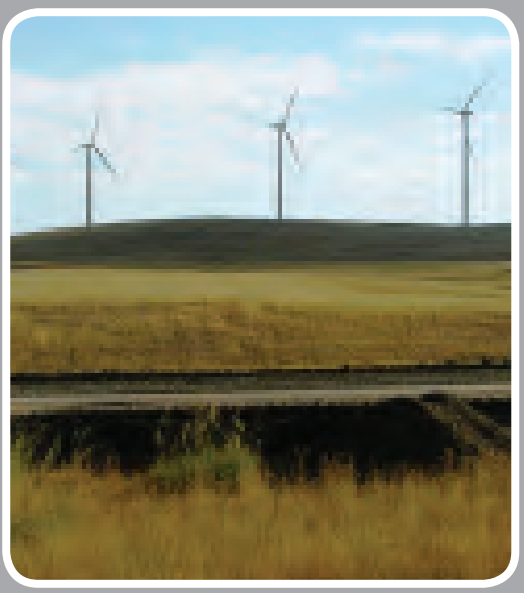
Draft Environmental Impact Statement



Hermosa West Wind Energy Project

DOE/EIS-0438

U.S. Department of Energy–Western Area Power Administration

ShellWind Energy

September 2012

Volume II – Appendices

APPENDICES

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APPENDIX A

FACILITIES STUDY

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FACILITIES STUDY

2007-G2

REVISION 2

July 2011

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Engineering
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Rocky Mountain Region

Western Area Power Administration

Facilities Study for Interconnection to the Craig to Ault 345kV Transmission Line, 2007-G2

Executive Summary

This Facilities Study is provided by the Western Area Power Administration (Western) in response to the ongoing request of queue position 2007-G2 (Requestor) and associated request 2008-T6. This Facilities Study provides reasonable estimates for Western's costs and schedule of project implementation.

The Craig-Ault Transmission Line is jointly owned by Western, Tri-State Generation and Transmission Association (TSGT), and Platte River Power Authority (PRPA). The transmission line is approximately 180 miles long and extends from Ault, Colorado, north through portions of Wyoming, then south to Craig, Colorado. The majority of the transmission line is 1272kCM ACSR bundled, dual conductor. The 372 foot approach span to the Ault Substation is 3064kCM ACSR. The thermal rating of the Craig-Ault Transmission Line is 717 MVA, limited by the current transformers at Ault Substation.

The Requestor expects to interconnect a large Wind Farm Facility to the Craig-Ault Transmission Line for service to the Ault Substation. The Requestor's Facility will add 300MW (333MVA) to the transmission line. The additional generation requires an increase in the thermal rating of the Craig-Ault Transmission Line to 1290MVA. An increase in the conductor size of the existing transmission line is not required to meet the elevated thermal rating of 1290MVA. The additional generation will only affect the transmission line east of the Requestor's Facility and the thermal rating of the transmission line from the Requestor's Facility to the Craig Substation will remain at 956MVA.

Western will require a 345kV three breaker ring bus Sectionalizing Switchyard for the Requestor's interconnection. The Switchyard will be located between structures 50-3 and 50-4 on the Craig-Ault Transmission Line; adjacent to U.S. Highway 287. The Switchyard will be approximately 51miles west of the Ault Substation.

The Requestor also seeks the consideration of an optional redundant generation interconnection bay. This Facilities Study refers to the additional bay as 'Option 1'.

In addition to the Switchyard, Network Upgrades to the Ault Substation are required by Western to allow the Requestor's interconnection as follows:

a. Five 345kV, 1600 amp disconnect switches must be replaced with 345kV, 3000 amp disconnect switches
b. A 345kV, 1600 amp wave-trap must be replaced with a 345kV, 3000 amp wave-trap for Power Line Carrier (PLC) communications
c. The Line Metering Current Transformers (CT's) must be replaced to provide for 1290MVA capacity on the Craig-Ault Transmission Line
d. Various relay setting changes are required to accommodate the new elements on Western's System
e. The Bus Differential Relays must be replaced to accommodate the higher CT ratings

No Network Upgrades are required at the Craig Substation.

The total estimated cost for the Network Upgrades is $ $8,918,878.

The Switchyard project is scheduled to begin in March 2012. The scheduled in-service date is in May 2013.

Facilities Study for Interconnection to the Craig to Ault 345kV Transmission Line, 2007-G2

1. Description

1.1. Background of Request

The Requestor in interconnection queue position 2007-G2 requires a facilities study for an interconnection to the 345kV transmission line between the Ault and Craig substations in northern Colorado and southern Wyoming. This transmission line is jointly owned by Western, TSGT, and PRPA. The Requestor has asked Western for an in-service date of December 1, 2011.

The proposed Point of Interconnection identified in the Environmental Impact Statement (EIS) is on the west side of U.S. Highway 287, between structures 50-3 and 50-4.

A Transmission Request System Impact Study (SIS) was performed by Western in November of 2008. The SIS is the basis of this study. The SIS examined the effects of interconnecting the Requestor's 300MW Wind Farm Facility to Western's transmission system.

1.2. Purpose

This Facilities Study specifies and estimates the cost of the equipment, engineering, procurement and construction work needed (see Appendices A and D) to implement the conclusions of the SIS in accordance with Good Utility Practice. The electrical switching configuration of the connection equipment is identified in this Facilities Study. The connection equipment includes, without limitation, switchgear, breakers, meters, and other station equipment (see Appendices B, C, and F). This Facilities Study also defines the nature and estimated cost of Western's transmission interconnection facilities and identifies Network Upgrades that are necessary to accomplish the interconnection (see Appendix A). The interconnection provides for power delivery from West to East on the Craig to Ault Transmission Line from the Requestor's interconnection facility to the Ault substation. An estimate of the time required for completion of the construction and installation of the Network Upgrades is included in Appendix F. Network Upgrades are discussed further in section 4.1 of this Facilities Study.

1.3. Description of Connection Facility

The requirement for interconnection to the Craig-Ault 345kV line is a sectionalizing Switchyard. Western requires the installation of a 345kV, three breaker ring bus configuration to meet the sectionalizing requirements (see switching diagram in Appendix B, drawings in Appendix C and design data in Appendix D).

1.3.1. Optional Interconnection Bay

The Requestor desires that this Facilities Study include an option for an additional breaker position in the Sectionalizing Switchyard for redundancy. The additional breaker position is referred to as Option 1 in this Facilities Study and is discussed further in paragraph 4.3.1. Details of Option 1 are also shown in Appendices A, D and F.

1.4. Description of Existing Western Facilities

1.4.1. 345kV Transmission Line From Craig to Ault

Western operates and maintains the 345kV transmission line from the Craig Substation to the Ault Substation. The cost for operation and maintenance is shared between the three owners of the transmission line.

The Craig to Ault Transmission Line is 181.3 miles long and has a thermal rating of 717MVA limited by the current transformers at Ault Substation. The transmission line was constructed using bundled two-conductor 1272kCM ACSR. There are four sections of the Transmission Line that are constructed using 3064kCM ACSR. Those sections are the approach spans at Steamboat, Craig and Ault Substations, and the span over Buffalo Pass. The thermal rating of the 3064kCM ACSR on the approach span to the Ault Substation is 1005MVA. The total length of the Ault Substation approach span is 372 feet (see Appendix H).

1.4.2. 345kV Ault Substation

The Ault Substation is located near Ault, Colorado. The Craig to Ault Transmission line is connected to the 345kV section of Ault Substation at switch 199. The disconnect switches in the Ault Substation are rated 345kV, 1600 amps. Switches 193 and 195, normally open, were installed for the purpose of connecting to a series capacitor bank (removed in the 1980's, see Appendix B). Switches 193 and 195 will not be modified. The bus system on the 345kV portion of the Ault Substation is 5" IPS Aluminum.

1.4.3. 345kV Craig Substation

The Craig Substation is located near Craig, Colorado. The Craig to Ault Transmission line is connected to the 345kV section of the Craig Substation at switches 795 and 893. The disconnect switches in the Craig Substation are rated 345kV, 1600 amps. No modifications are required at the Craig Substation.

2. Summary of Existing Studies

2.1. Feasibility Study

Western performed a Feasibility Study for this request in June of 2007.

2.2. System Impact Study

A System Impact Study (SIS) was performed in November, 2008. The SIS was an interconnection and transmission study. The transmission request SIS forms the basis of this Facilities Study. The SIS concluded that the interconnection of 300MW on the Craig-Ault Transmission Line would require upgrades to the current transformers on each end of the line.

3. Study Requirements

3.1. Contracts

Under contract 09-RMR-1909, Western performed this Facilities Study to specify and estimate the cost of the equipment, engineering procurement and construction work needed to implement the conclusions of the SIS.

Western has developed a switchyard layout, performed a preliminary bus design, determined all electrical equipment requirements, and determined a suitable site location to accommodate the Requestor's inquiry. In addition, Western has developed a schedule and cost estimate for all Western labor, switchyard design and construction, land acquisition and associated overhead, line bay additions, substation upgrades, equipment modifications, and transmission line modifications.

3.2. Interconnection Facilities

As defined in the Large Generation Interconnection Procedures (LGIP) Manual, Interconnection Facilities shall mean the Transmission Provider's (Western's) Interconnection Facilities. Collectively, Interconnection Facilities include all facilities and equipment between the Generating Facility (Requestor's Wind Farm) and the Point of Interconnection, including any modifications, additions or upgrades that are necessary to physically and electrically interconnect the Generating Facility to the Transmission Provider's System.

3.3. Network Upgrades and/or Modifications

The LGIP Manual describes Network Upgrades as the additions, modifications and upgrades to the Transmission Provider's (Western's) system as a result of the interconnection of a Large Generation Facility (Requestor's Wind Farm). The transmission system additions, modifications and upgrades are located at or beyond the Point of Interconnection. The Point of Interconnection is the location at which a Large Generation Facility is interconnected with the transmission system.

Western has reviewed and documented any interconnection/control area requirements, such as indication/metering, monitoring, control, relaying network upgrades and transmission line upgrades and included them in the cost estimate in Appendix A.

3.4. Operations Requirements

A Large Generation Interconnection Agreement is required prior to energization. An Operating Procedures will be developed by Western to outline the necessary operating restrictions on the Requestor's Wind Farm site. Coordination of the proposed work at all affected facilities could affect the generation output capability until all work is completed.

3.5. Environmental Requirements

The Requestor shall make a separate request for the environmental studies. The Requestor shall be responsible for establishing the scope of the environmental studies requirements. This Facilities Study section 4.1.6 specifies an Environmental Impact Statement (EIS) and provides additional details of this requirement. The Requestor shall be responsible for the costs of the Environment Assessment in either of the following options: Prior to approving the Interconnection Request, Western requires an

environmental review of the Project and connected actions. This Facility Study section 4.3.5 specifies an Environmental Impact Statement (EIS) and provides additional details of this requirement. The Requestor shall make a separate request to Western for the environmental review. The Requestor shall perform all surveys, studies, reports, and assessments required for the EIS and environmental compliance [e.g., cultural resource surveys, biological surveys and monitoring, wetland delineation]. The Requestor shall be responsible for both items listed below:

a. Fund third party contract to prepare the EIS and for the cost of environmental studies.
b. Sign a separate agreement and provide funding to Western for their technical oversight, review, and approval of the EIS

4. Study Results

4.1. Requestor's Interconnection Facilities

These costs are not included in the Facility Study Cost Estimates (Appendix A). The Requestors Facility shall include (as a minimum):

a. One – Self supporting, full tension Dead-End Structure located approximately 200 to 400 feet outside of Western's Switchyard and aligned with the designated Requestor (2007-G2) connection point
b. 345-kV transmission line between the Dead-End Structure (above) and the Requestor's Substation
c. One – 345-kV, 3000 amp power circuit breaker or equivalent interrupter for transformer protection
d. One – 345-kV manual group operated disconnecting switch
e. One – 34.5/345-kV step-up transformer
f. Relaying at the Requestor's Facility shall provide adequate safeguards in order to prevent the operation of the turbines onto a faulted system

Western will make the final connection from the Requestor's 345kV dead-end structure to the dead-end in Western's switchyard.

4.2. Western's Interconnection Facilities

The point of interconnection for this request is the transmission Dead-End in the new Sectionalizing Switchyard detailed in Section 4.3.1 therefore the interconnection facilities required are the conductors from the sectionalizing switchyard Dead-End to the self supporting full tension Dead-End Structure detailed in Section 4.1.

4.3. Network Upgrades

4.3.1. Western's Sectionalizing Switchyard

Topographical considerations dictate that Location 1, as defined in paragraph 1.1, be chosen as the site of Western's Interconnection Facility. The Plan and Profile drawing can be found in Appendix G. The location is accessible from U.S. Highway

287. The area between structures 50-3 and 50-4 requires less cut and fill to build the Switchyard. Any of the locations west of Highway 287 would incur much higher site preparation costs. The new Switchyard will be constructed directly under the Craig-Ault Transmission Line.

Western's Interconnection Facility is a Switchyard configured as a 345kV three breaker ring bus. The three breaker ring bus consists of the following elements (see Appendices B and C):

a. Three 345kV, 3000 amp, SF6 power circuit breakers

b. Six 345kV, 3000 amp, motor operated, group operated disconnect switches

c. Three 345kV, 3000 amp, motor operated, group operated disconnect switches with ground blades

d. Instrument transformers for control, relaying and metering

e. Metering equipment

f. Relay and control equipment (also, see section 4.3.3)

g. Communication equipment – Communication is required from Western's operation center located in Loveland, Colorado to the Switchyard to provide for remote control of equipment, obtain alarm status and metering data from the Switchyard, relay communications requirements and to provide a voice link to the Switchyard. Western will design, procure, and install all communication equipment necessary for communication from the Switchyard to Western's operation center. The existing Craig-Ault 345kV Transmission Line has microwave and power line carrier systems for communications. Communication equipment required for the new Switchyard is included in the estimated cost (see Appendix A).

h. One 1200 square foot Control building

i. 5 acres (217,800 square feet) of land for the new Switchyard

j. Two 345kV A-Frame dead-ends

k. Approximately one mile of distribution interconnect for station service power

l. Metering equipment located at the terminal in Western's switchyard

If Option 1 is implemented in accordance with paragraph 1.3.1, additional equipment is required as follows (see Appendix F):

a. One 345kV, 3000 amp, SF6 power circuit breaker

b. Two 345kV, 3000 amp, motor operated, group-operated, disconnect switches

c. One 345kV, 3000 amp, motor operated, group-operated, disconnect switch with ground blades

d. One 345kV A-Frame dead-end

e. Instrument transformers for control, relaying and metering

f. Metering equipment located at the terminal in Western's switchyard

g. Relay and control equipment (also, see section 4.3.3)

4.3.2. Craig-Ault Transmission Line Considerations

An additional 300MW (333MVA) of capacity is required on the Craig-Ault Transmission Line in order to interconnect the Requestor's Wind Farm Facility. In accordance with the SIS, a 956MVA line rating was used for the analysis in this Facilities Study. The additional capacity raises the required thermal limit to 1290MVA.

The potential capacity of the bundled 1272kCM ACSR on the Craig-Ault Transmission Line is 1430MVA. Therefore, the limiting factor for the addition of 333MVA of capacity is the single conductor approach span into the Ault Substation (see Appendix H). The capacity of the approach span is 1005MVA. Western has calculated that an increase to 1290MVA will increase the steady-state operating temperature of the 3064kCM ACSR approach span to 86ºC. The span is presently designed for a steady-state temperature of 75ºC. As a result of the increased steady-state temperature, the Ault Approach Span will sag an additional two feet. The additional sag will result in a clearance above grade of 38 feet. Western has confirmed that 38 feet of clearance is acceptable. The conductor manufacturer has confirmed that the 11ºC increase in temperature will not degrade the performance of the cable or connectors on that span. The 3064kCM ACSR approach span to the Ault terminal will remain in place with no upgrades required.

4.3.3. Ault Substation

All of the 345kV switches in the Ault Substation are rated for 1600 amps. All equipment required for Network Upgrades must be rated for 3000 amps. A total of five 345kV switches in the Ault Substation will be replaced to comply with this requirement. The switches to be replaced are numbered as follows (see Appendix B):

- 199
- 693
- 691
- 695
- 697

The 345kV, 1600 amp wave-trap used for Power Line Carrier (PLC) at the Ault Substation will be replaced with a 345kV, 3000 amp wave-trap.

Three Line Metering CT's in Ault Substation are rated 1200/600:5 amps and will be replaced to allow a thermal limit of 1290MVA. Presently, the CT's at the Ault Substation limit the capacity from the Western Facility to 717MVA. The new CT ratio will be 3000:5.

4.3.4. Relaying

The cost estimate for Western's Switchyard includes the installation and setting of relays within the Switchyard. Additional costs for relay setting changes at the Ault Substation are included in the cost estimate (Appendix A). No relay setting changes are required at the Craig Substation.

a. The bus differential relays at Ault Substation must be replaced in order to use the 3000:5 setting of the new Line Metering CT's.

b. Adjustment of Zone 3 distance relay settings at secondary substations and switchyards not directly adjacent to the Western Switchyard may be required. The costs for these adjustments are included in the cost estimate (Appendix A).

4.3.5. Environmental Requirements

Western requires an Environmental Impact Statement (EIS) to comply with the National Environmental Policy Act (NEPA) requirements. In addition, Western must demonstrate compliance with several other environmental regulations including, but not limited to, the Endangered Species Act, the Migratory Bird Treaty Act, the National Historic Preservations Act, and the Clean Water Act. Generally, $100,000 is estimated for Western's costs for environmental reviews and approvals if no other lead agencies are involved.

The Requestor is responsible for signing a separate agreement and providing funding to Western for the environmental review. The Requestor shall coordinate with Western to discuss the environmental requirements, agreements, schedules and other activities.

4.4. Cost Estimate

The Project Cost Estimate is provided in Appendix A. The estimated cost of each line item is given in FY2008 dollars and then escalated to FY 2012 dollar values. Total Costs for each fiscal year depends on actual expenditures and actual project schedule. The Requestor is obligated to reimburse actual expenditures.

4.5. Project Schedule

Western's project schedule is in Appendix E. The major milestones shown are applicable if Western constructs the Interconnection Facilities. Any project delays will result in a reevaluation of equipment lead times, workload, and construction seasons to determine a reasonable schedule. The Requestor requested an in-service date of March 1, 2013. Western's schedule will not meet that requirement. Some of the project milestones are listed below. There are phases of the project that take the schedule beyond what was asked for by the Requestor.

4.5.1. Project Start – December, 2010

4.5.2. Planning Phase – February, 2010 to April, 2010

4.5.3. Environmental Studies – March, 2010 to December, 2011

4.5.4. Land Acquisition – March, 2010 to February, 2012

4.5.5. Substation Design & Specification – April, 2010 to March, 2012

4.5.6. Procure GFE Breakers – December, 2011 to October, 2012

4.5.7. Procure GFE Switchboards – October, 2011 to October, 2012

4.5.8. Procure Meters – August, 2012 to October, 2012

4.5.9. Procure RTU Communications – June, 2012 to October, 2012

4.5.10. Procure SCADA Communications – July, 2012 to October, 2012

4.5.11. Procure GFE Batteries and Charger – June, 2012 to September, 2012

4.5.12. Construction Start – March, 2012

4.5.13. Construction End – February, 2013

4.5.14. Commissioning Phase – February, 2013 to May, 2013

4.5.15. In Service Date – May, 2013

Appendix A

Cost Estimate

2007-G2
Estimated Switching Station Costs

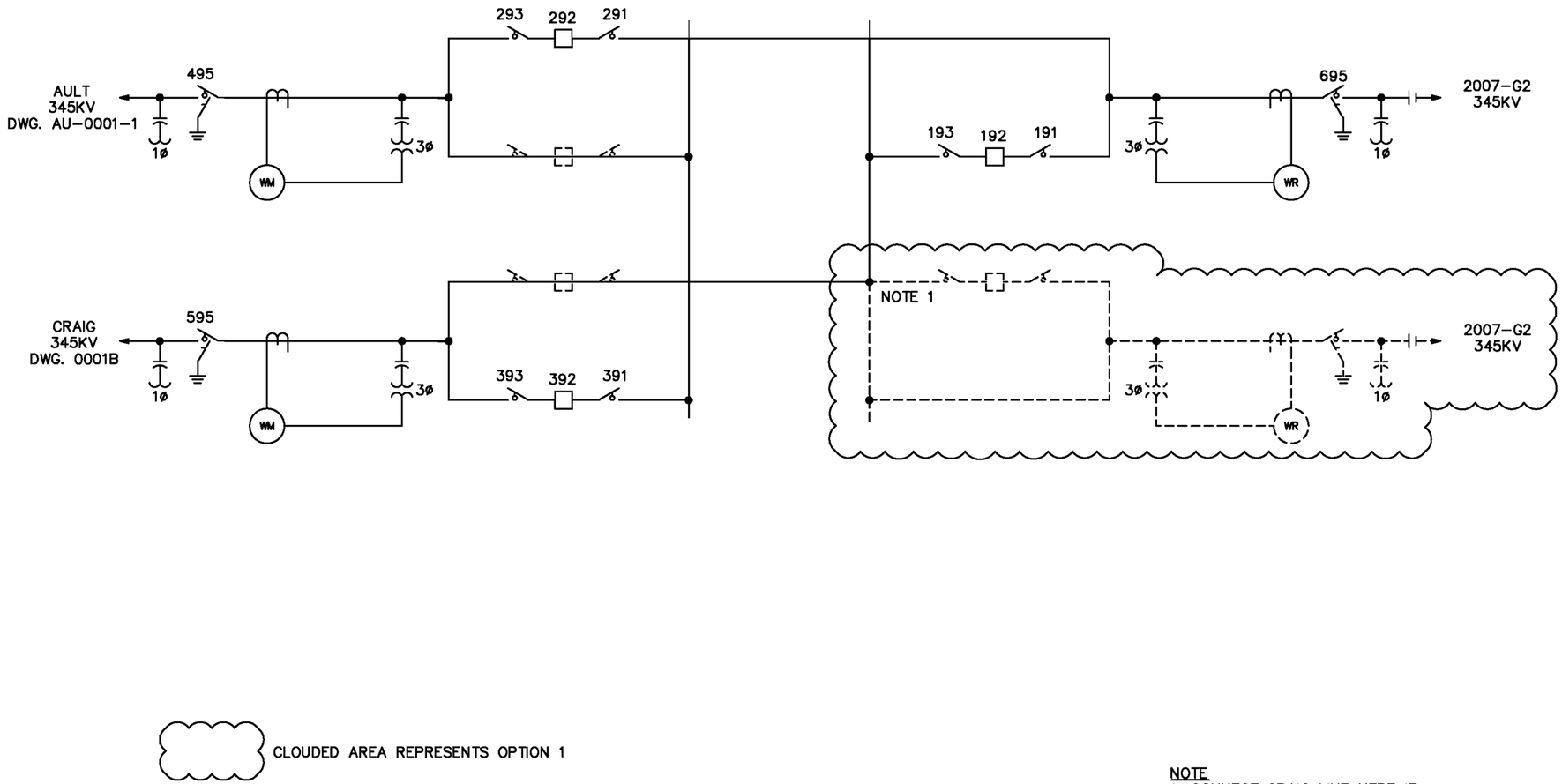
Element	No. of Units	Est. Cost (per unit)	Total Cost - Escalated for Inflation (FY2012)
345kV, 3000A Line Bay	3		
Site Preparation	3	$128,000	$419,967
Circuit Breaker	3	$324,000	$1,063,042
Three Switches (per bay)	3	$195,000	$639,794
Control System	3	$177,000	$580,736
Metering Unit	3	$35,000	$114,835
Current Transformer	9	$33,000	$324,818
Potential Transformer	9	$36,500	$359,269
Bus System	3	$390,000	$1,279,588
Steel & Footings	3	$496,000	$1,627,373
Line Bay Sub-Totals			**$6,409,421**
Communications			
Microwave	1	$460,000	$503,086
Power Line Carrier			
345kV Wave-Trap	2	$19,500	$42,653
345kV Line Tuner	2	$5,000	$10,937
345kV CCVT	2	$11,500	$25,154
Communications Sub-Totals			**$581,830**
Additional Materials Required			
Service Building (units in ft^2)	1200	$250	$328,099
Static Mast (installed)	3	$45,000	$147,645
Distribution interconnect for station service	1	$60,000	$65,620
Additional Materials Sub-Totals			**$475,744**
Ault Substation Upgrades			
345kV, 3000A switches	5	$30,000	$164,050
Wave-Trap	1	$19,500	$21,326
CT adjustment	2	$25,000	$54,683
Relaying Equipment	3	$6,280	$20,605
Metering Unit	3	$35,000	$114,835
Ault Substation Upgrade Totals			**$375,499**
Western Labor Costs			
Planning / Field Data	1	$25,000	$27,342
Environmental	1	$50,000	$54,683
Design	1	$330,000	$360,909
Construction Management	1	$300,000	$328,099
Commissioning	1	$200,000	$218,733
Project Management	1	$50,000	$54,683
Relaying Changes	4	$4,800	$20,998
Contract Administration	1	$10,000	$10,937
Western Labor Costs Sub-Totals			**$1,076,385**
Switching Station Cost Estimate Totals:			**$8,918,878**

2007-G2 Option1
Estimated Adder

Element	No. of Units	Est. Cost (per unit)	Total Cost - Escalated for Inflation (FY2012)
345kV, 3000A Line Bay	1		
Site Preparation	1	$128,000	$139,989
Circuit Breaker	1	$324,000	$354,347
Three Switches	1	$195,000	$213,265
Control System	1	$177,000	$193,579
Metering Equipment	1	$35,000	$38,278
Current Transformer	3	$33,000	$108,273
Potential Transformer	3	$36,500	$119,756
Bus System	1	$390,000	$426,529
Steel & Footings	1	$496,000	$542,458
Option 1 Adder Cost Estimate Totals			**$2,136,474**

Appendix B

Switching Diagrams



CLOUDED AREA REPRESENTS OPTION 1

LEGEND:

- FACILITIES TO BE BUILT
- FUTURE/OPTIONAL FACILITIES
- BREAKER
- MOTOR OPERATED DISCONNECT SWITCH
- MOTOR OPERATED DISCONNECT SWITCH WITH GROUND SWITCH BLADES
- CAPACITIVELY COUPLED VOLTAGE TRANSFORMER
- OWNERSHIP BOUNDARY
- (WM) WESTERN (RMR) METER
- (WR) WESTERN (RMR) REVENUE METER
- CURRENT TRANSFORMER

NOTE
1. CONNECT CRAIG LINE HERE IF OPTION 1 IS NOT INSTALLED.

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
CORPORATE SERVICES OFFICE – LAKEWOOD, COLORADO

2007-G2 345KV SUBSTATION
ROCKY MOUNTAIN REGION
SWITCHING DIAGRAM

DESIGNED _____ APPROVED _____ DESIGN MANAGER

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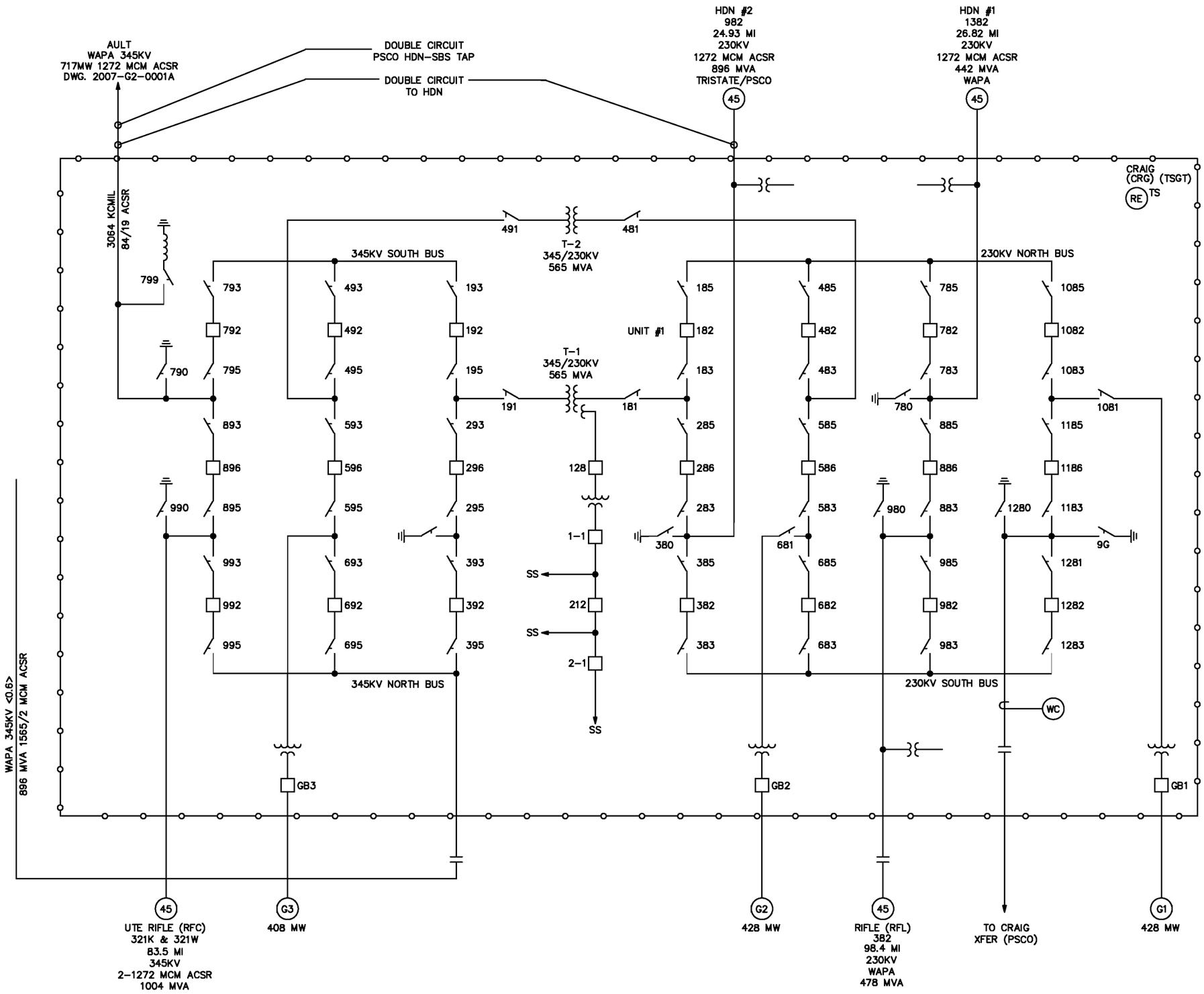

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
CORPORATE SERVICES OFFICE – LAKEWOOD, COLORADO

2007-G2 CRAIG SUBSTATION
ROCKY MOUNTAIN REGION
SWITCHING DIAGRAM

DESIGNED _____ APPROVED _____ DESIGN MANAGER

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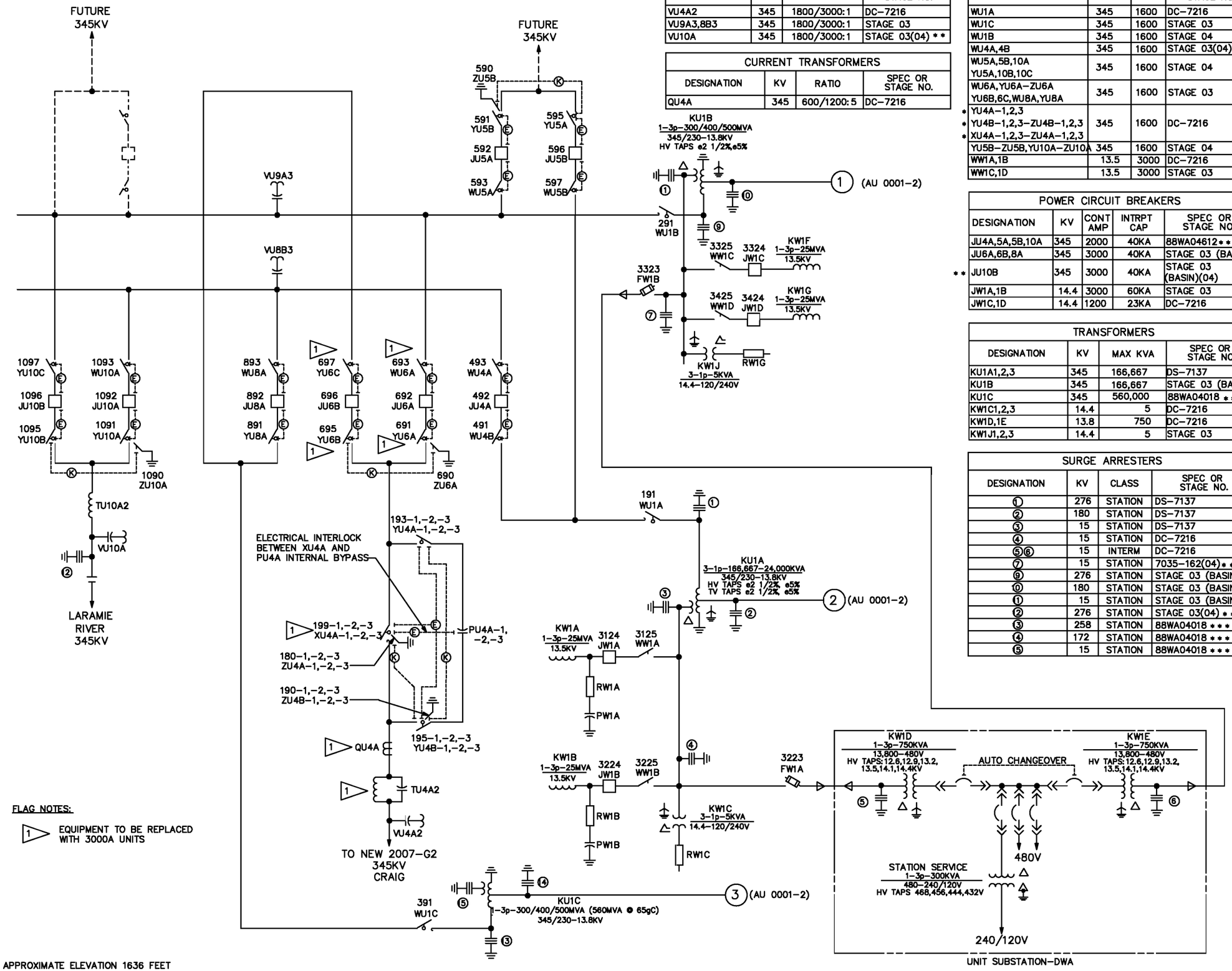


COUPLING CAPACITOR VOLTAGE TRANSFORMERS			
DESIGNATION	KV	RATIO	SPEC OR STAGE NO.
VU4A2	345	1800/3000:1	DC-7216
VU9A3,8B3	345	1800/3000:1	STAGE 03
VU10A	345	1800/3000:1	STAGE 03(04) **

CURRENT TRANSFORMERS			
DESIGNATION	KV	RATIO	SPEC OR STAGE NO.
QU4A	345	600/1200:5	DC-7216

SWITCHES			
DESIGNATION	KV	AMP	SPEC OR STAGE NO.
WU1A	345	1600	DC-7216
WU1C	345	1600	STAGE 03
WU1B	345	1600	STAGE 04
WU4A,4B	345	1600	STAGE 03(04) **
WU5A,5B,10A YU5A,10B,10C	345	1600	STAGE 04
WU6A,YU6A-ZU6A YU6B,6C,WU8A,YU8A	345	1600	STAGE 03
* YU4A-1,2,3 * YU4B-1,2,3-ZU4B-1,2,3 * XU4A-1,2,3-ZU4A-1,2,3	345	1600	DC-7216
YU5B-ZU5B,YU10A-ZU10A	345	1600	STAGE 04
WW1A,1B	13.5	3000	DC-7216
WW1C,1D	13.5	3000	STAGE 03

POWER CIRCUIT BREAKERS				
DESIGNATION	KV	CONT AMP	INTRPT CAP	SPEC OR STAGE NO.
JU4A,5A,5B,10A	345	2000	40KA	88WA04612***
JU6A,6B,8A	345	3000	40KA	STAGE 03 (BASIN)
** JU10B	345	3000	40KA	STAGE 03 (BASIN)(04)
JW1A,1B	14.4	3000	60KA	STAGE 03
JW1C,1D	14.4	1200	23KA	DC-7216

TRANSFORMERS			
DESIGNATION	KV	MAX KVA	SPEC OR STAGE NO.
KU1A1,2,3	345	166,667	DS-7137
KU1B	345	166,667	STAGE 03 (BASIN)
KU1C	345	560,000	88WA04018 ***
KW1C1,2,3	14.4	5	DC-7216
KW1D,1E	13.8	750	DC-7216
KW1J1,2,3	14.4	5	STAGE 03

SURGE ARRESTERS			
DESIGNATION	KV	CLASS	SPEC OR STAGE NO.
①	276	STATION	DS-7137
②	180	STATION	DS-7137
③	15	STATION	DS-7137
④	15	STATION	DC-7216
⑤⑥	15	INTERM	DC-7216
⑦	15	STATION	7035-162(04)**
⑨	276	STATION	STAGE 03 (BASIN)
⑩	180	STATION	STAGE 03 (BASIN)
⑪	15	STATION	STAGE 03 (BASIN)
⑫	276	STATION	STAGE 03(04) **
⑬	258	STATION	88WA04018 ***
⑭	172	STATION	88WA04018 ***
⑮	15	STATION	88WA04018 ***

FUSE DISCONNECTING SWITCHES			
DESIGNATION	KV	INTRPT AMP (SYM)	SPEC OR STAGE NO.
FW1A	15	63KA	DC-7216
FW1B	15	17KA	STAGE 04

RESISTORS				
DESIGNATION	VOLTS	AMP	OHMS	SPEC OR STAGE NO.
□ RW1A,1B	15,000	2.5	55	DC-7216
□□ RW1C	208	37.5	5.5	DC-7216
□□ RW1G	208	37.5	5.5	STAGE 03

REACTORS			
DESIGNATION	KV	MAX MVA	SPEC OR STAGE NO.
KW1A,1B	13.5	25	DC-7216
KW1F,1G	13.5	25	STAGE 03

UNIT SUBSTATIONS			
DESIGNATION	VOLTS	KVA	SPEC OR STAGE NO.
DWA	13,800	750	DC-7216
DWB	480	300	DC-7216
DWC	480	150	STAGE 03

WAVE TRAPS AND LINE INDUCTORS			
DESIGNATION	KV	AMP	SPEC OR STAGE NO.
TU4A2	345	1600	DC-7216
TU10A2	345	1600	STAGE 03(04) **

SUPPRESSOR CAPACITORS (3-1p PER SUPPRESSOR)			
DESIGNATION	KV	KVA	SPEC OR STAGE NO.
PW1A,1B	13.8	50	DC-7216

SERIES CAPACITORS				
DESIGNATION	KV	AMP	OHMS PER PHASE	SPEC OR STAGE NO.
PU4A-1,2,3	345	837	46	DS-7181

EXPLANATION

- (E) ELECTRICAL INTERLOCK
- (K) KEY INTERLOCK
- * SINGLE POLE-MOTOR OPERATED
- ** RELOCATED-STAGE 04
- *** WESTERN FURNISHED EQUIPMENT INSTALLED UNDER STAGE 04
- □ 3-1p PER SUPPRESSOR
- □□ 1 PER 3p BANK

SUPERSEDES DWG NO. AU 0001 (IN PART)

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
HEADQUARTERS - GOLDEN, COLORADO

AULT SUBSTATION
COLORADO

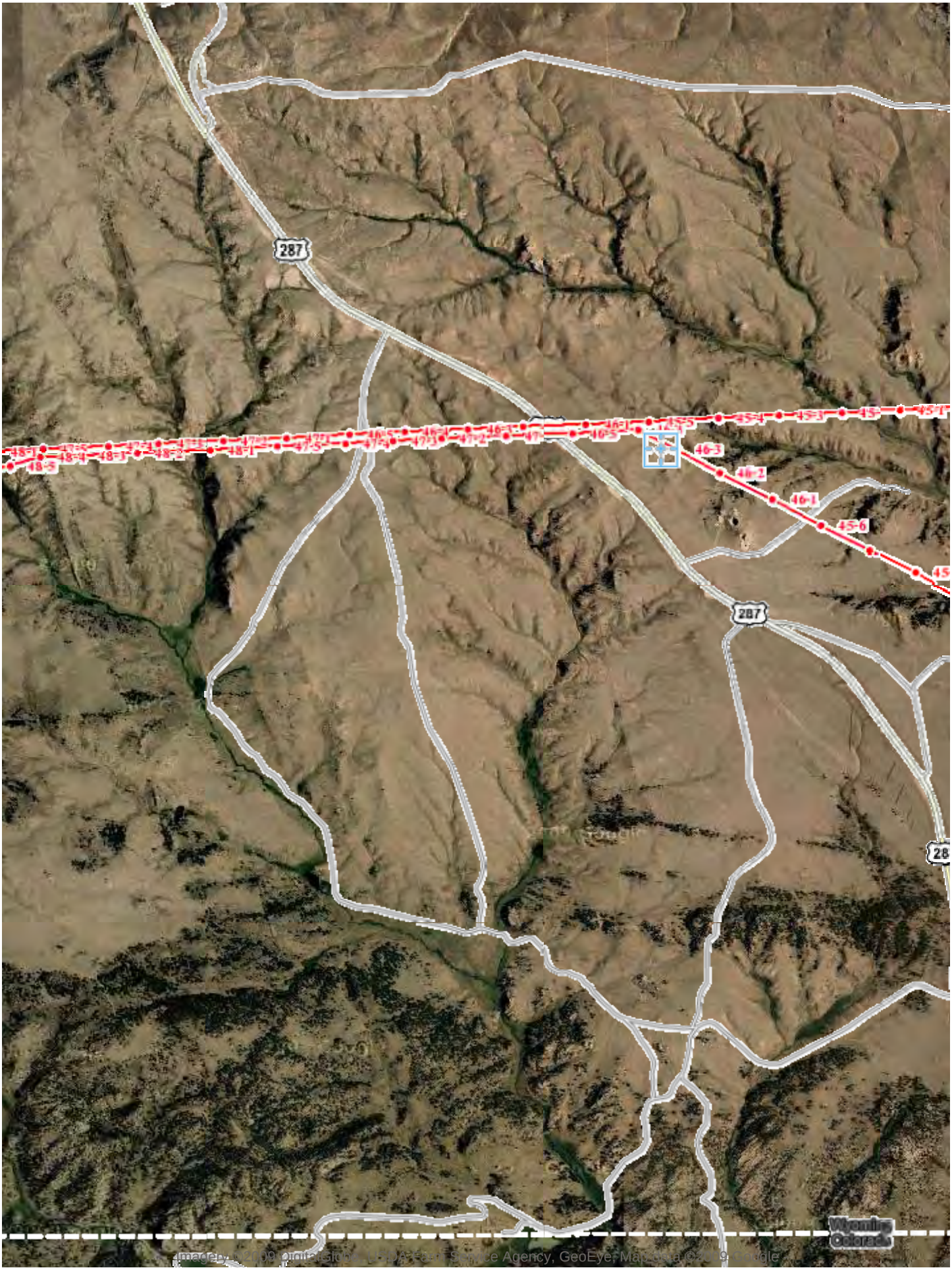
345KV, 13.8KV, TRANSFORMER & STATION SERVICE AREAS SWITCHING DIAGRAM (SH 1 OF 2)

