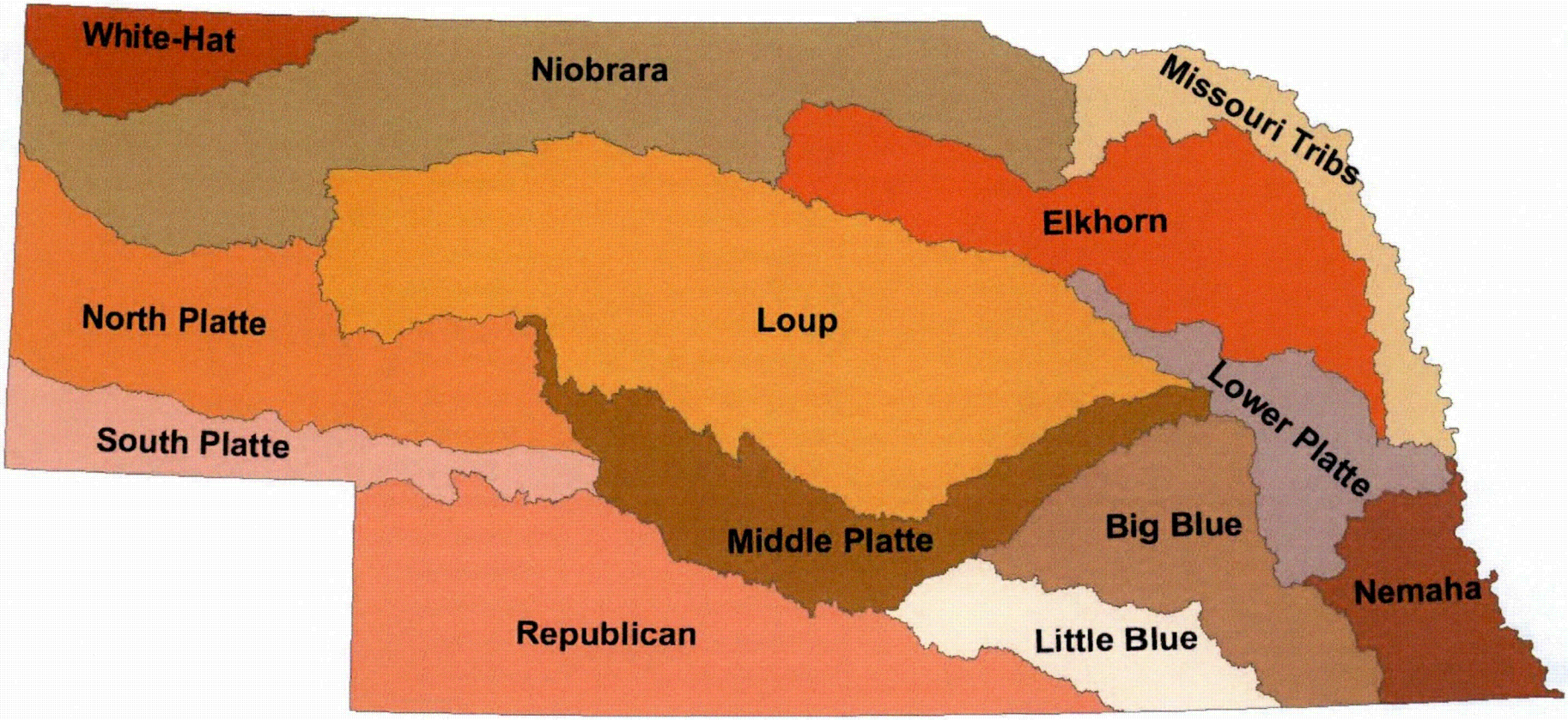

Source: NDEQ, 2010

CROW BUTTE RESOURCES, INC.

