77	5067.14	0.002847	4.40	1432.14	523.87	0.47
High West	700	500-YR	14200.00	5062.36	5066.68	5065.86	5067.00	0.003973	5.02	3119.45	1416.40	0.55
High West	700	50-Year	4250.00	5062.36	5065.43	5064.85	5065.56	0.003405	2.98	1486.12	1201.02	0.46
High West	700	10-YR	1500.00	5062.36	5064.73	5064.30	5064.80	0.003135	2.17	717.72	937.73	0.41

HEC-RAS Plan: HW-REV River: Lodgepole Creek Reach: High West

Reach	River Sta	Profile	W.S. Elev (ft)	Prof Delta WS (ft)	E.G. Elev (ft)	Top Wdth Act (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Enc Sta L (ft)	Ch Sta L (ft)	Ch Sta R (ft)	Enc Sta R (ft)
High West	19.83	100-YR	5061.72		5061.93	1681.13	3690.32	2594.36	15.32		1559.71	1944.73	
High West	19.83	Floodway	5062.63	0.91	5063.14	529.18	714.36	5585.64		1415.55	1559.71	1944.73	1944.73
High West	19.83	500-YR	5062.42	0.69	5062.79	1733.26	9334.94	4827.90	37.16		1559.71	1944.73	
High West	19.83	50-Year	5061.47	-0.25	5061.64	1625.35	2278.54	1961.26	10.21		1559.71	1944.73	
High West	19.83	10-YR	5061.01	-0.72	5061.11	1350.24	514.96	981.23	3.81		1559.71	1944.73	
High West	308.39	100-YR	5063.51		5063.70	1662.54	5212.18	1083.64	4.19		1651.70	1848.88	
High West	308.39	Floodway	5064.39	0.88	5064.94	451.86	3770.13	2529.87		1397.02	1651.70	1848.88	1848.88
High West	308.39	500-YR	5064.19	0.68	5064.56	1716.95	12014.26	2152.67	33.06		1651.70	1848.88	
High West	308.39	50-Year	5063.27	-0.23	5063.42	1643.89	3456.30	792.62	1.08		1651.70	1848.88	
High West	308.39	10-YR	5062.76	-0.74	5062.86	1202.51	1094.27	405.73			1651.70	1848.88	
High West	500.47	100-YR	5064.68		5064.98	1336.89	4804.44	1489.42	6.14		1691.75	1813.28	
High West	500.47	Floodway	5065.57	0.89	5066.26	378.61	3623.83	2676.17		1434.68	1691.75	1813.28	1813.28
High West	500.47	500-YR	5065.41	0.72	5065.92	1472.32	11602.45	2559.02	38.53		1691.75	1813.28	
High West	500.47	50-Year	5064.42	-0.27	5064.65	1220.19	3099.34	1149.36	1.29		1691.75	1813.28	
High West	500.47	10-YR	5063.84	-0.84	5063.98	903.44	882.37	617.63			1691.75	1813.28	
High West	700	100-YR	5065.76		5065.94	1258.65	4499.65	1794.56	5.79		1463.97	1772.09	
High West	700	Floodway	5066.84	1.07	5067.14	523.87	2602.83	3697.17		1248.22	1463.97	1772.09	1772.09
High West	700	500-YR	5066.68	0.91	5067.00	1416.40	10204.30	3967.95	27.75		1463.97	1772.09	
High West	700	50-Year	5065.43	-0.33	5065.56	1201.02	3036.76	1210.85	2.39		1463.97	1772.09	
High West	700	10-YR	5064.73	-1.03	5064.80	937.73	1047.80	452.17	0.03		1463.97	1772.09	