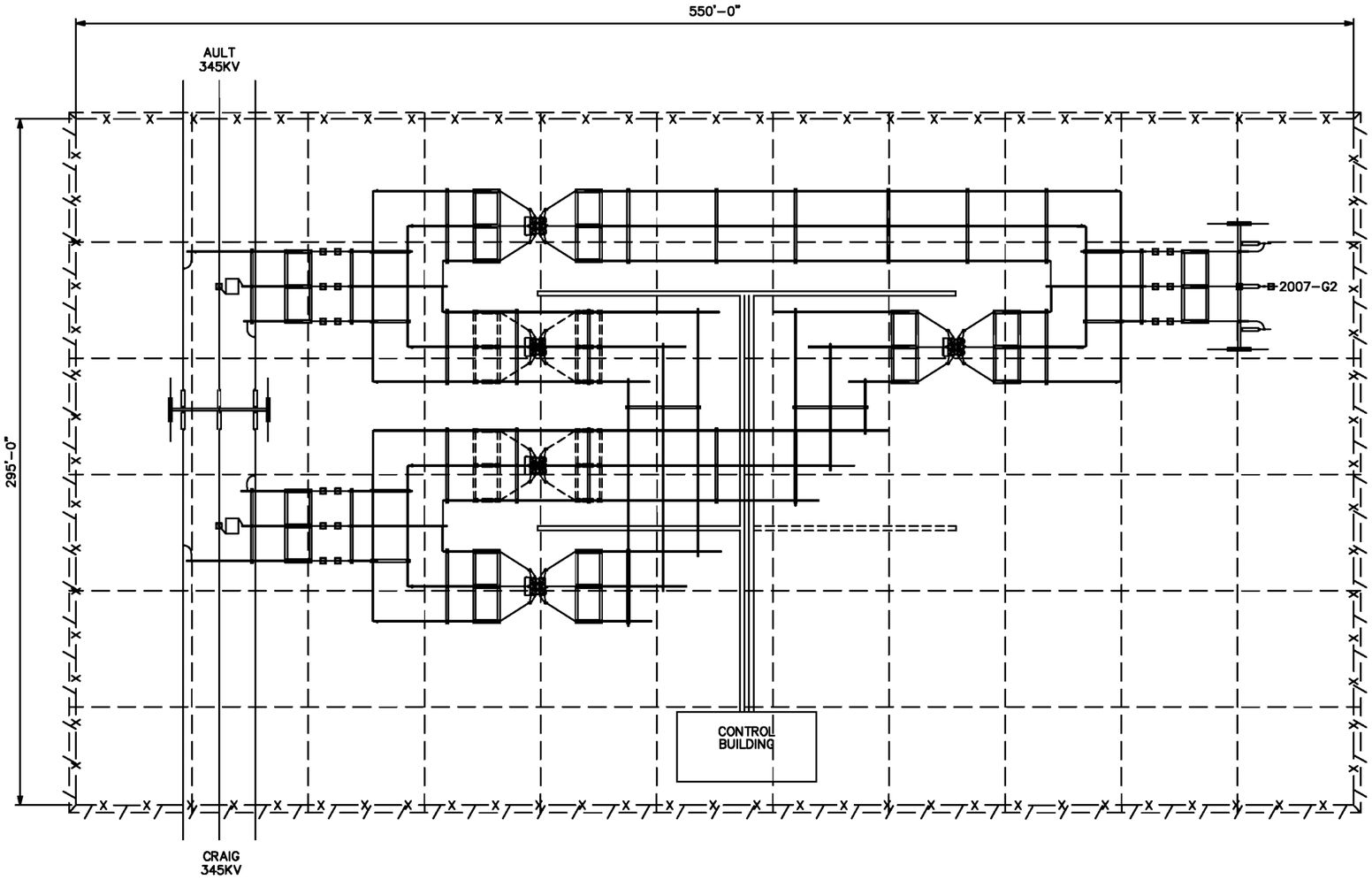
DESIGNED KENNETH E. BROWN — RECOMMENDED JAMES J. WOLF
DRAWN A. McCRARY — APPROVED LLYOD GREINER, ASSISTANT ADMINISTRATOR FOR ENGINEERING
CHECKED RUTH A. JOHNSON

AE	JULY 27, 2011	AU	0001-1

Appendix C

General Arrangement


287
46-3
46-2
46-1
45-6
287
Wyoming
Colorado
Imagery © 2009 DigitalGlobe, USDA Farm Service Agency, GeoEye, Map data ©2009 Google



N

LEGEND:

——————— FACILITIES TO BE BUILT

- - - - - - - - FUTURE FACILITIES

30 0 30 60 90

SCALE OF FEET
1"=30'-0"

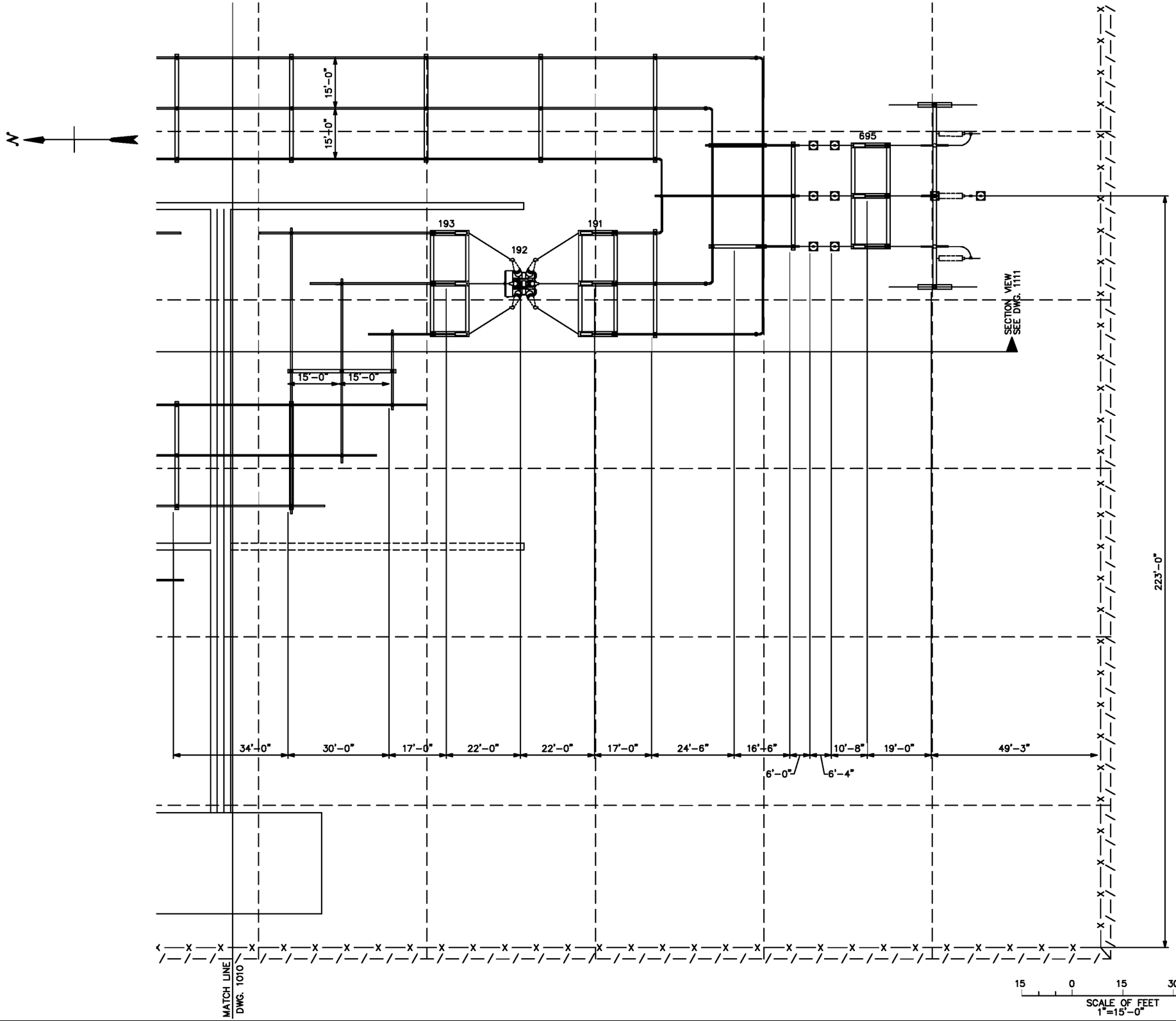
UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
CORPORATE SERVICES OFFICE - LAKEWOOD, COLORADO

2007-G2 345KV SUBSTATION
ROCKY MOUNTAIN REGION
ARRANGEMENT PLAN

XREF(S) = 2007-G2-9500

DESIGNED _____ APPROVED _____
ELECTRICAL ENGINEERING MANAGER

XR	CAE	July 29, 2011	2007-G2	1000



LEGEND:

——— FACILITIES TO BE BUILT

- - - - - - - - FUTURE FACILITIES

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
CORPORATE SERVICES OFFICE – LAKEWOOD, COLORADO

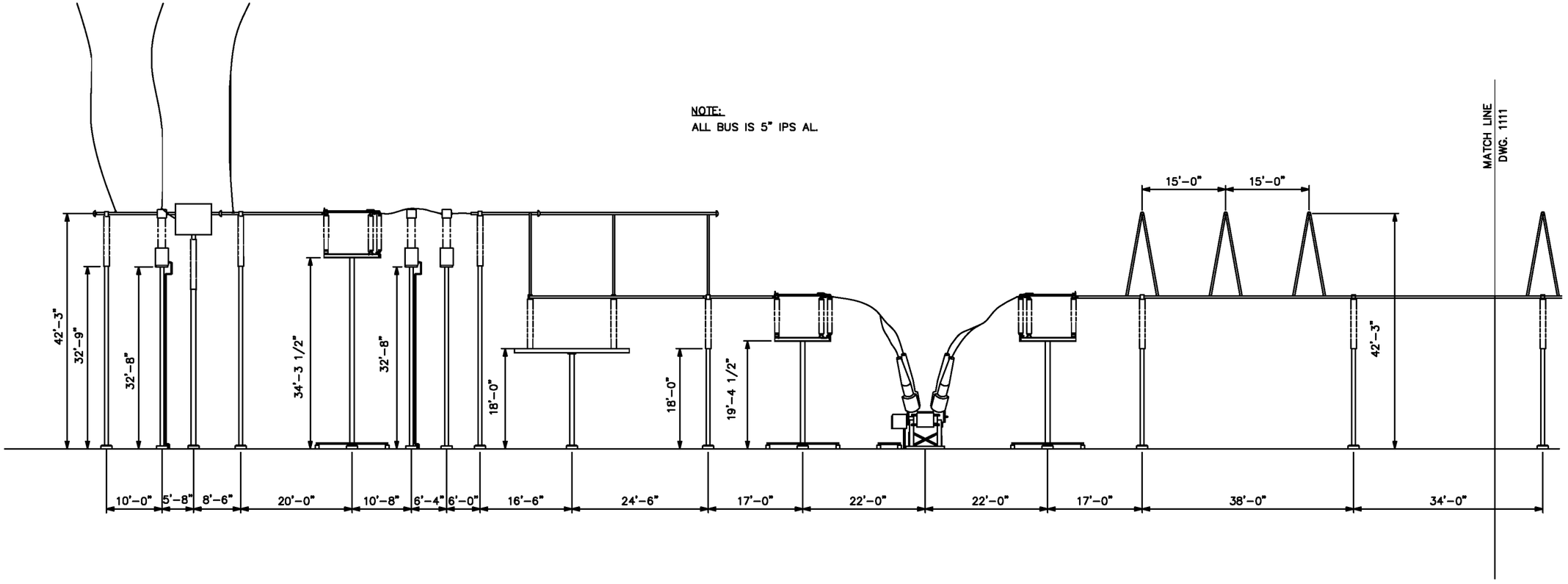
2007–G2 345KV SUBSTATION
ROCKY MOUNTAIN REGION
AREA PLAN

DESIGNED _____ APPROVED _____
ELECTRICAL ENGINEERING MANAGER

XREF(S) = 2007-G2-9500

XR | CAD | October 30, 2009 | 2007–G2 | 1011

NOTE:
ALL BUS IS 5" IPS AL.



10 0 10 20
SCALE OF FEET
1"=20'-0"

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
CORPORATE SERVICES OFFICE - LAKEWOOD, COLORADO

2007-G2 345KV SUBSTATION
ROCKY MOUNTAIN REGION
TYPICAL SECTION

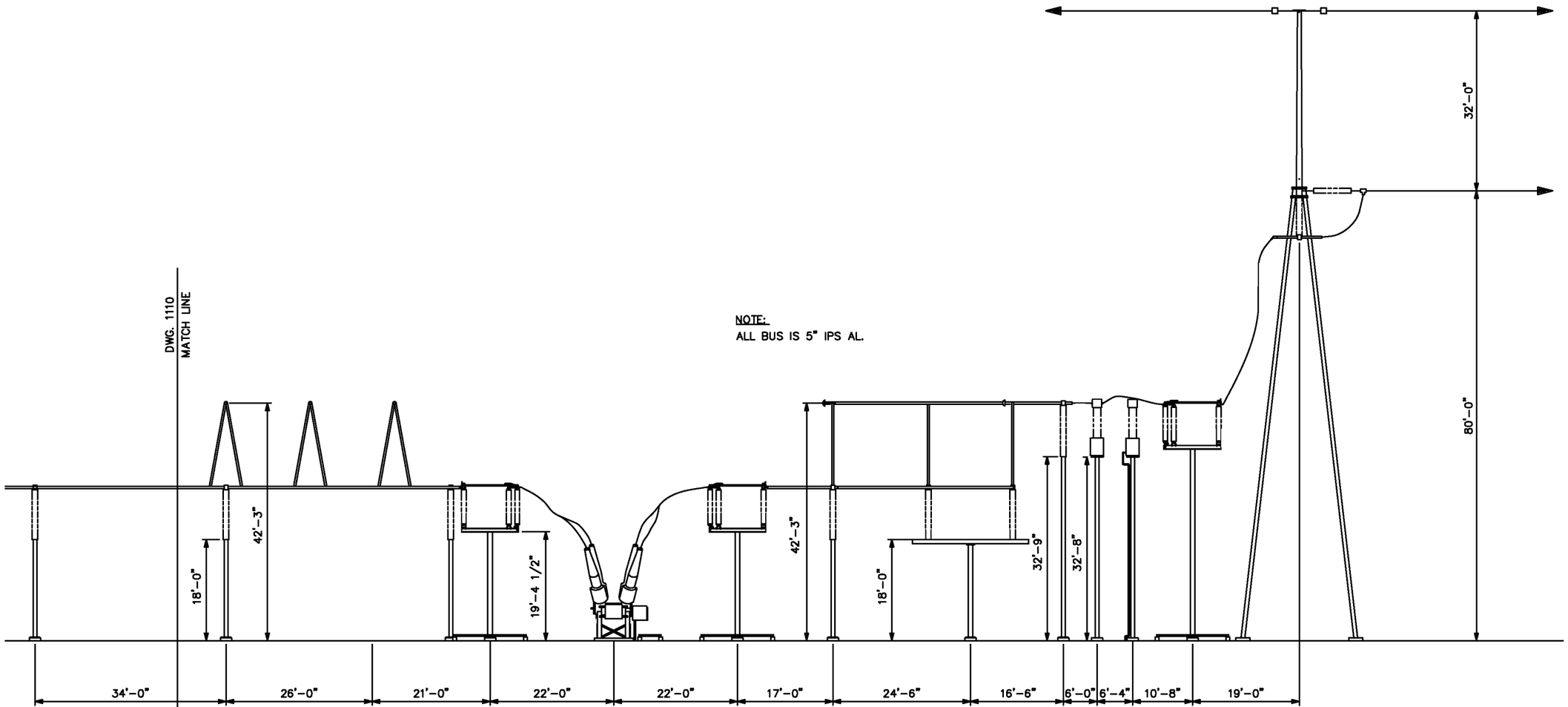
DESIGNED _____ APPROVED _____ ELECTRICAL ENGINEERING MANAGER

C/E	October 30, 2009	2007-G2	1110

Plotted By:richmondc Jul 29, 2011- 1:02pm
MicroStation V8
J:\WAPA\0904 - Facility Studies\2007-G2\Submittals\2011-07-29\2007_G2_1110.dwg Last Saved By: Cloud Richmond on 10/30/2009 2:31 PM

DWG. 1110
MATCH LINE

NOTE:
ALL BUS IS 5" IPS AL.



10 0 10 20
SCALE OF FEET
1"=20'-0"

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
CORPORATE SERVICES OFFICE - LAKEWOOD, COLORADO

2007-G2 345KV SUBSTATION
ROCKY MOUNTAIN REGION
TYPICAL SECTION

DESIGNED _____ APPROVED _____ ELECTRICAL ENGINEERING MANAGER

CAE	October 30, 2009	2007-G2	1111

Appendix D

Design Data

DESIGN DATA SHEET
2007-G2 Wind Farm Interconnection
Switching Station

DESCRIPTION	UNITS	DESIGN REQUIREMENT
Service Conditions		
Location	--	Laramie, WY
Maximum ambient temperature	°C (°F)	43.3 (110)
Average 24 hour temperature	°C (°F)	6.1 (43)
Minimum ambient temperature	°C (°F)	-40 (-40)
Seismic zone rating	--	MODERATE
Altitude	feet	8000
Maximum wind speed	mph	110
Snow and ice loading	--	1-inch radial ice
System Description		
Primary voltage	kV	345
Frequency	Hz	60
Load current harmonic factor	%	-
Transmission Line		
Conductor size	Kcmil	1272
Conductor type	ACSR, AAC	ACSR
Conductor stranding	Al / steel	45/7
Length of transmission line	--	
To Ault Terminal	Miles	46.9
To Craig Terminal	Miles	134.4
Switching station electrical data		
Current rating	Amps	3000
Phase to phase clearance*	Inches	192
Phase to ground clearance*	Inches	120
Equipment basic impulse level (BIL)	kV	1300
Switching station bus		
Material		Aluminum Tube
Diameter (IPS)	Inches	5
Schedule	-	40
Alloy	-	6063-T6

DESIGN DATA SHEET
2007-G2 Wind Farm Interconnection
Switching Station

DESCRIPTION	UNITS	DESIGN REQUIREMENT
Breakers		
Quantity		3**
Voltage rating	kV	345
Current rating	Amps	3000
Interrupt rating	kA	40
Metering Units		
Quantity		3
Single or multi-ratio	-	single
Ratio	-	1000:5
Accuracy	%	±0.3
Disconnect switches		
With ground blades		
Quantity		3**
Without ground blades		
Quantity		6***
Motor operated	Yes / No	Yes
Voltage rating	kV	345
Current rating	Amps	3000
Material	Al / Cu	Al
Configuration	-	Vertical break
Group operated	Yes / No	Yes

DESIGN DATA SHEET 2007-G2 Wind Farm Interconnection Switching Station		
DESCRIPTION	**UNITS**	**DESIGN REQUIREMENT**
Static Protection System		
Static wire		
Material	--	HSS
Size	--	1/2”
Stranding	--	7 strand

* In accordance with NEMA SG6-1974 (R1979) Appendix A, page 2

** For the Facilities Study *Option 1* this quantity will increase by 1 unit

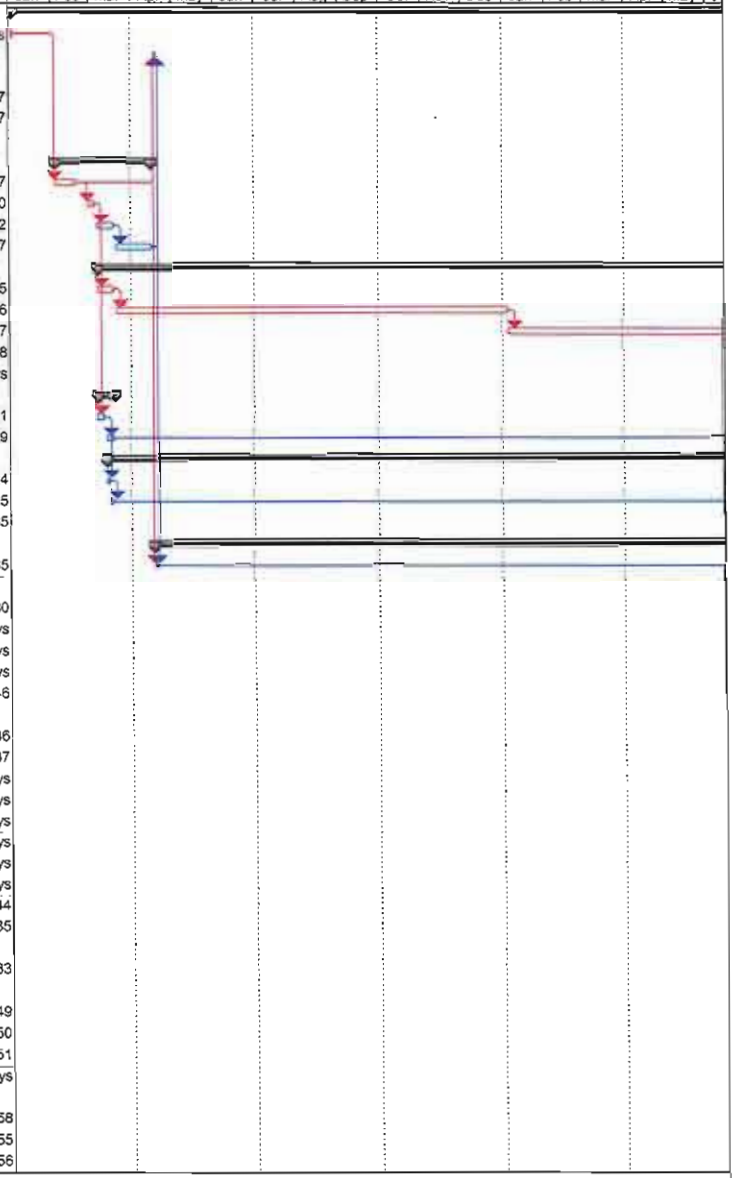
*** For the Facilities Study *Option 1* this quantity will increase by 2 units

Appendix E

Schedule

Facilities Study 2007-G2, Appendix E

ID	Task Name	Duration	Start	Finish	Predecessors	Successors
1	**Project Management (30022)**	1020 days	Mon 1/4/10	Thu 1/23/14		
2	Project start date	1 day	Mon 1/4/10	Mon 1/4/10		9FS+22 days
3	Acquisition Plan (purchases over $5 million)	2 days	Mon 4/19/10	Tue 4/20/10	12,9	
4	**Project Close-out Completed**	77 days	Thu 10/3/13	Thu 1/23/14		
5	Construction Contract Closeout	40 days	Thu 10/3/13	Mon 12/2/13	85	7
6	Settle Land Claims and Damages	30 days	Thu 10/3/13	Fri 11/15/13	85	7
7	Project close out report completed and signed by project sponsor(s)	15 days	Fri 1/3/14	Thu 1/23/14	88,5,6	
8	**PLANNING (30010)**	50 days	Fri 2/5/10	Fri 4/16/10		
9	PID-Project Intiation Document-Development	10 days	Fri 2/5/10	Fri 2/19/10	2FS+22 days	10FS+5 days,3,27
10	Planning Site Visit	5 days	Mon 3/1/10	Fri 3/5/10	9FS+5 days	11,14,20
11	Facility Study Completed	10 days	Mon 3/8/10	Fri 3/19/10	10	12
12	FDD-Facility Development Document-APPROVED	20 days	Mon 3/22/10	Fri 4/16/10	11	3,27
13	**ENVIRONMENT (30011)**	441 days	Mon 3/8/10	Tue 12/6/11		
14	Procure Environmental Sub-Contracts	10 days	Mon 3/8/10	Fri 3/19/10	10	15
15	Required Environmental Studies Developed	10 mons	Mon 3/22/10	Wed 1/5/11	14	16
16	Draft EA/EIS Document Review	220 days	Thu 1/6/11	Fri 11/18/11	15	17
17	Final CX/EA/EIS review	10 days	Mon 11/21/11	Mon 12/5/11	16	18
18	Environmental Clearance Completed	1 day	Tue 12/8/11	Tue 12/8/11	17	5,33,29FS+40 days
19	**Field Data Collection (30012)**	10 days	Mon 3/8/10	Fri 3/19/10		
20	Land and ROW needs/routes Identified	5 days	Mon 3/8/10	Fri 3/12/10	10	23,21
21	Field/Design Data Completed	5 days	Mon 3/15/10	Fri 3/19/10	20	29
22	**LANDS (35000)**	476 days	Mon 3/15/10	Fri 2/3/12		
23	Research Ownership	2 days	Mon 3/15/10	Tue 3/16/10	20	24
24	Rights of Entry Completed	2 days	Wed 3/17/10	Thu 3/18/10	23	25
25	Lands/ROW Acquired	40 days	Wed 12/7/11	Fri 2/3/12	18,24	85
26	**Substation Design and Specifications (30013)**	630 days	Mon 4/19/10	Thu 10/18/12		
27	Project Kick Off / Pre-design Site Meeting	2 days	Mon 4/19/10	Tue 4/20/10	12,9	29,35
28	**SUBSTATION Design & Specifications**	117 days	Mon 2/6/12	Fri 7/20/12		
29	Start Construction Specification & Design	55 days	Mon 2/6/12	Mon 4/23/12	21,27,18FS+40 d	30
30	Design Review #1	10 days	Tue 4/24/12	Mon 5/7/12	29	31FS+10 days
31	Design Review #2	10 days	Tue 5/22/12	Tue 6/5/12	30FS+10 days	32FS+10 days
32	Design Review #3	10 days	Wed 6/20/12	Tue 7/3/12	31FS+10 days	33FS+10 days
33	Final Design & Specifications Received at RMR	2 days	Thu 7/19/12	Fri 7/20/12	18,32FS+10 days	46
34	**Control Design**	146 days	Fri 3/23/12	Thu 10/18/12		
35	Start Control Design	60 days	Fri 3/23/12	Fri 6/15/12	27	36
36	Relay Recommendation Prepared	2 days	Mon 6/18/12	Tue 6/19/12	35	37
37	Review Single Line Diagram	10 days	Wed 6/20/12	Tue 7/3/12	36	38FS+3 days
38	Review Control Panel Layout Drawings	10 days	Tue 7/10/12	Mon 7/23/12	37FS+3 days	39FS+3 days
39	Review AC Circuits	10 days	Fri 7/27/12	Thu 8/9/12	38FS+3 days	40FS+3 days
40	Review DC Circuits	10 days	Wed 8/15/12	Tue 8/28/12	39FS+3 days	41FS+3 days
41	Review Misc Schematic Items and Logic Diagrams	10 days	Tue 9/4/12	Mon 9/17/12	40FS+3 days	42FS+3 days
42	Review Control Panel Wiring Diagrams	10 days	Fri 9/21/12	Thu 10/4/12	41FS+3 days	43FS+3 days
43	Relay Settings Providad to Region	5 days	Thu 10/11/12	Wed 10/17/12	42FS+3 days,57	44
44	Control Design-Outdoor Equipment Wiring Diagrams Completed	1 day	Thu 10/18/12	Thu 10/18/12	43	85
45	**Principle Contract (30015)**	60 days	Mon 7/23/12	Tue 10/16/12		
46	Construction Contract Solicitation	60 days	Mon 7/23/12	Tue 10/16/12	33	83
47	**GFE BREAKERS (30015)**	215 days	Wed 8/1/12	Mon 6/10/13		
48	GFE Breaker Specifications Prepared	15 days	Wed 8/1/12	Tue 8/21/12		49
49	GFE Breaker Purchased	40 days	Wed 8/22/12	Thu 10/18/12	48	50
50	GFE Breakers Manufactured	140 days	Fri 10/19/12	Fri 5/10/13	49	51
51	GFE Breakers Shipped	20 days	Mon 5/13/13	Mon 6/10/13	50	85FS-160 days
52	**GFE Control Switchboards (30015)**	266 days	Fri 5/18/12	Mon 6/10/13		
53	Switchboard Specifications Prepared	10 days	Wed 11/14/12	Wed 11/28/12		58
54	GFE Relay Specifications Prepared	10 days	Fri 5/18/12	Fri 6/1/12		55
55	GFE Relay Procurement Package to Procurement	10 days	Mon 6/4/12	Fri 6/15/12	54	56



Project: 2007-G2 Rev 2, Substation Sc
Date: Thu 8/18/11

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Critical Split
Critical Progress
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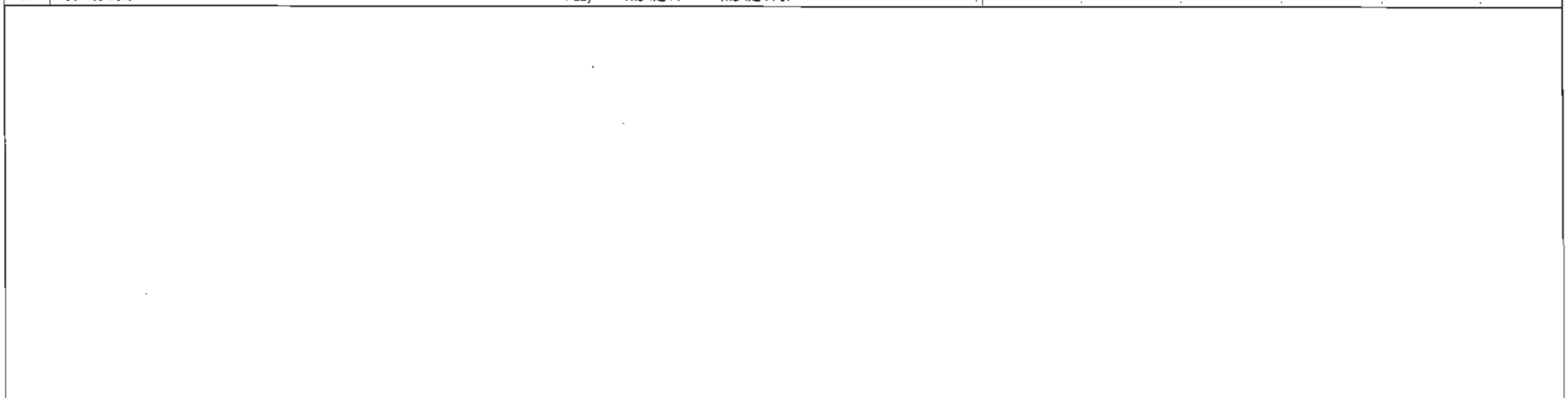
Baseline Split
Baseline Milestone
Milestone
Summary Progress
Summary
Project Summary
Critical Split
Critical Progress
Task
Split
Baseline Milestone
Milestone
Task Progress
Baseline
Baseline Split
Summary Progress
Summary

ID	Task Name	Duration	Start	Finish	Predecessors	Successors
56	GFE Relays Purchased	40 days	Mon 6/18/12	Mon 8/13/12	55	57
57	GFE Relays Manufactured and Shipped to Switchboard Manufacturer	40 days	Tue 8/14/12	Wed 10/10/12	56	59,43
58	GFE Procurement of Switchboard(s)	40 days	Thu 11/29/12	Mon 1/28/13	53	59
59	GFE Control Switchboard(s) Manufactured	80 days	Tue 1/29/13	Tue 5/21/13	58,57	60
60	GFE Control Switchboard Inspection	3 days	Wed 5/22/13	Fri 5/24/13	59	61
61	GFE Control Switchboard(s) Shipped	10 days	Tue 5/28/13	Mon 8/10/13	60	85FS-160 days
62	**Meters (30015)**	**55 days**	**Mon 3/25/13**	**Mon 6/10/13**		
63	GFE Meter Specifications Prepared	10 days	Mon 3/25/13	Fri 4/5/13		64
64	GFE Meter Purchased	20 days	Mon 4/8/13	Fri 5/3/13	63	65
65	GFE Meters Manufactured	15 days	Mon 5/6/13	Fri 5/24/13	64	66
66	GFE Meters Shipped	10 days	Tue 5/28/13	Mon 6/10/13	65	85FS-160 days
67	**RTU Communications (30015)**	**85 days**	**Fri 2/8/13**	**Mon 6/10/13**		
68	RTU Specifications Prepared	10 days	Fri 2/8/13	Fri 2/22/13		69
69	RTU Purchased	40 days	Mon 2/25/13	Fri 4/19/13	68	70
70	RTU Manufactured	25 days	Mon 4/22/13	Fri 5/24/13	69	71
71	RTU Shipped	10 days	Tue 5/28/13	Mon 6/10/13	70	85FS-160 days
72	**SCADA Communications (30015)**	**75 days**	**Mon 2/25/13**	**Mon 6/10/13**		
73	SCADA Communication Equipment Specifications Prepared	10 days	Mon 2/25/13	Fri 3/8/13		74
74	SCADA Communication Equipment Purchased	40 days	Mon 3/11/13	Fri 5/3/13	73	75
75	SCADA Communication Equipment Manufactured	15 days	Mon 5/6/13	Fri 5/24/13	74	76
76	SCADA Communication Equipment Shipped	10 days	Tue 5/28/13	Mon 6/10/13	75	85FS-160 days
77	**GFE Batteries & Charger (30015)**	**75 days**	**Fri 1/25/13**	**Fri 5/10/13**		
78	GFE Battery Specifications Prepared	10 days	Fri 1/25/13	Thu 2/7/13		79
79	GFE Battery Purchased	40 days	Fri 2/8/13	Fri 4/5/13	78	80
80	GFE Batteries Manufactured	15 days	Mon 4/8/13	Fri 4/26/13	79	81
81	GFE Batteries Shipped	10 days	Mon 4/29/13	Fri 5/10/13	80	85FS-140 days
82	**Construction Supervision (30014)**	**243 days**	**Wed 10/17/12**	**Thu 10/3/13**		
83	Pre-Construction Meeting	2 days	Wed 10/17/12	Thu 10/16/12	46	85
84	**Contract Period**	**241 days**	**Fri 10/19/12**	**Thu 10/3/13**		
85	Construction Period	240 days	Fri 10/19/12	Wed 10/2/13	25,63,44,51FS-1	5,6,86
86	Contract Completion Date	1 day	Thu 10/3/13	Thu 10/3/13	85	87
87	Commissioning (30021)	60 days	Fri 10/4/13	Wed 1/1/14	86	88
88	In Service Date	1 day	Thu 1/2/14	Thu 1/2/14	87	7



Project: 2007-G2 Rev 2, Substation Sc
Date: Thu 8/18/11

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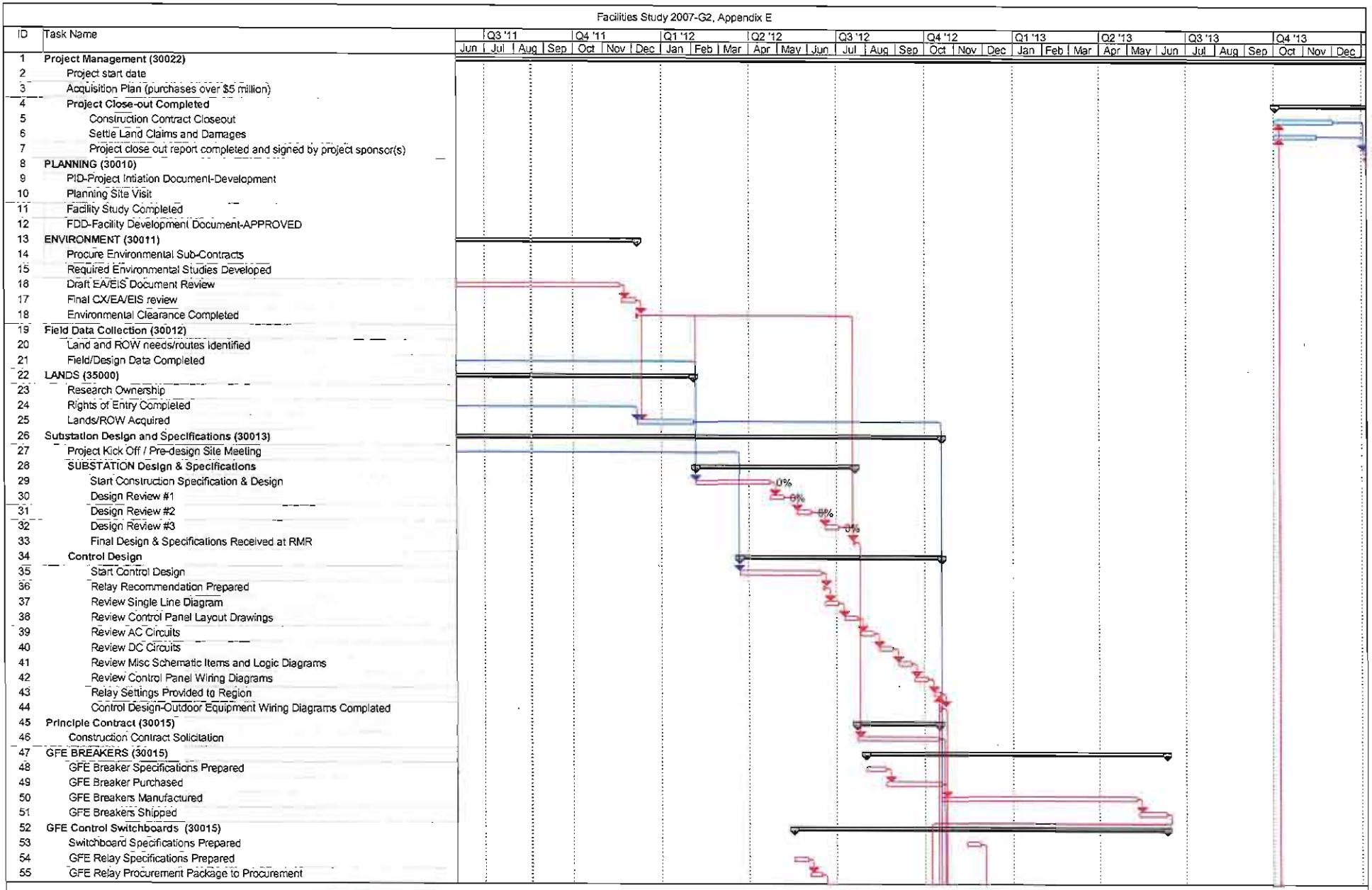
Summary Progress
Summary



Project: 2007-G2 Rev 2, Substation Sc
Date: Thu 8/18/11

Critical	Task Progress	Summary Progress	Task	Baseline Milestone
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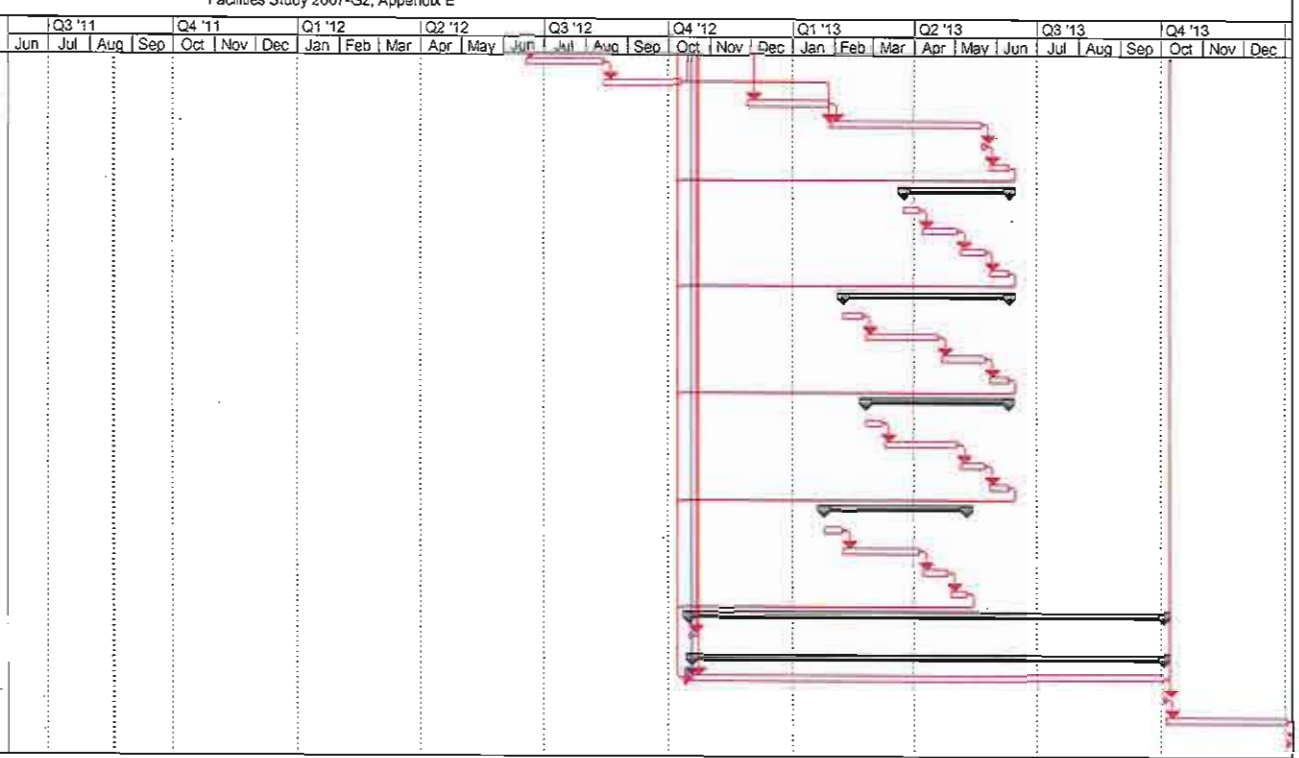
Critical Progress	Baseline Split	Project Summary	Task Progress	Summary Progress
Task	Baseline Milestone	Critical Split	Baseline	Summary
Split	Milestone	Critical Progress	Baseline Split	

ID	Task Name
56	GFE Relays Purchased
57	GFE Relays Manufactured and Shipped to Switchboard Manufacturer
58	GFE Procurement of Switchboard(s)
59	GFE Control Switchboard(s) Manufactured
60	GFE Control Switchboard Inspection
61	GFE Control Switchboard(s) Shipped
62	**Meters (30015)**
63	GFE Meter Specifications Prepared
64	GFE Meter Purchased
65	GFE Meters Manufactured
66	GFE Meters Shipped
67	**RTU Communications (30015)**
68	RTU Specifications Prepared
69	RTU Purchased
70	RTU Manufactured
71	RTU Shipped
72	**SCADA Communications (30015)**
73	SCADA Communication Equipment Specifications Prepared
74	SCADA Communication Equipment Purchased
75	SCADA Communication Equipment Manufactured
76	SCADA Communication Equipment Shipped
77	**GFE Batteries & Charger (30015)**
78	GFE Battery Specifications Prepared
79	GFE Battery Purchased
80	GFE Batteries Manufactured
81	GFE Batteries Shipped
82	**Construction Supervision (30014)**
83	Pre-Construction Meeting
84	**Contract Period**
85	Construction Period
86	Contract Completion Date
87	Commissioning (30021)
88	In Service Date



Project: 2007-G2 Rev 2, Substation Sc
Date: Thu 8/18/11

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Baseline Milestone
Milestone
Summary Progress
Summary
Project Summary
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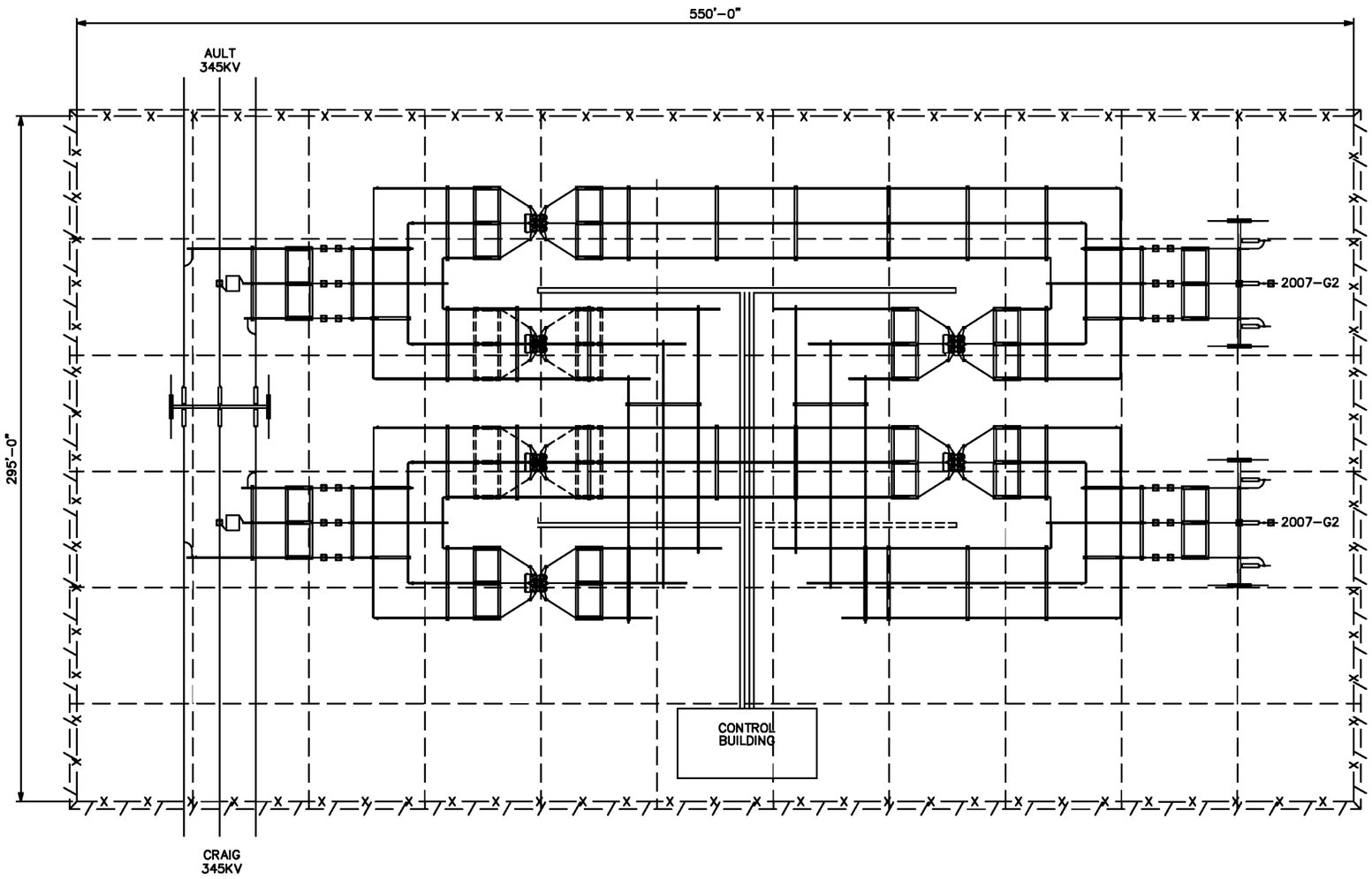
Critical Progress
Task
Split
Task Progress
Baseline
Baseline Split
Baseline Milestone
Milestone
Summary Progress
Summary