FIGURE 2.7-1
NEBRASKA'S MAJOR RIVER BASINS

PROJECT: CO001636 MAPPED BY: JC CHECKED BY: JEC

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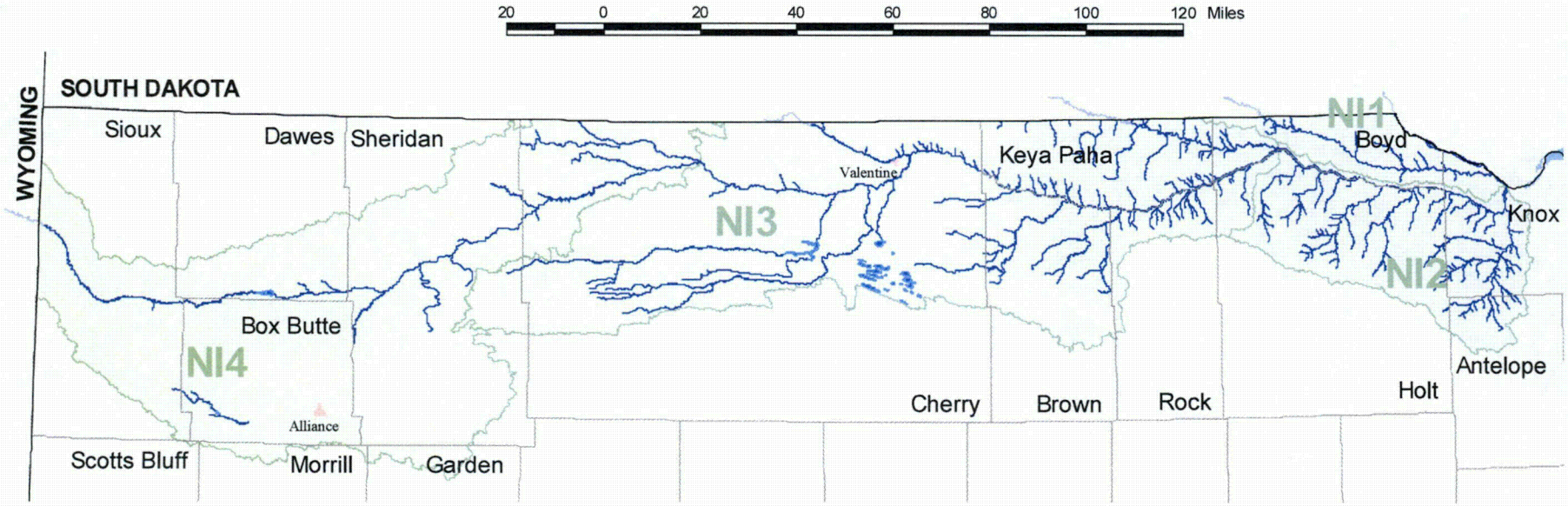
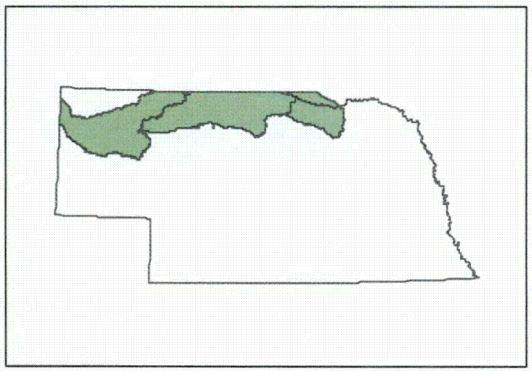
K:\CBR_Projects\CO001636_Marsland\3_IMAGES\Illustrator\TR Figure 2_7-1 NE Major River Basins.ai @ 10/15/2011





N

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FIGURE 2.7-2
NIOBRARA RIVER BASIN
(AND SUBBASINS)