Appendix F

Option 1



LEGEND:

——————— FACILITIES TO BE BUILT
- - - - - - - - - FUTURE FACILITIES

30 0 30 60 90
SCALE OF FEET
1"=30'-0"

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
CORPORATE SERVICES OFFICE - LAKEWOOD, COLORADO

2007-G2 345KV SUBSTATION
ROCKY MOUNTAIN REGION
ARRANGEMENT PLAN OPTION 1

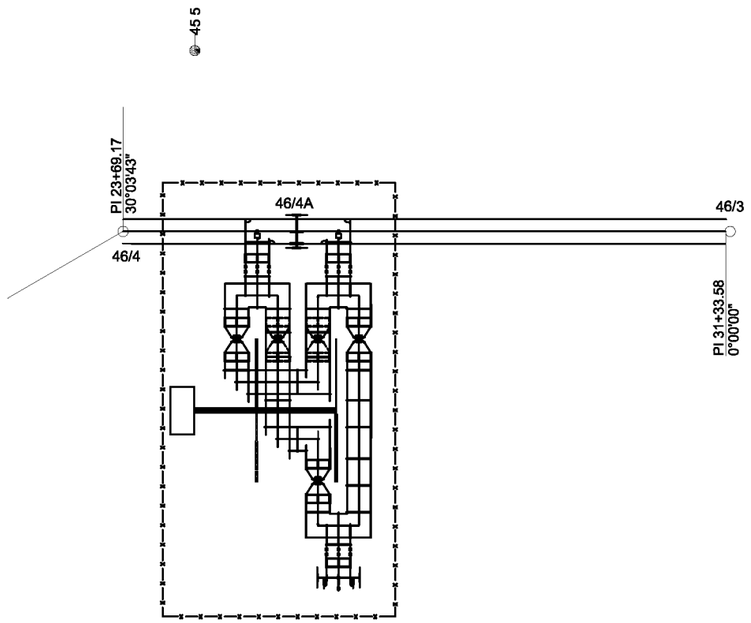
DESIGNED _____ APPROVED _____
ELECTRICAL ENGINEERING MANAGER

XREF(S) = 2007-G2-9500-1

XR	CAD	July 29, 2011	2007-G2	1000-1

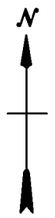
Appendix G

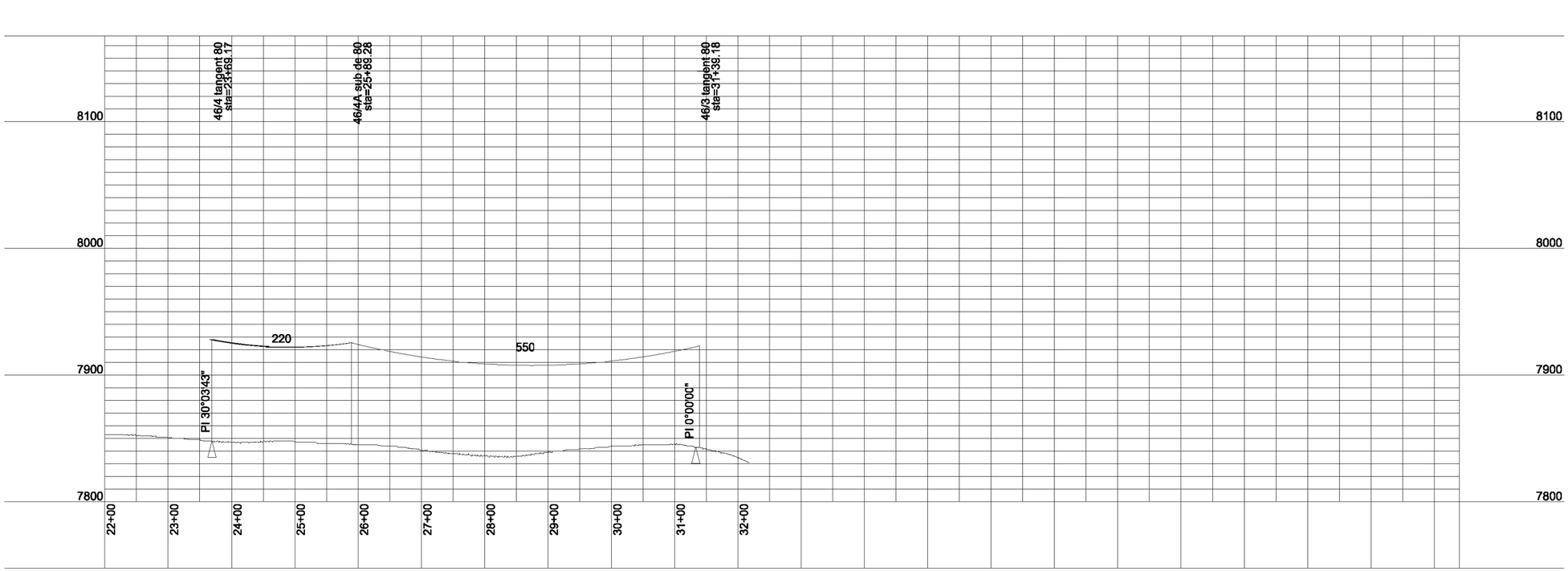
Location Plan and Profile



200.0 ft. Horiz. Scale

100.0 ft. Vert. Scale





UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
CORPORATE SERVICES OFFICE – LAKEWOOD, COLORADO

2007–G2 345KV SUBSTATION
ROCKY MOUNTAIN REGION
PLAN AND PROFILE

DESIGNED _____ APPROVED _____
ELECTRICAL ENGINEERING MANAGER

CAE	July 27, 2011	2007–G2	1200

Appendix H

Ault Approach Span

REFERENCE DRAWINGS

Ruling Span String Sags (1150 ft)

1272 MCM ACSR 45/7	864-D-5837
½ INCH H.S. STEEL, 7-STRAND	864-D-5839

Special Span String Sags

1272 MCM ACSR 45/7	864-D-5838
3064 MCM ACSR 84/19	864-D-5841
½ INCH H.S. STEEL, 7-STRAND	864-D-5840

Vibration Damper Location and Attachment Details	864-D-5657

LINE DATA

Conductor — 1272 MCM ACSR 45/7 2-conductor bundle
Tmax = 14,200 lbs @ NESC Heavy Loading

3064 MCM ACSR 84/19 single conductor for spans > 1800 feet, substation approach spans and for line portion across Buffalo Pass
Tmax = 27,000 lbs @ NESC Heavy Loading

OGW — ½ inch, H.S. Steel, 7-strand
Tmax = 7000 lbs @ NESC Heavy Loading

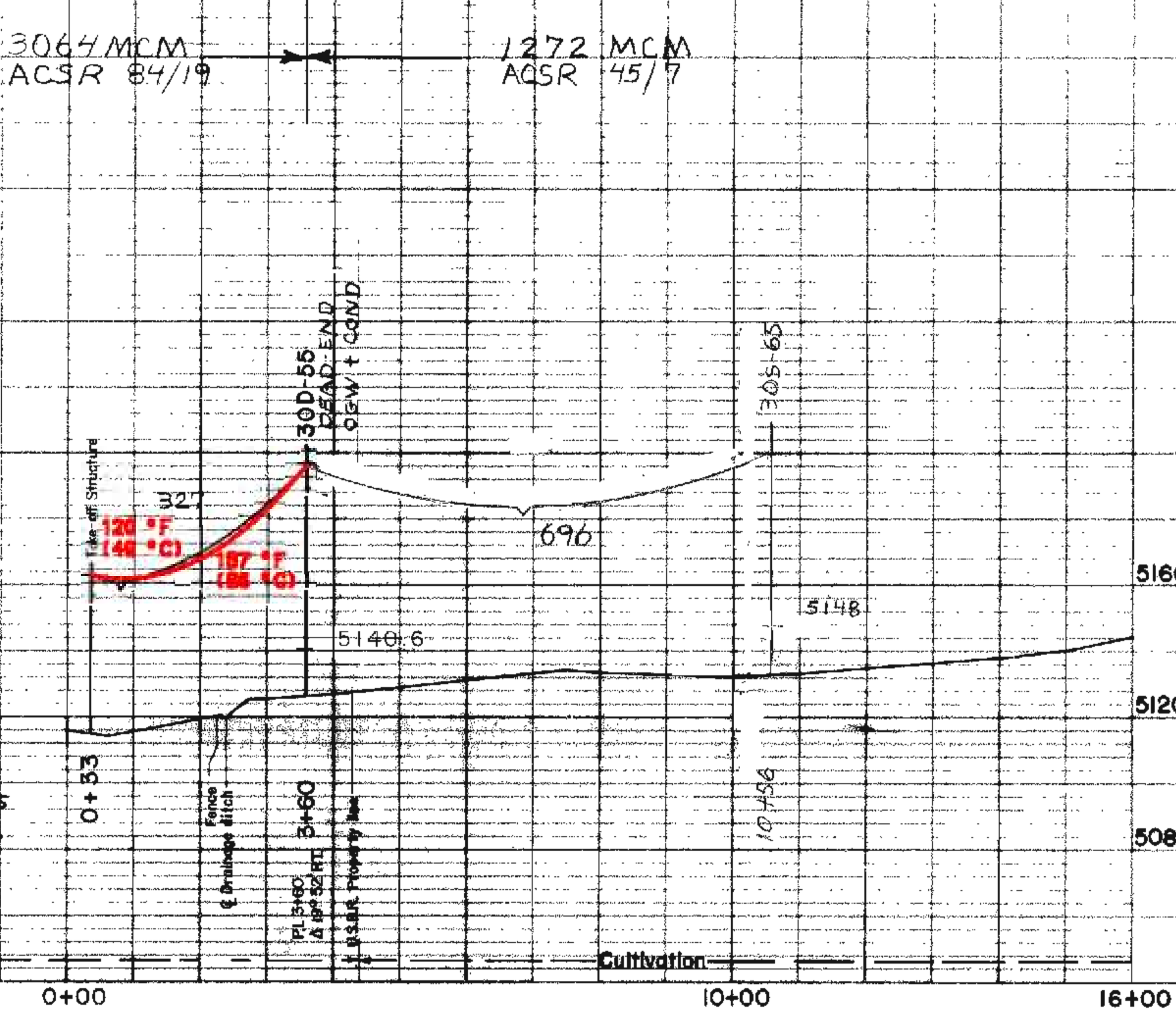
Ruling Span — 1150 feet

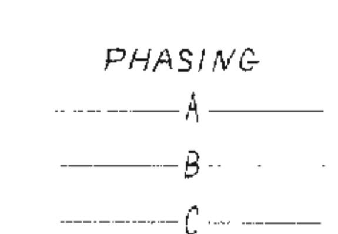
Ground Clearance — 34 feet @ 60° F. Final

APPROACH SPAN

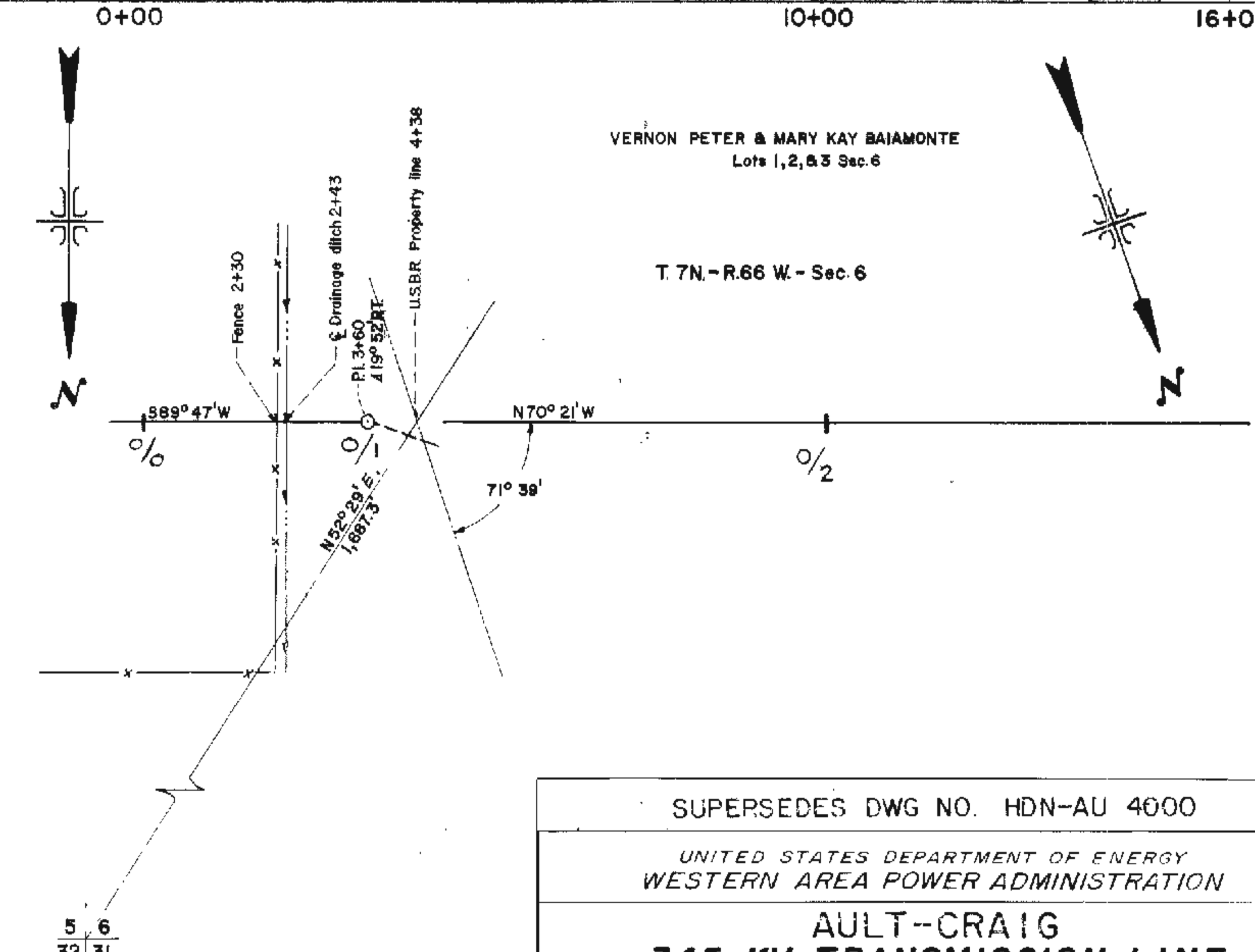
Cond: Tmax = 8000 lbs
T 60°F = 4316 lbs
Sag = 11.18 ft

OGW: Tmax = 2500 lbs
Sag = 8.32 ft





AULT SUBSTATION



SUPERSEDES DWG NO. HDN-AU 4000

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION

AULT-CRAIG
345-KV TRANSMISSION LINE
COLORADO - WYOMING
PLAN AND PROFILE
STA. 0+00 TO STA 6+00

DESIGNED
DRAWN M. R. Wale
CHECKED R.L. Harding
SUBMITTED Gerald D. Birney
RECOMMENDED E. A. Cabral
APPROVED L. Y. Nitta — CHIEF, ELECTRICAL BRANCH

CHEYENNE, WYOMING — 864-732-2006
JULY 25, 1997 — AU-CRG — 4000

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APPENDIX B

THREATENED AND ENDANGERED SPECIES REPORT

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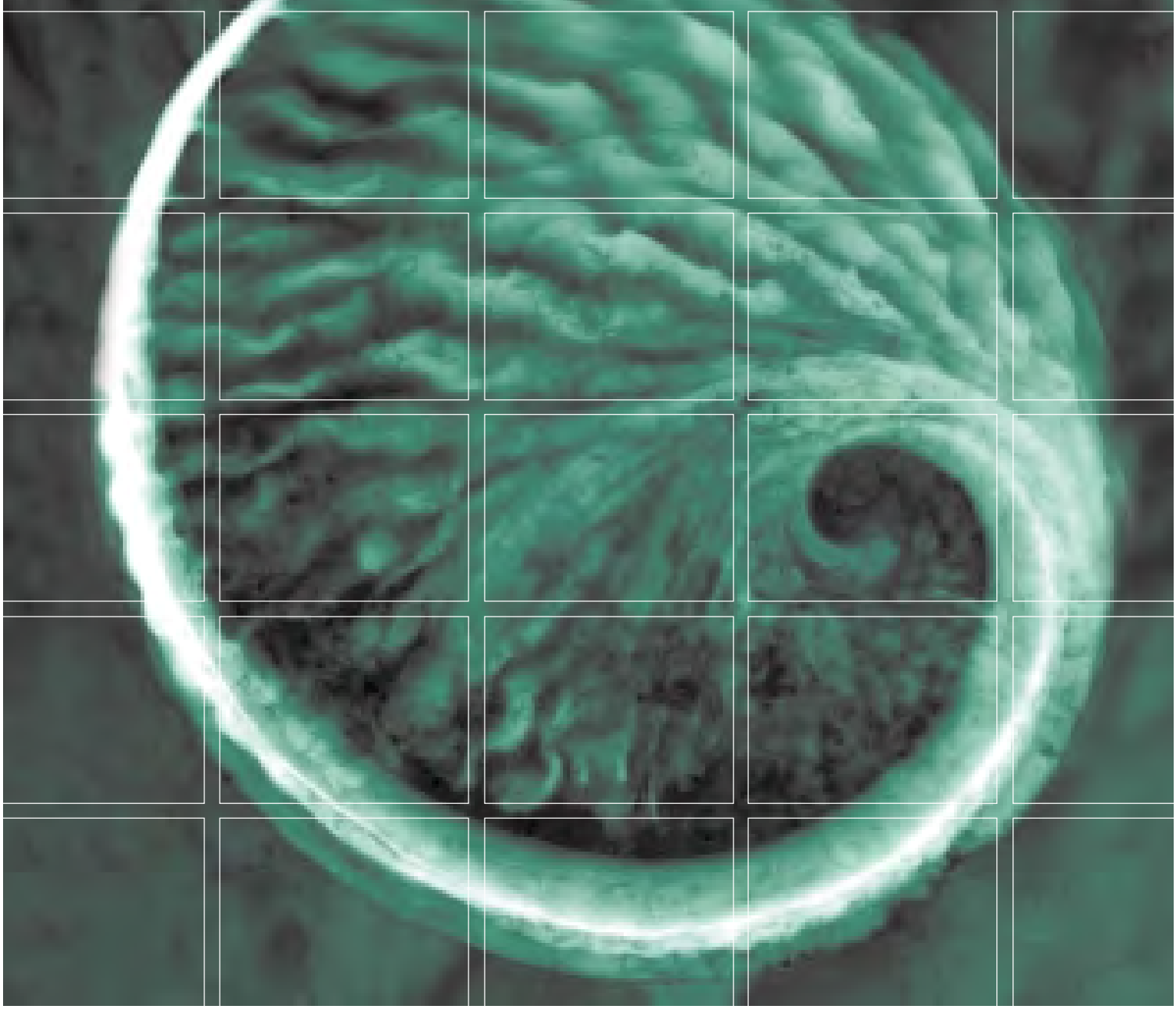

Threatened and Endangered Species Report

Shell WindEnergy Inc.
Hermosa West Wind Project, Albany County, WY

January 11, 2010

www.erm.com

Texas Registered Engineering Firm F-2393

ERM

Delivering sustainable solutions in a more competitive world

Shell WindEnergy Inc.

Threatened and Endangered Species Report: Hermosa West Wind Farm Project

January 11, 2010

Project No. 0105023
Albany County, Wyoming

Alicia C. Smith, R.E.M.
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ACRONYM GLOSSARY

ACWPD	Albany County Weed and Pest Division
BLM	Bureau of Land Management
BMP	Best Management Practices
ERM	Environmental Resources Management Southwest, Inc.
FE	Federally-endangered
FT	Federally-listed
ft	Feet
FX	Federal Nonessential/Experimental Population
kV	Kilovolts
MDNR	Minnesota Department of Natural Resources
MW	Mega Watts
NSS	Native Species Status
PEM	Palustrine Emergent Wetland
Project	Hermosa West Wind Farm Project
ROW	Right-of-Way
SOC	State Designated Species of Concern
SP	State Protection
SWE	Shell WindEnergy
T&E	Threatened and Endangered
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
Western	Western Area Power Authority
WGFD	Wyoming Game and Fish Department

Environmental Resources Management Southwest, Inc. (ERM) completed a Threatened and Endangered (T&E) species assessment for the proposed Shell WindEnergy (SWE) Hermosa West Wind Project (Project) in Albany County, Wyoming in 2009. Western Area Power Authority (WAPA) is evaluating under the National Environmental Policy Act (NEPA) the interconnection of the Project, which consists of transmission system upgrades and construction of a new substation (Proposed Action). The proposed overall Project will consist of approximately 100-200 wind turbines, electrical gathering lines and transmission lines, access roads, operations and maintenance building, and other affiliated structures across an approximately 11,125 acre Project area. A desktop assessment was performed on the entire Project area while ground surveys were conducted in the Survey Area, located in southeastern Wyoming approximately 18 miles south of Laramie, Wyoming along State Highway 287. The Survey Area consists of approximately 2,198 acres of both private and State-owned land.

Field investigations were performed in August and October 2009 to identify the location and extent of any aquatic and terrestrial T&E species and their habitat within the Survey Area. The Project area is not located within a Sage Grouse Core Area (per Governor's Order 2008-2). Avian species, including the sage grouse, are currently being reviewed in a separate effort. Land use and land cover designations were assigned using field observations, interpretation of 2008 aerial photography, and interpretation of U.S. Geological Survey 7.5-minute topographic maps. Land use and land cover types were classified as emergent wetland, stream, forested or grassland/prairie. The presence of 12 noxious weed species was also evaluated, while none were identified within the Survey Area. Nine wetlands and a total of 45 waterbodies were identified within the Survey Area and documented in a separate Wetland Delineation Report.

The Proposed Action is anticipated to have **no effect** on the following T&E species because there is no suitable foraging and/or breeding habitat located in the Survey Area or on immediately adjacent lands or the species is believed to be extirpated: blowout penstemon (*Penstemon haydenii*), ute ladies' tresses (*Spiranthes diluvialis*), greenback cutthroat trout (*Oncorhynchus clarki stomias*), pallid sturgeon (*Scaphirhynchus albus*), western prairie fringed orchid (*Platanthera praeclara*), Wyoming toad (*Bufo baxteri*), river otter (*Lutra canadensis*), and black-footed ferret (*Mustela nigripes*).

The Proposed Action is anticipated to **not likely to adversely affect** the following T&E species as adjacent suitable habitat is present or mitigation measures can be effective: wolverine (*Gulo gulo*) and Canada lynx (*Lynx canadensis*.

The Project is anticipated to have **no effect** on the following T&E species because there is no suitable foraging and/or breeding habitat located in the Survey Area or on immediately adjacent lands or the species is believed to be extirpated: blowout penstemon (*Penstemon haydenii*), ute ladies' tresses (*Spiranthes diluvialis*),

greenback cutthroat trout (*Oncorhynchus clarki stomias*), pallid sturgeon (*Scaphirhynchus albus*).

The Project is anticipated to **not likely to adversely affect** the following T&E species as adjacent suitable habitat is present or mitigation measures can be effective: western prairie fringed orchid (*Platanthera praeclara*), Wyoming toad (*Bufo baxteri*), river otter (*Lutra canadensis*), wolverine (*Gulo gulo*), Canada lynx (*Lynx canadensis*), and black-footed ferret (*Mustela nigripes*).

Mitigation measures will be implemented to minimize, to the extent practicable, potential adverse effects to T&E species. Specific mitigation measures for the Project may include:

- Implement water quality Best Management Practices (BMPs) including the use of silt fences, or other of appropriate sediment and erosion control measures, near wetlands and waterbodies;
- Construction Personnel will receive environmental overview and training prior to construction activities
- Implement a no approach, no kill policy for all T&E by all on-site personnel during construction and operation activities;
- Maximize the primary use of existing access roads, which have been actively and historically used throughout the area;
- Siting, to the extent practical, the turbines, facilities and access roads outside of wetlands and waterbodies, or otherwise sensitive areas (i.e. prairie dog colonies). The Project was re-designed November 2009 to cross 30 waterbodies versus 45.

1.0 INTRODUCTION

Environmental Resources Management Southwest, Inc. (ERM) completed a threatened and endangered (T&E) species assessment for Shell WindEnergy at the proposed Hermosa West Wind Project (Project) in Albany County, Wyoming (Figure 1-1). Western Area Power Authority (Western) is evaluating under the National Environmental Policy Act (NEPA) the interconnection of the Project, which consists of transmission system upgrades and construction of a new substation (Proposed Action).

1.1 OBJECTIVES AND SCOPE

The purpose of this assessment is to identify, characterize, and determine potential Project impacts to terrestrial and aquatic Federally- and State-listed Threatened and Endangered (T&E) species and Wyoming Game and Fish Department (WGFD) listed Species of Concern (SOC), which Western reviewed, within the Survey Area to support the Project's permitting, development and future management.

A desktop assessment was performed on the entire Project area (11,125 acres) while ground surveys were conducted in the Survey Area, located in southeastern Wyoming approximately 18 miles south of Laramie, Wyoming along State Highway 287 (Figure 1-2). The Survey Area consists of approximately 2,198 acres of both private and State-owned land, consisting of 100 to 400 foot buffers around the Project components described below.

1.2 PROJECT SUMMARY

1.2.1 Project Description

SWE is proposing to develop the Project, consisting approximately 100 to 200 wind turbines, with an anticipated total generating capacity of up to 300 megawatts (MW). The wind turbines would be arranged in roughly collinear "strings"; each turbine string would be situated within an approximately 250 foot (ft) or 400ft wide corridor, depending on topography. The Project would interconnect with a Western-operated transmission line traversing the Project area.

In addition to turbines, the Project would include the following:

- Access roads and truck turn-around areas;
- One permanent meteorological tower;
- Supervisory Control and Data Acquisition (SCADA) equipment;
- 34.5 kilovolt (kV) power collection lines that would deliver power to the substation;
- Metering equipment for custody transfer related communication equipment;

- Operations and Maintenance (O&M) facilities, approximately 5,000 to 8,000 ft^2, including: offices, signage, spare parts storage, restrooms, telecommunications, equipment laydown areas, emergency living accommodations, shop area, conference rooms, outdoor parking, a turn-around area for larger vehicles, and potentially a welcome/information center;
- Project substation, approximately 70,000 to 85,000 ft^2 (1.6 to 2 acres), where the power from the collection system would be stepped up to the voltage required to interconnect with an existing Western-operated transmission line (i.e., 345 kV);
- High voltage (345 kV) transmission line less than one mile in length connecting the substation to the existing Western transmission line; and
- System upgrades that would need to be made to Western's transmission line and associated facilities to accept the 300MW at the point of interconnection.

The last three Project components are part of the Proposed Action.

1.2.2 Project Area Description

The Project area is located within Albany County, Wyoming. The City of Laramie is located approximately 18 miles northwest of the Project area. The Project is located within the Upper Laramie River and South Platte River Sub-basins of the Platte River Basin.

The typical landscape of the region is low mountain slopes and nearly level floodplains, as are associated with the Mid-Elevation Forests and Shrublands of the Southern Rockies Ecoregion, and Laramie Basin of the Wyoming Basin Ecoregion (Chapman et al. 2004). The Mid-Elevation Forests and Shrublands Ecoregion ranges from 7,500 to 9,000 ft in elevation. The ecoregion is characterized by low mountain slopes and outwash fans with moderate to high gradient perennial streams. The dominant vegetation in this ecoregion is lodgepole pine forests and Douglas-fir forests with some timber pine. Some aspen forests occur in the Sierra Madre range, while ponderosa pine woodlands occur in the Laramie Mountains. The Laramie Basin Ecoregion ranges from 7,100 to 7,900 ft in elevation and is characterized by nearly level floodplains and terraces. This Ecoregion is dominated by mixed grass prairie.

2.0 METHODOLOGY

Field investigations and literature reviews were used to evaluate the site for the suitability of habitats supporting terrestrial and aquatic Federal- or State-listed T&E species, SOC, and noxious weeds.

2.1 DESKTOP ASSESSMENT

Prior to conducting field investigations, a review of listed species at the county level was performed. Federally-listed terrestrial and aquatic T&E species were obtained from the U.S. Fish and Wildlife (USFWS) Mountain-Prairie Region website (USFWS 2008) to determine potential species occurrences and their critical habitat in Albany County. In June 2009, the Project team met with USFWS and WGFD to introduce the project. State-listed terrestrial and aquatic T&E species and SOC, and associated habitats were obtained from the WGFD website (WGFD 2009a) and reviewed with Western. The site was also evaluated for the presence of noxious or invasive weeds. ERM obtained a list of 12 noxious weeds of concern from Albany County Weed and Pest Division (ACWPD 2009).

The potential for Federally-listed and State-listed species to occur within the vicinity of the Project area was evaluated in this desktop analysis based on the presence or absence of suitable habitat, based on a review of the following sources:

- U.S. Geological Survey (USGS) 7.5-minute Topographic Quadrangle Maps;
- USFWS National Wetlands Inventory (NWI) Maps;
- WEST, Inc. habitat map (Figure 3-2).
- Current and Aerial Photography (2007); and
- U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) County Soil Surveys (2008).

Furthermore, ERM conducted a consultation with Western biologist, prior to field efforts to review the collected desktop species information and Albany County noxious weeds lists for the Project Area.

2.2 FIELD SURVEY

ERM biologists performed field investigations on August 24-28, 2009 and October 14-15, 2009. The biologists used visual observation surveys to identify and characterize the habitat types, vegetation communities, and to detect potential terrestrial and aquatic T&E species occurring in the Survey Area as well as to investigate the occurrence of 12 noxious weeds. Surveys consisted of meandering pedestrian transects throughout the Survey Area. Visual observations extended beyond the Survey Area boundaries to adjacent lands.

3.0 SITE HABITAT AND VEGETATION COMMUNITIES

During the field investigation, three distinct habitat types were identified in the Survey Area: emergent wetlands; aquatic habitat; and uplands as shown in Figure 3-1. The following discussion describes each habitat type and associated vegetation communities located in the Survey Area and immediately adjacent lands.

3.1 EMERGENT WETLANDS

ERM performed a wetland delineation of the Survey Area as part of a separate effort. The wetland delineation identified nine (9) wetlands (approximately 6.18 acres) within the Survey Area. The delineated wetlands were all classified as palustrine emergent (PEM) wetlands due to the predominance of yellow nutsedge (*Cypreus esculentus*) and Baltic rush (*Juncus balticus*), within the wetlands (ERM 2009). PEM wetlands, as defined by Cowardin, et al. (1979), are those wetlands that are dominated by erect, rooted, herbaceous plants. These wetlands are commonly dominated by cattails (*Typha* spp.), bulrushes (*Scirpus* spp.), sedges (*Carex* spp.), rushes (*Juncus* spp.), and various forbs.

Table 3-1 summarizes data for wetlands identified within the Survey Area, including the wetland location, size, type, and connectivity. Detailed information for these features is provided in the Wetland Assessment Report (ERM 2009).

Herbaceous stratum within the wetlands observed in the Survey Area were dominated by colonies of creeping bentgrass (*Agrostis stoloniferia*), yellow nutsedge, Baltic rush, and spikerush (*Eleocharis spp*). Shrub and tree stratum, while typically not dominant, consisted of Bebb willow (*Salix bebbina*) and quaking aspen (*Populus tremuloides*). These tree species were found in wetlands associated with banks of perennial streams.

TABLE 3-1: Wetlands within the Survey Area

Feature ID	*Latitude*	*Longitude*	*Type (A)*	*Acreage (B)*	*Connection*
WAAL001	41.0564	-105.5732	PEM	1.29	Associated with Forest Creek
WAAL002	41.0477	-105.5604	PEM	0.90	Associated with Boulder Creek
WAAL003	41.0501	-105.5360	PEM	0.33	Associated with Willow Creek
WAAL004	41.0389	-105.5356	PEM	1.52	Associated with Willow Creek
WBAL001	41.0687	-105.5458	PEM	0.20	Associated with Boulder Creek
WBAL002	41.0824	-105.5461	PEM	0.13	Isolated depressional wetland
WBAL003	41.0585	-105.5540	PEM	0.43	Associated with Boulder Creek
WBAL004	41.0585	-105.5239	PEM	0.16	Associated with Willow Creek
WBAL005	41.0210	-105.5163	PEM	1.22	Associated with Fish Creek
			TOTAL	**6.18**	
			Total Potentially Jurisdictional Wetlands	**6.05**	

(A) Wetland types: PEM = palustrine emergent; PFO = palustrine forested
(B) Wetland acreages are based on surveyed boundaries.

3.2 WATERBODIES

A total of 45 waterbodies were identified during the wetland delineation survey. Of these, 21 are perennial streams, 12 are intermittent streams, and 12 are ephemeral streams. Additionally, one headwater spring was identified within the Survey Area and another was identified outside the Survey Area in connection with identified features SAAL014 and SAAL012, respectively. No ephemeral pools or playas were identified within the Survey area. Table 3-2 summarizes the waterbodies by feature identification, name, type, and size and relation to a traditional navigable waterbody (TNW). Waterbody Data Sheets containing detailed information regarding the waterbodies (stream flow, depth, water characteristics, etc.) are contained under separate cover in the Wetland Assessment Report (ERM 2009).

TABLE 3-2: Waterbodies within the Survey Area

Feature ID	*Lat*	*Long*	*Name*	*Type*	*Length (ft)*
SAAL001	41.0669	-105.5826	Government Creek	Perennial	735
SAAL002	41.0724	-105.5749	Government Creek	Perennial	785
SAAL003	41.0796	-105.5639	Government Creek	Ephemeral	1301
SAAL004	41.0563	-105.5733	Forest Creek	Perennial	1299
SAAL005	41.0620	-105.5643	Forest Creek	Intermittent	827
SAAL006	41.0464	-105.5629	Tributary of Boulder Creek	Ephemeral	619
SAAL007	41.0454	-105.5628	Tributary of Boulder Creek	Ephemeral	225
SAAL008	41.0478	-105.5603	Boulder Creek	Ephemeral	1224
SAAL009	41.0433	-105.5619	Tributary of Boulder Creek	Ephemeral	3979
SAAL010	41.0430	-105.5357	Willow Creek	Perennial	1313
SAAL012	41.0388	-105.5360	Tributary of Willow Creek	Perennial	781
SAAL013	41.0419	-105.5270	Tributary of Willow Creek	Ephemeral	1493
SAAL014	41.0258	-105.4873	Unnamed Tributary	Perennial	443
SAAL015	41.0286	-105.4933	Unnamed Tributary	Ephemeral	633
SAAL016	41.0271	-105.5071	Unnamed Tributary	Ephemeral	960
SAAL017	41.0190	-105.5052	Tributary of Fish Creek	Perennial	1087
SAAL018	41.0091	-105.5158	Tributary of Fish Creek	Ephemeral	657
SAAL019	41.0199	-105.5252	Fish Creek	Perennial	1180
SAAL020	41.0189	-105.5356	Fish Creek	Perennial	809
SAAL021	41.0708	-105.5221	Willow Creek	Perennial	473
SAAL022	41.0795	-105.5080	Tributary to Grant Creek	Intermittent	341
SBAL001	41.0684	-105.5445	Tributary to Forest Creek	Ephemeral	607
SBAL002	41.0698	-105.5450	Forest Creek	Perennial	3034
SBAL003	41.0647	-105.5547	Forest Creek	Perennial	776
SBAL004	41.0583	-105.5541	Boulder Creek	Perennial	637
SBAL005	41.0580	-105.5537	Tributary to Boulder Creek	Perennial	268
SBAL006	41.0544	-105.5066	Tributary to Willow Creek	Intermittent	335
SBAL007	41.0571	-105.5156	Tributary to Willow Creek	Intermittent	336
SBAL008	41.0532	-105.5166	Tributary to Willow Creek	Perennial	522
SBAL009	41.0515	-105.5166	Tributary to Willow Creek	Intermittent	1744
SBAL010	41.0414	-105.5176	Tributary to Willow Creek	Ephemeral	296
SBAL011	41.0468	-105.5162	Tributary to Willow Creek	Ephemeral	775
SBAL012	41.0477	-105.5163	Tributary to Willow Creek	Intermittent	390

Feature ID	*Lat*	*Long*	*Name*	*Type*	*Length (ft)*
SBAL013	41.0584	-105.5239	Tributary to Willow Creek	Perennial	440
SBAL014	41.0571	-105.5254	Willow Creek	Perennial	1561
SBAL015	41.0458	-105.5274	Tributary to Willow Creek	Intermittent	318
SBAL016	41.0455	-105.5264	Tributary to Willow Creek	Intermittent	1040
SBAL017	41.0147	-105.4891	Unnamed Tributary	Intermittent	1012
SBAL018	41.0153	-105.5044	Fish Creek	Perennial	3605
SBAL019	41.0216	-105.5166	Tributary of Fish Creek	Perennial, man made	451
SBAL020	41.0209	-105.5163	Fish Creek	Perennial	938
SBAL021	41.0204	-105.5259	Tributary of Fish Creek	Intermittent	562
SBAL022	41.0209	-105.5250	Tributary of Fish Creek	Intermittent	307
SBAL023	41.0194	-105.5347	Tributary of Fish Creek	Intermittent	303
SBAL024	41.0789	-105.5080	Grant Creek	Perennial	329

3.3 UPLANDS

Habitat mapping was performed under separate cover by West, Inc. for the Project Area. Figure 3-2 shows the mapped habitat types in the Project Area which consist of grasslands, riparian areas, riparian/willow areas, shrub steppe, coniferous forest, and mountain mahogany. Approximate acreage and percent cover of each habitat type are detailed in Table 3-3.

TABLE 3-3: Mapped Habitats within the Survey Area

Habitat Type	*Acreage*	*Percent Cover*
grassland	9,743	87.5%
coniferous forest	661	6%
mountain mahogany	131	1%
shrub steppe	106	1%
riparian areas	398	3.5%
riparian/willow areas	86	1%
TOTAL:	**11,125**	**100.0%**

Mapped habitat types can be broken into two categories; uplands and aquatic habitats. Riparian and Riparian/willow habitats comprise the aquatic habitat and were discussed in detail in Sections 3.1 and 3.2 regarding wetlands and waterbodies. Grasslands, coniferous forests, mountain mahogany, and shrub steppe make up the uplands habitat.

The upland habitat located throughout the majority of the ProjectArea is characterized as grasslands (87.5%) dominated by spare ground cover including spineless horsebrush (*Tetradymia canescens*), big sagebrush (*Artemisia tridentate*), wax currant (*Ribes cereum*), Timothy grass (*Phleum pretense*), blue wildrye (*Elymus glaucus)*, elkweed (*Frasera speciosa*), Canada goldenrod (*Solidago canadensus*), big bluestem (*Andropogon geradii*), little bluestem (*Schizachyrium scoparium*), and assorted upland grasses (Whitson 2004).

While grassland habitat continues through the majority of the Project area, the Project area is also bordered to the South and West by sparsely populated mixed

pines stands mapped as coniferous forests (6%) and mountain mahogany (1%), with interspersed shrub steppe (1%). These stands continue to the South and West outside the Project area into predominantly coniferous forests.

3.4 NOXIOUS WEEDS

Surveys included a determination of the presence of twelve noxious and invasive weeds (Table 3-3), as designated by Albany County, as species of particular concern for the Project. None of these noxious or invasive weeds were documented within the Survey Area.

Numerous similar species were identified within the Survey Area, including; Canada thistle (*Cirsium arvense* (L.)), Platte thistle (*Cirsium canescens*) and Queen Anne's lace (*Daucus carota*). However, these are not considered noxious or invasive by Albany County.

TABLE 3-4: Noxious Weeds of Concern

Common Name	*Scientific Name*	*Identified within Survey Area*
Hoary Cress	*Cardaria draba* (L.) Desv.	No
Diffuse Knapweed	*Centaurea diffusa* Lam.	No
Spotted Knapweed	*Centaurea maculosa* auct. non Lam.	No
Russian Knapweed	*Centaurea repens* L.	No
Leafy Spurge	*Euphorbia esula* L.	No
Black Henbane	*Hyoscyamus niger* L.	No
Dyers Woad	*Isatis tinctoria* L.	No
Perennial Pepperweed	*Lepidium latifolium* L.	No
Dalmatian Toadflax	*Linaria dalmatica* (L.) Mill.	No
Yellow Toadflax	*Linaria vulgaris* Mill.	No
Scotch Thistle	*Onopordum acanthium* L.	No
Saltcedar (Tamarask)	*Tamarix* L.	No

4.0 PROJECT EFFECTS ON THREATENED AND ENDANGERED SPECIES

The potential for Federally-listed and State-listed terrestrial and aquatic T&E species and SOC to occur on or in the vicinity of the Survey Area was evaluated based on the presence or absence of suitable habitat, species-specific agency information, and the identification of species actively using the Survey Area during field investigations. The USFWS and the WGFD provide lists of species protected by the Endangered Species Act (ESA) by county based on population distribution and occurrence data. Table 4-1 lists T&E species that are known to occur or may potentially occur in Albany County, and summarizes their listing status and potential to occur in the Survey Area. Table 4-2 lists State designated SOC that may potentially occur in the Survey Area. Avian species are currently being evaluated as part of a separate effort and will be included in a separate report. No critical habitat of those species listed in Table 4-1 was identified within the Survey Area.

Potential effects on T&E species from the Proposed Action and total Project can be classified as short-term, long-term, and permanent. Short-term effects last less than five years and include impacts to suitable habitat, disturbance to wildlife from Project activities (e.g., noise disturbance or increases in human presence during construction, operation, and decommissioning), and displacement of individuals. Long-term impacts consist of changes to wildlife habitats lasting five years or longer. The severity of both short- and long-term impacts depends on factors such as the sensitivity of the species impacted, seasonal use patterns, type and timing of construction activities, and physical parameters (e.g., topography, cover, forage, and climate). Permanent impacts include habitat loss resulting from aboveground activities.

Potential effects to T&E species can also be classified as direct or indirect. A direct effect may include individual injury or mortality. Indirect effects may alter the survivorship or reproductive capacity of a species changing the quantity and/or continuity of available suitable habitat, altering the quality and availability of resources used by the species, or altering intraspecific or interspecific competition dynamics.

The following subsections provide a species summary and evaluation of the effects of Proposed Action and the total Project upon T&E species if they have a potential to occur in the Survey Area. Project effects determinations are defined as follows:

- **No effect** – Project activities will have no adverse or beneficial effect on the listed species;
- **Not likely to adversely affect** – Project activities may directly or indirectly affect the listed species or its habitat; however, the effects are likely to be discountable, insignificant, or beneficial; and
- **Likely to adversely affect** – Project activities are anticipated to have significant adverse effects (direct or indirect) on the listed species or its habitat.

TABLE 4-1: Terrestrial and Aquatic T&E Species Listed in Albany County, Wyoming

Common Name	*Scientific Name*	*Federal Status*	*State Status*	*Potential Occurrence in the Survey Area*	*Proposed Action Potential Impact*	*Total Project Potential Impact*	*Proposed Mitigation*
PLANTS							
Blowout Penstemon	*Penstemon haydenii*	FE	--	No – Requires sand blowouts or dunes which were not identified within the Survey Area	No Effect	No Effect	None
Western Prairie Fringed Orchid	*Platanthera praeclara*	FT	--	**Low** - Typically found within moist tall-grass prairies and sedge meadows associated with the Platte River System downstream of Albany County	No Effect	Not Likely to Adversely Affect	Water quality best management practices (BMPs)
Ute Ladies' Tresses	*Spiranthes diluvialis*	FT	--	No – Requires wet meadows and seasonally moist soils associated with drainages below 7,000 ft (Project elevation is approximately 7,900 ft)	No Effect	No Effect	None
FISH							
Greenback Cutthroat Trout	*Oncorhynchus clarki stomias*	FT	--	No – Prefers cold, clear, gravely streams and mountain lakes. Believed to be extirpated in Wyoming.	No Effect	No Effect	None
Pallid Sturgeon	*Scaphirhynchus albus*	FE	--	No – Prefers large rivers with high turbidity; occurs in Platte River System downstream of Albany County	No Effect	No Effect	None
AMPHIBIANS							
Wyoming Toad	*Bufo baxteri*	FE	NSS1	**Low –** Historically found within floodplains, ponds, small lakes in the Laramie basin short grass prairie. Believed to be extirpated in Wyoming.	No Effect	Not Likely to Adversely Affect	Water quality BMPs
MAMMALS							
Wolverine	*Gulo gulo*	--	NSS3, SP	**Low –** Typically found in edge habitat associated with dense, continuous stands of coniferous forests.	Not Likely to Adversely Affect	Not Likely to Adversely Affect	No-approach, no-kill policy
River Otter	*Lutra canadensis*	--	NSS4, SP	**Low** –Requires permanent waterbodies and uses naturally occurring shelters, beaver lodges, or animal burrows for dens.	No Effect	Not Likely to Adversely Affect	Water quality BMPs
Canada Lynx	*Lynx canadensis*	FT	NSS1, SP	**Low –** Found in high elevation, edge habitat associated with dense coniferous forests	Not Likely to Adversely Affect	Not Likely to Adversely Affect	No-approach, no-kill policy
Black-footed Ferret	*Mustela nigripes*	FE, FX	NSS1, SP	**Medium –** Typically associated with prairie dog colonies.	No Effect	Not Likely to Adversely Affect	No-approach, no-kill policy ; and change in layout to minimize impact to prairie dog colonies

Key:
FT = Federally Threatened under the ESA
FE = Federally Endangered under the ESA
FX = Federal Nonessential/Experimental Population (no added protection)
SP = State Protected
NSS1-4 = WGFD Native Species Status of Species of Special Concern ; 1 most sensitive, 4 least sensitive, (no protection)
(1) Source: WGFD (http://gf.state.wy.us/wildlife/nongame/SpeciesofSpecialConcern/index.asp)
(2) Source: USFWS Mountain Prairie Region (http://www.fws.gov/mountain-prairie/species/wyoming/Albany- sp.pdf)

4.1 LISTED PLANTS

4.1.1 Blowout penstemon

Blowout penstemon (*Penstemon haydenii*) is Federally-listed as endangered for Albany County. The blowout penstemon is an herbaceous plant, which typically grows on sand dunes and sandy blowouts that do not have existing established plant communities. Habitable sand dunes may be located on steep slopes between 5,800 and 7,500 feet in elevation, and can be up to 120 feet tall. There are three known populations of this species in Wyoming in northwestern Carbon County, which is located just west of Albany County. (BLM 2009)

The Proposed Action and this Project are anticipated to have **no effect** on the blowout penstemon as there is no suitable habitat present within the Survey Area.