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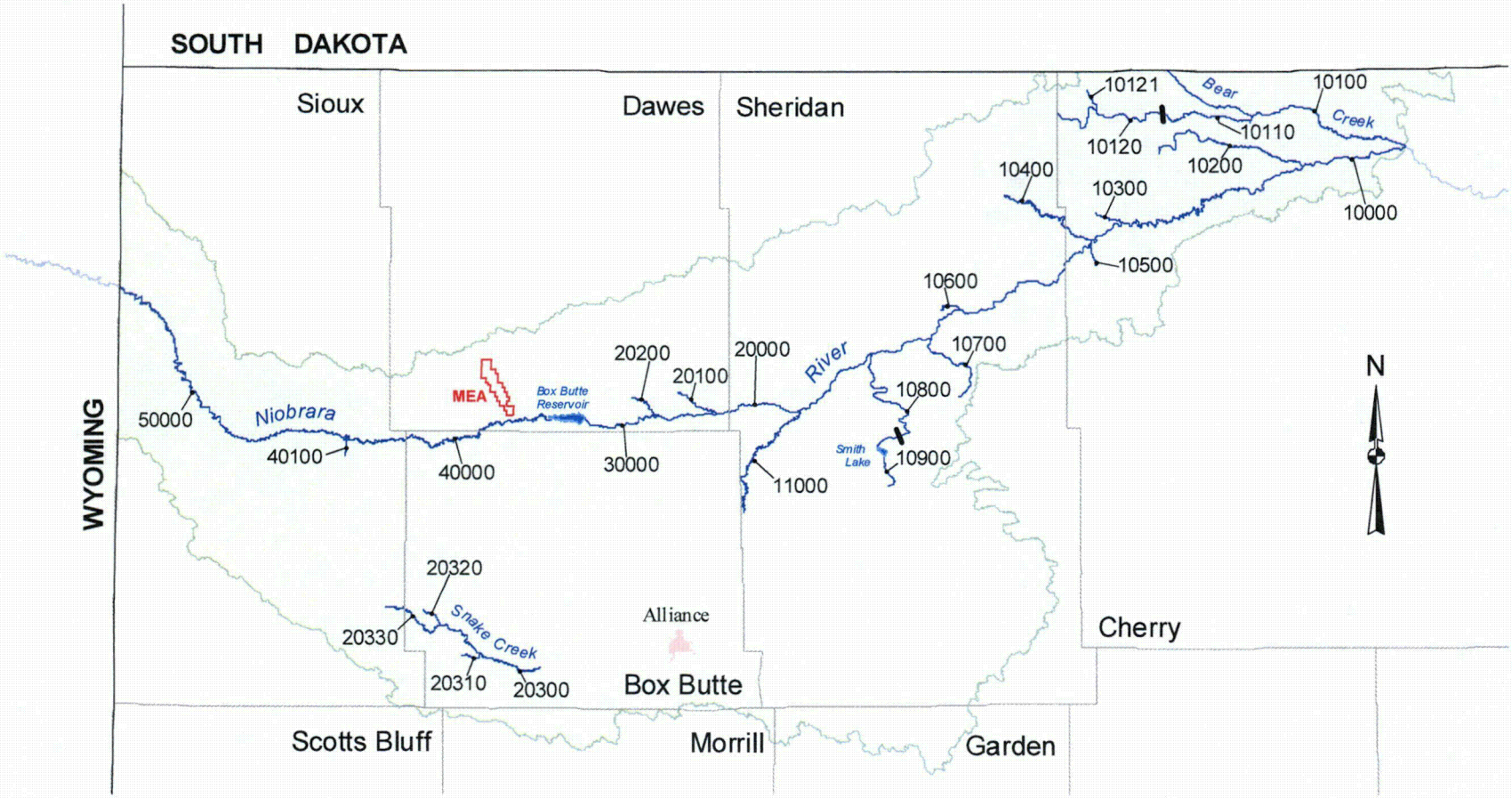
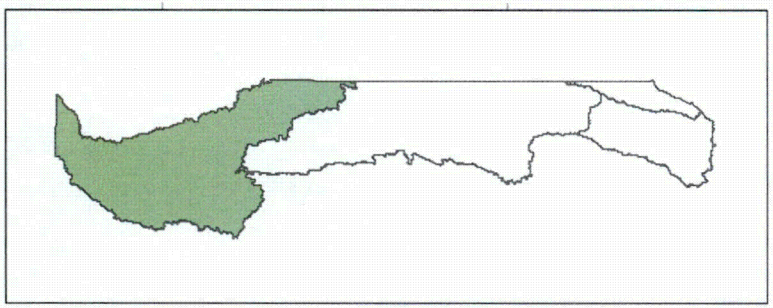
Source: NDEQ, 2009

K:\CBR_Projects\CO001636_Marsland\3_IMAGES\Illustrator\TR Figure 2_7-2 Niobrara River Basin and Subbasins.ai @ 10/15/2011





Source: NDEQ, 2009

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FIGURE 2.7-3
NIOBRARA RIVER SUBBASIN N14