4.1.2 Western prairie fringed orchid

The western prairie fringed orchid (*Platanthera praeclara*) is Federally-listed as threatened. The Western prairie fringed orchid is known to occur among sedge meadows and moist tall grass prairies in the Platte River System (MDNR 2009; USFWS 2008). No individual species were identified during the surveys, and no suitable habitat was identified within the Survey Area for the Proposed Action. Suitable habitat within the small wetlands identified was present within the Survey area for the Project. However, it is also believed that the western prairie fringed orchid occurs further downstream of the Platte River System outside of Albany County, Wyoming and the Survey Area. Furthermore, current open grazing of cattle throughout the area would most likely inhibit the success of this species. It is not anticipated that the Project would have any adverse direct impacts to this species.

Water quality BMPs will be implemented to minimize any unforeseen impacts to the Platte River System's watershed including the use of appropriate sediment and erosion control measures, such as silt fencing and/or hay bales near waterbodies and wetlands and the installation of construction barriers and notices to identify sensitive receptors. Furthermore, construction work areas, turbines, access roads, and facilities will be sited outside of wetlands and waterbodies, to all extents practicable, to further minimize impacts to the Platte River System watershed. The Project was re-designed November 2009 to cross 30 waterbodies versus 45. Furthermore waterbody crossings have been designed at points where less temporary modification of stream banks would be required.

The Proposed Action is anticipated to have **no effect** on the western prairie fringed orchid as there is no suitable habitat present within the Survey Area for the Proposed Action.

This Project is anticipated to **not likely to adversely affect** the western prairie fringed orchid as the species is not believed to occur with the Survey Area for

the total Project. Furthermore, the implementation of BMPs will minimize any unforeseen impacts.

4.1.3 Ute ladies' tresses

The ute ladies' tresses (*Spiranthes diluvialis*) is Federally-listed as threatened in Albany County. This orchid typically inhabits riparian zones, wetlands, and moist meadows near continuously flowing streams. This species has also been found to exist up to an altitude of 7,000 ft in Utah. Populations of the orchid in Wyoming have been found in the Northern Great Plains and Central Shortgrass Prairie ecoregions on the eastern side of the State in Converse, Laramie, and Niobrara Counties. No ute ladies' tresses were observed in the Survey Area. While wetlands and moist areas were found within the Survey Area, the Project Area does not appear to have appropriate habitat as the Project is located at an elevation of approximately 7,900 ft, well above the known altitude limit (Fertig, Black, and Wolken 2005; USFWS 2009b). Furthermore, current open grazing of cattle throughout the Project Area would most likely inhibit the success of this species.

The Proposed Action and this Project are anticipated to have **no effect** on the ute ladies' tresses as there is no suitable habitat within the Project Area.

4.2 FEDERALLY-LISTED FISH

4.2.1 Greenback cutthroat trout

The greenback cutthroat trout is Federally-listed as threatened outside Albany County; however, it was identified as a SOC by Western. This species historically inhabited the South Platte River System in Wyoming and Colorado. The greenback cutthroat trout typically inhabits clear, cold streams and lakes with gravel beds. Overfishing, the introduction of competing species, and habitat destruction all pose threats to this species. This Project will not affect fishing and is not anticipated to introduce competing species. While no individual species were observed in the field, the southern most part of Fish Creek in the Survey Area could provide suitable habitat. However, no Project impacts to the greenback cutthroat trout are anticipated, as this species is believed to be extirpated from Wyoming (Colorado Division of Wildlife 2009).

Water quality BMPs will be implemented to minimize any unforeseen impacts to the Platte River System's watershed including the use of appropriate sediment and erosion control measures, such as silt fencing and/or hay bales near water bodies and wetlands and the installation of construction barriers and notices to identify sensitive receptors. Furthermore, construction work areas, turbines, access roads, and facilities will be sited outside of wetlands and water bodies, to all extents practicable, to further minimize impacts to the Platte River System watershed. The Project was re-designed in November 2009 to cross 30 waterbodies versus 45. Furthermore waterbody crossings have been designed to cross at points where less temporary modification of stream banks would be

required (e.g. existing road crossings, stable sloping banks, or less vegetated banks).

Therefore, the Proposed Action and this Project are anticipated to have **no effect** on the greenback cutthroat trout as they are believe to be extirpated from Wyoming.

4.2.2 Pallid sturgeon

The pallid sturgeon is Federally-listed as threatened in Albany County. This fish can live for over 50 years and can grow up to six feet in length. It inhabits large, turbid rivers, swimming in areas with strong currents near sandy floors. Prior to the construction of mainstream dams, the pallid sturgeon was historically found in the North Platte River System, over 100 miles downstream of the Project Area. No suitable habitat was found in the Survey Area (Montana Fish, Wildlife, and Parks 2009; Platte River Recovery Implementation Program 2009).

Water quality BMPs will be implemented to minimize any unforeseen impacts to the Platte River System's watershed including the use of appropriate sediment and erosion control measures, such as silt fencing and/or hay bales near water bodies and wetlands and the installation of construction barriers and notices to identify sensitive receptors. Furthermore, construction work areas, turbines, access roads, and facilities will be sited outside of wetlands and water bodies, to all extents practicable, to further minimize impacts to the Platte River System watershed. The Project was re-designed in November 2009 to cross 30 waterbodies versus 45. Furthermore waterbody crossings have been designed to cross at points where less temporary modification of stream banks would be required (e.g. existing road crossings, stable sloping banks, or less vegetated banks).

Therefore, the Proposed Action and this Project are anticipated to have **no effect** on the pallid sturgeon, due to the lack of suitable habitat.

4.3 LISTED AMPHIBIANS

4.3.1 Wyoming toad

The Wyoming toad is Federally-listed as endangered and is a SOC in Wyoming and in Albany County. This species is found in the Laramie Basin in Albany County inhabiting ponds, small seepage lakes, and floodplains. The Wyoming toad breeds mid-May through early June. A single specific cause for its decline has not been found; however, insecticide use, agricultural practices, climatic changes, predation, and the chytrid fungus (*Batrachochytrium dendrobatidis*) may each negatively impact the species (USFWS 2009c).

No individual Wyoming toads were seen in the Survey Area, and no suitable habitat was identified within the Survey Area for the Proposed Action. However, there is suitable habitat, consisting of small wetlands and streams,

identified within the Survey Area for the Project. According to the International Union for Conservation of Nature (IUCN) World Conservation Union, the Wyoming toad is considered extinct in the wild and survives only in captivity (Hammerson 2004).

BMPs will be implemented to minimize any unforeseen impacts to the Wyoming toad including the use of appropriate sediment and erosion control measures, such as silt fencing and/or hay bales near water bodies and wetlands and the installation of construction barriers and notices to identify sensitive receptors. Furthermore, construction work areas, turbines, access roads, and facilities will be sited outside of wetlands and water bodies, to all extents practicable, to further minimize impacts to the Wyoming toad. Impacts to this species have also been minimized by the primary use of existing access roads, which have been actively and historically used throughout the area. The Project was redesigned in November 2009 to cross 30 waterbodies versus 45. Furthermore waterbody crossings have been designed to cross at points where less temporary modification of stream banks would be required (e.g. existing road crossings, stable sloping banks, or less vegetated banks).

The Proposed Action is anticipated to have **no effect** on the Wyoming toad due to the lack of suitable habitat in the Survey Area or the Proposed Action.

This Project is anticipated to **not likely to adversely impact** the Wyoming toad, due to the proximity of the Project to wetlands and waterbody features. The implementation of BMPs will minimize any unforeseen impacts.

4.4 LISTED MAMMALS

4.4.1 Wolverine

The wolverine is listed for State protection in Wyoming and is found in Wyoming's western mountains. This species inhabits coniferous forests, preferring continuous, dense tree stands in remote mountainous sites. Wolverine dens can be found in thickets, within fallen trees, in caves and rock crevices within old-growth or mature spruce-fir stands. They may use established tree stands as corridors between optimal habitats. Territory sizes are approximately 290 miles for females and 350 miles for males (WGFD 2009b).

No wolverines or dens were found within the Survey Area. The Project Area is comprised largely of open grassland, which does not provide suitable denning habitat for the wolverine. Patches of medium density ponderosa pine occur along the southern edge of the Survey Area near the Colorado border. Pine forest is also present in the mountainous area to the west of the Project Area outside the Survey Area. While the Project Area would not provide good core habitat for the species, it is possible that if individuals were present in the denser forest in Colorado or to the west, then it would be possible for them to travel into the edge habitat within the Project Area. Impacts to this species have also been minimized by the primary use of existing access roads, which have been actively

and historically used throughout the area. Individual wolverines passing through the Project Area will be allowed to pass unharmed and unharassed, as required under the ESA. This will be accomplished by the implementation of a no approach, no kill policy for all T&E by all on-site personnel during construction and operation activities.

The Proposed Action and this Project are anticipated to **not likely to adversely affect** the wolverine as the Project area does not contain suitable denning habitat for the species. While it is possible for individual wolverines to pass through the Project Area, impacts would be minimal as the species is highly mobile and could easily avoid Project activities.

4.4.2 River otter

The river otter is listed for State protection in Wyoming. Otters are scattered along the western portion of Wyoming and are rarely seen. They are protected from hunting, but they are a SOC because their population trends are not known and their habitats are at risk of loss. River otters inhabit permanent water bodies and riparian habitats. Riparian areas account for approximately six percent of the Project Area and less than one percent of the Survey Area. Slightly more than half of these features are intermittent or ephemeral streams. The remaining perennial features are small and do not provide suitable supporting habitat for the river otter. One waterbody has been artificially dammed by human activity, such that it could support suitable permanent waterbody feature; however, the Project construction footprint avoids this feature. Though minimal suitable habitat was present within the Survey Area for the total Project, no evidence of river otter presence was seen in the Survey Area (WGFD 2009b). No suitable habitat was identified within the Survey Area for the Proposed Action.

As direct impacts to individual species is not anticipated, Project impacts would be limited to protecting water quality for potential species downstream. Water quality BMPs will be implemented to minimize any unforeseen impacts to the river otter including the use of appropriate sediment and erosion control measures, such as silt fencing and/or hay bales near water bodies and wetlands and the installation of construction barriers and notices to identify sensitive receptors. Furthermore, construction work areas, turbines, access roads, and facilities will be sited outside of wetlands and water bodies, to all extents practicable, to further minimize impacts to the river otter. The Project was redesigned in November 2009 to cross 30 waterbodies versus 45. Furthermore waterbody crossings have been designed to cross at points where less temporary modification of stream banks would be required (e.g. existing road crossings, stable sloping banks, or less vegetated banks).

The Proposed Action is anticipated to have **no effect** on the river otter as there is no suitable habitat present within the Survey Area for the Proposed Action.

The Project is anticipated to **not likely to adversely affect** the river otter though, the implementation of BMPs will minimize any unforeseen impacts.

4.4.3 Canada lynx

The Canada lynx is Federally-listed as threatened and is listed for State protection in Wyoming. This species typically is found in the western mountains in Wyoming, although it has also been documented in the Laramie mountain range. It inhabits mountain ranges and 8 to 12% slopes and prefers large, dense Engelmann spruce and subalpine fir coniferous forests. The prime habitat for the lynx is based on that of its prey, the snowshoe hare. The lynx dens in areas with large woody debris, and forages in areas with an understory of young trees and shrubs (WGFD 2009b).

The Project Area does not contain suitable habitat for the Canada lynx. The forested areas along the southern portion of the property are not densely forested and are primarily pine. Large woody debris was not encountered within the Survey Area, and as the forested area is edge habitat, it would not provide good denning habitat. The forested area did not contain an appropriate understory for foraging. However, it is possible that the surrounding forest could contain suitable habitat and that if individuals were present in the denser forest in Colorado or to the west, then it would be possible for them to travel into the edge habitat within the Project Area. Impacts to this species have also been minimized by the primary use of existing access roads, which have been actively and historically used throughout the area. Individuals passing through the Project area will be allowed to pass unharmed and unharassed, as required under the ESA. This will be accomplished by the implementation of a no approach, no kill policy for all T&E by all on-site personnel during construction and operation activities.

The Proposed Action and this Project are anticipated to **not likely to adversely affect** the Canada lynx as the Project Area does not contain suitable habitat for the species. While it is possible for individuals to pass through the area, impacts would be minimal as the species is highly mobile and could avoid Project activities.

4.4.4 Black-footed ferret

The black-footed ferret is Federally-listed as endangered in Albany County and is listed for State protection in Wyoming. The black footed ferret is historically found in grasslands and sagebrush habitats. However, the only known population in Wyoming is located in Shirley Basin, approximately 100 miles north of the Project Area. This population was re-introduced using captive bred ferrets and is one of only two established populations (Wyoming and South Dakota). The black-footed ferret inhabits and feeds within prairie dog colonies in prairie grasslands, shrublands and sagebrush-grasslands (WGFD 2009b).

The fate of the ferret is closely tied to that of prairie dogs. Threats to prairie dogs have coincided with ferret declines as prairie dog towns provide habitat and food for the ferrets. The white-tailed prairie dog is petitioned for listing under

the ESA, but are not currently under Federal protection. Both prairie dog species are SOC within Wyoming, but do not receive State protection.

White-tailed prairie dog individuals and colonies were identified during the survey in August 2009. Three sets of 8 to 10 mounds were seen within the Survey Area as seen in Figure 3-1c. Each group of mounds was approximately 50 to 150 feet in diameter. No evidence of prairie dogs or black-footed ferrets was identified within the Survey Area for the Proposed Action.

To mitigate impacts to the black-footed ferret habitat, efforts will be taken to avoid direct impact to the identified prairie dog tunnel systems, to the extent practical, by adjusting the construction corridor. Specifically, the impacts have been minimized by use of an existing access road that has been actively and historically used throughout the area.

The Proposed Action is anticipated to have **no effect** on the black-footed ferret as there is no suitable habitat present within the Survey Area for the Proposed Action.

This Project is anticipated to **not likely to adversely affect** the black-footed ferret as suitable habitat for the species may potentially be avoided by adjusting the proposed corridor(s) of the Project to all extents practical. While it is possible for individuals to pass through the Project Area, impacts would be minimal as the species is highly mobile and could avoid Project activities.

4.5 SPECIES OF CONCERN

The WGFD and the USFWS designate plant and wildlife species with limited distribution and/or rare occurrence SOC, and seek to identify and minimize potential conservation threats. Terrestrial and aquatic SOC are listed in Table 4-2. WGFD designated SOC as native species status NSS1 through NSS4, with NSS1 being of the most concern. SOC do not receive regulatory protection, therefore a determination of Project effects is not required. Mitigation measures designed to minimize potential adverse Project effects on T&E species also are likely to minimize potential adverse effects on SOCs.

There is not an indicator system for the status of plants of concern in Wyoming as there is for animals (e.g. NSS1-4). Those plants of concern that are listed as sensitive for Wyoming are included in Appendix B.

TABLE 4-2: State Species of Concern Potentially Occurring in the Survey Area

Common Name	*Scientific Name*	*State Status*	*Habitat*
FISH			
Hornyhead Chub	*Nocomis biguttatus*	NSS1	Laramie River downstream of Wheatland Reservoir 2, North Laramie River; medium to large clear gravely streams.
Common Shiner	*Luxilus cornatus*	NSS3	Tributaries of North and South Platte Rivers; clear gravely streams and small lakes.
Iowa Darter	*Etheostoma exile*	NSS4	North Platte, South Platte, Niobrara River drainages; cool, slow moving streams, small lakes, ponds.
AMPHIBIANS			
Northern Leopard Frog	*Rana pipiens*	NSS4	Cattail marshes, beaver ponds up to 9,000 ft.
Wood Frog	*Rana sylvatica*	NSS3	Beaver ponds, small lakes, slow moving streams, wet meadows, willow thickets around 9,000 ft.
Tiger Salamander	*Amnystoma tigrinum*	NSS4	Wide range of habitats with non-flowing water nearby for breeding; overwinter in rodent burrows or other moist areas.
Boreal Western Toad (Southern Rocky Mountain Population)	*Bufo boreas boreas*	NSS2	Wet areas at 8,000 to 11,000 ft elevation.
REPTILES			
Eastern Yellowbelly Racer	*Coluber constrictor flaviventris*	NSS4	Woodlands in plains and foothills zone; typically near water
MAMMALS			
Hayden's Shrew	*Sorex haydeni*	NSS4	Grasslands, marshes, riparian areas, wet meadows.
Southern Rocky Mountain Pygmy Shrew	*Sorex hoyi montanus*	NSS2	Engelmann spruce/subalpine fir forest near wet areas.
Dwarf Shrew	*Sorex nanus*	NSS3	Coniferous forests, aspen, shrublands, grasslands, rock outcrops, talus fields.
Olive-backed Pocket Mouse	*Perognathus fasciatus*	NSS3	Shrublands, sagebrush-grasslands, grasslands; prefers sandy soils
Swift Fox	*Vulpes velox*	NSS3	Grasslands, agricultural areas, irrigated meadows, road/railroad right-of-way; use dens year-round.

Key:
NSS1-4 = WGFD Native Species Status of Species of Special Concern ; 1 most sensitive, 4 least sensitive, (no protection)

4.5.1 Sage grouse

The Project Area is not located with Sage Grouse Core Area (per Governor's Order 2008-2). No sage grouse individuals or leks were observed in the Survey Area Avian species, including the Sage grouse, are currently being reviewed in a separate effort and will be included under separate cover.

4.5.2 Big game

The Project area is not located within any big game crucial winter range or identified parturition areas. Though antelope and mule deer were observed within the Project Area, the Proposed Action and this Project are anticipated to **not likely to adversely affect** big game.

5.0 CONCLUSIONS

The Proposed Action is anticipated to have **no effect** on the following T&E species because there is no suitable foraging and/or breeding habitat located in the Survey Area or on immediately adjacent lands or the species is believed to be extirpated: blowout penstemon, ute ladies' tresses, greenback cutthroat trout, pallid sturgeon, western prairie fringed orchid, Wyoming toad, river otter, and black-footed ferret.

The Proposed Action is anticipated to **not likely to adversely affect** the following T&E species as adjacent suitable habitat is present or mitigation measures can be effective: wolverine and Canada lynx.

The Project is anticipated to have **no effect** on the following T&E species because there is no suitable foraging and/or breeding habitat located in the Survey Area or on immediately adjacent lands or the species is believed to be extirpated: blowout penstemon, ute ladies' tresses, greenback cutthroat trout, and pallid sturgeon.

The Project is anticipated to **not likely to adversely affect** the following T&E species as adjacent suitable habitat is present or mitigation measures can be effective: western prairie fringed orchid, Wyoming toad, river otter, wolverine, Canada lynx, and black-footed ferret.

Mitigation measures will be implemented to ensure that potential adverse effects to T&E species are minimized to all extents practicable. Specific mitigation measures for the Project may include:

- Implement water quality Best Management Practices (BMPs) including the use of silt fences, or other of appropriate sediment and erosion control measures, near wetlands and waterbodies;
- Construction Personnel will receive environmental overview and training prior to construction activities
- Implement a no approach, no kill policy for all T&E by all on-site personnel during construction and operation activities;
- Maximize the primary use of existing access roads, which have been actively and historically used throughout the area;
- Siting, to all extents practical, the turbines, facilities and access roads outside of wetlands and waterbodies, or otherwise sensitive areas (i.e. prairie dog colonies). The Project was re-designed November 2009 to cross 30 waterbodies versus 45.

6.0 REFERENCES

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Johnson, Erin	Environmental Resources Management, Environmental Scientist
Wanka, Kathryn	Environmental Ressources Management, Environnemental Scientist
Zeisloft, Chris	Environmental Resources Management, Environmental Scientist
Zuniga, Amanda	Environmental Resources Management, Environmental Scientist

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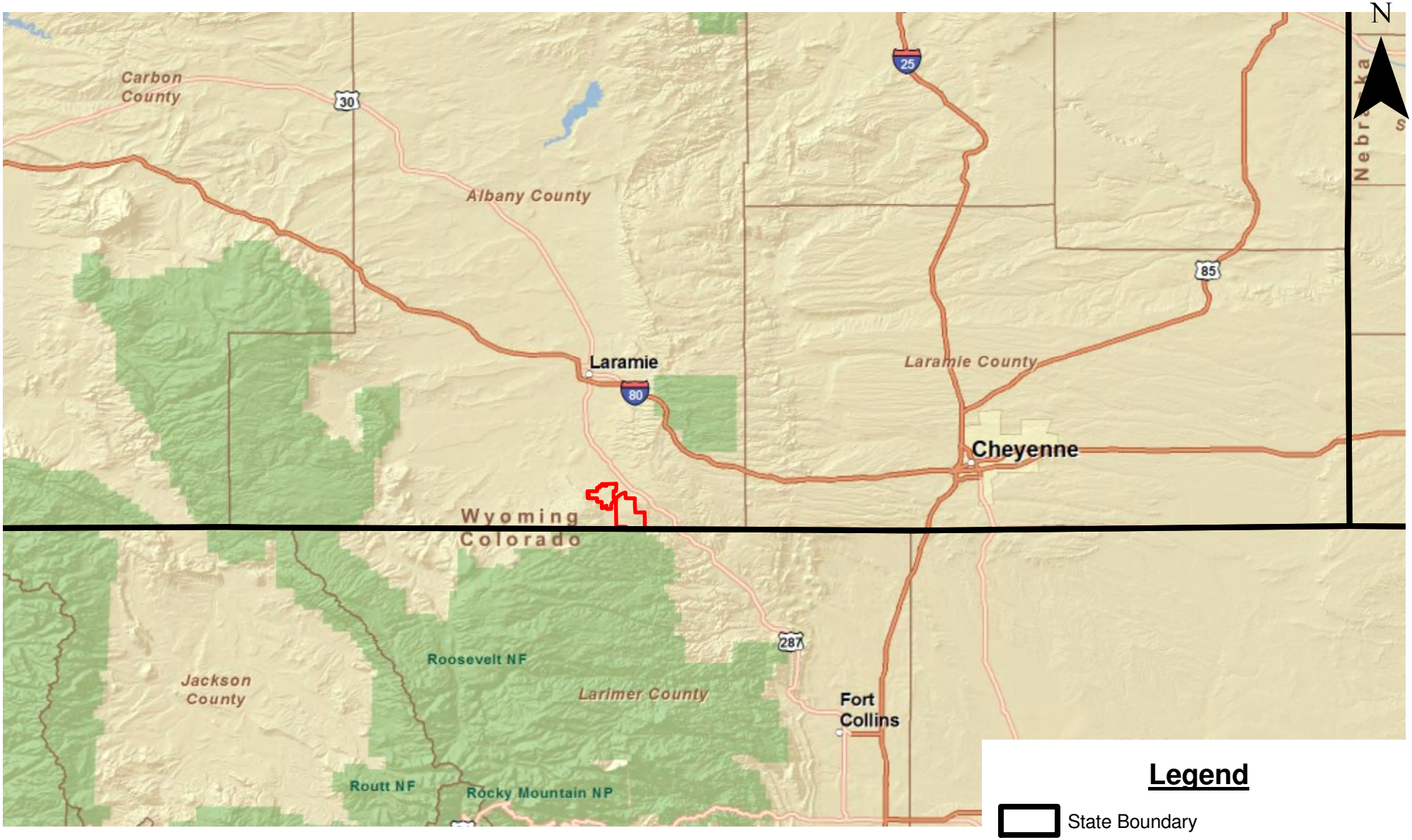
Figures

January 11, 2010
Project No. 0105023

Environmental Resources Management South west, Inc.
15810 Park Ten Place, Suite 300
Houston, Texas 77084-5140
(281) 600-1000



Environmental Resources Management

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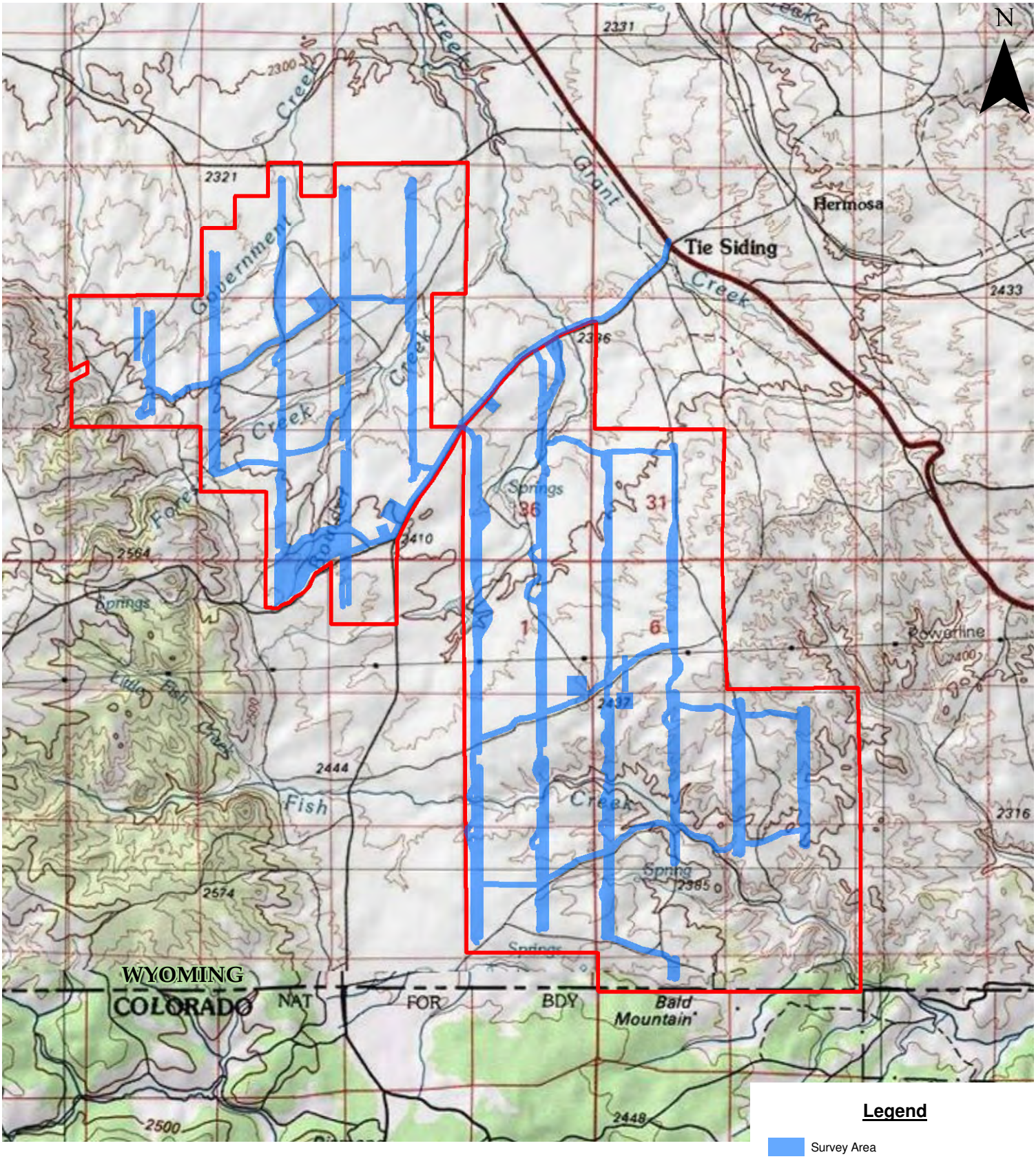
FIGURE 1-1
VICINITY MAP
Shell Wind Energy
Hermosa West Wind Farm Project

ERM



Environmental Resources Management

DESIGN: E Johnson	DRAWN: S King	CHKD.: A Smith
DATE: 11/12/2009	SCALE: AS SHOWN	REVISION: 0
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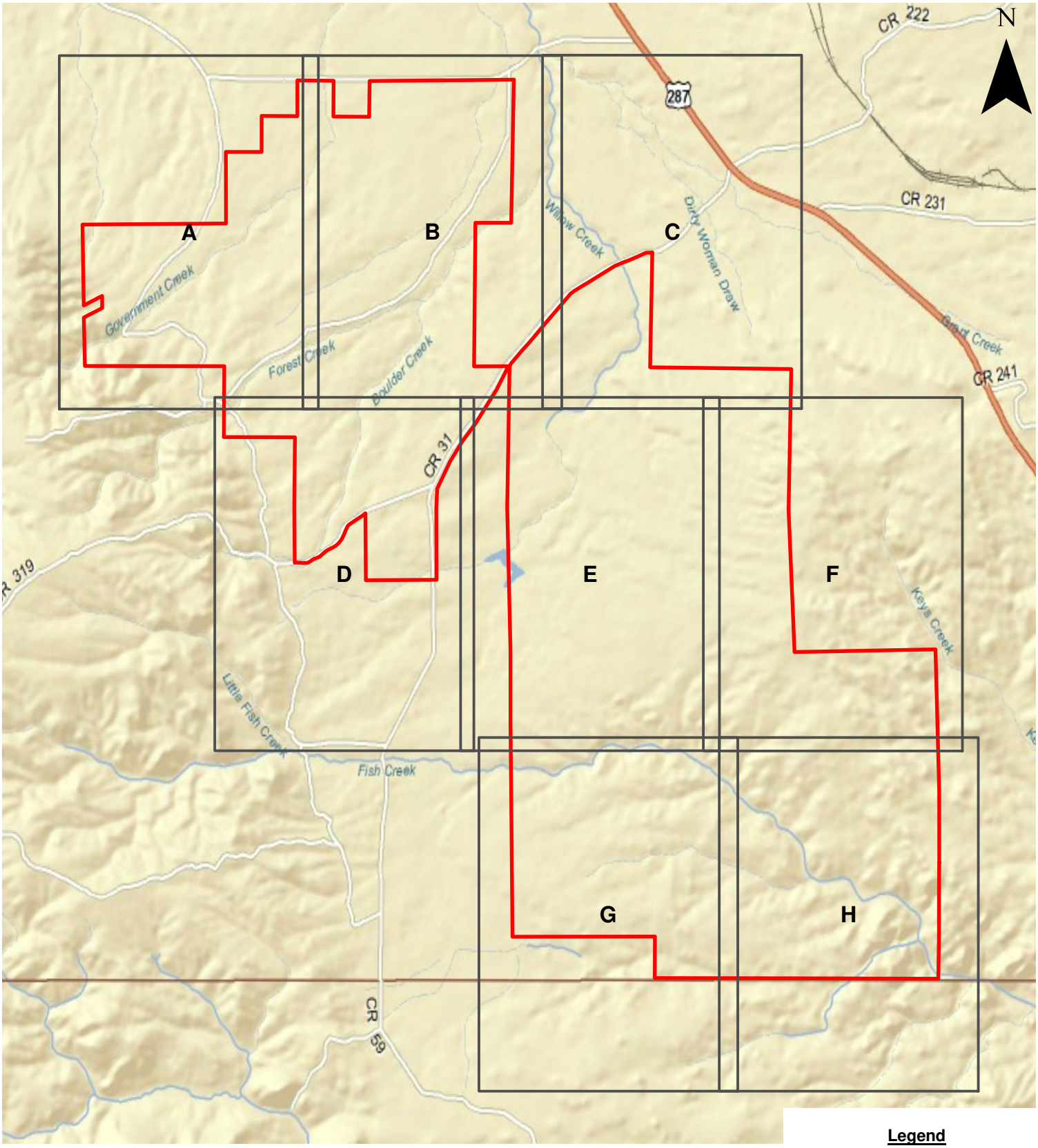
FIGURE 1-2
SITE PLAN
Shell WindEnergy
Hermosa Wind Farm Project
Albany County, Wyoming

ERM

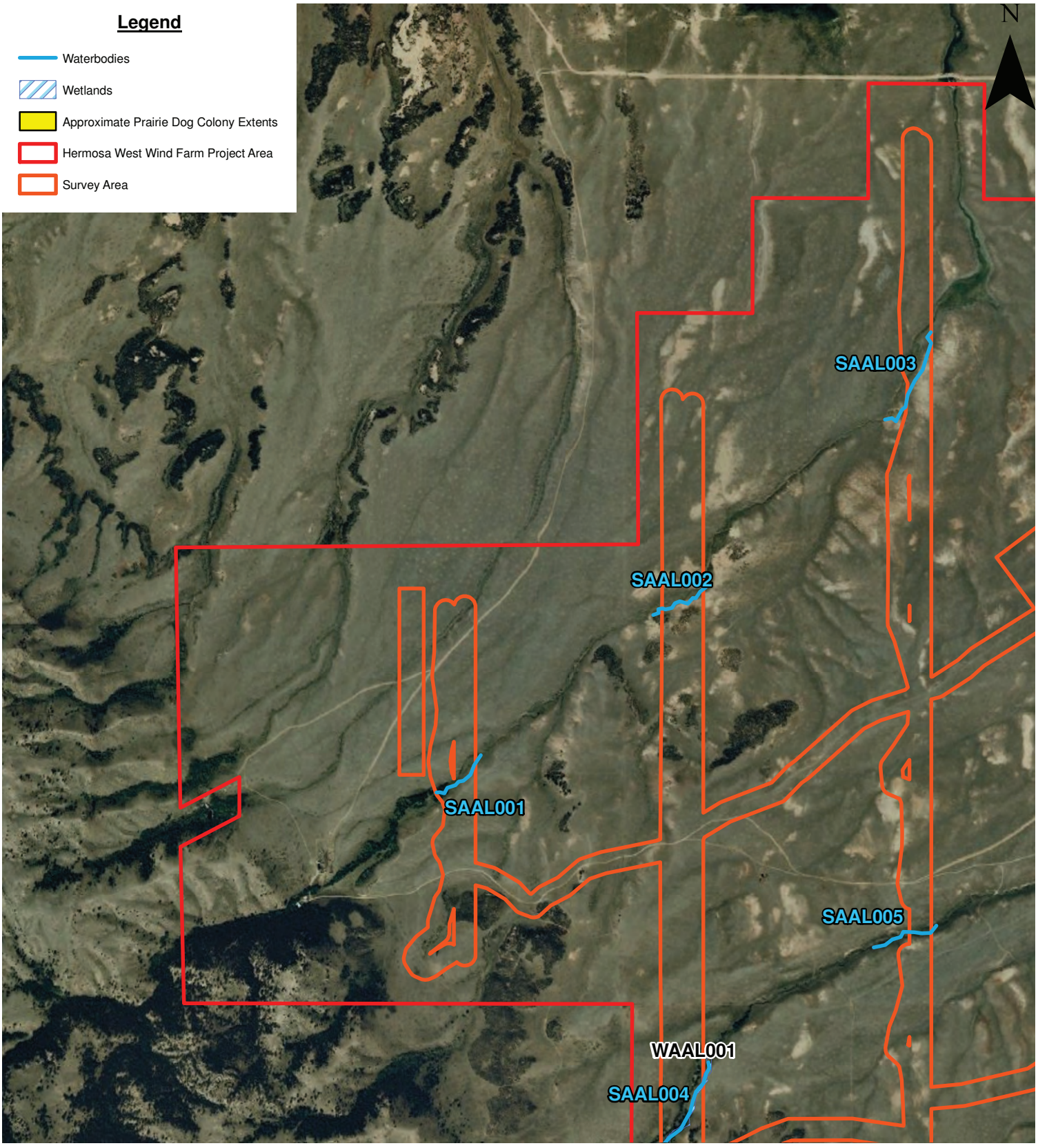


Environmental Resources Management

DESIGN: E Johnson	DRAWN: S King	CHKD.: A Smith
DATE: 12/15/2009	SCALE: AS SHOWN	REVISION: 0
File: I:\GIS\Shell\Hermosa\projects\map_key.mxd		

MAP KEY
Shell WindEnergy
Hermosa West Wind Farm Project
Albany County, Wyoming

ERM

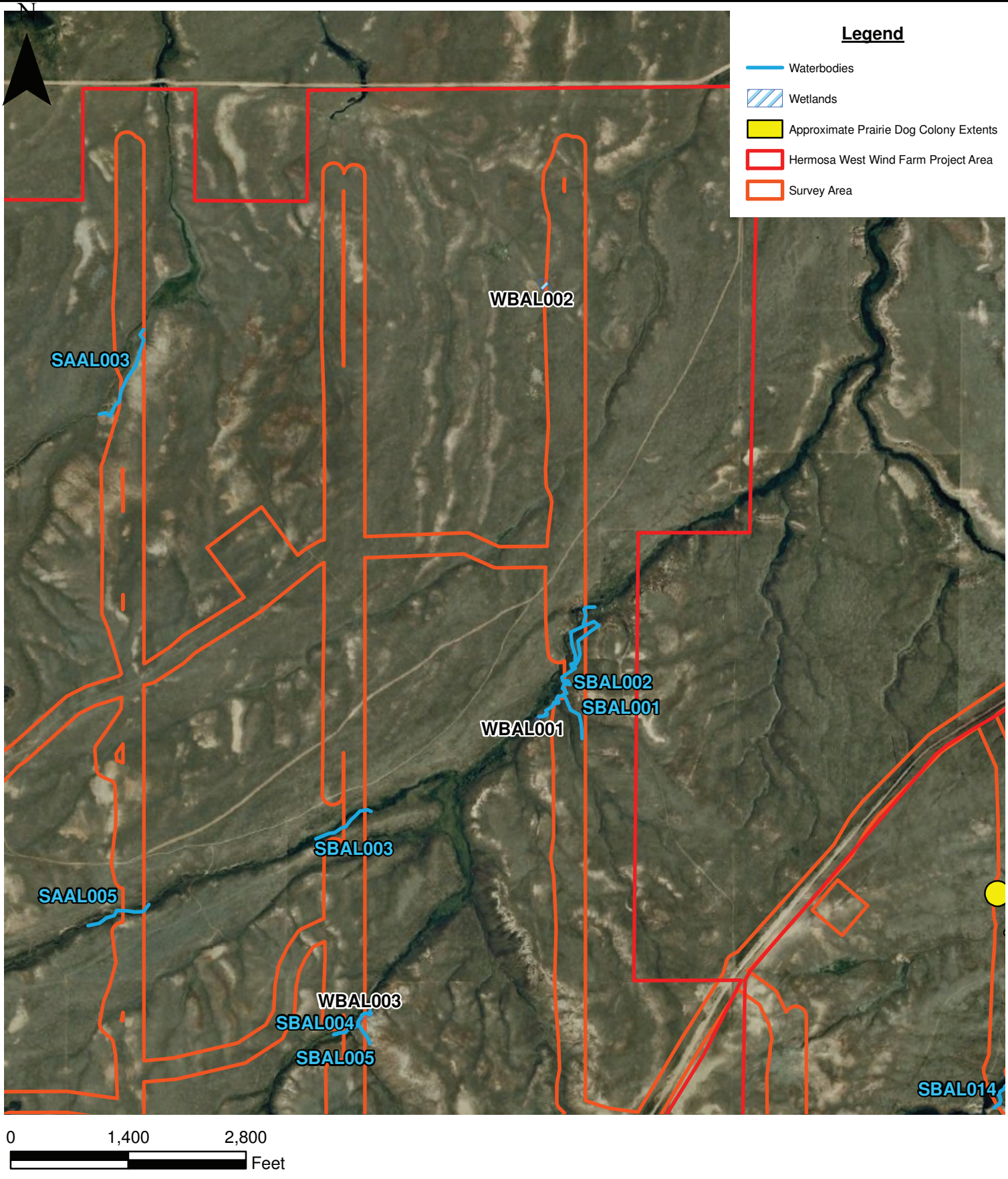


Environmental Resources Management

DESIGN: A Zuniga	DRAWN: S King	CHKD.: A Smith
DATE: 11/12/2009	SCALE: AS SHOWN	REVISION: 0
File: I:\GIS\Shell\projects\te_aerial.mxd		

FIGURE 3-1a
AERIAL MAP
Shell WindEnergy
Hermosa West Wind Farm Project
Albany County, Wyoming

ERM

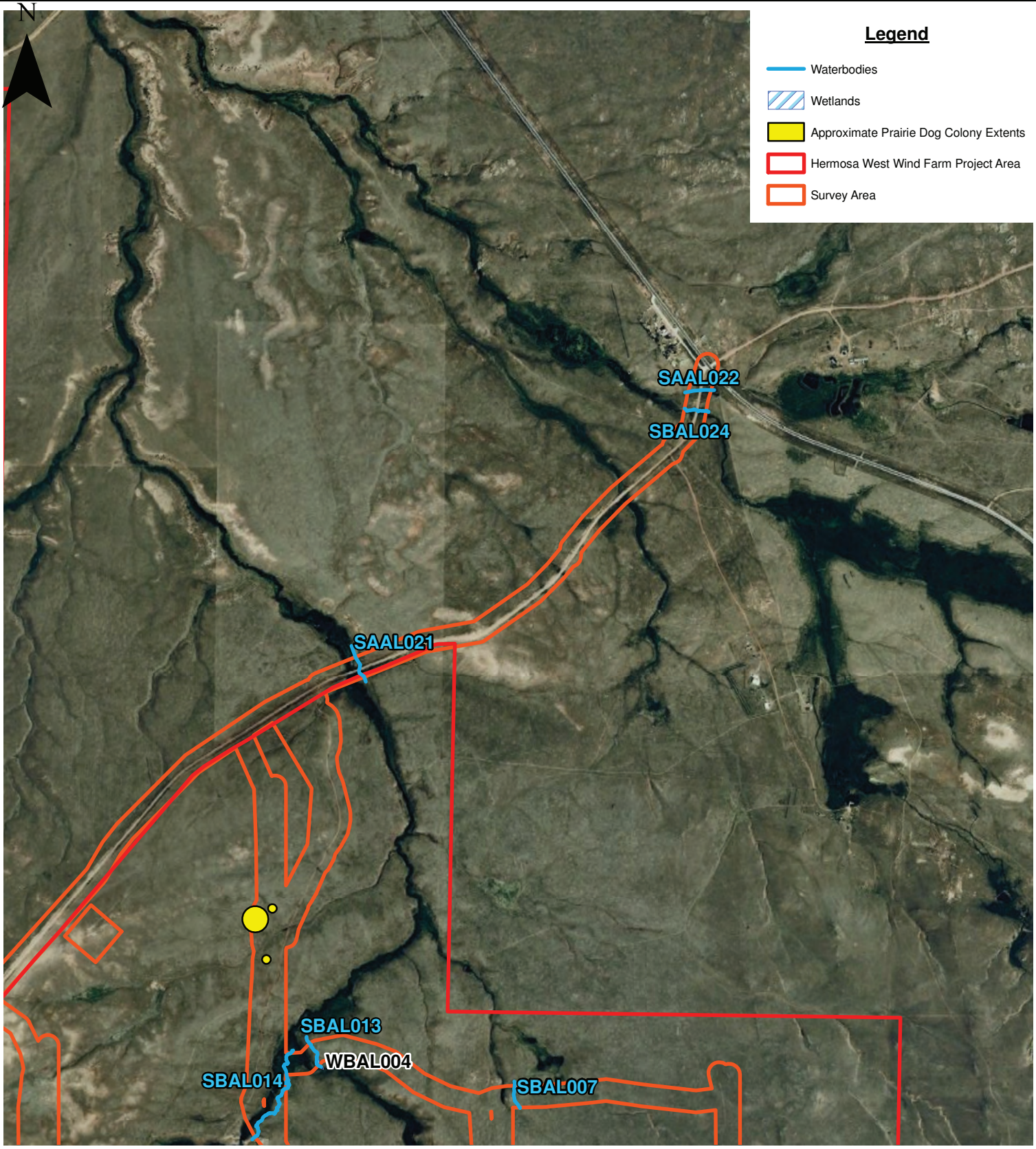


Environmental Resources Management

DESIGN:	A Zuniga	DRAWN:	S King	CHKD.:	A Smith
DATE:	11/12/2009	SCALE:	AS SHOWN	REVISION:	0
File:	I:\GIS\Shell\projects\te_aerial.mxd				

FIGURE 3-1b
AERIAL MAP
Shell WindEnergy
Hermosa West Wind Farm Project
Albany County, Wyoming

ERM

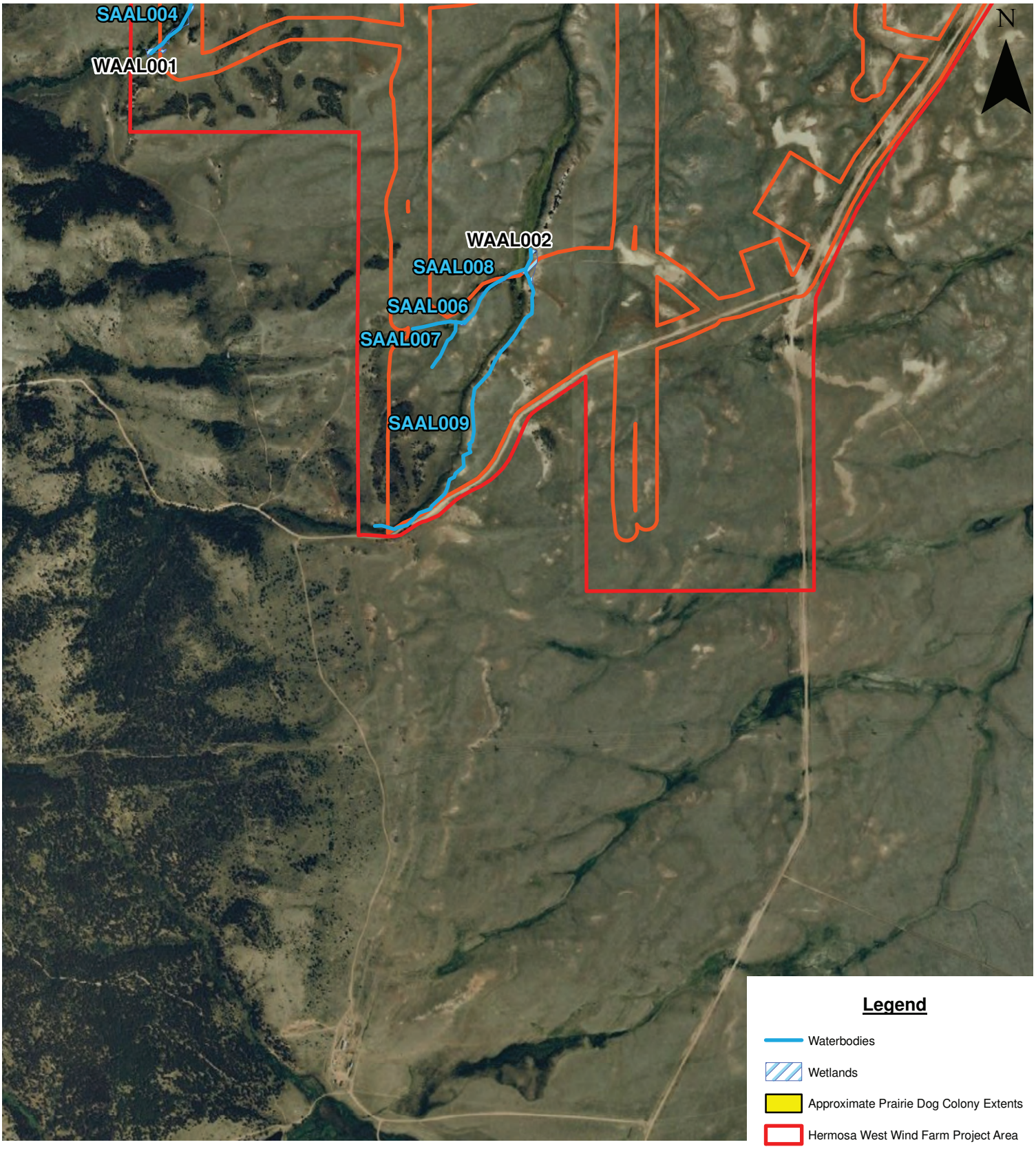


Environmental Resources Management

DESIGN: A Zuniga	DRAWN: S King	CHKD.: A Smith
DATE: 11/12/2009	SCALE: AS SHOWN	REVISION: 0
File: I:\GIS\Shell\projects\te_aerial.mxd		

FIGURE 3-1c
AERIAL MAP
Shell WindEnergy
Hermosa West Wind Farm Project
Albany County, Wyoming

ERM

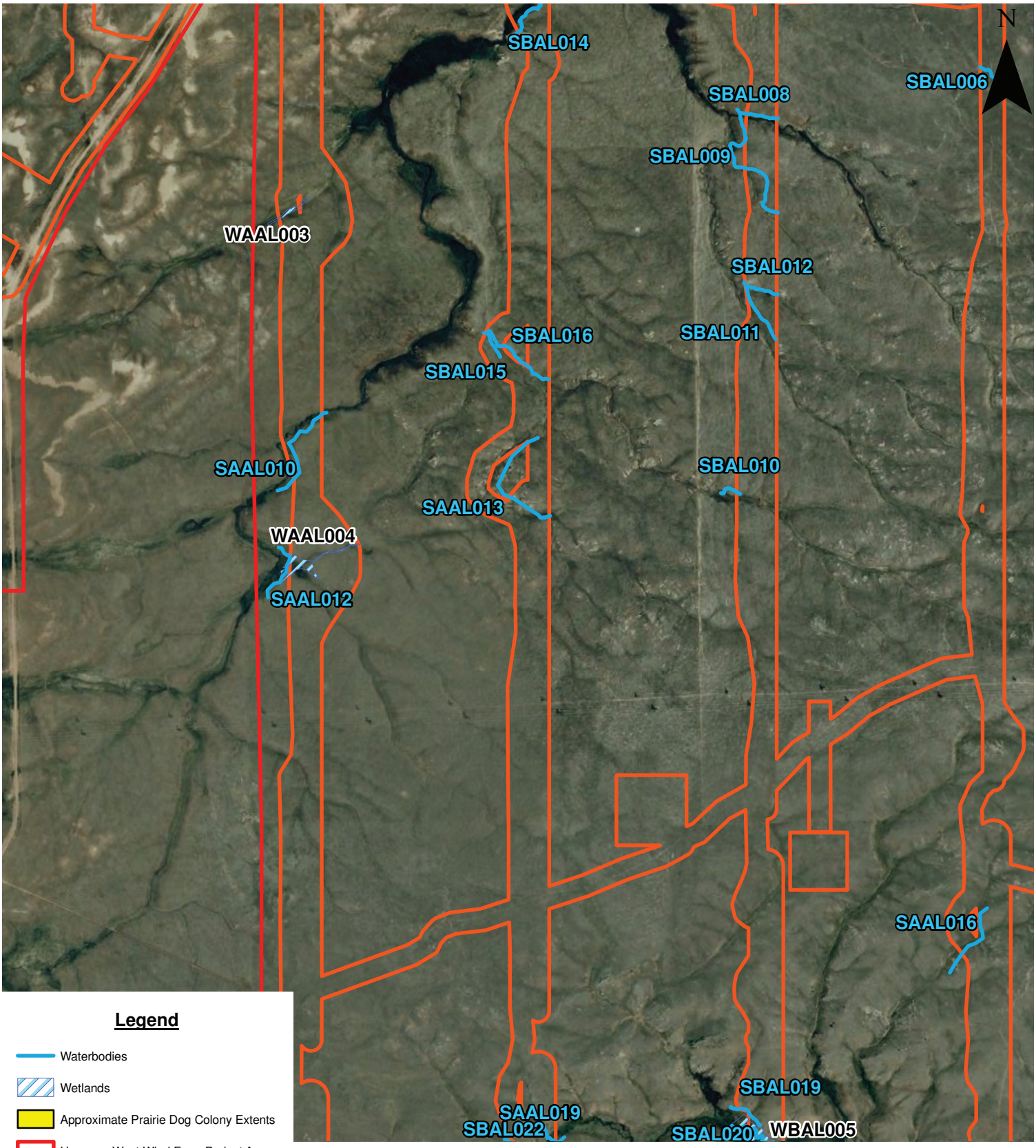


Environmental Resources Management

DESIGN: A Zuniga	DRAWN: S King	CHKD.: A Smith
DATE: 11/12/2009	SCALE: AS SHOWN	REVISION: 0
File: I:\GIS\Shell\projects\te_aerial.mxd		

FIGURE 3-1d
AERIAL MAP
Shell WindEnergy
Hermosa West Wind Farm Project
Albany County, Wyoming

ERM

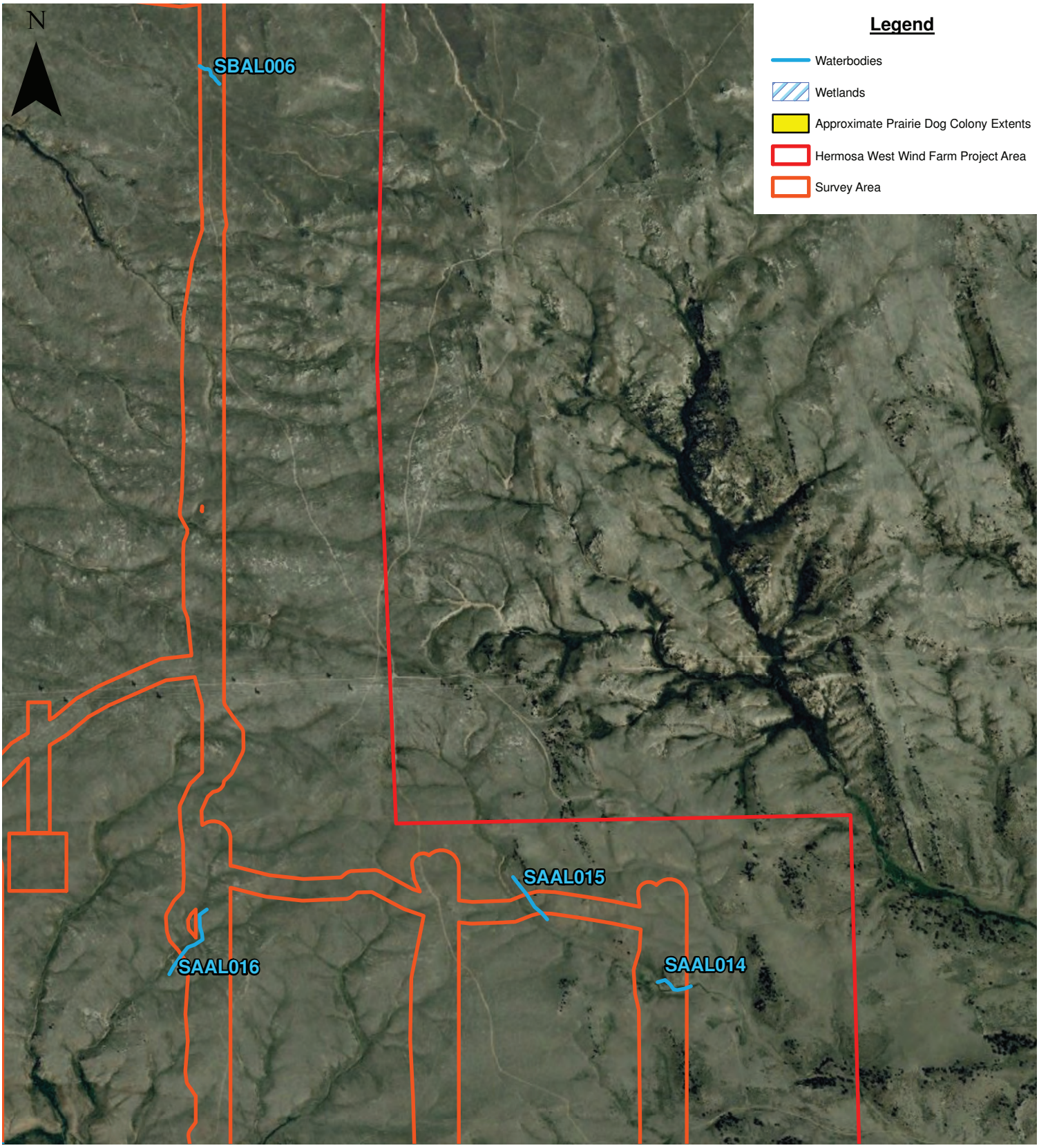


Environmental Resources Management

DESIGN:	A Zuniga	DRAWN:	S King	CHKD.:	A Smith
DATE:	11/12/2009	SCALE:	AS SHOWN	REVISION:	0
File:	I:\GIS\Shell\projects\te_aerial.mxd				

FIGURE 3-1e
AERIAL MAP
Shell WindEnergy
Hermosa West Wind Farm Project
Albany County, Wyoming

ERM

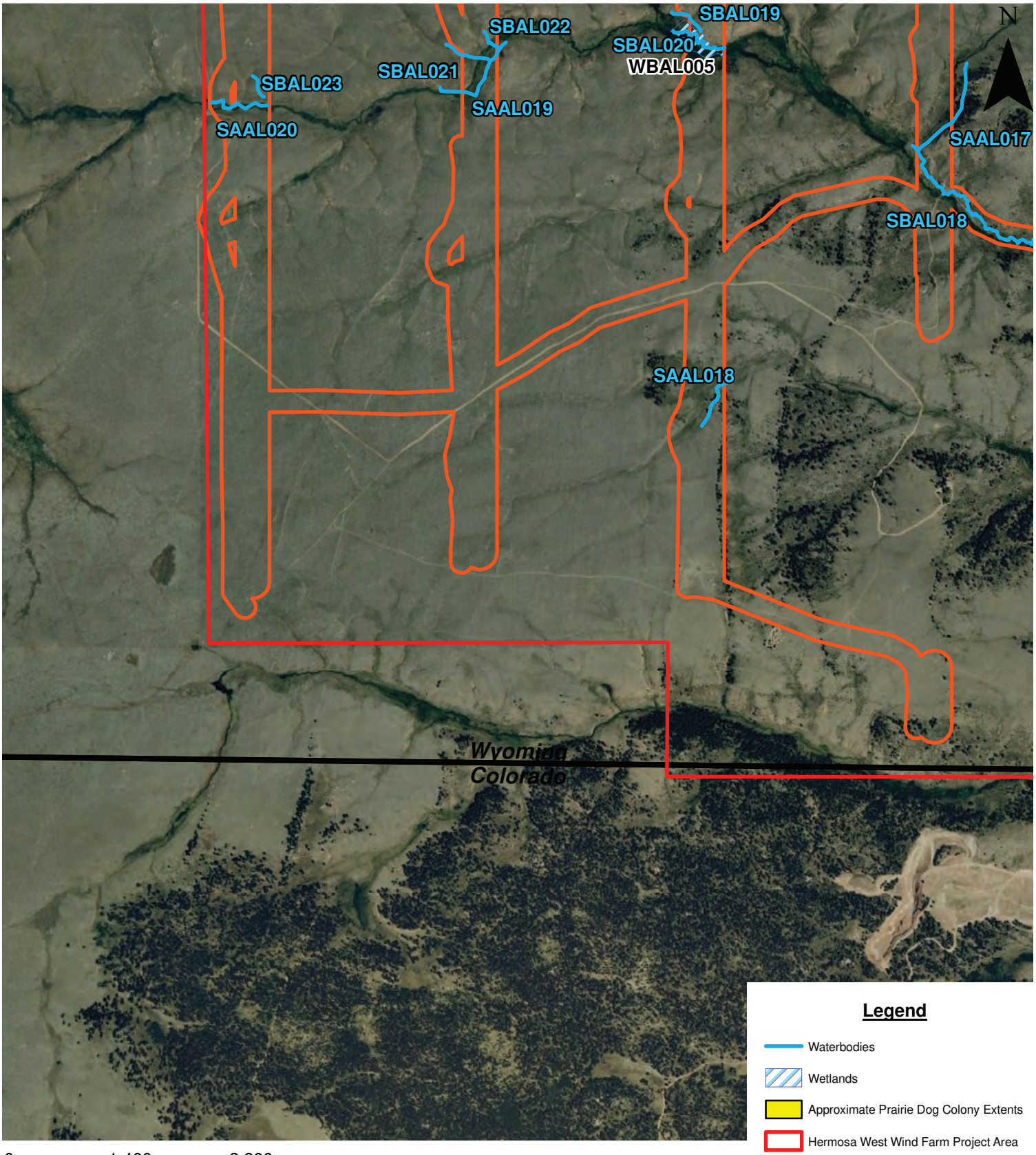


Environmental Resources Management

DESIGN: A Zuniga	DRAWN: S King	CHKD.: A Smith
DATE: 11/12/2009	SCALE: AS SHOWN	REVISION: 0
File: I:\GIS\Shell\projects\te_aerial.mxd		

FIGURE 3-1f
AERIAL MAP
Shell WindEnergy
Hermosa West Wind Farm Project
Albany County, Wyoming

ERM

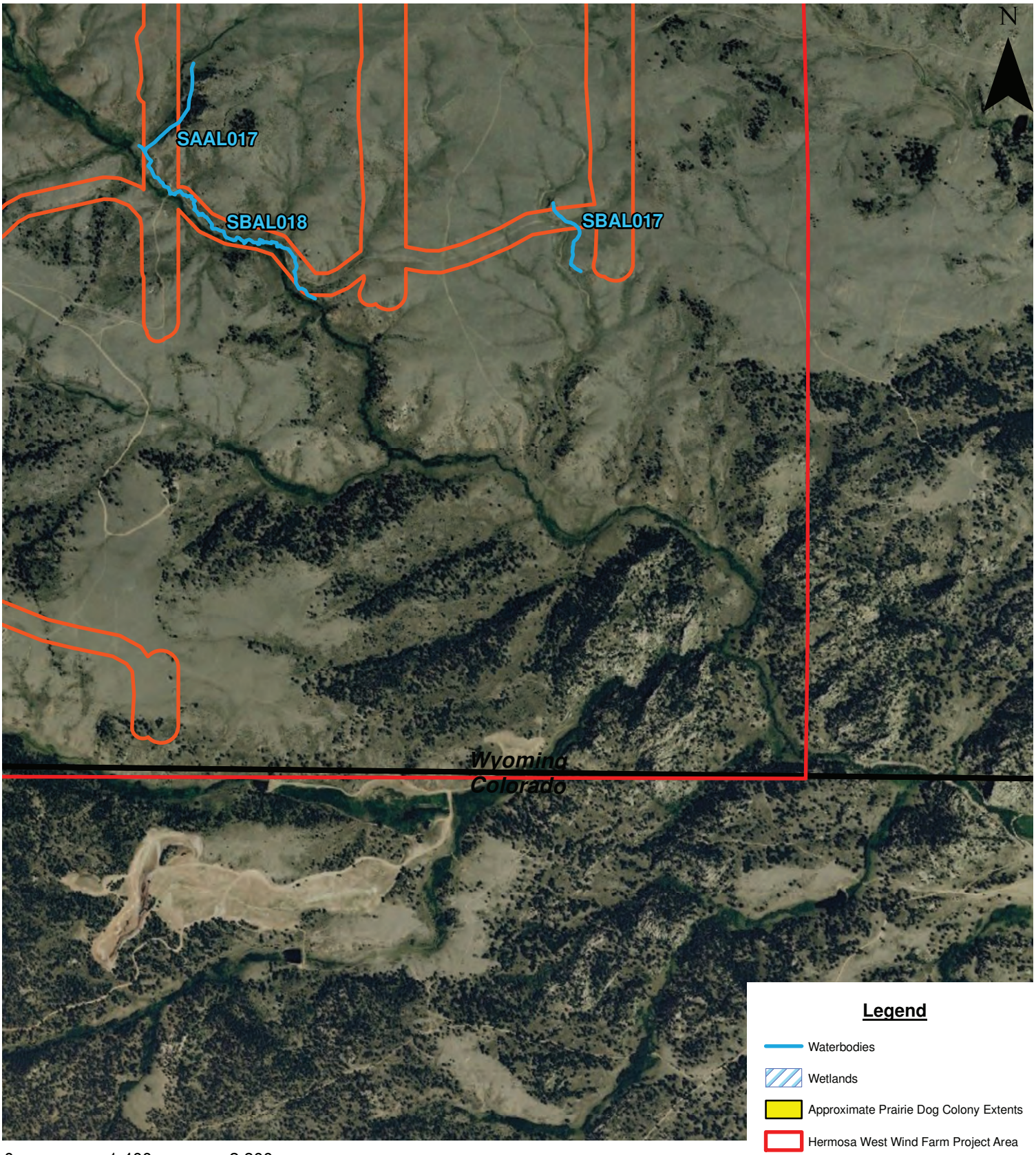


Environmental Resources Management

DESIGN: A Zuniga	DRAWN: S King	CHKD.: A Smith
DATE: 11/12/2009	SCALE: AS SHOWN	REVISION: 0
File: I:\GIS\Shell\projects\te_aerial.mxd		

FIGURE 3-1g
AERIAL MAP
Shell WindEnergy
Hermosa West Wind Farm Project
Albany County, Wyoming

ERM

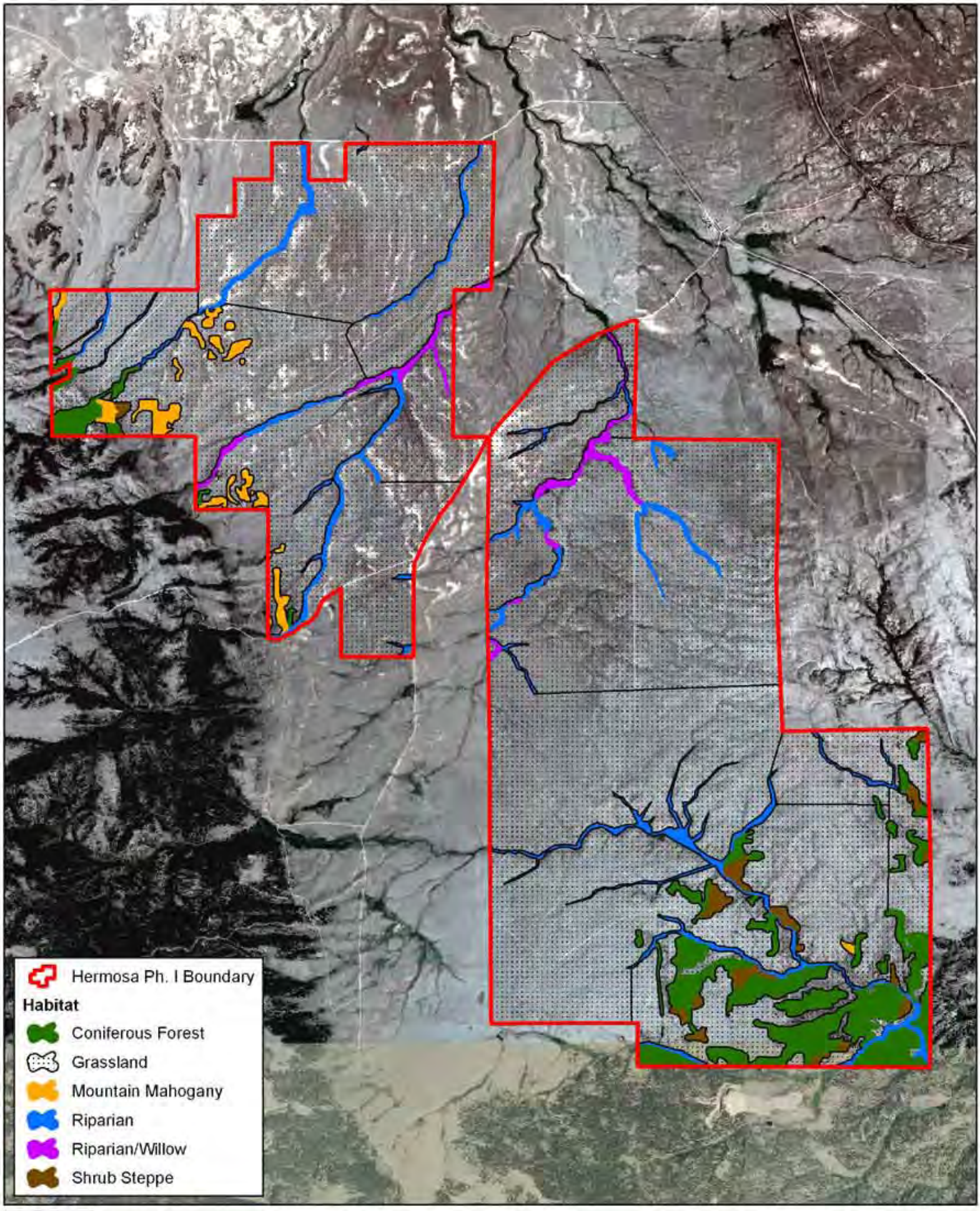


Environmental Resources Management

DESIGN: A Zuniga	DRAWN: S King	CHKD.: A Smith
DATE: 11/12/2009	SCALE: AS SHOWN	REVISION: 0
File: I:\GIS\Shell\projects\te_aerial.mxd		

FIGURE 3-1h
AERIAL MAP
Shell WindEnergy
Hermosa West Wind Farm Project
Albany County, Wyoming

ERM



WEST, Inc.

Data Source: USDA National Agriculture Imagery Program 2006
Projection: Transverse Mercator
Coordinate System: NAD 27 Zone 13
Created By: J.R. Boehrs Date: 12/17/2009

0 0.5 1 2 Kilometers
0 0.25 0.5 1 1.5 Miles

N
W E
S

Photographic Log

Appendix A

January 11, 2010
Project No. 0105023

Environmental Resources Management Southwest, Inc.
15810 Park Ten Place, Suite 300
Houston, Texas 77084-5140
(281) 600-1000

Environmental
Resources
Management

15810 Park Ten Place
Suite 300
Houston, Texas 77084-5140
(281) 600-1000
(281) 600-1001 (fax)

Photographic Log

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: A35

Feature: WAAL001

Date: 08-25-2009

Comments: Looking south, this photo depicts wetland WAAL001 associated with stream SAL004 (Forest Creek).

Photograph ID: A36

Feature: WAAL001

Date: 08-25-2009

Comments: Looking north, this image shows another view of wetland WAAL001.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: A37

Feature: WAAL001U

Date: 08-25-2009

Comments: Looking west, this photograph shows the upland vegetation community adjacent to wetland WAAL001.

Photograph ID: A54

Feature: WAAL002

Date: 08-26-2009

Comments: Looking south-southwest this image shows a view of wetland WAAL002 associated with the confluence of stream SAAL008 (Boulder Creek) and SAAL009.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: A55 **Feature:** WAAL002 **Date:** 08-26-2009 **Comments:** Looking north-northeast this photograph shows another view of wetland WAAL002.	
Photograph ID: A56 **Feature:** WAAL002U **Date:** 08-26-2009 **Comments:** Looking south, this picture shows the upland plant community associated with wetland WAAL002.	

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: A65

Feature: WAAL003

Date: 08-26-2009

Comments: Looking west, this image shows wetland WAAL003. This wetland is located in a low-lying area near an offsite wetland complex associated with a tributary to Willow Creek.

Photograph ID: A66

Feature: WAAL003

Date: 08-26-2009

Comments: Looking east, this image shows another view of the hummocks within wetland WAAL003.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID:
A67

Feature:
WAAL003U

Date:
08-26-2009

Comments:
Looking north, this photograph shows the upland community associated with wetland WAAL003.

Photograph ID:
A74

Feature:
WAAL004

Date:
08-26-2009

Comments:
Looking east, this photograph shows wetland WAAL004, a large wetland associated with the confluence of SAAL011 and SAAL012, both unnamed tributaries of Willow Creek.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: A75 **Feature:** WAAL004 **Date:** 08-26-2009 **Comments:** Looking west, this image depicts another view of wetland WAAL004.	
Photograph ID: A76 **Feature:** WAAL004U **Date:** 08-26-2009 **Comments:** Looking north, this photo shows the upland plant community associated with wetland WAAL004.	

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: B6

Feature: WBAL001

Date: 08-25-2009

Comments: Fringing wetland at junction of stream features SBAL001 and SBAL002. Photograph taken facing south.

Photograph ID: B7

Feature: WBAL001

Date: 08-25-2009

Comments: Fringing wetland at junction of SBAL001 and SBAL002 facing north.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: B17

Feature: WBAL002

Date: 08-25-2009

Comments: Isolated wetland feature facing south.

Photograph ID: B29

Feature: WBAL003

Date: 08-25-2009

Comments: SBAL004 facing south with fringing wetland WBAL003 at junction of SBAL004 and SBAL005.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: B85

Feature: WBAL004

Date: 08-26-2009

Comments: Stream SBAL013 and wetland feature WBAL004 facing south.

Photograph ID: B86

Feature: WBAL004

Date: 08-26-2009

Comments: Stream SBAL013 and wetland feature WBAL004 facing north.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: B113 **Feature:** WBAL005 **Date:** 08-27-2009 **Comments:** Photograph taken from SBAL019 looking towards wetland WBAL005 with stream SBAL020 following the line of shrubs in the distance.	
Photograph ID: **Feature:** **Date:** **Comments:**	[INTENTIONALLY LEFT BLANK]

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: A11

Feature: SAAL001

Date: 08-25-2009

Comments: Looking west, this image shows the aspen lined stream banks of SAAL001 (Government Creek).

Photograph ID: A12

Feature: SAAL001

Date: 08-25-2009

Comments: Looking east, this photo shows another view of the perennial streem SAAL001.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: A21

Feature: SAAL002

Date: 08-25-2009

Comments: Looking west this image shows a view of the perennial stream SAAL002 (Government Creek).

Photograph ID: A22

Feature: SAAL002

Date: 08-25-2009

Comments: Looking east this image shows another view of this Waterbody.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: A25

Feature: SAAL003

Date: 08-25-2009

Comments: Looking southwest, this image shows stream SAAL003. While this is still Government Creek, this reach is considered an ephemeral creek.

Photograph ID: A26

Feature: ESAAL003

Date: 08-25-2009

Comments: Looking northeast, this image shows the shelving of SAAO003.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: A33

Feature: SAAL004

Date: 08-25-2009

Comments: Looking west, this image shows the perennial creek SAAL004 (Forrest Creek). This Waterbody is associated with wetland WAAL001.

Photograph ID: A34

Feature: ESAAL004

Date: 08-25-2009

Comments: Looking east, this image provides another view of SAAL004 and wetland WAAL001.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID:
A38

Feature:
SAAL005

Date:
08-26-2009

Comments:
Looking west, this image shows the intermittent reach of Forrest Creek SAAL005.

Photograph ID:
A39

Feature:
SAAL005

Date:
08-26-2009

Comments:
Looking east, this image shows the shelving associated with this intermittent waterbody.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID:
A50

Feature:
SAAL006

Date:
08-26-2009

Comments:
Looking west, this photograph shows the ephemeral creek SAAL006, a tributary to Boulder Creek.

Photograph ID:
A51

Feature:
SAAL006

Date:
08-26-2009

Comments:
Looking east, this image shows another view of this ephemeral creek.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: A52

Feature: SAAL007

Date: 08-26-2009

Comments: Looking west, this image shows the ephemeral creek SAAL007. This Waterbody is a tertiary tributary to Boulder Creek.

Photograph ID: A53

Feature: SAAL007

Date: 08-26-2009

Comments: Looking east, this image shows Boulder Creek in the distance along the tree line.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: A57 **Feature:** SAAL008 **Date:** 08-26-2009 **Comments:** Looking west, this image shows the ephemeral creek SAAL008. This photograph also show the associated wetland, WAAL002.	
Photograph ID: A58 **Feature:** SAAL008 **Date:** 08-26-2009 **Comments:** Looking east, this image provides another view of SAAL008 and the associated wetland WAAL002.	

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: A59 **Feature:** SAAL009 **Date:** 08-26-2009 **Comments:** Looking north, this image shows the ephemeral stream SAAL009 and the associated wetland WAAL002.	
Photograph ID: A60 **Feature:** SAAL009 **Date:** 08-26-2009 **Comments:** Looking south this image provides another view of the ephemeral stream and the associated wetland.	

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID:
A70

Feature:
SAAL010

Date:
08-26-2009

Comments:
Looking west, this image shows the perennial stream SAAL010, an unnamed tributary to Willow Creek.

Photograph ID:
A71

Feature:
SAAL010

Date:
08-26-2009

Comments:
Looking east this image provides another view of this stream.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: A72

Feature: SAAL011

Date: 08-26-2009

Comments: Looking northeast this image shows the perennial stream SAAL011. This stream flows into wetland WAAL004 where it looses all channeling.

Photograph ID: A73

Feature: SAAL011

Date: 08-26-2009

Comments: Looking southwest this image shows another view of SAAL011.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: A77

Feature: SAAL012

Date: 08-26-2009

Comments: Looking northeast this image shows the perennial stream SAAL012. This image also provides a view of the wetland WAAL004.

Photograph ID: A78

Feature: SAAL012

Date: 08-26-2009

Comments: Looking southwest, this image shows another view of SAAL012 and the associated wetland WAAL004.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: A87

Feature: SAAL013

Date: 08-26-2009

Comments: Looking west this image depicts the ephemeral stream SAAL013.

Photograph ID: A88

Feature: SAAL013

Date: 08-26-2009

Comments: Looking east, this photograph provides another view of SAAL013.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: A93 **Feature:** SAAL015 **Date:** 08-27-2009 **Comments:** Looking west this image shows the shelving associated with the ephemeral stream SAAL015.	
Photograph ID: A94 **Feature:** SAAL014 **Date:** 08-27-2009 **Comments:** Looking east, this photo provides another view of SAAL015.	

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID:
A95

Feature:
SAAL014

Date:
08-27-2009

Comments:
Looking northwest, this photo shows the perennial stream SAAL014.

Photograph ID:
A96

Feature:
SAAL015

Date:
08-27-2009

Comments:
Looking southeast this image shows another view of SAAL015.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: A101

Feature: SAAL016

Date: 08-27-2009

Comments: Looking northeast this photograph shows the ephemeral stream SAAL016.

Photograph ID: A102

Feature: SAAL016

Date: 08-27-2009

Comments: Looking southwest this image shows the shelving associated with SAAL016.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: A103

Feature: SAAL017

Date: 08-27-2009

Comments: Looking east this image shows a view of the perennial stream SAAL017.

Photograph ID: A104

Feature: SAAL017

Date: 08-27-2009

Comments: Looking west this image shows another view of the stream course.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: A109

Feature: SAAL018

Date: 08-27-2009

Comments: Looking west this picture shows the ephemeral creek SAAL018.

Photograph ID: A110

Feature: SAAL018

Date: 08-27-2009

Comments: Looking east this photograph provides another view of SAAL018.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: A114 **Feature:** SAAL019 **Date:** 08-27-2009 **Comments:** Looking west this photo depicts the perennial stream SAAL019 (Fish Creek).	
Photograph ID: A115 **Feature:** SAAL019 **Date:** 08-27-2009 **Comments:** Looking east this photo provides another view of this perennial stream.	

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID:
A120

Feature:
SAAL020

Date:
08-27-2009

Comments:
Looking west this picture shows the westernmost crossing of Fish Creek.

Photograph ID:
A121

Feature:
SAAL020

Date:
08-27-2009

Comments:
Looking east this photo provides an additional view of Fish Creek.

PHOTOGRAPHIC LOG

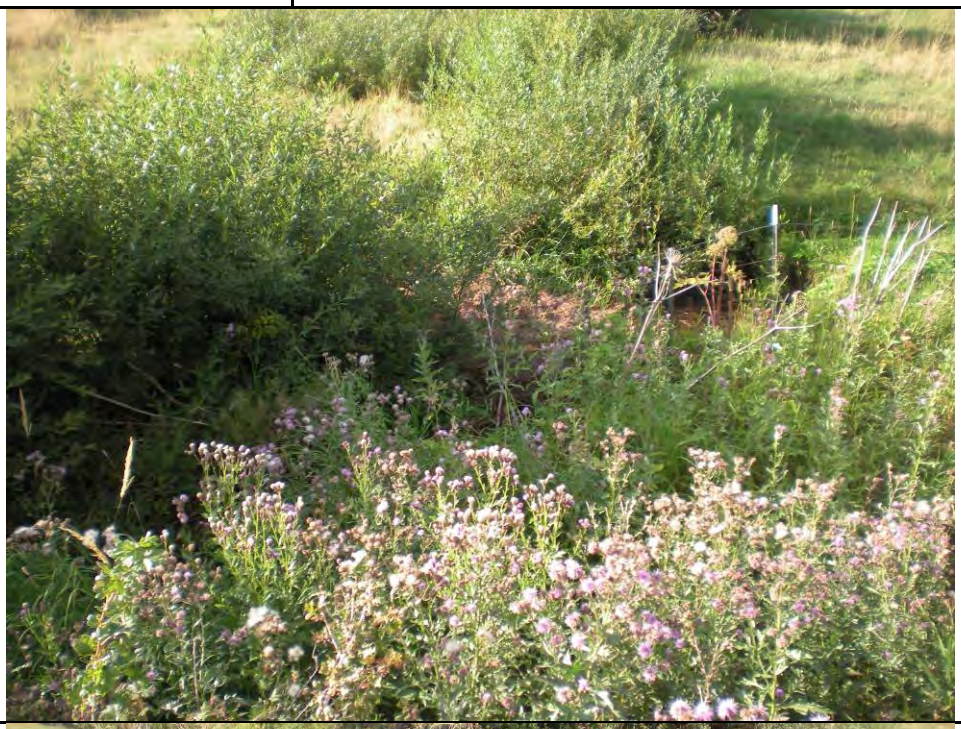
Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID:
A122

Feature:
SAAL021

Date:
08-27-2009

Comments:
Looking north this image shows the perennial creek SAAL021 along the entry road.



Photograph ID:
A123

Feature:
SAAL021

Date:
08-27-2009

Comments:
Looking south, this photograph shows another view of SAAL021 along the entry road.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: A124

Feature: SAAL022

Date: 08-27-2009

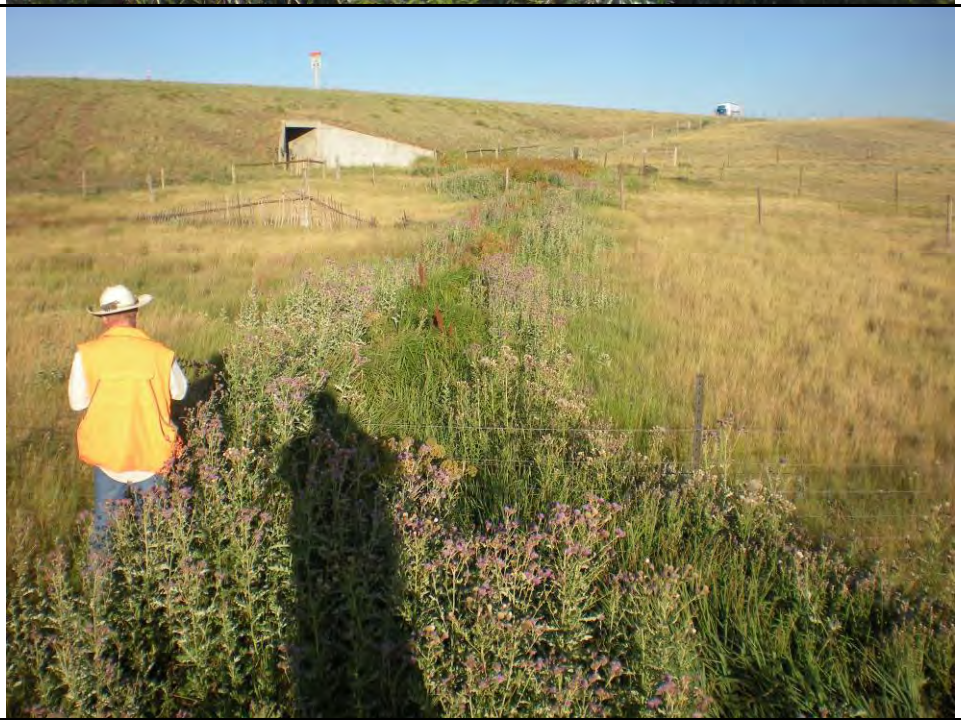
Comments: Looking north along the entry road, this photograph shows the intermittent stream SAAL022.

Photograph ID: A125

Feature: SAAL022

Date: 08-27-2009

Comments: Looking south along the entry road, this photograph shows another view of SAAL022



PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID:
B5

Feature:
SBAL001

Date:
08-25-2009

Comments:
Stream feature facing south.

Photograph ID:
B8

Feature:
SBAL002

Date:
08-25-2009

Comments:
Stream feature facing south.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: B9 **Feature:** SBAL002 **Date:** 08-25-2009 **Comments:** Stream feature on the left side of the photograph, facing north into WBAL001.	
Photograph ID: B10 **Feature:** SBAL002 **Date:** 08-25-2009 **Comments:** Segment of stream feature SBAL002 to the north of previous photographs. Facing south from a berm.	

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: B11

Feature: SBAL002

Date: 08-25-2009

Comments: Facing north from the berm.

Photograph ID: B12

Feature: SBAL002

Date: 08-25-2009

Comments: Facing east from the berm.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: B13

Feature: SBAL002

Date: 08-25-2009

Comments: Same stream feature a little further north.

Photograph ID: B14

Feature: SBAL002

Date: 08-25-2009

Comments: Same general location as photograph B13 facing south.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID:
B25

Feature:
SBAL003

Date:
08-25-2009

Comments:
Stream feature facing east.

Photograph ID:
B26

Feature:
SBAL003

Date:
08-25-2009

Comments:
Stream feature facing west.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: B31 **Feature:** SBAL004 **Date:** 08-25-2009 **Comments:** SBAL005 facing west with fringing wetland WBAL003 at junction of SBAL005 and SBAL004.	
Photograph ID: B32 **Feature:** SBAL004 **Date:** 08-25-2009 **Comments:** SBAL005 facing east with fringing wetland WBAL003 at junction of SBAL005 and SBAL004.	

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: B29 **Feature:** SBAL005 **Date:** 08-25-2009 **Comments:** SBAL004 facing south with fringing wetland WBAL003 at junction of SBAL004 and SBAL005.	
Photograph ID: B30 **Feature:** Metal corral **Date:** 08-25-2009 **Comments:** Metal cistern with water flowing out of black pipe in center at junction of SBAL004 and SBAL005. (Located just to the left of photograph B29)	

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: B53 **Feature:** SBAL006 **Date:** 08-26-2009 **Comments:** Stream feature facing east.	
Photograph ID: B54 **Feature:** SBAL006 **Date:** 08-26-2009 **Comments:** Stream feature facing west.	

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: B59 **Feature:** SBAL007 **Date:** 08-26-2009 **Comments:** Stream feature facing south.	
Photograph ID: B60 **Feature:** SBAL007 **Date:** 08-26-2009 **Comments:** Stream feature facing north.	

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: B63 **Feature:** SBAL008 **Date:** 08-26-2009 **Comments:** Stream feature facing east.	
Photograph ID: B64 **Feature:** SBAL008 **Date:** 08-26-2009 **Comments:** Stream feature facing west.	

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID:
B65

Feature:
SBAL009

Date:
08-26-2009

Comments:
Stream feature facing south.

Photograph ID:
B66

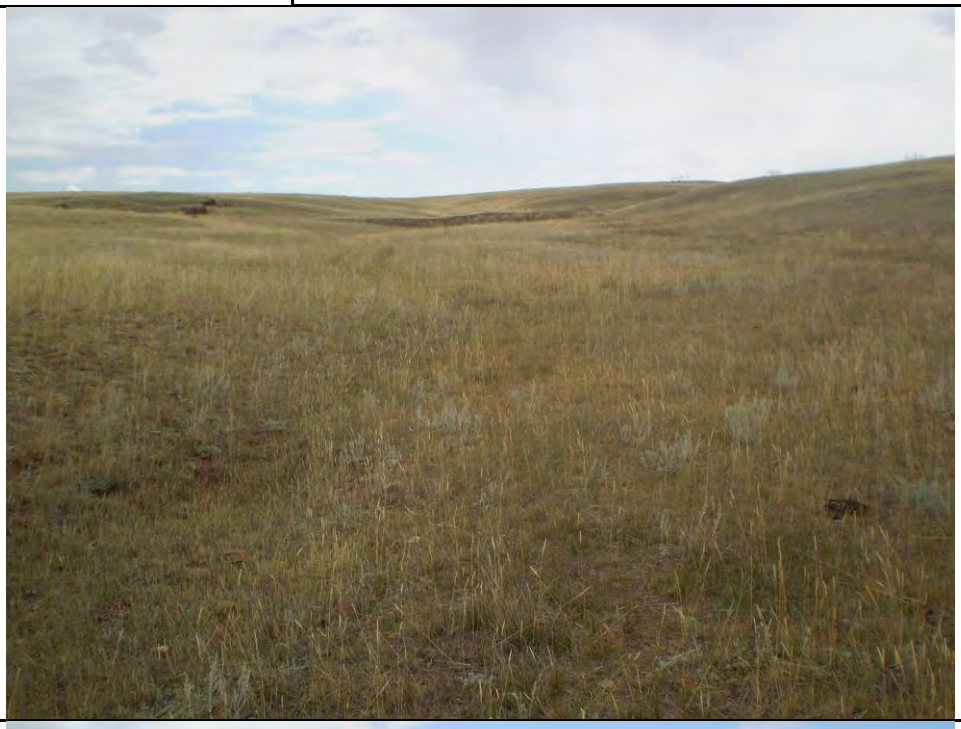
Feature:
SBAL009

Date:
08-26-2009

Comments:
Stream feature facing north.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: B76 **Feature:** SBAL010 **Date:** 08-26-2009 **Comments:** Looking east, into corridor from the edge of stream feature SBAL010.	
Photograph ID: B77 **Feature:** SBAL010 **Date:** 08-26-2009 **Comments:** Looking west, out of the corridor into stream feature SBAL010.	

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID:
B78

Feature:
SBAL011

Date:
08-26-2009

Comments:
Stream feature facing east.

Photograph ID:
B79

Feature:
SBAL011

Date:
08-26-2009

Comments:
Stream feature facing west.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: B80 **Feature:** SBAL012 **Date:** 08-26-2009 **Comments:** Stream feature facing east to the edge of the corridor.	
Photograph ID: B81 **Feature:** SBAL012 **Date:** 08-26-2009 **Comments:** Stream feature facing west.	

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: B82 **Feature:** SBAL012 **Date:** 08-26-2009 **Comments:** Facing south from the same stream feature as photographs B80 and B81.	
Photograph ID: **Feature:** **Date:** **Comments:**	[INTENTIONALLY LEFT BLANK]

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID:
B85

Feature:
SBAL013

Date:
08-26-2009

Comments:
Stream SBAL013 and wetland feature WBAL004 facing south.

Photograph ID:
B86

Feature:
SBAL013

Date:
08-26-2009

Comments:
Stream SBAL013 and wetland feature WBAL004 facing north.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: B91 **Feature:** SBAL014 **Date:** 08-26-2009 **Comments:** Stream feature facing east.	
Photograph ID: B92 **Feature:** SBAL014 **Date:** 08-26-2009 **Comments:** Stream feature facing west.	

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: B100

Feature: SBAL015

Date: 08-26-2009

Comments: Stream feature facing south.

Photograph ID: B101

Feature: SBAL016

Date: 08-26-2009

Comments: Stream feature facing south.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: B102 **Feature:** SBAL015, SBAL016 **Date:** 08-26-2009 **Comments:** Junction of SBAL015 and SBAL016, facing north.	
Photograph ID: **Feature:** **Date:** **Comments:**	[INTENTIONALLY LEFT BLANK]

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: B104

Feature: SBAL017

Date: 08-27-2009

Comments: Stream feature facing south from existing culverted road.

Photograph ID: B105

Feature: SBAL017

Date: 08-27-2009

Comments: Culverts under existing road for stream feature SBAL017, facing south.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID:
B106

Feature:
SBAL017

Date:
08-27-2009

Comments:
Stream feature facing north while standing on existing road.

Photograph ID:
B107

Feature:
SBAL017

Date:
08-27-2009

Comments:
Further north on stream feature SBAL017.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: B108

Feature: SBAL018

Date: 08-27-2009

Comments: Photograph taken just north of an existing access road and wood fence facing northwest towards the end of the corridor. An existing road parallels the stream along the north (unseen to the right).

Photograph ID: B109

Feature: SBAL018

Date: 08-27-2009

Comments: Same position as previous photograph, facing east towards the access road and wooden fence.

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: B112 **Feature:** SBAL019 **Date:** 08-27-2009 **Comments:** Photograph taken facing southwest from a fence. Stream feature is channelized and appears to be man-made.	
Photograph ID: B113 **Feature:** SBAL020 **Date:** 08-27-2009 **Comments:** Photograph taken from SBAL019 looking towards wetland WBAL005 with stream SBAL020 following the line of shrubs in the distance.	

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: B116 **Feature:** SBAL021 **Date:** 08-27-2009 **Comments:** Stream feature facing north. Tributary to Fish Creek	
Photograph ID: B117 **Feature:** SBAL021 **Date:** 08-27-2009 **Comments:** Stream feature facing south. Tributary to Fish Creek	

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: B118 **Feature:** SBAL022 **Date:** 08-27-2009 **Comments:** Stream feature facing north. Tributary to Fish Creek	
Photograph ID: **Feature:** **Date:** **Comments:**	[INTENTIONALLY LEFT BLANK]

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: B123 **Feature:** SBAL023 **Date:** 08-27-2009 **Comments:** Stream feature facing northwest.	
Photograph ID: B124 **Feature:** SBAL023 **Date:** 08-27-2009 **Comments:** Stream feature facing southwest.	

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: B127 **Feature:** SBAL024 **Date:** 08-27-2009 **Comments:** Stream feature facing south from existing culverted road.	
Photograph ID: B128 **Feature:** SBAL024 **Date:** 08-27-2009 **Comments:** Stream feature facing north from existing culverted road.	

PHOTOGRAPHIC LOG

Client:	**Shell Wind Energy**	**Project Number:**	**0105023**
Project Name:	Hermosa West	**Location:**	Albany County, WY

Photograph ID: B93	
Feature: Prairie Dog	
Date: 08-26-2009	
Comments: Prairie dog town located on Wyoming State property.	
Photograph ID:	[INTENTIONALLY LEFT BLANK]
Feature:	
Date:	
Comments:	

State Plant Species of Concern in Wyoming

Appendix B

January 11, 2010
Project No. 0105023

Environmental Resources Management Southwest, Inc.
15810 Park Ten Place, Suite 300
Houston, Texas 77084-5140
(281) 600-1000

STATE PLANT SPECIES OF CONCERN IN WYOMING

Appendix B

State Plant Species of Concern Potentially Occurring in the Survey Area

Common Name	*Scientific Name*	*Common Name*	*Scientific Name*
Moschatel	*Adoxa moschatellina*	Tall fleabane	*Erigeron elatior*
Northern bentgrass	*Agrostis mertensii*	Pinnate fleabane	*Erigeron pinnatisectus*
Larimer aletes	*Aletes humilis*	Slender cotton-grass	*Eriophorum gracile*
Laramie columbine	*Aquailegia laramiensis*	Flat-top fragrant goldenrod	*Euthamia graminifolia var. major*
Maidenhair spleenwort	*Asplenium trichomanes*	Hall's fescue	*Festuca hallii*
Green spleenwort	*Asplenium trichomanes-rmosum*	Bigelow's prairie gentian	*Gentiana affinis var. bigelovii*
American alpine lady fern	*Athyrium distentifolium var. amerianum*	Little golden-aster	*Heterotheca pumila*
Dissected bahia	*Bahia dissecta*	Slender-trumpet ipomopsis	*Ipomopsis aggregata var. tenuituba*
Alpine kittentails	*Besseya alpine*	Northern white rush	*Juncus triglumis var. albescens*
White River kittentails	*Besseya plantaginea*	Vasey rush	*Juncus vaseyi*
Perennial rockcress	*Boechera perennans*	Bigelow's groundsel	*Ligularia bigelovii var. hallii*
Lesser panicled sedge	*Carex diandra*	Dwarf bulrush	*Lipocarpha drummondii*
Eggleston's sedge	*Carex egglestonii*	Broad-leaved twayblade	*Listera convallaroides*
Bristly-stalk sedge	*Carex leptalea*	Marsh felwort	*Lomatogonium rotatum*
Nelson's sedge	*Carex nelsonii*	Swamp loosestrife	*Lysimachia thyrsiflora*
Mountain-loving sedge	*Carex oreocharis*	Bigelow's tansy-aster	*Machaeranthera bigelovii var. bigelovii*
Halls sedge	*Carex parryana var. unica*	Colorado tansy-aster	*Machaeranthera coloradoensis*
Sartwell's sedge	*Carex sartwellii var. sartwellii*	Ruby's stickleaf	*Metzelia rusbyi*
Rocky Mountain snowlover	*Chinophila jamesii*	Marsh muhly	*Muhlenburgia glomerata*
Alpine oreoxis	*Cymopterus alpinus*	Saffron groundsel	*Packera crocata*
Large yellow lady-slipper	*Cypripedium parviflorum var. pubescens*	Streambank groundsel	*Packera pseudaurea var. flavula*
Andean prairie-clover	*Dalea cylindriceps*	James nailwort	*Paronychia jamesii*
Slim-leaf witchgrass	*Dichanthelium linearifolium*	Rocky Mountain nailwort	*Paronychia pulvinata*
Great Basin downingia	*Downingia laeta*	White scorpion-weed	*Phacelia alba*

Common Name	*Scientific Name*	*Common Name*	*Scientific Name*
Creeping wildrye	*Elymus triticoides*	Rocky Mountain phacelia	*Phacelia denticulate*
Small-flowered fame-flower	*Phemeranthus parviflorus*	Golden saxifrage	*Saxifraga serpyllifolia var. chrysantha*
Rocky Mountain polypody	*Polypodium saximontarum*	Underwood's spike-moss	*Selaginella underwoodii*
Illinois pondweed	*Potamogeton illinoensis*	Laramie false sagebrush	*Sphaeromeria simplex*
White-stem pondweed	*Potamogeton praelongus*	Porter's aster	*Symphyotrichum porteri*
Strict-leaved pondweed	*Potamogeton stricifolius*	Pygmy goldenweed	*Tonestrus pygmaeus*
Giant cinquefoil	*Potentilla ambigens*	Pygmy bulrush	*Trichophorum pumilum*
Many-flowered rattlesnake-root	*Prenanthes racemosa spp. multiflora*	Large flower triteleia	*Triteleia grandiflora*
Cusick's alkali-grass	*Puccinellia cusickii*	Lesser bladderwort	*Utricularia minor*
Hoary willow	*Salix candida*	Dwarf bilberry	*Vaccinium myrtillus var. oreophilum*
Autumn willow	*Salix serissima*		

APPENDIX C

SURFACE WATER ASSESSMENT REPORT

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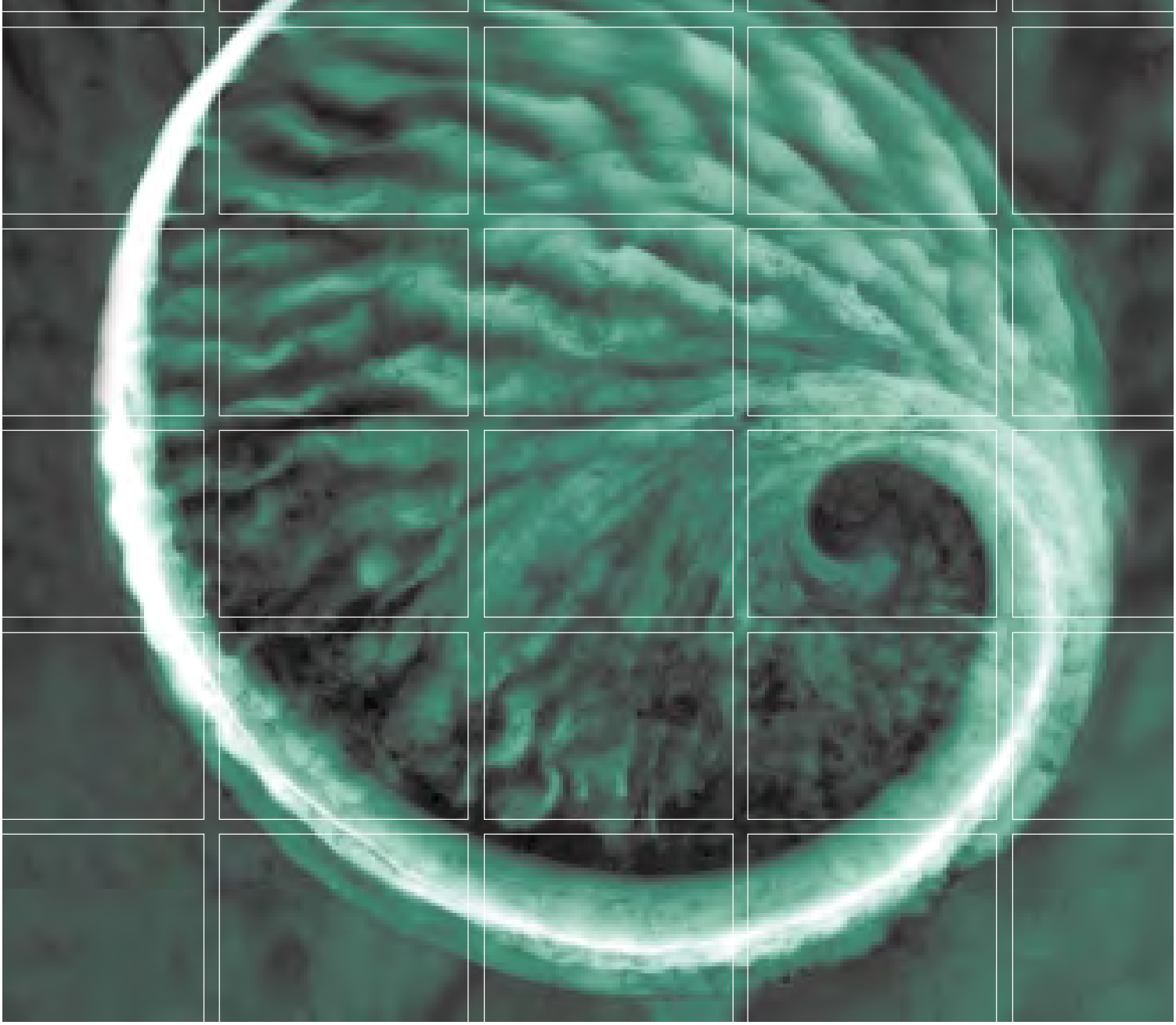


Surface Water Resource Assessment Report

Shell WindEnergy, Inc.
Albany County, Wyoming

June 23, 2010

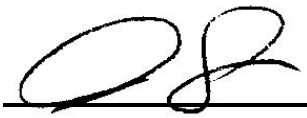
www.erm.com

Shell WindEnergy, Inc.

Surface Water Resource Assessment Report

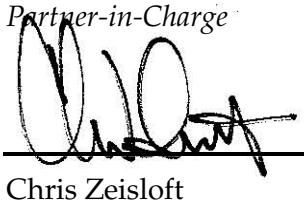
June 23, 2010

Project No. 0116974
Hermosa West Wind Farm Project
Albany County, Wyoming



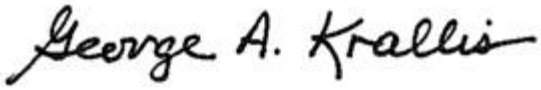
Alicia Smith, REM

Partner-in-Charge



Chris Zeisloft

Project Manager



Dr. George A. Krallis, P.E.

Project Scientist

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1.0 INTRODUCTION

1.1 OBJECTIVES AND SCOPE

At the request of the Shell WindEnergy, Inc. (SWE), Environmental Resources Management (ERM) has prepared this Surface Water Resource Assessment Report for the Hermosa West Wind Farm Project (the Project). This document is intended to provide the Western Area Power Administration (Western) with information on impacts that the Project is likely to have on surface waters in and around the vicinity of the proposed 300 megawatt wind energy project in southeast Albany County, Wyoming. The information is provided in sufficient detail to address concerns raised by the Wyoming Game and Fish Department (WYGFD) regarding surface water quality as identified in the letter dated October 21, 2009 (provided as Appendix A). This desktop based analysis is designed to:

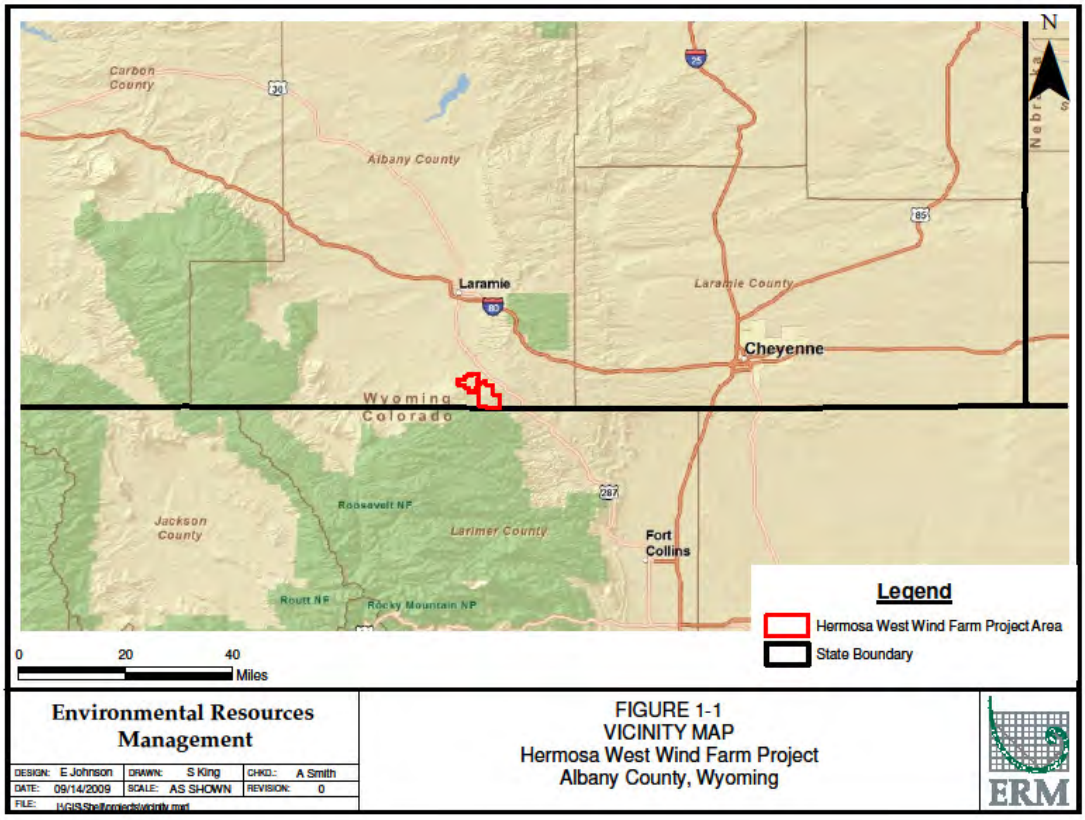
- Identify places in the watershed that represent likely sediment sources and channel stability problems, and thereby limit or eliminate the effort and costs of the more intensive Watershed Assessment of River Stability and Sediment Supply (WARSSS) phases; and
- Begin assembling and examining existing baseline information.

1.2 PROJECT SUMMARY

Shell WindEnergy, Inc. (SWE) proposes to construct, operate, and maintain the Project in southeast Albany County, Wyoming, near Tie Siding. The specific areas assessed (hereafter "the Project Area") are located in southeastern Wyoming approximately 18 miles south of Laramie, Wyoming along State Highway 287 (Figure 1-1, Site Vicinity Map). The Project Area consists of approximately 11,125 acre acres of both private and State-owned land. The Project will consist of up to 200 wind turbines, with a total generating capacity of up to 300 megawatts (MW) of electricity. In addition to the wind energy collection system, the Project will include an on-site operation and maintenance (O&M) building, underground collector lines, transmission lines and substation, and associated access roads. Additional detail on the Project's components, construction, operation, and decommissioning can be found in the Project Description document (ERM, 2009).

In conducting this analysis ERM reviewed a variety of available resources, these include topographic maps, land cover, soils, and geologic maps, and aerial photographs. This background research was supported by previous field reconnaissance observations. The studies were undertaken to provide an understanding of the pre-construction conditions and relate them to effects on flow, hill slope erosion and channel processes and the identification of sediment sources and effects. ERM also documented the hydrographic basin boundaries, and has determined that none of the streams in the Project Area are on Wyoming's 303(d) impaired list.

FIGURE 1-1: Vicinity Map



Given the limited land development in the Project Area and SWE's commitment to the use of appropriate erosion and sediment controls detailed below, ERM anticipates that no additional phases of WARSSS will be required.

2.0 PROJECT ACTIVITIES

The Project has been designed to minimize impacts to wetlands, waterbodies, and other environmentally sensitive areas. This has been done in concert with a variety of pre-construction field based and desktop surveys intended to identify areas of potential impact. The results of these assessments fed the design process which identified construction methodologies to reduce or avoid the potential impacts. This initial planning effort identified the following Project activities that could result in a potential impact to the water resources of the Project Area:

- Grading and construction of new and improved roadways,
- Grading and construction of laydown areas, turbine pads, substation and O&M building,
- Trenching for electrical collection system, and
- Final grading around the facilities after construction has been completed.

Grading

Grading would be finished to the contours and elevations indicated on the final design drawings, or match contours and elevations of the original undisturbed ground surface. The final grading would provide a smooth uniform surface and minimize the impact to existing runoff patterns.

Typically, the construction of the wind turbine foundations constitutes the largest volume of earth excavation associated with a wind power project, although some foundation designs allow for much of the excavated material to be backfilled in and around the foundation itself. Excavated soils would be placed back into the foundation hole, and then compacted to a level as close to pre-excavation as possible. The surface of the site would be re-vegetated using native seeds, or landowner approved mixture.

Temporary Construction Areas

The establishment of necessary construction zones around each wind turbine site is similar to the construction of access roads. The expected construction zone around each turbine site would be a radius of approximately 100 ft. This area would need to be clear and level enough to allow for delivery of components and for safe set-up and operation of the crane and ancillary machinery necessary to assemble and erect the wind turbine components. Construction would be designed to minimize the amount of workspace required at each turbine site. Wherever possible, only a minimal amount of vegetation would be removed to allow for component delivery. Typically, the pad constructed for the crane requires the same amount of work as the roads, although these pads would be removed and the site restored to the preexisting state once construction of the turbine is complete. Therefore impacts associated with these and similar work areas are considered temporary in nature.

Trenching

If open trenching is necessary for the placement of electrical collection system cables or fiber optic lines, the extent of the trench open at any given time would be minimized to only those distances necessary to expedite work. In areas where trenching has to take place in waterbodies best management practices will be developed and implemented to minimize impacts to water quality and sensitive species and required permits will be obtained. Waterbodies will be restored to their preexisting contours and riparian areas will be allowed to re-vegetate.

Reclamation

Once the construction of the wind farm is complete, reclamation would be performed around the areas disturbed by the construction. The fill material accumulated during the road construction will likely be used to return contours to near pre-construction conditions. Any remaining fill material would be distributed across the Project Area in a manner that would not adversely affect dust and erosion, nor change drainage conditions, nor impact any sensitive vegetative communities. Any exposed areas that are not covered by road materials will likely be re-vegetated using a native seed mixture, or landowner preferred mixture. Noxious weed control would continue on-site during the re-vegetation process and during the Project's operation.

3.0 PROJECT SETTING

The Project Area is located in Albany County, Wyoming, primarily within the Willow Creek and Laramie River perennial river drainage. The Laramie River is located approximately 12 miles to the northwest of the Project Area at its closest point. The Project is located within the Upper Laramie River and South Platte River Sub-basins of the Platte River Basin.

The typical landscape of the region is low mountain slopes and nearly level floodplains, as are associated with the Mid-Elevation Forests and Shrublands of the Southern Rockies Ecoregion, and Laramie Basin of the Wyoming Basin Ecoregion (Chapman et al, 2004). The Mid-Elevation Forests and Shrublands Ecoregion ranges from 7,500 to 9,000 ft in elevation. The Ecoregion is characterized by low mountain slopes and outwash fans with moderate to high gradient perennial streams. The dominant vegetation in this ecoregion is lodgepole pine (*Pinus contorta*) forests and Douglas-fir (*Pseudotsuga menziesii*) forests with some timber pine. Some aspen (*Populus tremuloides*) forests occur in the Sierra Madre range, while ponderosa pine (*Pinus ponderosa*) woodlands occur in the Laramie Mountains. The Laramie Basin Ecoregion ranges from 7,100 to 7,900 ft in elevation and is characterized by nearly level floodplains and low terraces. This Ecoregion is dominated by mixed grass prairie.

Depletions to the surface waters and groundwater in the Platte River Basin will be considered in connection with the Project. The Project would not withdraw from surface waters within the Platte River Basin within the Project area. No temporary wells will be required for construction of the Project facilities. Concrete will be sourced from an off-site concrete batch plant during construction activities. Water will be trucked into the site during construction for dust suppression, as needed.

A permanent water well may be used to supply the O&M building, but current design plans are to use a rainwater cistern to supply firewater. Given the long-term workforce numbers, this permanent water well would likely have de minimis long-term impacts on the Platte River Basin. SWE will strive to minimize depletions to the Platte River System and will develop and implement best management practices to protect water quality, and obtain appropriate permits.

3.1 PREVIOUS STUDIES

Field investigations were performed by ERM in August and October 2009 to identify the location and extent of any jurisdictional wetlands or waterbodies within the Survey Area (ERM, 2010). The results of this field survey are included as Appendix B to this report. The Survey Area consists of approximately 2,198 acres of both private and State-owned land anticipated for temporary or permanent impact by these proposed Project activities. Land use and land cover designations were assigned using field observations, interpretation of 2008 aerial photography, and interpretation of U.S. Geological Survey 7.5-minute

Survey 7.5-minute topographic maps. Land use and land cover types were classified as agricultural land primarily dedicated to livestock grazing. The Project Area is sparsely populated and contained few structures, owing mostly to homesteads and barns/outbuildings associated with livestock.

The Survey Area contained a total of 44 waterbodies. Of these, 20 are perennial streams, 12 are intermittent streams, and 12 are ephemeral streams. ERM has concluded that all of the waterbodies encountered within the Survey Area are likely under the jurisdiction of Section 404 of the Clean Water Act (CWA) and the U.S. Army Corps of Engineers (USACE).

The Project is anticipated to impact 0.17 acres of wetlands due to access road construction (ERM, 2010). Additionally, the Project is anticipated to traverse (i.e. access road and connection line crossings) 30 waterbodies. Where possible crossings of wetlands and waterbodies have been rerouted to minimize crossing and, in some cases, avoid completely.

In addition to conducting the environmental field activities, a desktop analysis of the Survey Area and adjacent lands was performed by reviewing the following sources (included as Appendix C):

- U.S. Geological Survey (USGS) 7.5-minute Topographic Quadrangle Maps (2009);
- U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) Maps (2009);
- Aerial Photographs (2006);
- U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) County Soil Surveys (2008); and
- Federal Emergency Management Agency (FEMA) Flood Hazard Maps were not available digitally for the Project Area.

ERM gathered applicable data for each waterbody feature, including: perennial/intermittent/ephemeral status, stream width, bank height, bank slope, stream-flow, direction and type, water appearance, stream substrate, aquatic habitats, channel conditions, and disturbances. Data were documented on Waterbody Data Sheets, which are provided in Appendix A of the Wetland Assessment (ERM, 2010). Waterbodies indicated on USGS topographic maps were also field verified. Photographs and maps detailing the locations of waterbodies, swales, and erosion features are presented in Appendix D of the Wetland Assessment (ERM, 2010).

4.0 HYDROLOGY BASELINE

This hydrologic baseline is developed from climate data, topographic maps, land cover, soils, and geologic maps, and aerial photographs from publicly available sources, as well as from field reconnaissance observations provided in ERM's Wetlands Assessment (2010).

Wyoming is an arid, high-elevation state with expansive basins and mountain ranges. The mountains receive most of the state's precipitation in the form of snow, which runs off to form the headwaters of Wyoming's major river systems and to recharge aquifer systems. Due to the seasonal nature of Wyoming's surface water, there are a variety of dams and reservoirs in the state. Wyoming's limited water is a precious resource used extensively for irrigation, recreation, wildlife, and urban consumption.

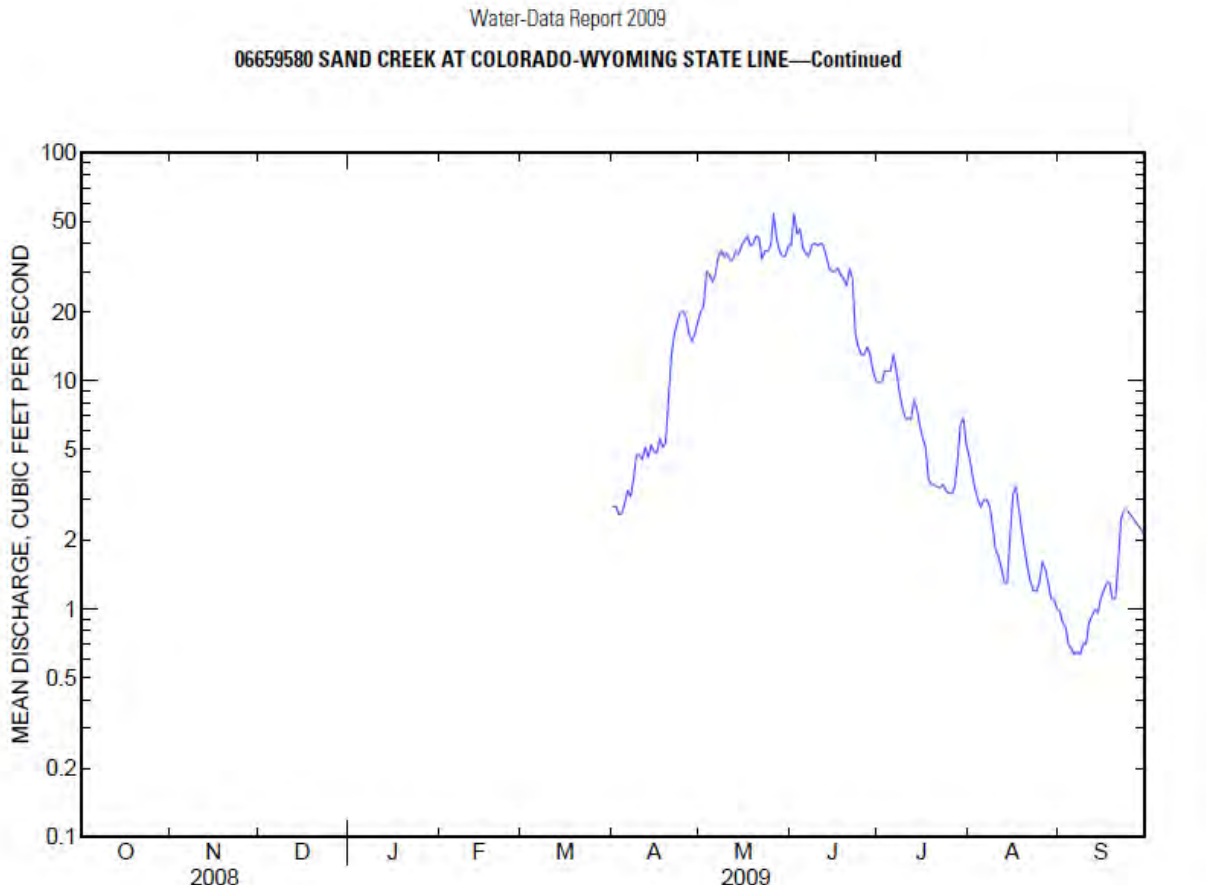
Wyoming is the fifth driest state (16.84 inches of annual precipitation) in the U.S. Its many scattered mountain ranges control the distribution of snowfall and streamflow, and the deserts and plains between them store water in aquifers and reservoirs (Wyoming State Geological Survey, 2010).

In the Project Area, precipitation ranges from 10 to 15 inches per year (National Atlas, 2010). Numerous ephemeral and intermittent streams in the Project Area indicate that base flow and rainfall-driven streamflow are low. The majority of streamflow in Wyoming and in the Project Area consists of snowmelt runoff, which peaks in May through July.

USGS stream gage station #06659580 Sand Creek at Colorado-Wyoming state line is near the Project Area and is representative of conditions expected there. The drainage area at the gage is 29.2 square miles, which is larger than the drainage area of the streams flowing through the Project Area. As illustrated in Figure 4-1, flow at Sand Creek in 2009 ranged from below 1 cfs to 60 cfs. This translates to a normalized flow range of 0.03 to 2.05 cfs per square mile. The gage is not operated during the winter months (USGS, 2009).

Nearer to the Project Area and within Albany County, Wyoming, there are other USGS stream gages (listed in Table 4-1) that exhibit similar hydrologic behavior: high snowmelt runoff from May to July, low base flow during the rest of the year. These stations gage streamflow from drainage areas an order of magnitude larger than the Project Area, and they may contain within their drainage areas diversions, irrigation canals, dams and reservoirs that affect their flow rates. Several lakes and reservoirs exist on the Laramie and North Platte Rivers further downstream of the Project Area. They moderate flow by storing seasonal inflow and releasing it throughout the year.

FIGURE 4-1: Sand Creek Hydrograph 2009



Sediment transport within the hydrologic framework can be separated into two processes: the watershed contribution of sediments to the streams, and the stream channel ability to transport or deposit sediments. The watershed contribution of sediment is a function of soil type, geology, slope and length, land cover and use, vegetation, and rainfall erosivity, as expressed in the Universal Soil Loss Equation (Wischmeier, 1978).

During periods of no surface drainage (when the intermittent streams are dry) there is minimal transport of sediments from the watershed to the streams. Wind-driven sediment transport can be a factor in Wyoming, but it has not been quantified. Therefore, for the purpose of this assessment, the amount of sediment blown into dry streambeds is assumed to be nearly equal to that blown out of them.

The stream channel ability to transport sediment load, consisting of the watershed contribution plus its own bed material, is a function of channel flow rate, slope, velocity, and the sizes of sediment particles. The total sediment transported includes bed load and suspended load components.

Man-made and natural reservoirs in Wyoming and elsewhere disrupt the flow of sediments. Bed load and suspended particles settle in these slow-moving reservoirs. Only the smallest particles that stay in suspension are carried through

the reservoirs into the downstream reaches. Much of the larger suspended particles and bed loads are retained. Several man-made reservoirs exist on the Laramie and North Platte Rivers further downstream of the Project site.

TABLE 4-1: USGS Stream Gages in Albany County, WY

Site Number	Site Name	Drainage Area (sq. mi.)
06633500	ROCK CREEK BELOW ROCK RIVER, WY	2180
06658500	LARAMIE RIVER NEAR JELM, WY	294
06660000	LARAMIE RIVER AT LARAMIE, WY	1071
06660500	LARAMIE RIVER AT TWO RIVERS, WY	1224
06661500	LITTLE LARAMIE RIVER AT TWO RIVERS, WY	376
06661585	LARAMIE RIVER NEAR BOSLER, WY	1790
06662000	LARAMIE RIVER NEAR LOOKOUT, WY	2174

4.1 ANALYSIS AND EVALUATION OF WATER RESOURCES AND SEDIMENT TRANSPORT

The basic hydrology of the Project Area is typical of the mountainous high plains of Wyoming. Water is stored in the mountainous headwaters and is released throughout the year, and rainfall runoff is a small component of overall streamflow. Snowmelt runoff peaks in May through July. The numerous ephemeral and intermittent streams in the Project Area indicate that base flow and rainfall-driven streamflow are low.

Land uses in the higher elevations are logging, recreation, and grazing; while at the lower elevations, grazing, irrigated hay production, and some oil and gas development. Historically, the land use of the Project Area has changed very little, besides the introduction cattle grazing and oil/gas development. The majority of the streams and lakes exhibit good water quality and meet their aquatic life uses (Wyoming Water Quality Assessment and Impaired Waters List, 2010).

Streamflow conditions at the Project site are comparable to those at USGS #06659580 Sand Creek at Colorado-Wyoming state line. Flow at Sand Creek (drainage area = 29.2 square miles) in 2009 ranged from below 1 cfs to 60 cfs or 0.03 to 2.05 cfs/square mile (USGS, 2009). These values can be proportioned by drainage area size to each of the drainage basins within the Project Area to estimate the range of streamflows expected at each location.

Sediment transport within the hydrologic framework can be separated into two processes: the watershed contribution of sediments to the streams, and the stream channel ability to transport or deposit sediments. The watershed contribution of sediments includes both hillslope and overall basin hydrology. Similarly, the WARSSS approach looks at hillslope, hydrology, and channel processes (U.S. Environmental Protection Agency [EPA], 2008). The watershed contribution of sediment is a function of soil type, geology, slope and length, land cover and use, vegetation, and rainfall erosivity, as expressed in the Universal Soil Loss Equation (Wischmeier, 1978).

Watershed Contribution

Project features are designed to minimize changes in surface water runoff (volume, velocity, and seasonality). With limited changes in surface water runoff from the watershed, there will be limited changes in watershed contribution of sediments or additional flow in the streams. Snowmelt and base flow quantity, quality, and seasonality are not expected to change.

Drainage areas for each watershed at the Project boundaries and drainage areas at each stream crossing locations were delineated using Aquaveo's Watershed Modeling System (WMS) software (2010). WMS uses USGS digital elevation model (DEM) maps downloaded from a publicly-available server at http://www.webgis.com. The watershed map is provided as Figure 4-2. Drainage areas for each watershed are listed in Table 4-2.

TABLE 4-2: Drainage Areas within the Project Area

Stream Name	Approximate Drainage Area (square miles)	Drainage Area (acres)
Government Creek (at Project boundary)	2.3	1,472
Forest Creek (at Boulder Creek)	1.7	1,088
Boulder Creek (at Project boundary, including Forest Creek)	4.6	2,944
Willow Creek (at Project boundary, excluding Forest and Boulder Creeks)	8.1	5,180
Fish Creek (at state line)	17.1	10,944

Disturbed areas within the Project Area consist of roads, electrical connections, buildings, and turbine pads. ERM estimates that new and improved roadways could cover 134 to 268 acres of the Project Area, depending on roadway/electrical connector lines widths (25 to 50 ft). The substation covers 2 acres and the O&M building is 8,000 square feet (0.2 acres). The 100-ft radius construction zone around each of the 200 turbine pads totals 144.2 acres. A summary of the disturbed areas is provided in Table 4-3, which also shows that the total disturbed area is less than 4% of the total Project Area.

FIGURE 4-2: Watershed Map

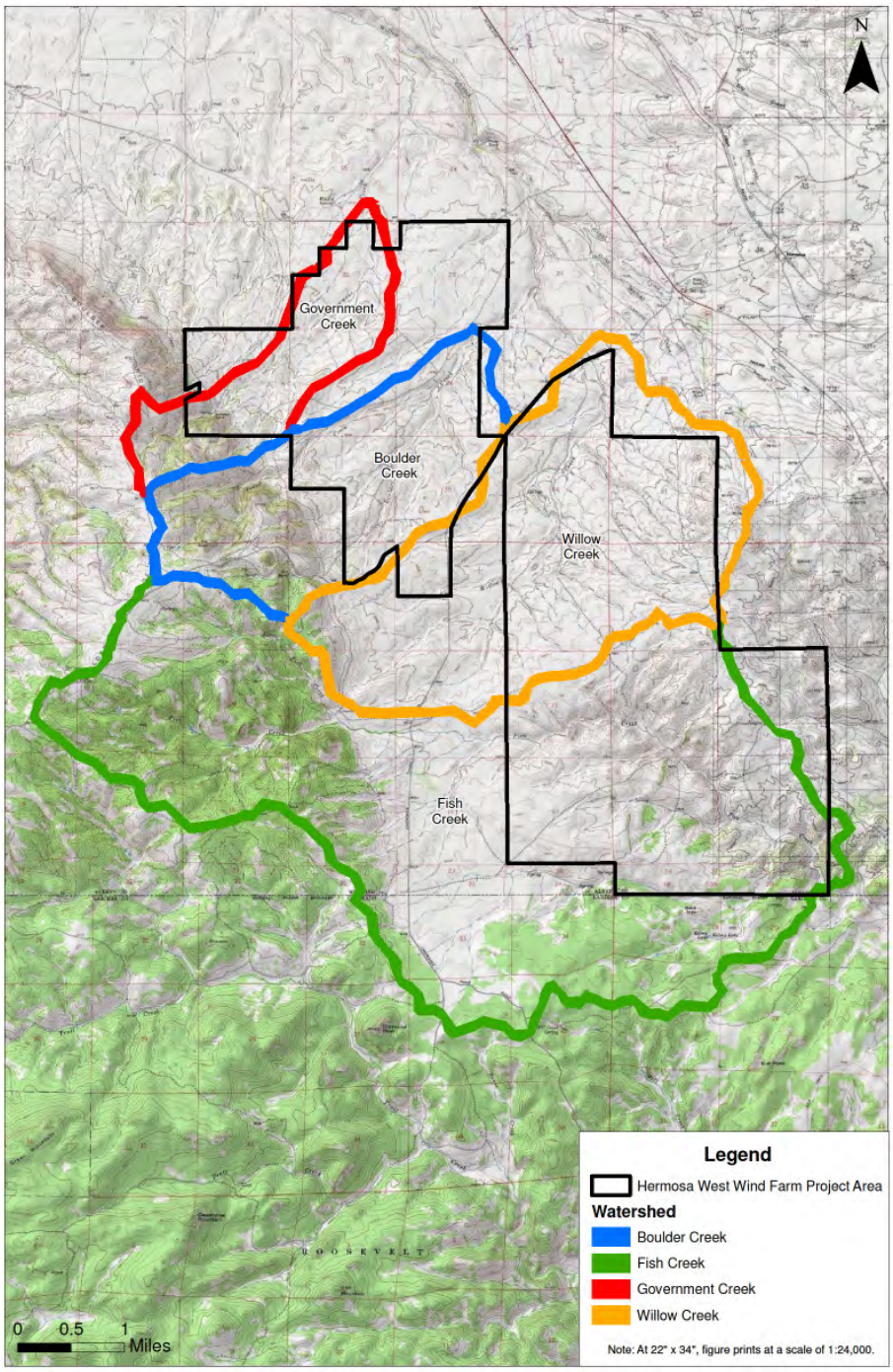


TABLE 4-3: Project Area Dimensions

Feature	Area (acres)	Percent of Project Area (11,125 acres)
Project Area	11,125	
Study Area	2198	19.76%
Roads and Electrical Connection Lines*	268	2.41%
200 Turbines	144.2	1.30%
Substation	2.0	0.02%
O&M building	0.2	0.00%
Total Modified	414.4	3.72%

* Roadways/electrical connection lines will be collocated where possible and are anticipated to cover 268 acres based on a width of 25ft for roads and an additional 15ft for connection lines

Changes in the watershed contribution of sediment can be traced to the alteration of specific physical parameters within the watershed. The Universal Soil Loss Equation (USLE) can be used to quantify watershed and hillslope sediment load and, in this case, to illustrate which physical parameters lead to increased or decreased watershed sediment load. The USLE is defined as follows (USLE, 2010a and b; USDA, 1978; and Wischmeier, et al, 1978):

A = R K LS C P (tons/ha/year)

Where: A= soil loss; R= rainfall erosivity factor; K= soil erodibility factor; LS = slope and slope length factor; C= vegetative cover factor; P= conservation practice factor

Rainfall erosivity (R) is based on climatological conditions (rainfall distribution and intensity), and the Project will not change this parameter. Soil erodibility (K) is based on soil type. Changes in soil type and condition will be minimized. Slopes and lengths (LS) of drainage patterns will be maintained as close to existing as possible in the Project, as will vegetative cover (C) and conservation practices (P). Therefore, as long as the Project activities do not markedly increase rainfall runoff or modify these watershed conditions, changes in watershed contribution of sediment will be minimized.

Two studies of sediment transport specifically in Wyoming (Rankl, 2010; and Ryan and Dixon, 2008) show that sediment transport in streams is a non-linear (exponential or power law) function of flow rate. Provided the Project does not increase or decrease flow rate from the watershed into the streams, sediment transport will also not increase or decrease, and channel stability will be maintained.

Stream Channels

Over time, streams achieve a state of equilibrium between flow rate, sediment load, channel gradient and shape. This occurs because all of these variables are interdependent and will adjust until the stream achieves a level of energy equilibrium. Streams adjust their gradient and channel dimensions to allow their flow rate to efficiently transport the sediment load delivered to the stream from the watershed. Streams adjust their gradient and channel dimensions by eroding or depositing sediment. Erosion lowers the stream bottom and flattens out the

gradient, while deposition raises the stream bottom and increases the gradient. Channel widths can also be modified by bank sedimentation and/or erosion.

The amount of sediment delivered to the stream is independent of the stream itself. As noted above, the watershed is not expected to contribute marked changes in sediment load due to the Project. Changes in the streams channels, in the form of stream crossings, however, are anticipated in the Project which could trigger changes in stream morphology in the Project Area.

An erodibility risk parameter was developed for this analysis based on slopes and USLE K factor for all of the stream crossings encountered in the Project. The parameter is defined as follows:

High Erodibility = slopes > 25% and K > 0.25 (meeting both conditions)
Medium Erodibility = slope > 25% or K > 0.25 (meeting either condition)
Low Erodibility = slopes < 25% and K < 0.25 (meeting both conditions)

The soil types identified in the Project Area at stream crossing locations and their associated USLE K factors are presented in Table 4-4. USLE K factors range from 0.05 (low erodibility) to 0.45 (high erodibility). The mean of 0.25 was selected as the dividing point in the erodibility risk parameter determination. Slopes were segregated at the mid range value of 25%.

TABLE 4-4: Soil Erodibility Factors for Soils Found in the Project Area

Soil Series	Soil Texture[1]	USLE Erodibility Factor K[2]
Alcova	Fine loam	0.30
Amesmount	Fine loam	0.30
Boyle	Loamy skeletal	0.13
Canburn	Fine loam	0.30
Dalecreek	Fine loam	0.30
Kovich	Fine loam	0.30
Lininger	Fine loam	0.30
Pilotpeak	Loamy skeletal	0.13
Rogert	Loamy skeletal	0.13
Silas	Fine loam	0.30
Stunner	Fine loam	0.30
Tieside	Loamy	0.13
Thermopolis	Loamy	0.13
Vensora	Fine loam	0.30
Wycolo	Fine loam	0.30

1 - http://soilsurvey.org/soilseries.asp?x=C&sort=Series&st=WY
2 - http://www.omafra.gov.on.ca/english/engineer/facts/00-001.htm#tab2

A summary of the crossings by feature identification, name, soil type, slope, stream type, erodiblility risk, and drainage area is provided in Table 4-5. The data show that five feature sites have a low risk rating and the rest have medium risk rating. Where rock outcrops are present, channels are considered to be less erodible than those with soil beds and are given a medium rating.

TABLE 4-5: Feature data

Feature ID	Name	Soil Type, Slope	Stream Type	Erodibility Risk[1]	Approximate Drainage Area (square miles)
SAAL001	Government Creek	Wycolo-Alcova, 3-10% slopes	Perennial	Medium	0.6
SAAL002	Government Creek	Wycolo-Alcova, 3-10% slopes	Perennial	Medium	1.1
SAAL003	Government Creek	Tieside-Pilotpeak-Rock outcrop, 3-10% slopes	Ephemeral	Low	1.7
SAAL004	Forest Creek	Canburn Loam, 1-4% slopes	Perennial	Medium	1.0
SAAL005	Forest Creek	Canburn Loam, 1-4% slopes	Intermittent	Medium	1.3
SAAL006	Tributary of Boulder Creek	Wycolo-Tieside sandy loams, 3-10% slopes	Ephemeral	Medium	0.3
SAAL007	Tributary of Boulder Creek	Stuner-Tisworth-Blazon, 1-6% slopes	Ephemeral	Medium	0.2
SAAL008	Boulder Creek	Wycolo-Tieside sandy loams, 3-10% slopes	Ephemeral	Medium	1.0
SAAL009	Tributary of Boulder Creek	Canburn Loam, 1-4% slopes	Ephemeral	Medium	0.6
SAAL010	Willow Creek	Boyle-Rock outcrop 5-25%	Perennial	Medium	3.3
SAAL012	Tributary of Willow Creek	Dalecreek-Kovich, 0-9% slopes	Perennial	Medium	2.3
SAAL013	Tributary of Willow Creek	Boyle-Rock outcrop 5-25%	Ephemeral	Low	0.2
SAAL014	Unnamed Tributary	Rock outcrop-Rogert, 25-99% slopes	Perennial	Medium	0.3
SAAL015	Unnamed Tributary	Rogert-Rock outcrop-Amesmount, 5-25% slopes	Ephemeral	Medium	0.2
SAAL016	Unnamed Tributary	Rogert-Rock outcrop-Amesmount, 5-25% slopes	Ephemeral	Medium	0.1
SAAL017	Tributary of Fish Creek	Rock outcrop-Rogert, 25-99% slopes	Perennial	Medium	0.3
SAAL018	Tributary of Fish Creek	Silas gravelly substratum-Vensora loam, 0-6% slopes	Ephemeral	Medium	0.5
SAAL019	Fish Creek	Rogert-Rock outcrop-Amesmount, 5-25% slopes	Perennial	Medium	7.0
SAAL020	Fish Creek	Silas gravelly substratum-Vensora loam, 0-6% slopes	Perennial	Medium	6.7
SAAL021	Willow Creek	Wycolo-Thermopolis-Rock outcrop, 10-50% slopes	Perennial	Medium	8.1
SAAL022	Tributary to Grant Creek	Canburn Loam, 1-4% slopes	Intermittent	Medium	1.0
SBAL001	Tributary to Forest Creek	Tieside-Pilotpeak-Rock outcrop, 3-10% slopes	Ephemeral	Low	0.2
SBAL002	Forest Creek	Canburn Loam, 1-4% slopes	Perennial	Medium	4.4
SBAL003	Forest Creek	Canburn Loam, 1-4% slopes	Perennial	Medium	1.7
SBAL004	Boulder Creek	Wycolo-Tieside sandy loams, 3-10% slopes	Perennial	Medium	1.8
SBAL005	Tributary to Boulder Creek	Canburn Loam, 1-4% slopes	Perennial	Medium	0.2
SBAL006	Tributary to Willow Creek	Boyle-Lininger, 1-15% slopes	Intermittent	Medium	0.2
SBAL007	Tributary to Willow Creek	Boyle-Lininger, 1-15% slopes	Intermittent	Medium	0.2
SBAL008	Tributary to Willow Creek	Boyle-Rock outcrop 5-25%	Perennial	Low	0.3
SBAL009	Tributary to Willow Creek	Boyle-Lininger, 1-15% slopes	Intermittent	Medium	0.1
SBAL010	Tributary to Willow Creek	Boyle-Lininger, 1-15% slopes	Ephemeral	Medium	0.1
SBAL011	Tributary to Willow Creek	Rogert-Rock outcrop-Amesmount, 5-25% slopes	Ephemeral	Medium	0.1
SBAL012	Tributary to Willow Creek	Rogert-Rock outcrop-Amesmount, 5-25% slopes	Intermittent	Medium	0.1

Feature ID	Name	Soil Type, Slope	Stream Type	Erodibility Risk[1]	Approximate Drainage Area (square miles)
SBAL013	Tributary to Willow Creek	Boyle-Lininger, 1-15% slopes	Perennial	Medium	1.0
SBAL014	Willow Creek	Boyle-Lininger, 1-15% slopes	Perennial	Medium	5.2
SBAL015	Tributary to Willow Creek	Boyle-Lininger, 1-15% slopes	Intermittent	Medium	0.3
SBAL016	Tributary to Willow Creek	Boyle-Lininger, 1-15% slopes	Intermittent	Medium	0.7
SBAL017	Unnamed Tributary	Rogert-Rock outcrop-Amesmount, 5-25% slopes	Intermittent	Medium	0.1
SBAL018	Fish Creek	Silas gravelly substratum-Vensora loam, 0-6% slopes	Perennial	Medium	9.7
SBAL019	Tributary of Fish Creek	Rock outcrop-Rogert, 25-99% slopes	Perennial, man made	Medium	0.3
SBAL020	Fish Creek	Silas gravelly substratum-Vensora loam, 0-6% slopes	Perennial	Medium	7.8
SBAL021	Tributary of Fish Creek	Rogert-Rock outcrop-Amesmount, 5-25% slopes	Intermittent	Medium	0.1
SBAL022	Tributary of Fish Creek	Silas gravelly substratum-Vensora loam, 0-6% slopes	Intermittent	Medium	0.1
SBAL023	Tributary of Fish Creek	Rogert-Rock outcrop-Amesmount, 5-25% slopes	Intermittent	Medium	0.1

1 - Erodibility Risk based on slopes and USLE K factor.
High = slopes > 25% and K > 0.25 (both)
Medium = slope > 25% or K > 0.25 (either)
Low = slopes < 25% and K < 0.25 (both)
Rock outcrops lessen erodibility risk

4.2 SURFACE WATER QUALITY IN THE PROJECT AREA

Impaired Waters

The EPA is charged with administering the CWA. However, states are encouraged to develop their own programs to prevent, reduce, and eliminate water pollution. Section 305(b) of the CWA requires that a report of the surface water quality condition of each state be provided every two years (during even numbered years). In addition, Section 303(d) requires that a list of the impaired waters requiring Total Maximum Daily Loads (TMDL) be provided. Wyoming's 2010 Integrated 305(b) and 303(d) Report combines the requirements of both sections into a single document.

Section 303(d) of the CWA requires that states identify and list waters for which the effluent limits outlined in Section 301 of the CWA are not effective in attaining designated uses. The CWA also requires that states develop a separate TMDL for each pollutant/segment combination on the 303(d) List. These TMDLs are to be completed on these impaired waters to assure the protection and propagation of a balanced indigenous population of shellfish, fish and wildlife, and allow recreational activities in and on the water.

Watersheds within the Project Area

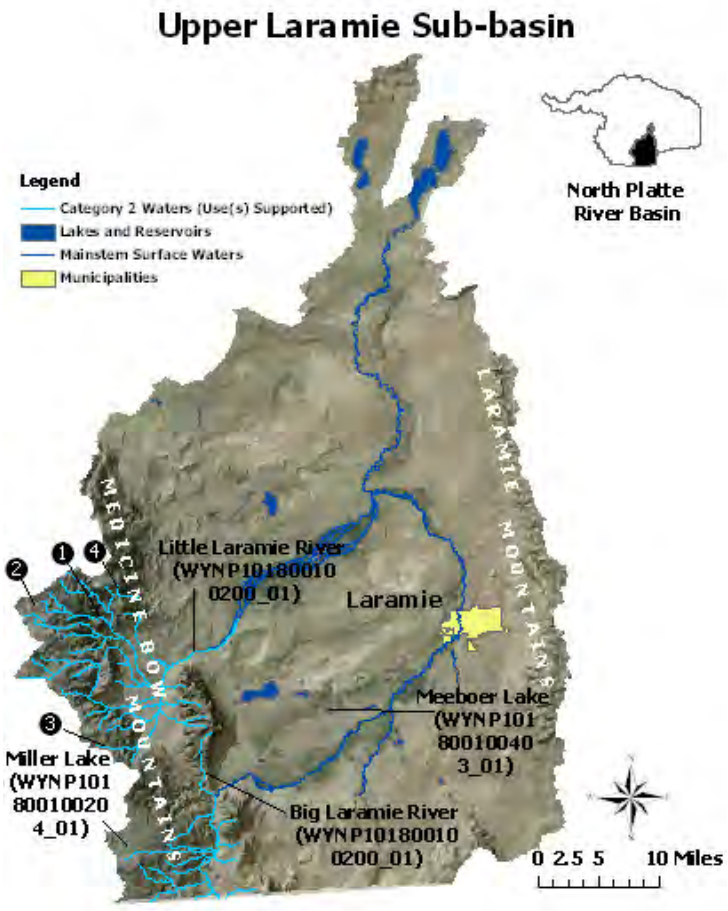
The Project Area is primarily found in the Upper Laramie Sub-basin (HUC 10180010). In 2010, Wyoming Department of Environmental Quality (DEQ) did not list any impaired waters in the southeast corner (Willow Creek watershed) of the Sub-basin (Wyoming DEQ, 2010), as shown in Figure 4-3.

This Sub-basin includes all the drainages above Wheatland Reservoir #2. Major drainages in the Upper Laramie Sub-basin are the Laramie and Little Laramie Rivers whose headwaters are in the Medicine Bow Mountains. Land uses are logging, recreation, and grazing at higher elevations; grazing, irrigated hay production, and some oil and gas development in the lower elevations. The City of Laramie (third largest in Wyoming) lies in this sub-basin.

Extensive water quality assessments by universities, the Forest Service, and DEQ in the Little Laramie Drainage above Millbrook indicate that the majority of the streams and lakes are meeting their aquatic life uses (Wyoming DEQ, 2010).

No National Water-Quality Assessment Program (NAWQA) water quality stations are located in the Project Area or in the North Platte River Basin in Wyoming. Within the rest of Wyoming, there are 50 total NAQWA stations, primarily in the western end of the state. Similarly, the USGS does not have any water quality monitoring stations in its stream database within the Project Area or within Albany County, Wyoming.

FIGURE 4-3: Upper Laramie Sub-basin with 303(d) listed streams



Source: Water Quality Assessment and Impaired Waters List (2010 Integrated 305(b) and 303(d) Report). Wyoming Department of Environmental Quality, Water Quality Division, Document #10-0230. June 2010.

A small portion of the Project Area is with the Fish Creek watershed, in the Cache La Poudre Sub-basin (HUC 10190007). Fish Creek originates in Wyoming's Laramie Mountains before draining south into Colorado. In 2010, Wyoming DEQ did not list any 303(d) impaired waters in the Fish Creek watershed (Wyoming DEQ, 2010).

4.3 GENERAL WATER RESOURCE AND SEDIMENT MITIGATIONS

Project design documents show facilities and crossings within identified water resource areas. In those areas where avoidance is not possible, SWE has worked to minimize impacts to the practical extent possible. Minimization includes actions taken to reduce overall impacts through Project development and construction techniques.

SWE is proposing to utilize best management practices (BMPs) during Project construction to preserve and protect water resources in order to minimize impacts. During the initial clearing phase of the construction process in water resource areas, woody vegetation would be cut at ground level. This would leave

leave the root systems intact and encourage sprouting of the existing species following construction. Small stumps of shrubs and trees may be cut at or just below ground level. Larger trees and shrubs would be removed to the extent necessary to provide a safe, level work surface for equipment. Equipment operation in water resource areas would be kept to the minimum necessary to safely perform the work, and would operate on prefabricated equipment matting or an acceptable substitute. Additionally, in areas where electrical collector lines or access roads have to take place in waterbodies BMPs will be developed and implemented to minimize impacts to water quality and sensitive species and required permits will be obtained.

In order to protect water resources, a storm water pollution prevention plan (SWPPP), which includes erosion control measures, would be generated and implemented on site for the Project. The SWPPP would be based on the EPA document entitled "Storm Water Management for Construction Activities-Developing Pollution Prevention Plans and Best Management Practices. The Project will obtain a General Stormwater Construction Permit from the Wyoming DEQ.

Given the dry and windy nature of the area, dust control measures will be proposed as part of the SWPPP to protect water quality, minimize impacts to local residents, and minimize impacts to vehicles traveling along local roads. Examples of BMPs that can be included in the SWPPP are the use of water or other dust control measures on or near heavily used public roads, holding traffic speeds to appropriate levels to minimize dust generation, using rock to cover disturbed soil, and re-vegetating or otherwise covering soils as soon as possible following soil disturbance.

SWE will develop a restoration plan, as part of the SWPPP, in order to further minimize permanent impacts to associated water resource areas. Upon the completion of the Project, the construction corridor would be restored to pre-construction contours, with exception of the turbine foundations, access roads, and permanent Project facilities (i.e. O&M area and substation). These areas would also be allowed to naturally re-vegetate from the existing rootstock and supplemented with native seed mix or a landowner preferred seed mixture where necessary.

While many steps have been taken to minimize impacts to water resources within the Project Area, certain impacts may be unavoidable due to the nature of the Project. Primary among this is the potential modification of the watershed contribution of sediments and the resulting stream channel capacity to transport that sediment load. SWE will mitigate for other unavoidable impacts to water resource areas as part of the USACE permit process, as required.

Part of the responsibilities of the Project operation staff would be to verify that proper environmental monitoring activities are being performed. The environmental monitoring program would incorporate monitoring observations and additional mitigation measures as needed into standard operating

procedures for the Project. Key to this is conducting routine inspections to identify and record incidences of erosion and sedimentation around all roads, turbines, buildings, and stream crossings.

Areas where structures, equipment, or materials are removed will be re-graded back to pre-construction contours, to the extent possible. Holes where foundations have been removed to six inches below grade would be refilled with native soils. Removed roads would be re-graded to original contours if cuts and fills make such re-grading practical. Crane pads would also be re-graded. All areas of disturbed ground would be re-vegetated using native seed mixtures or those approved by the landowner.

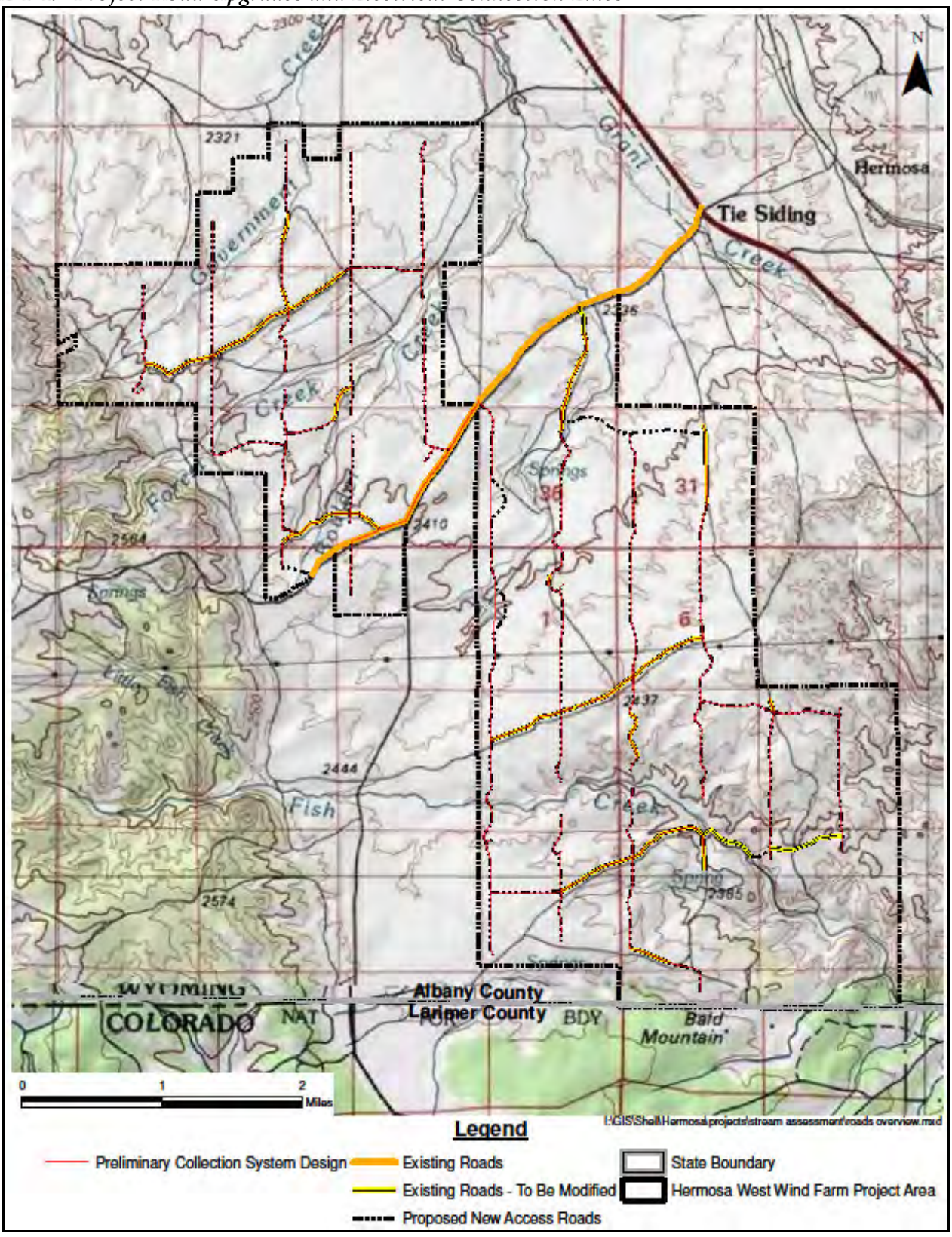
4.4 SPECIFIC WATER RESOURCE AND SEDIMENT MITIGATIONS

The Project seeks to minimize disturbance to the area by utilizing existing two track roads where possible. These roads will be upgraded to facilitate safe usage during the construction and operational phases of the Project. To further minimize disturbance the electrical collection lines will be collocated within the roadway corridor throughout much of the Project (see Figure 4-4). This collocation has eliminated several otherwise necessary waterbody crossings particularly in the southeastern portion of the Project Area (in the vicinity of Fish Creek). The location of these eliminated crossings as well as those which are necessitated by the Project facilities are detailed in Attachment 1 which summarizes all the identified waterbodies with the potential to be impacted by the development of this Project.

This analysis has shown how hillslope and watershed erosion will be minimized by the Project through the use of native soils and maintenance of existing drainage lengths and slopes, vegetation, cover, and similar practices. Similarly, overall hydrologic conditions in the Project Area will be unchanged. Drainage paths, slopes, and cover will be maintained. Base flow and snowmelt into the streams will remain unchanged. The overall quantity and seasonality of flow to the streams in the Project Area will continue as they currently exist. Project design documents also show that stream crossings can be designed to present no net change in stream velocity, depth, and slope, and no change in the ability of each stream section to transport sediment.

Stream crossings at perennial streams will include culverts, bottomless culverts, or temporary bridges to effect no change in channel carrying capacity, water depth, velocity, or slope.

FIGURE 4-4: Project Road Upgrades and Electrical Connection Lines



The field surveys did not produce any evidence of recent slumps, earth flows, debris flows, avalanche activity in the watershed or in near waterways. Channel down-cutting was noted in the field surveys (Waterbody Data Sheets, Appendix A of the Wetland Assessment, ERM, 2010) at the following field identified streams: SAAL001, SAAL005, SAAL010, SAAL019, and SAAL020. Of these, the proposed Project roads will traverse SAAL001, SAAL010, and SAAL120 (Government Creek, Willow Creek, and Fish Creek respectively); for these crossings through perennial streams bottomless culverts or temporary bridges will be installed to effect no change in channel carrying capacity. These and all waterbodies identified within the Project Area are identified in Attachment 1.

Turbine pads, buildings, laydown areas, and roadways will follow their prescribed SWPPP and return the Project Area to its existing state with the use of appropriate soils, grading, and vegetative cover. All of the specialized water resource features, concerns, actions, and expected results are listed in Table 4-6. This information is supported by a series of maps, included as Attachment 1, which depict all of the proposed crossing location identified in the table below.

TABLE 4-6: Specific Water Resource and Sediment Mitigations Summary

Feature ID	Concern	Action	Expected Result
Turbine pads	Hillslope erosion	SWPPP, natural grading and vegetation	No change in stormwater or sediment runoff
Buildings and laydown areas	Hillslope erosion	SWPPP, natural grading and vegetation	No change in stormwater or sediment runoff
Roadways and trenches	Hillslope erosion	Natural grading and vegetation, maintain natural drainage patterns	No change in stormwater or sediment runoff
Waterbody Crossings* (Roadway and Electrical Connections)			
Crossings at perennial streams with downcutting leading to high erodibilty risk: SAAL001, SAAL010, SAAL020	Channel degradation	Bottomless culverts or temporary bridges will be used for these crossings to minimize potential impacts. Increased regular monitoring of stream banks and channel stability	No change in channel capacity: slope, depth, velocity
Crossings at perennial streams with medium to low erodibilty risk: SAAL002, SAAL003, SAAL004, SAAL006, SAAL007, SAAL008, SAAL009, SAAL010, SAAL013 SAAL014, SAAL016, SAAL018, SAAL021, SAAL022, SAAL024 SBAL007, SBAL008, SBAL009, SBAL011, SBAL012, SBAL016, SBAL018, SBAL024	Channel degradation	Best Management Practices are recommended for these proposed crossings and include culverts, bottomless culverts or temporary bridges	No change in channel capacity: slope, depth, velocity

**Please see Attachment 1 for details of the waterbody crossings*

4.5 COMPARISON TO WARSSS

ERM has prepared this Surface Water Resource Assessment using several approaches that parallel those used in a WARSSS assessment. The WARSSS approach considers hillslope, hydrology, and channel processes. Hillslope processes are defined by land uses that influence sediment supply as well as soil/geology hazards. This is then used to identify potential erodibility risks and to reveal specific locations of potentially accelerated erosion and/ or increased sediment levels. The WARSSS risk rating of hydrologic processes evaluates the potential for increased water yield and associated flow-related sediment increases. A higher altered area percentage poses a higher the potential for flow-related changes in sediment supply. Magnitude, duration, and timing of flow are also important. This assessment has calculated the small percentage of area to be developed in the Project and showed how the Project will not increase water yield or sediment supply.

Channel and stream type classification plays an important role in WARSSS. This assessment has evaluated the stream channels in the Project Area and concluded that they would not receive increased flow or sediment load from the watershed. It also identified stream crossing locations that should be protected based on an erodibility risk parameter.

5.0 SUMMARY AND CONCLUSIONS

This Surface Water Resource Assessment Report has identified places in the watershed that represent likely sediment sources and channel stability problems, and thereby eliminated the effort and costs of the more intensive WARSSS phases. It also has begun the process of assembling and examining existing hydrologic and sediment baseline information.

In conducting this analysis ERM reviewed topographic maps, land cover, soils, and geologic maps, aerial photographs, and field reconnaissance observations and related them to effects on flow, hillslope erosion, and channel processes. It also identified sediment sources and effects. ERM has documented the hydrographic basin boundaries, and has determined that none of the streams in the Project Area are on Wyoming's 303(d) impaired list.

The SWE Project is not anticipated to have an adverse effect to the surface waters of the Project Area or surrounding areas. The Project activities will not markedly increase runoff or modify the watersheds pre-construction conditions, therefore changes in watershed contribution of sediment will be minimized. Additionally, the Project is not anticipated to alter flow rate from the watershed into any of the associated waterways, therefore sediment transport will also not vary, and channel stability will be maintained. Through proper planning and implementation of appropriate control measures the construction and operational phases of the Project will not result in adverse impact to the watershed.

Previous field investigations identified 45 waterbody crossings within the Project Area. Three perennial streams Government Creek, Willow Creek, and Fish Creek (identified by the field designations SAAL001, SAAL010, and SAAL120 respectively) have been identified where crossing using a bridge or bottomless culvert are proposed to further minimize potential impacts. The Project was redesigned November 2009 to cross 30 waterbodies versus 45, and then further refined. The revised design requires development of access roads and the improvement of existing roads that will necessitate 24 additional waterbody crossings. However, planning and development of the Project layout has avoided the crossing of 18 waterbodies through proactive design and collocation of electrical connection lines within the roadway corridor.

Given the limited land development in the Project Area and SWE's commitment to the use of appropriate BMPs and erosion and sediment controls, ERM anticipates that no additional phases of WARSSS will be required.

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Wyoming Game and Fish Department letter dated October 21, 2009

Appendix A

June 23, 2010
Project No. 0116974

Environmental Resources Management Southwest, Inc.
15810 Park Ten Place, Suite 300
Houston, Texas 77084-5140
(281) 600-1000

WYOMING GAME AND FISH DEPARTMENT

5400 Bishop Blvd. Cheyenne, WY 82006

Phone: (307) 777-4600 Fax: (307) 777-4610

Web site: http://gf.state.wy.us

October 21, 2009

WER 11945
WEST, Inc
Draft Wildlife Baseline Study Plan
Hermosa Wind Resource Area
Albany County

Kenton Taylor
WEST, Inc.
2003 Central Ave
Cheyenne, Wyoming 82001

Dear Mr. Taylor:

In a letter dated June 22, 2009, WGFD stated that our main aquatic concern would be the road crossings of perennial streams within the proposed wind project. Since that letter, our knowledge and concerns about impacts of wind projects on aquatic resources have continued to evolve.
In a letter dated April 2, 2009, WGFD stated that our main aquatic concern would be the road crossings of perennial streams within the proposed wind project. Since that letter, our knowledge and concerns about impacts of wind projects on aquatic resources have continued to evolve.

We have attached new protocols for protecting aquatic resources.

Because we are not sure if or how these protocols will affect your project, we would like to meet with a representative from your company to discuss these new protocols and together develop the appropriate monitoring protocols for your specific wind development project. Please contact Mr. Rick Huber, Staff Aquatic Biologist, at 307-777-4558.

Sincerely,

John Emmerich
for Deputy Director

JE: MF:sg
Attachment

cc: USFWS

Attachment
Aquatic Monitoring
October 21, 2009

Wind development projects are not likely to directly impact aquatic resources unless a new structure is built on a perennial stream. However, we are concerned with the indirect and cumulative impacts to aquatic resources associated with the construction of a wind farm. The construction of roads and pads will change how water runs off the landscape. This change will affect the infiltration rate of water, increase the velocity and quantity of water running across the landscape, and potentially could increase erosion and sediment deposition into nearby waterways. Roads have the potential for having the most profound impact on hydrology. Changes in hydrology across the landscape will then be reflected in changes in the geomorphology of perennial streams downstream of the project area. Ultimately, changes in geomorphology will directly influence aquatic habitat which may impact fish populations.

Currently, we have little information regarding the effects of wind energy development on aquatic habitats. Much is known, however, about the effects of increased sediment in streams. Stream channels respond to increased sediment supply by adjusting their pattern (sinuosity) and dimensions. These changes may result in decreased pool depths, decreased riffle area, less diversity in channel substrate and increased lateral instability marked by eroding banks. These changes along with direct effects from increased sediment loading can affect macroinvertebrate populations and diversity and decrease fish habitat. A common impact is a decrease in gravel and cobble used by spawning fish.

Additional information is needed regarding the effects of wind energy development on aquatic habitat. It is recommended that geomorphological studies of nearby waterways be conducted and monitoring of cumulative impacts from culverts and roads with 5% slope or greater be conducted. Detailed recommendations follow below:

Culverts

Monitoring Cost: Minimal. Estimated at <$5,000 life of project using existing personnel.

The purpose of monitoring culverts is to determine the cumulative impacts of changing the upland surface hydrology, erosion and deposition, and to ensure that they are functioning as designed and they are being maintained.

The following is a recommended reference for the minimum guidelines for culvert sizing and placement: the BLM's Gold Book or the Forest Service Handbook 7709.56b.

- Collect GPS coordinates or other location specific information for each culvert site
- Collect pre-construction photographs of the planned culvert site; upstream and downstream
- Collect construction photographs of the planned culvert site following construction phase roadway installation (temporary XX ft. width) and following final roadway installation (permanent XX ft. width).

- Typical SWPPP monitoring and maintenance requirements will apply during construction phase of the project.
- Collect post-construction photographs of the culvert site; upstream and downstream.
- Following completion of final roadway and shoulder installation (permanent XX ft. width), place a graduated fence post upstream and downstream of each culvert. The posts should have visible markings every 2" to provide a visual reference within each photograph. Fence posts should be placed within 50 feet of the culvert openings. Posts should be placed outside of the main flow channel so they are not directly affected by storm flow events. Each fence post location will be referenced by GPS or other location specific information.
- GPS or otherwise identify the site where photographs will be taken for the upstream and downstream view.
- Following completion of final roadway and shoulder installation (permanent XX ft. width), culverts and accompanying fence posts will be monitored/photographed three times a year (spring after snow melt, summer, and fall) and after rainfall events accumulating greater than ½ inch of precipitation as measured at the nearest National Weather Service Monitoring point (if within 10 miles of the site) or at the Facility operations and maintenance building. The summer monitoring period can include a thunderstorm event as long as the monitoring occurs within seven days after the thunderstorm.
- Make photographs available for WGFD review within 30-60 days.
- Monitoring will continue for two-years post SWPPP release, and will be re-evaluated by XXXX (industry) and WGFD for necessity following that period.

If the photographs reveal observable changes from erosion or deposition, consultation between WGFD and industry will occur.

Roads with 5% or greater slope

Monitoring Cost: Minimal. Estimated at <$5,000 life of project using existing personnel.

The purpose of monitoring roads with 5% or greater slope is to determine the cumulative impacts of changing the upland surface hydrology, erosion and deposition, and to ensure that the long-term BMPs that were installed are still functioning and are being maintained.

- Collect GPS coordinates or other location specific information for each 5% roadway slope monitoring point
- Collect pre-construction photographs of each 5% roadway slope monitoring site; upstream and downstream
- Collect construction photographs of each 5% roadway slope monitoring site following construction phase roadway installation (temporary XX ft. width) and following final roadway installation (permanent XX ft. width).
- Typical SWPPP monitoring and maintenance requirements will apply during construction phase of the project.
- Collect post-construction photographs of the 5% roadway slope monitoring site; upstream and downstream.

- Following completion of final roadway and shoulder installation (permanent XX ft. width), place a graduated fence post midway down the 5% roadway slope and at the bottom of the slope in the drainage ditch / shoulder on the side of the road. If drainage ditches are installed on both sides of the road, graduated fence posts will be placed on both sides of the road. The posts should have visible markings every 2" to provide a visual reference within each photograph. Posts should be placed outside of the main flow channel so they are not directly affected by storm flow events.
- Each fence post location will be referenced by GPS or otherwise identified.
- GPS or otherwise identify the site where photographs will be taken.
- Following completion of final roadway and shoulder installation (permanent XX ft. width), fence posts will be monitored/photographed three times a year (spring after snow melt, summer, and fall) and after rainfall events accumulating greater than ½ inch of precipitation as measured at the nearest National Weather Service Monitoring point (if within 10 miles of the site) or at the Facility operations and maintenance building. The summer monitoring period can include a thunderstorm event as long as the monitoring occurs within seven days after the thunderstorm.
- Photographs will be made available for WGFD review within 30-60 days.
- Monitoring will continue for two-years post SWPPP release, and will be re-evaluated by XXXX (industry) and WGFD for necessity following that period.

If the photographs reveal observable changes from erosion or deposition, consultation between WGFD and industry will occur.

XXXX River/Creek Channel Monitoring

We are providing a brief description of the Rosgen Level II and Level III morphological studies (below) that we may recommend to determine if this project will have an impact on the aquatic habitat of XXXX River/Creek. We strongly recommend that the project proponent contact the Department to review the project and we can discuss recommendations on the type of morphological study that we would like completed.

If a wind project occurs within a Blue Ribbon trout stream watershed, a watershed that contains a SWAP NSS 1 or 2 species or within an Aquatic Crucial Habitat Priority Area, we are more likely to recommend that a Level III study be completed (see *Implementation Guidelines* below). However, we are willing to work with the project proponent to design a study that meets both of our needs.

Background: Watershed Assessment of River Stability and Sediment Supply (WARSSS)

This systematic methodology starts with general office-based methods and becomes progressively more detailed and field-data intensive as the need and location for collecting quantitative data become more apparent.

Monitoring Cost: The cost is highly variable depending on the scope and intensity of sampling. The sampling scheme will depend on the watershed and project characteristics. Performing a Reconnaissance Level Assessment (RLA; see below) requires one to a few office days and could

cost approximately $5,000. Performing the Rapid Resource Inventory for Sediment and Stability Consequence (RRISSC; see below) requires about 1 week depending on data availability. Cost is estimated at $5,000-$10,000. Performing a Prediction Level Assessment (PLA), if needed, would entail about $12,000 per sampling occasion/reach. At least 4 sampling occasions/reaches would be required (before/after project implementation, upstream/downstream of project area).

The following descriptions of the WARSSS methodology are quotes from Rosgen (2006) and are provided here as background information:

> Watershed Assessment of River Stability and Sediment Supply (WARSS) is a geomorphology-based procedure for quantifying the effects of land uses on sediment relations and channel stability (Pg. 1-1).
>
> The WARSS methodology provides the following (Pg. 1-1):
> - A mechanism to put fundamental geomorphic principles into practice;
> - A consistent, quantitative and comparative analysis that minimizes subjective bias;
> - Watershed-based and specific river reach assessments;
> - Linkages between various land uses and their associated sources of accelerated sediment supply;
> - A procedure that rapidly prioritizes high-risk sub-watersheds and river reaches at broad "screening" levels yet provides for more detailed assessments;
> - Methods to assess the probability, risk, and potential consequences of sediment problems despite the inevitable gaps in knowledge, large uncertainty and spatial and temporal variability;
> - A basis for mitigation and / or restoration plans that isolates processes responsible for high risk / adverse sediment-related consequences or watersheds and river systems;
> - A companion assessment that can be related to aquatic habitat;
> - A summary of output parameters useful for assessment of sediment consequences;
> - A time-integrated procedure to assess sediment and stability problems of the past and present to help set environmentally sound management direction for the future.
>
> WARSSS identifies the hillslope, hydrologic and channel processes responsible for significant changes in erosion, sedimentation and related stream channel instability. It uses a three-phase assessment process to quickly separate areas into low-, moderate- and high-risk landscapes and / or river reaches (Pg. 1-2).
>
> The results of the WARSSS assessment reveal significant, adverse influences of land uses on stream channel stability, sediment sources and sediment yield that may affect the material beneficial uses of rivers and streams. WARSSS data can be used for watershed planning, "clean sediment" Total Maximum Daily Load

> (TMDL) assessments for non-point source pollution and stability analysis for river restoration (Pg. 1-2).
>
> The Reconnaissance Level Assessment (RLA) is the first and most general phase of the three WARSSS assessment phases. It provides a broad overview of the landscape while focusing on processes that may affect sediment supply and channel stability (Pg. 3-1).
>
> Sensitive landscapes, potentially unstable stream systems and sediment-generating land use activities need to be identified, prioritized and evaluated for potential impacts at a level of detail beyond their initial RLA analysis. The Rapid Resource Inventory for Sediment and Stability Consequence (RRISSC) provides this finer level of analysis (Pg. 4-1).
>
> The Prediction Level Assessment (PLA), the most detailed level of the WARSS methodology, is reserved for sub-watersheds and river reaches previously identified as being at high risk for sediment and / or river stability problems… PLA compares direction, rate, nature and extent of departure of existing sediment and channel stability to a reference condition typical of stable, natural land and stream conditions (Pg. 5-1).

A Rosgen Level II assessment consists of a morphological description of stream channel conditions at a reach. A Level III is synonymous with the RLA and includes all the aspects of a Level II assessment plus assessments of river stability, bank erosion, sediment competence, and sediment transport capacity.

WARSSS Implementation Guidelines:

The following approach is recommended for applying the WARSSS methodology in the watershed upstream from the project area:

1) Perform the Reconnaissance Level Assessment (RLA) of the WARSSS methodology to identify sediment sources and existing channel stability problems,
2) Perform the Rapid Resource Inventory for Sediment and Stability Consequence (RRISSC) to identify and clarify potential natural sediment and channel problem areas and to put potential project-related impacts in context.
3) Based on the results of the RLA and RRISSC, identify channel monitoring reach (es) for collection of Level II and / or Level III data. At this stage, it is recommended the project proponent contact the Department to discuss the nature and extent of monitoring needed.
4) At a minimum, monitoring is anticipated to include completing a Rosgen Level II assessment at one reach downstream from the project area (or in an area potentially impacted by the project) and repeating measurements following a high flow/bankfull event or one year from the preconstruction survey (see Rosgen Level II section below).
5) For projects closely associated with streams, located in a watershed with a Blue Ribbon trout stream, a watershed that contains a SWAP NSS 1 or 2 species or within an Aquatic Crucial Habitat Priority Area, we are more likely to recommend additional monitoring reaches, reference reaches, and PLA (Level III) data be collected.

6) If PLA (Level III) data is collected, data will need to be collected at a minimum of one reference reach either upstream of the project area or from a reach having the same stream and valley type.
7) If PLA (Level III) data is collected, monitoring will consist of repeating measurements following a high flow/bankfull event or one year from the preconstruction survey.
8) Complete the various intermediate and summary worksheets associated with the Level II and Level III work to allow interpretation of project level impacts compared to natural or existing conditions.

All data including GPS locations of cross section pins, upstream and downstream locations, photographs, survey data, pebble count data, summary worksheets, etc. should be made available to the WGFD Staff Aquatic Biologist, Environmental Protection Program, within six months.

Rosgen Level II Morphological Study

Monitoring Cost: Estimated at less than $10,000 per sampling occasion/study reach.

The purpose of this monitoring is to measure cumulative impacts on stream channels and associated fish habitat from all surface disturbing activities including the road system, culvert placement, and pad development. The monitoring would detect changes that result in decreased pool depths, decreased riffle area, less diversity in channel substrate and increased lateral instability marked by eroding banks. Detecting these stream channel changes could indicate a need for upstream road improvements in design or maintenance.

We recommend monitoring XXXX River/Creek at a site downstream of the project area, RXXN, TXXW, Section XX. A repeated Level II stream channel morphological description (Rosgen 1996; Rosgen 2008) is the minimum level of monitoring recommended. The Level II monitoring addresses "…questions of sediment supply, stream sensitivity to disturbance, potential for natural recovery, channel response to flow regime, and fish habitat potential. These questions require, at a minimum, interpretations based on data and information developed at least to the resolution of a Level II classification" (page 5-1 *in* Rosgen 1996).

Additional Level III assessment as described in Watershed Assessment of River Stability and Sediment Supply, WARSSS (Rosgen 2006), while extremely valuable for understanding sediment dynamics and channel processes, is not being recommended at this time. The recommended Level II data will be valuable for determining if a Level III assessment is warranted in the future.

Establishing and monitoring an additional geomorphology reach upstream of the impact area would help discriminate project impacts from natural events. Although establishing such a reach would be very informative and is encouraged, the minimum monitoring recommended at this time is to establish a single reach downstream of the project area and identify potential project-related channel changes by repeating measurements as described below. This approach will describe current channel conditions and allow general inferences about impacts to stream channels.

Field techniques should follow the guidelines outlined in: Harrelson, C.C., C.L. Rawlins and J.P. Potyondy (1994); in Chapter 2 of Rosgen (2008); and in Chapter 5 of Rosgen (1996). As part of the Level II characterization, data collection considerations should include:

- A cross section through a riffle. If riffle features are not readily apparent from a longitudinal profile or other features, a relative straight section between meander curves can be selected. Geo-reference the site with coordinates of transect endpoints and with photographs. Cross section end points should be at an elevation of at least 2 times the maximum depth at the bankfull stage to ensure that the floodprone width is included in the survey.
- Longitudinal profile through a minimum of two meanders. Site will be geo-referenced with photographs. The profile should include thalweg, water surface, bankfull and low bank points. Adequate points should be surveyed to identify pool, riffle, run, and glide features and slopes.

Resurvey the reach and collect Level II data following a high flow/bankfull event or one year from the preconstruction survey.

Resurvey the reach and collect Level II data two years post construction.

Additional monitoring may be needed if impacts are occurring.

All data including GPS locations of cross section pins, upstream and downstream locations, photographs, survey data, pebble count data, etc. should be made available to the WGFD Staff Aquatic Biologist, Environmental Protection Program, within six months.

References:

Harrelson, C.C., C.L. Rawlins and J.P. Potyondy. 1994. Stream Channel Reference Sites: An Illustrated Guide to Field Technique. Gen. Tech. Rep. RM245. Rocky Mountain Forest and Range Experiment Station

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Rosgen, D. 2008. River Stability Field Guide. Chapter 2. Wildland Hydrology, 11210 N County Rd 19, Fort Collins, CO.

Amphibians

Potential impacts to amphibians species will vary based upon location and species present. Impacts that could potentially occur include: 1) mortality associated with infrastructure development; 2) disturbance due to shadow flicker; 3) disturbance due to noise; 4) collision and mortality due to vehicles.

Information regarding the effects of wind energy development on amphibians is lacking. Wind energy development is likely to affect each amphibian species differently based upon life history. Permanent bodies of water, wetlands, ephemeral pools, and playas are of particular concern. Amphibians are highly dependent on water to complete their lifecycle (aquatic tadpole or larval phase). Loss of water on the landscape during the larval period could negatively affect amphibian populations. This effect could be exacerbated with successive years of water loss. Road mortality may increase during specific times of year based upon breeding chronology. Spring breeding migrations and summer post-metamorphic emergence, result in amphibian congregations. Large mortality events could occur if these congregations were located on or near roads. Roads should not bisect or run immediately adjacent to any water feature, or prevent anurans from reaching adjacent habitat. Wind turbines should be placed away from water features. Noise and shadow flicker could interrupt breeding congregations of frogs and toads. Additional data is needed regarding the effects of wind energy development on amphibians. It is recommended that surveys be conducted on a diverse array of amphibians and habitats to ensure that impacts are minimized.

Reptiles

Potential impacts to reptile species will vary based upon location and species present. Impacts that could potentially occur would include: 1) mortality associated with infrastructure development; 2) direct mortality from workers (e.g., deliberate killing of snakes); 3) disturbance due to shadow flicker; 4) collision and mortality due to vehicles.

Information regarding the effects of wind energy development on reptiles is lacking. Wind energy development is likely to affect reptile species differently based upon life history. Development infrastructure could potentially increase basking opportunities for many reptiles, but could disturb daily routines due to shadow flicker and noise disturbance. Many reptile species are dependent on rocky outcroppings or accessible geologic features for hibernation. It is recommended that these features are avoided to ensure the integrity of hibernacula (overwintering areas or dens). Additionally, many species of reptile are reliant on cover features present on the landscape. It is recommended that fence rows, fallen trees, prairie dog colonies, and potential basking rocks are left in the condition in which they were found. Direct road mortality is of particular concern for reptile species. It is recommended that the minimum amount of roads be placed upon the landscape. Drivers should be instructed to avoid reptiles that are basking upon road surfaces, and taught procedures for dealing with prairie rattlesnakes. Additional data is needed regarding the effects of wind energy development on reptiles. It is recommended that surveys be conducted on a diverse array of reptiles and habitats to ensure that impacts are minimized.

Herptiles

The following recommendations constitute protocols for collecting baseline reptile and amphibian data. Specific questions or management concerns may dictate the alteration of these recommendations. Additional useful studies would include research on reptile and amphibian habitat utilization, population estimates, and food web / predator-prey interactions.

Amphibian Survey Protocols

1.) Create habitat maps for development area, taking into account ephemeral water features such as vernal pools and playas. Mapping will occur within 200 meters from proposed roads (100 meters on each side) and a circular radius of 500 meters from each pad.
2.) Contact the Wyoming Game and Fish Department to determine sensitive habitats or species within the development area. If amphibian monitoring is required, amphibian protocols can vary based upon species present. Examples of requested protocols could include:
    a. Acoustic breeding surveys should be conducted at least three times annually on all water features. Surveys periods should be temporally spaced to include peak calling of all amphibians estimated to be within the study area.
    b. During spring, small funnel traps should be placed in aquatic features to assess salamander populations.
    c. During late summer, visual encounter surveys should be conducted to look for post-metamorphic anurans. These surveys should be designed to assess recruitment into the population. Surveys should have a time or area constraint in order to estimate relative abundance.
    d. Additional protocol information can be found in the reference: Measuring and monitoring biological diversity: standard methods for amphibians. 1994. W. R. Heyer, M. A. Donnelly, R.W. McDiarmid, L.A. C. Hayek, and M. S. Foster, editors. Smithsonian Institution, Washington, D.C. Pp 364.
3.) Mitigation may be required if sensitive habitats or species are impacted.
4.) Because of breeding chronology and the secretive nature of some species, two years of survey are recommended before development begins. During pre-development surveys, important amphibian areas (such as breeding sites) should be designated for avoidance during construction. Surveys should be conducted at least three years post-construction to determine possible effects of development on amphibian species.

Reptile Survey Protocols

1) Create habitat maps for development area, taking into account major habitat types. Mapping will occur within 200 meters from proposed roads (100 meters on each side) and a circular radius of 500 meters from each pad.
2) Contact the Wyoming Game and Fish Department to determine sensitive habitats or species within the development area. If monitoring is required, reptile protocols can vary based upon species present. Examples of requested protocols could include:
    a. Perform multiple time or area constrained reptile surveys in all available habitats. Surveys should be designed to look for species presence and relative abundance. Surveys should take into consideration the natural history of all reptiles species thought to be on the study area. Special effort should be made to survey potential reptile hibernacula during spring and fall migrations.
    b. Effort should be made to look for secretive species. This could include night surveys, flipping cover objects, or setting drift fences along specific habitat features.
    c. Road mortality surveys should be conducted to determine the effects of roads on local reptile species.

d. Additional information regarding survey protocols may be found in the draft PARC document: **Inventory and Monitoring: Recommended Techniques for Reptiles and Amphibians, with application to the United States and Canada** (Accessed 20 August 2009).

3) Mitigation may be required if sensitive habitats or species are impacted.
4) Because of the secretive nature of many reptile species, it is recommended that surveys begin at least two years in advance of infrastructure development. During pre-development surveys, important reptile areas (such a hibernacula) should be designated for avoidance during construction. Surveys should continue at least 3 years post-construction to determine the effects of development on reptile species.

Wetland Delineation Report (ERM 2010)

Appendix B

June 23, 2010
Project No. 0116974

Environmental Resources Management Southwest, Inc.
15810 Park Ten Place, Suite 300
Houston, Texas 77084-5140
(281) 600-1000

Supporting Maps

Appendix C

June 23, 2010
Project No. 0116974

Environmental Resources Management Southwest, Inc.
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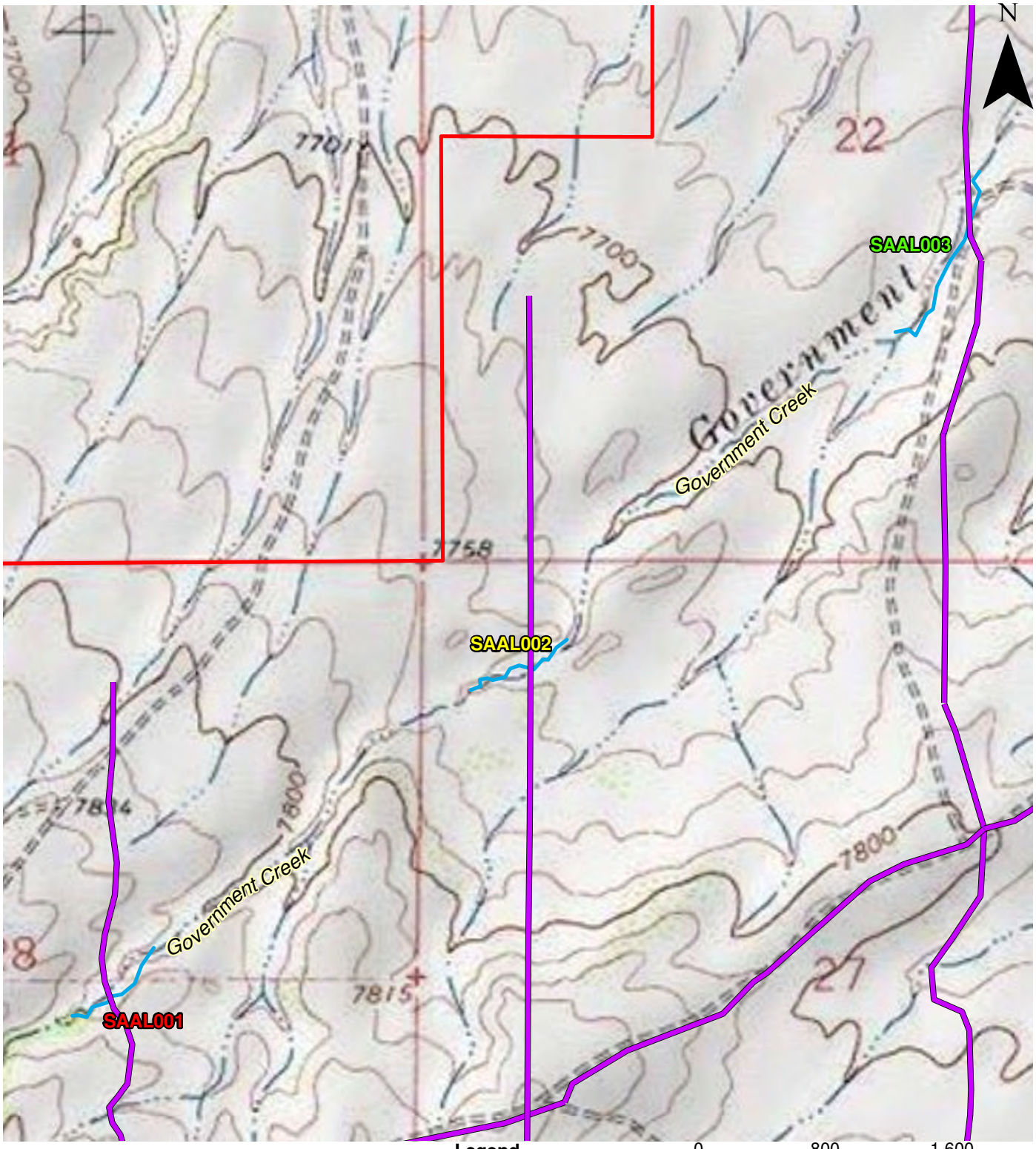
(281) 600-1000

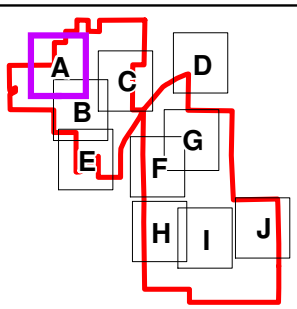


Legend

- Roads
- Delineated Waterbodies
- Hermosa West Wind Farm Project Area

0 800 1,600 Feet

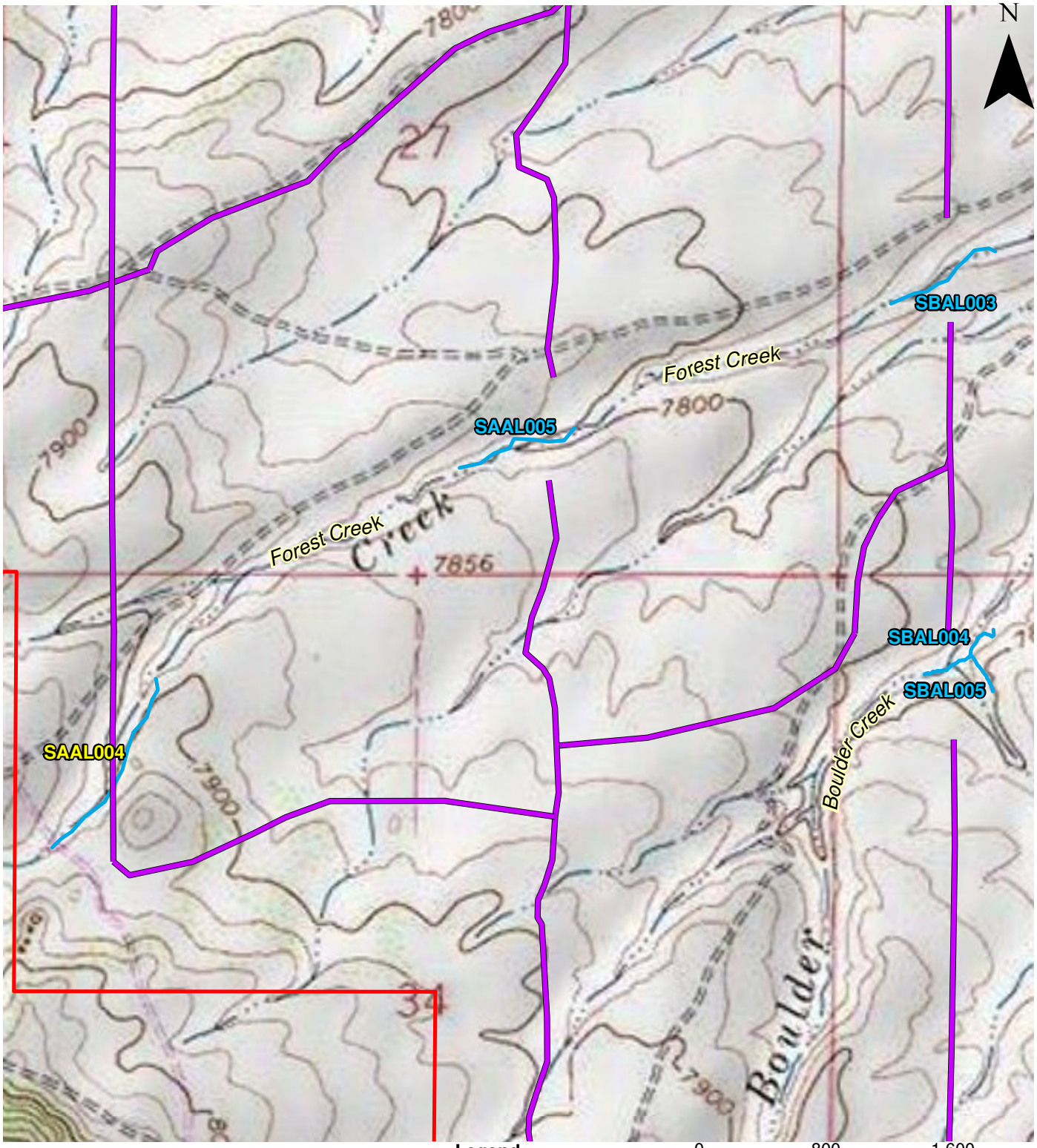
Map A



Red Text High Erodibility Risk Stream Crossing Location
Yellow Text Medium Erodibility Risk Stream Crossing Location
Green Text Low Erodibility Risk Stream Crossing Location
Blue Text Waterbody Avoided by Project Design

Note: When printed at 8.5" x 11", the scale of this map is 1:10,000.

I:\GIS\Shell\Hermosa\projects\stream assessment\stream_mapbook.mxd
g:\2010\0116974\15082H(AppC).pdf



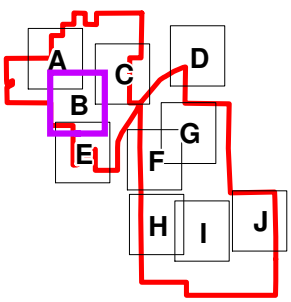
Legend

0 800 1,600 Feet

Roads

Delineated Waterbodies

Hermosa West Wind Farm Project Area



Map B

Red Text High Erodibility Risk Stream Crossing Location

Yellow Text Medium Erodibility Risk Stream Crossing Location

Green Text Low Erodibility Risk Stream Crossing Location

Blue Text Waterbody Avoided by Project Design

Note: When printed at 8.5" x 11", the scale of this map is 1:10,000.

I:\GIS\Shell\Hermosa\projects\stream assessment\stream_mapbook.mxd

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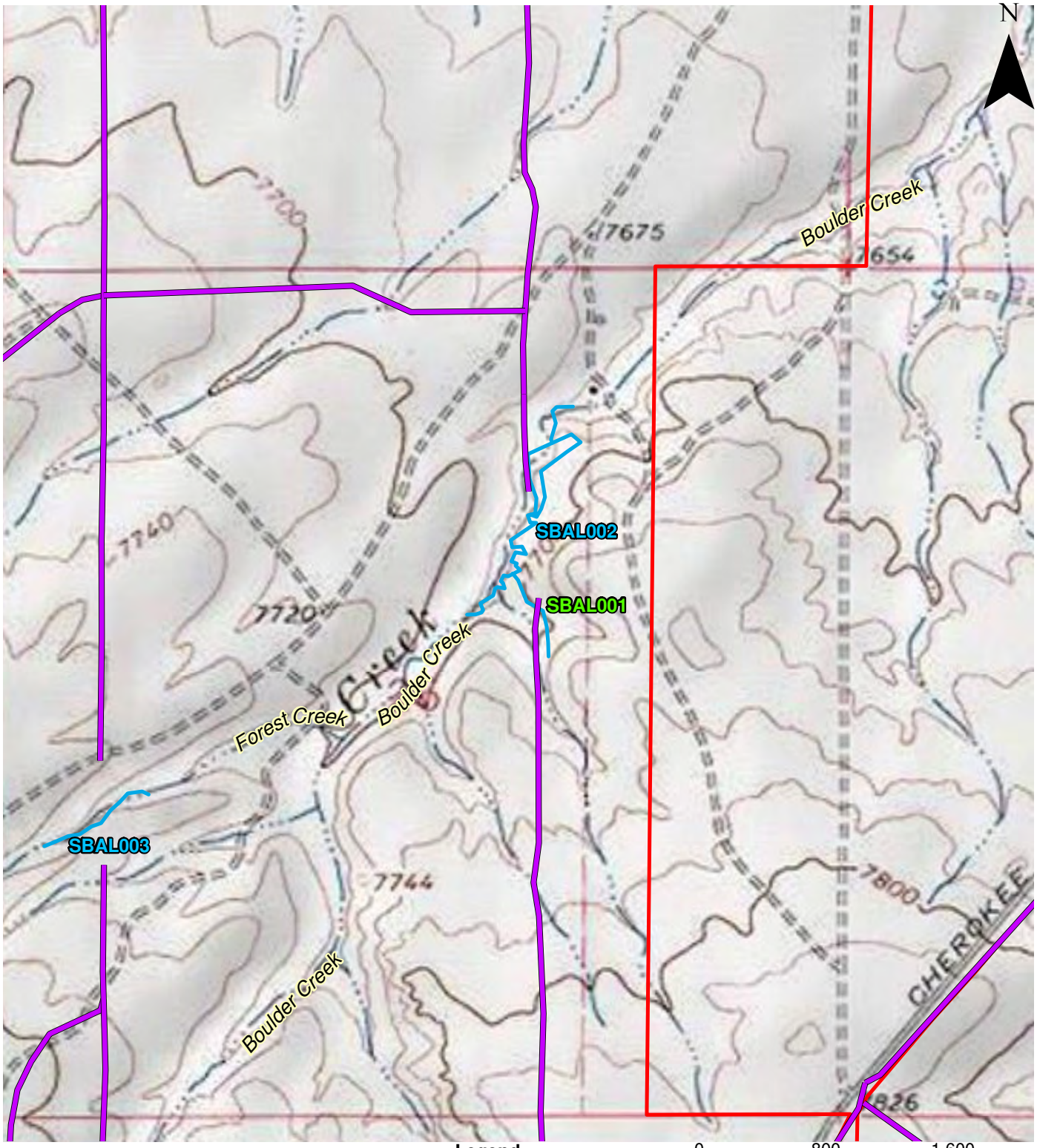
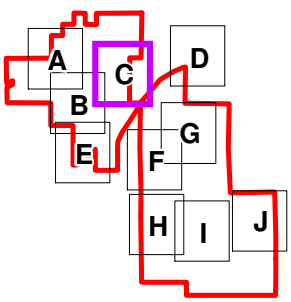


Legend

- Roads
- Delineated Waterbodies
- Hermosa West Wind Farm Project Area

0 800 1,600 Feet

Map C



Red Text High Erodibility Risk Stream Crossing Location

Yellow Text Medium Erodibility Risk Stream Crossing Location

Green Text Low Erodibility Risk Stream Crossing Location

Blue Text Waterbody Avoided by Project Design

Note: When printed at 8.5" x 11", the scale of this map is 1:10,000.

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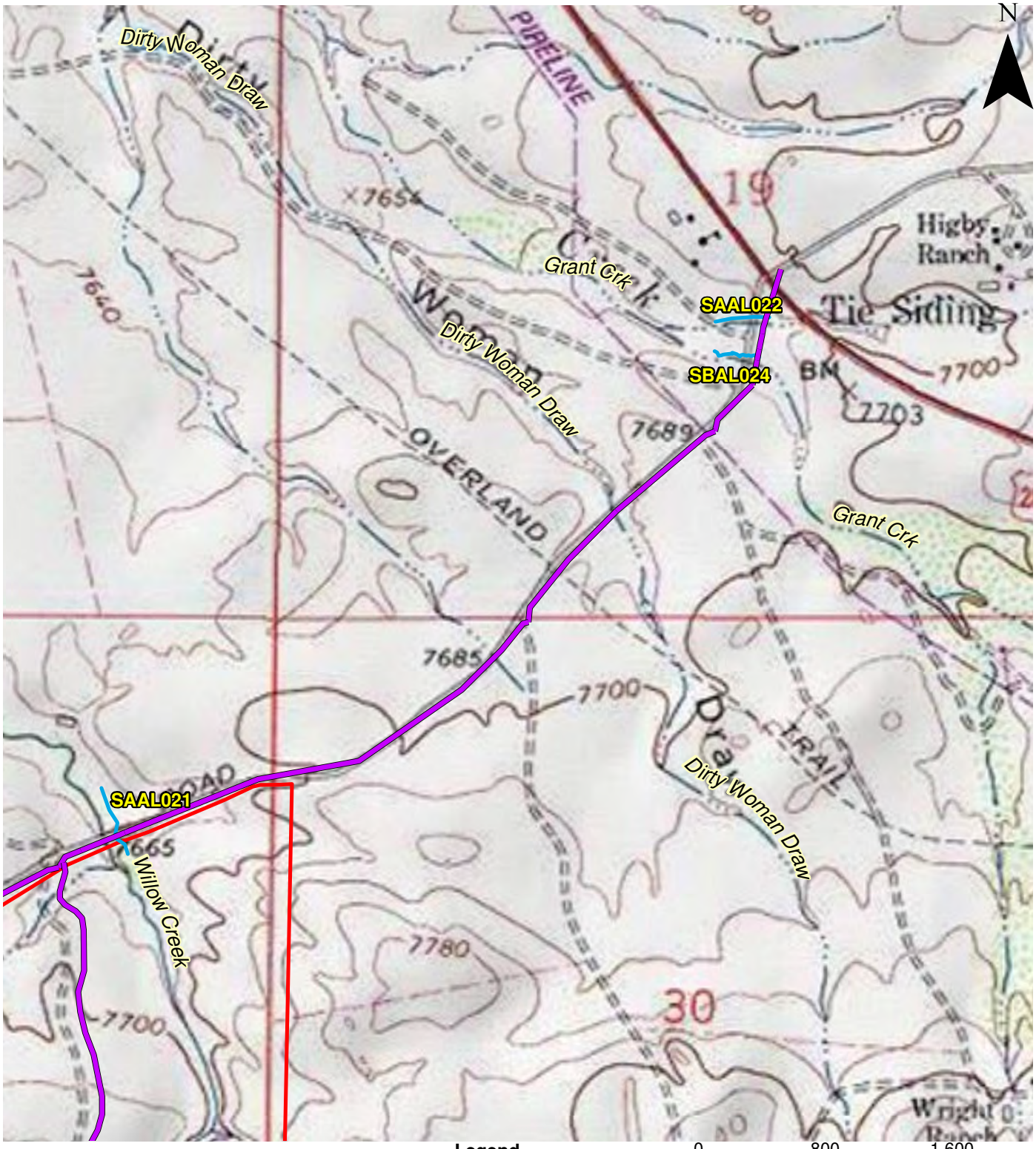

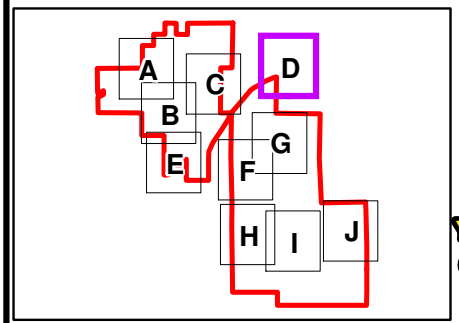

Legend

- Roads
- Delineated Waterbodies
- Hermosa West Wind Farm Project Area

0 800 1,600 Feet

Map D

Red Text High Erodibility Risk Stream Crossing Location

Yellow Text Medium Erodibility Risk Stream Crossing Location

Green Text Low Erodibility Risk Stream Crossing Location

Blue Text Waterbody Avoided by Project Design

Note: When printed at 8.5" x 11", the scale of this map is 1:10,000.

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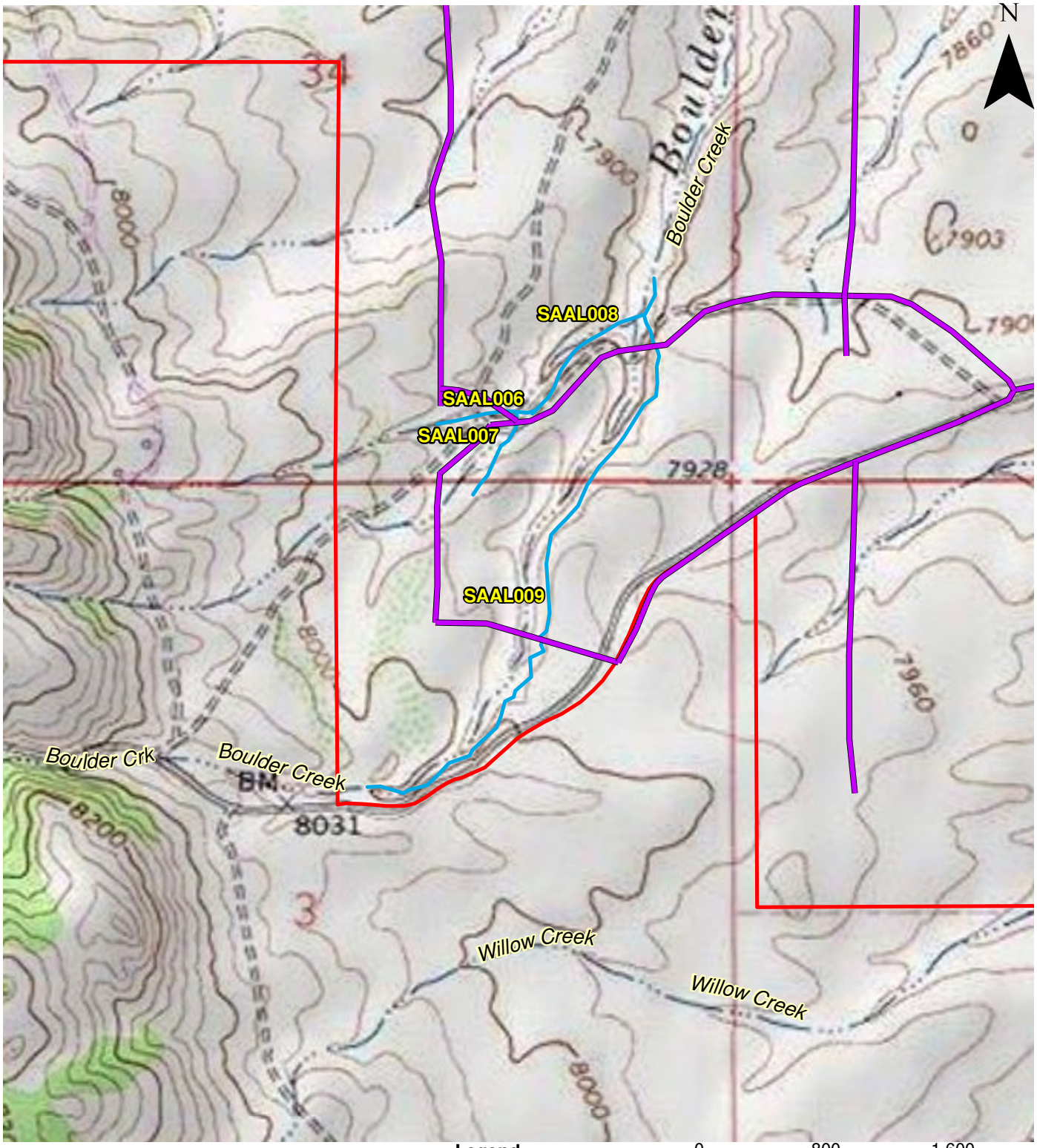

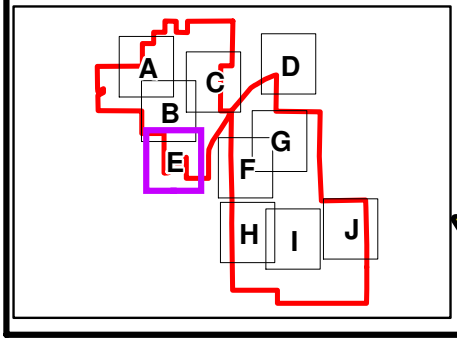

Legend

0 800 1,600 Feet

Roads

Delineated Waterbodies

Hermosa West Wind Farm Project Area

Map E

Red Text High Erodibility Risk Stream Crossing Location

Yellow Text Medium Erodibility Risk Stream Crossing Location

Green Text Low Erodibility Risk Stream Crossing Location

Blue Text Waterbody Avoided by Project Design

Note: When printed at 8.5" x 11", the scale of this map is 1:10,000.

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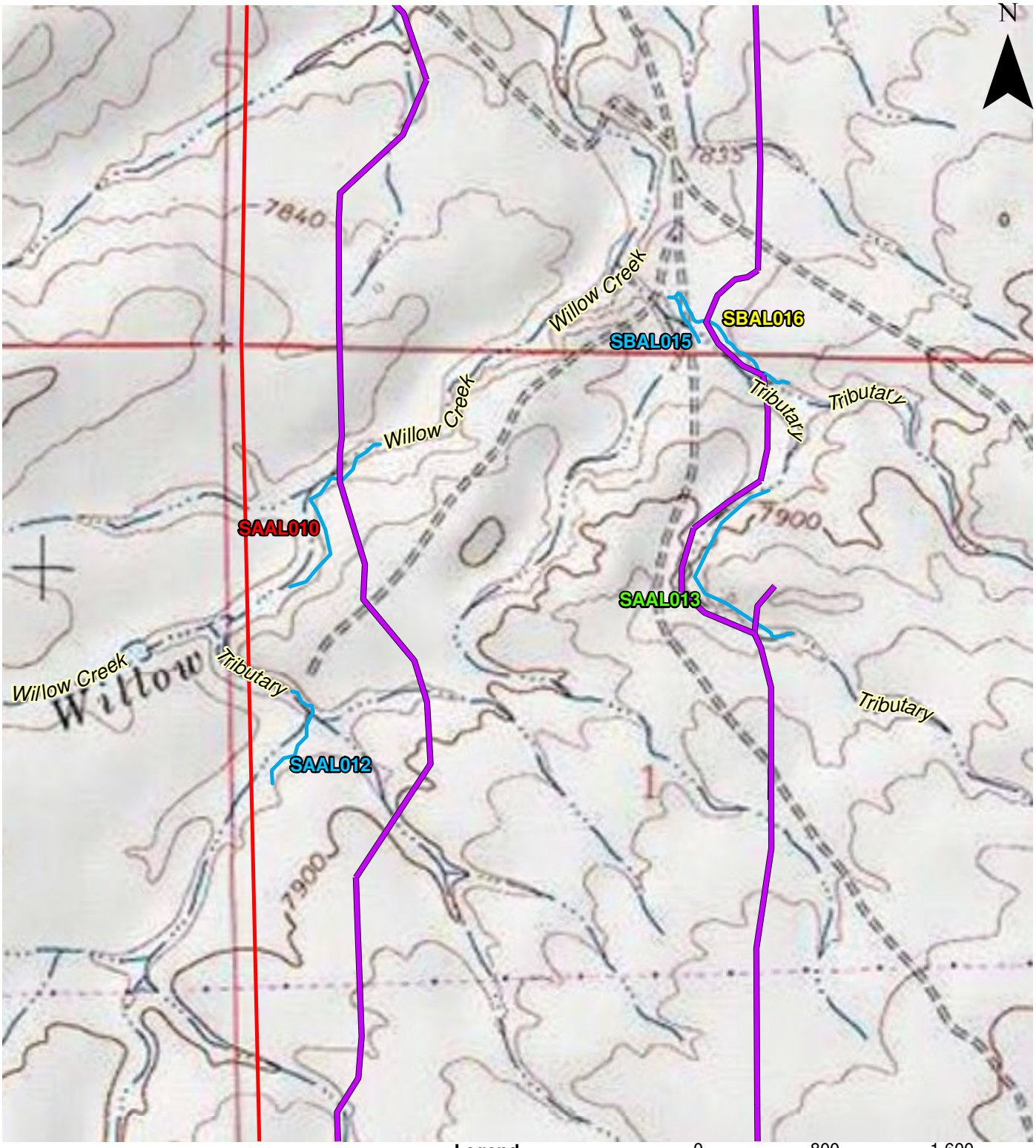

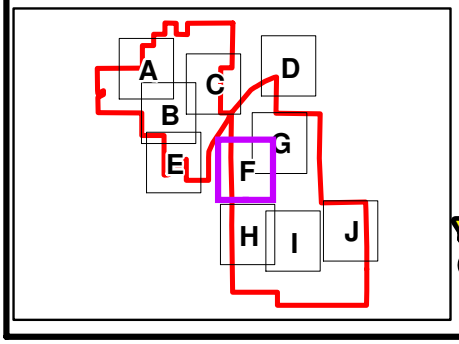

Legend

- Roads
- Delineated Waterbodies
- Hermosa West Wind Farm Project Area

0 800 1,600 Feet

Map F

Red Text High Erodibility Risk Stream Crossing Location
Yellow Text Medium Erodibility Risk Stream Crossing Location
Green Text Low Erodibility Risk Stream Crossing Location
Blue Text Waterbody Avoided by Project Design

Note: When printed at 8.5" x 11", the scale of this map is 1:10,000.

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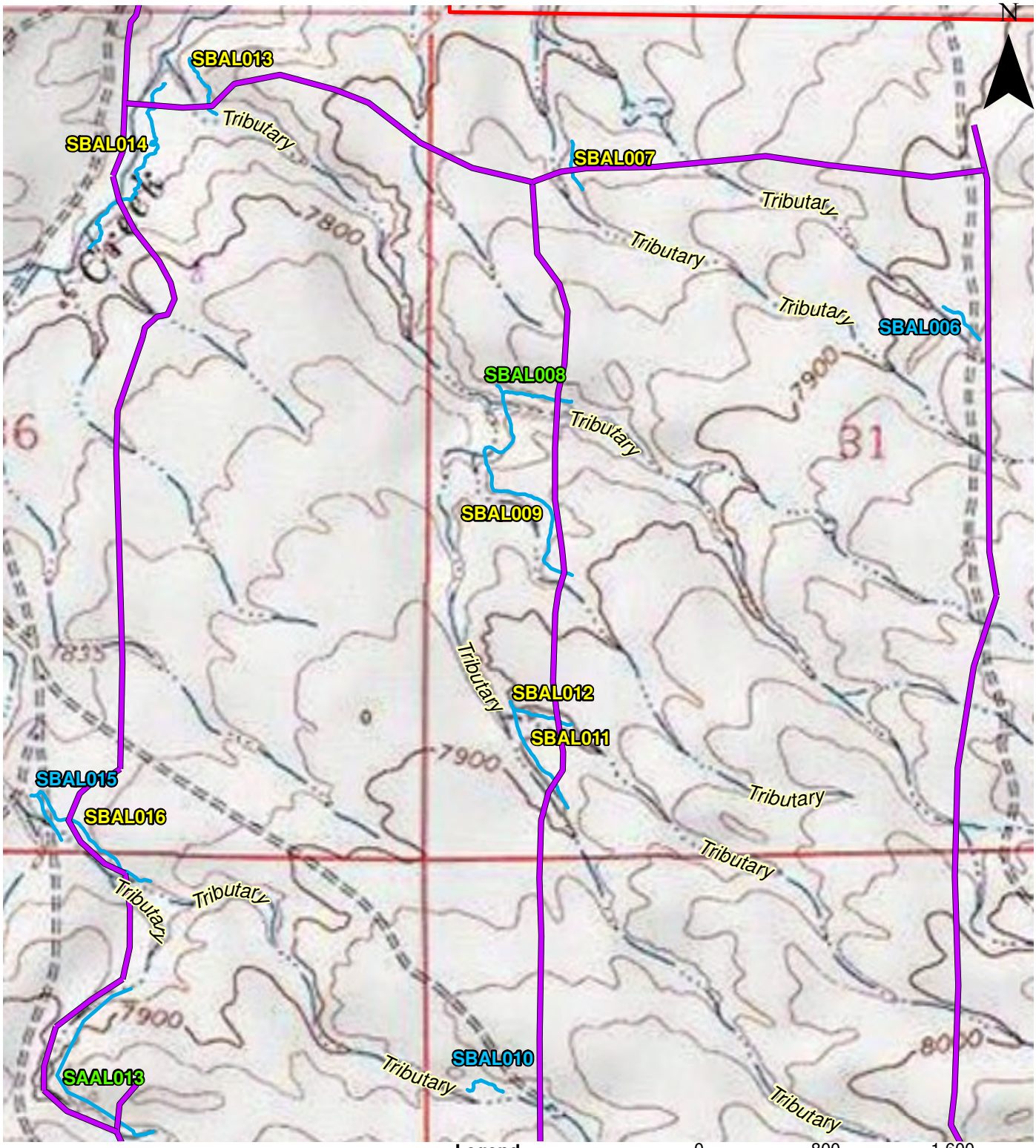

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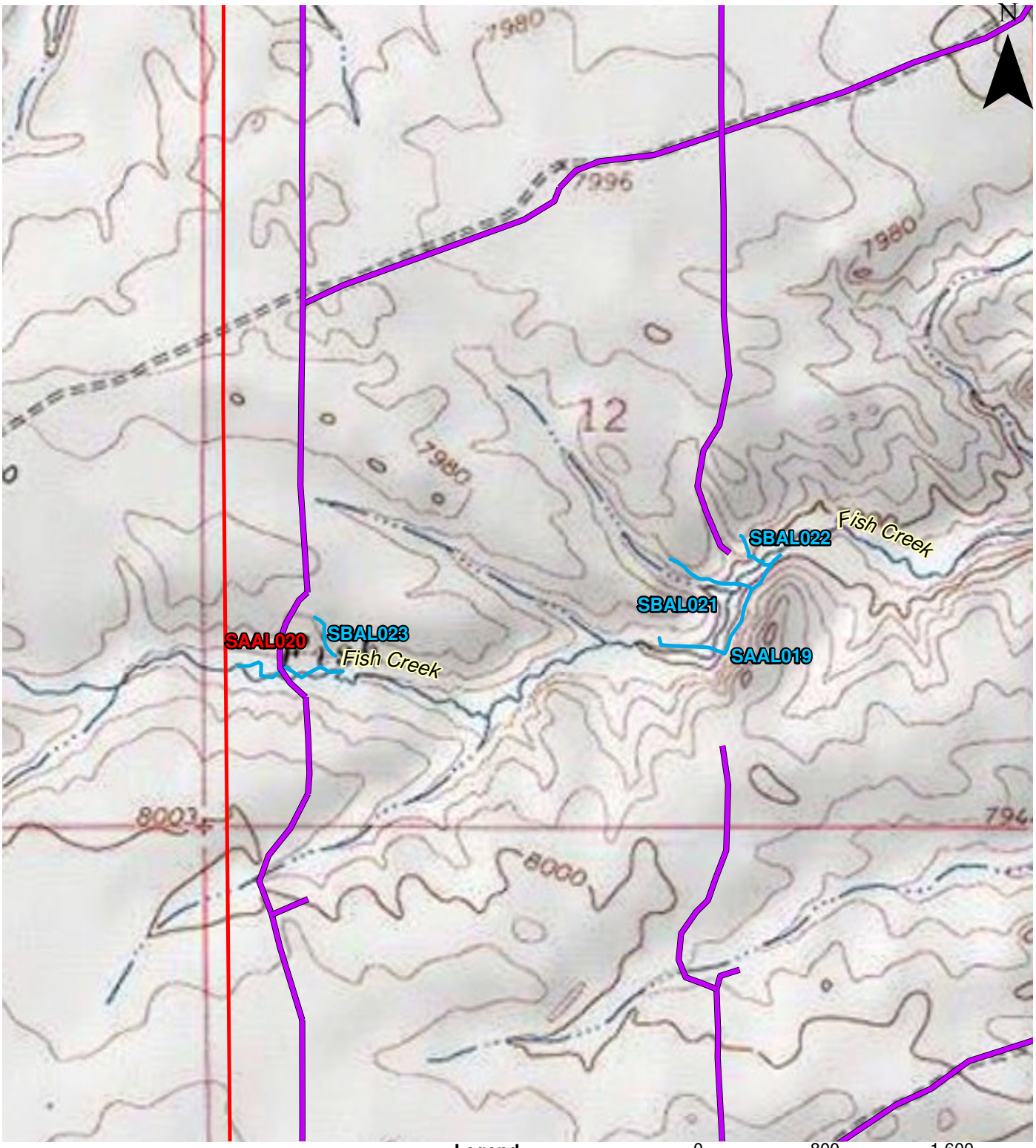

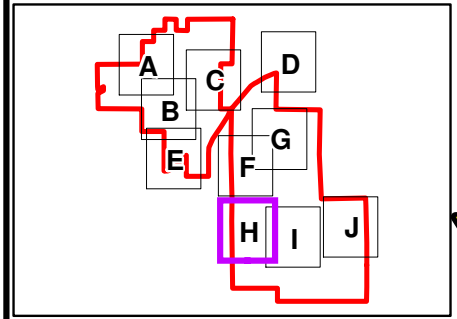

Legend

- Roads
- Delineated Waterbodies
- Hermosa West Wind Farm Project Area

0 800 1,600 Feet

Map H

Red Text High Erodibility Risk Stream Crossing Location

Yellow Text Medium Erodibility Risk Stream Crossing Location

Green Text Low Erodibility Risk Stream Crossing Location

Blue Text Waterbody Avoided by Project Design

Note: When printed at 8.5" x 11", the scale of this map is 1:10,000.

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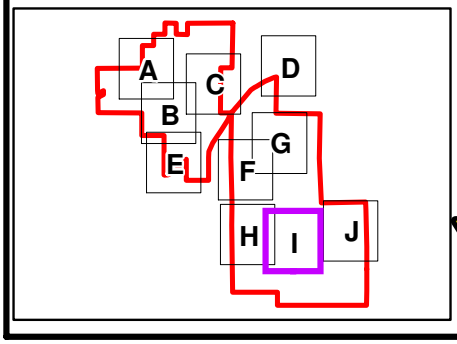

Legend

- Roads
- Delineated Waterbodies
- Hermosa West Wind Farm Project Area

0 800 1,600 Feet

Map I

Red Text High Erodibility Risk Stream Crossing Location
Yellow Text Medium Erodibility Risk Stream Crossing Location
Green Text Low Erodibility Risk Stream Crossing Location
Blue Text Waterbody Avoided by Project Design

Note: When printed at 8.5" x 11", the scale of this map is 1:10,000.

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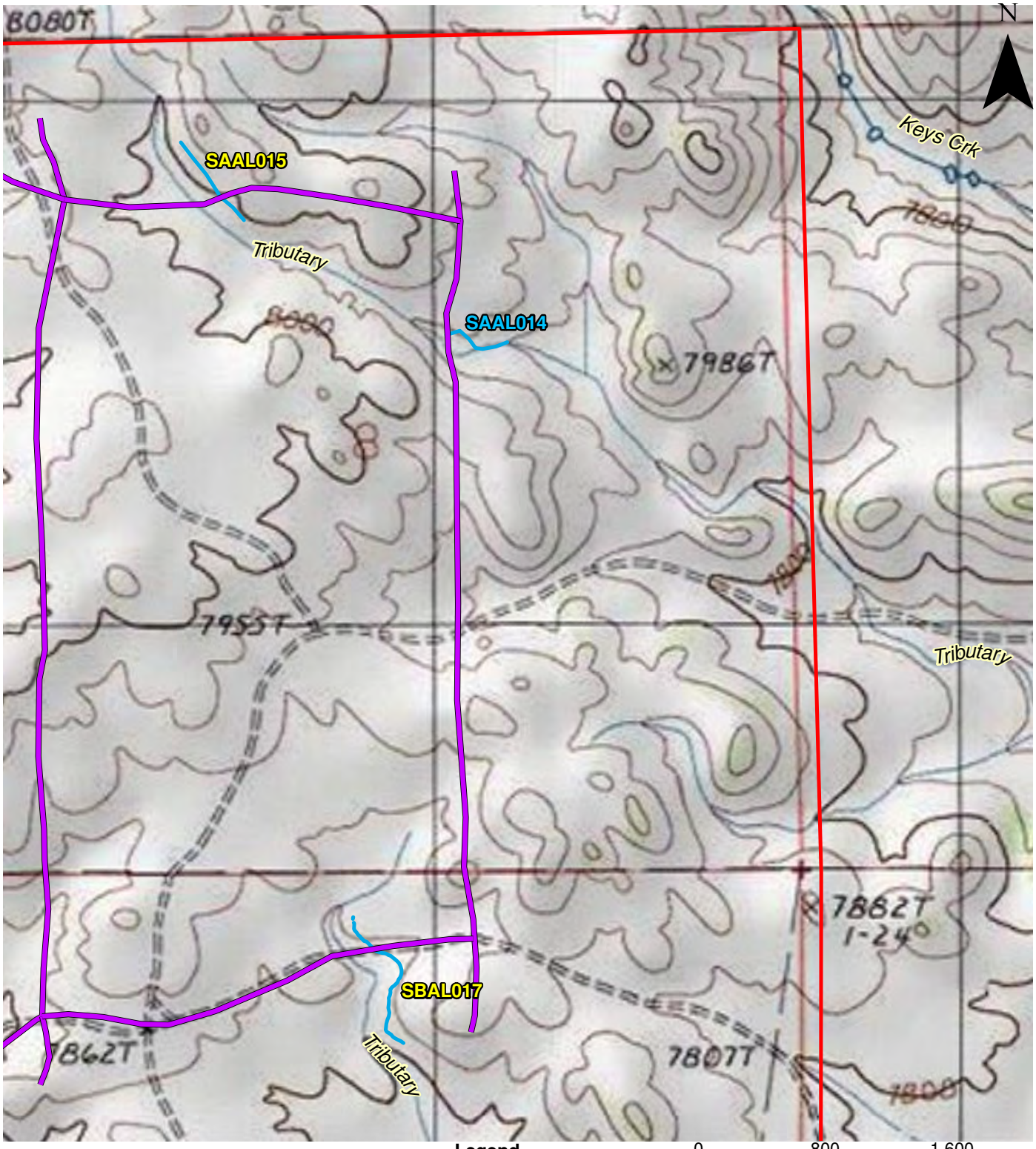

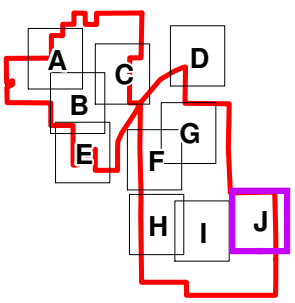

Legend

- Roads
- Delineated Waterbodies
- Hermosa West Wind Farm Project Area

0 800 1,600 Feet

Map J

Red Text High Erodibility Risk Stream Crossing Location
Yellow Text Medium Erodibility Risk Stream Crossing Location
Green Text Low Erodibility Risk Stream Crossing Location
Blue Text Waterbody Avoided by Project Design

Note: When printed at 8.5" x 11", the scale of this map is 1:10,000.

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