PROJECT: CO001636 MAPPED BY: JC CHECKED BY: JEC

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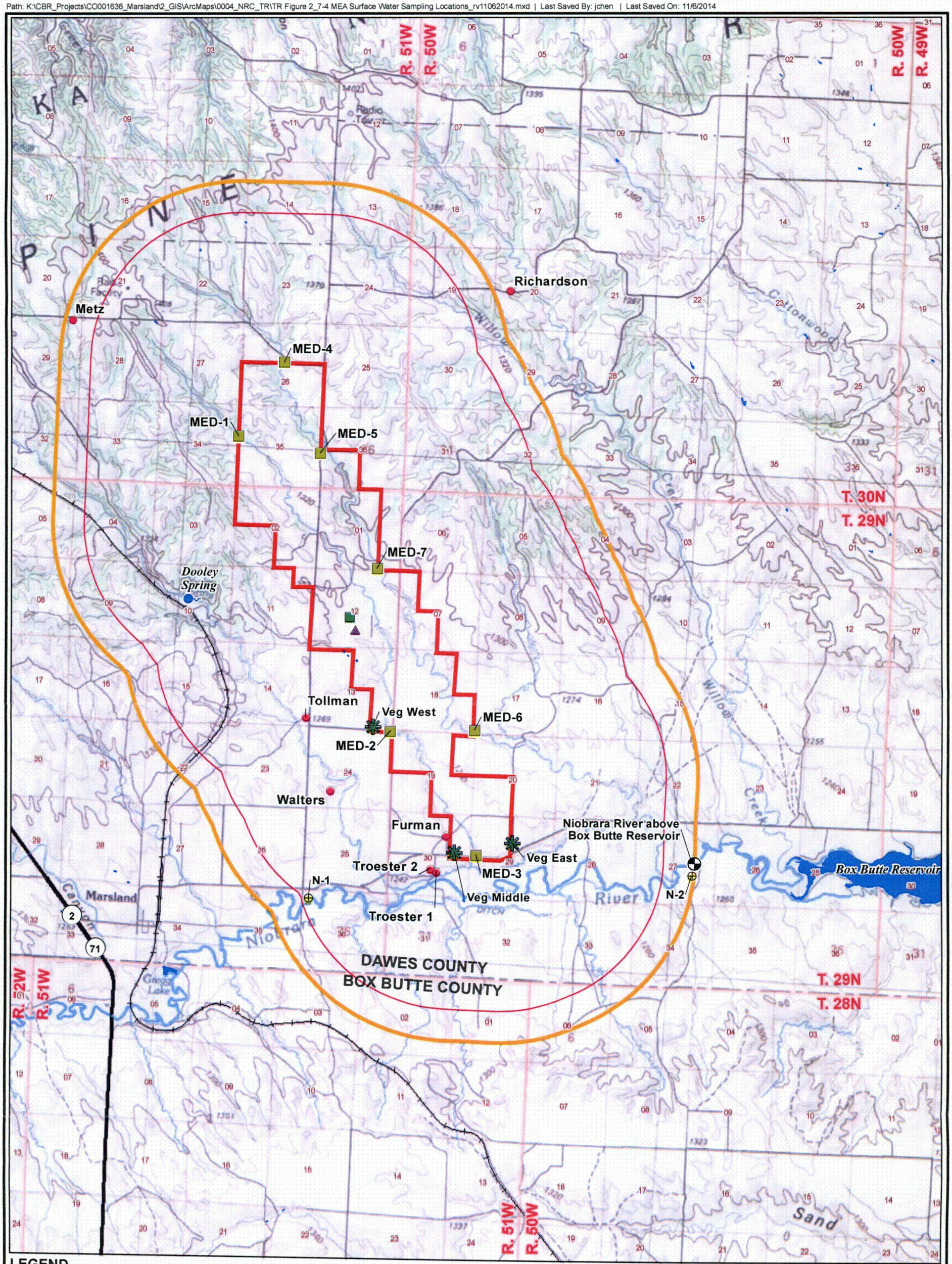
K:\CBR_Projects\CO001636_Marsland\3_IMAGES\Illustrator\TR Figure 2_7-3 Niobrara River Subbasin N14.ai @ 04/06/2012

Path: K:\CBR_Projects\CO001636_Marsland\2_GIS\ArcMaps\0004_NRC_TR\TR Figure 2_7-4 MEA Surface Water Sampling Locations_rv11062014.mxd | Last Saved By: jchen | Last Saved On: 11/6/2014



LEGEND

- Proposed Marsland Expansion Area
- 2.25-Mile Area of Review (AOR)
- 3-Kilometers AOR for Gardens
- Livestock Sampling Location
- Garden Soil Sampling Location
- Vegetation Sampling Location
- Proposed Marsland Satellite Facility Site
- CBR Surface Water/ Sediment Sampling Location
- Marsland Ephemeral Drainage (MED) Sediment and Surface Runoff Sampling Point
- USGS/NDNR 06454500 and NDEQ SNI4NIOBR402 Gaging Station
- Natural Spring
- Reservoir/Lake/Pond
- Perennial River
- Ephemeral Drainage
- Railroad
- StateHighway

Note: Fish sampling for radiological analysis occurs in headwaters of Box Butte Reservoir.

N

0 0.5 1
Miles

PROJECTION: NAD 1983, STATE PLANE NEBRASKA NORTH, FIPS 2600
SOURCES: US TOPO MAPS, SERVICED BY ESRI ARCGIS ONLINE

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FIGURE 2.7-4
SURFACE WATER/SEDIMENT, VEGETATION, GARDEN AND LIVESTOCK SAMPLING LOCATIONS

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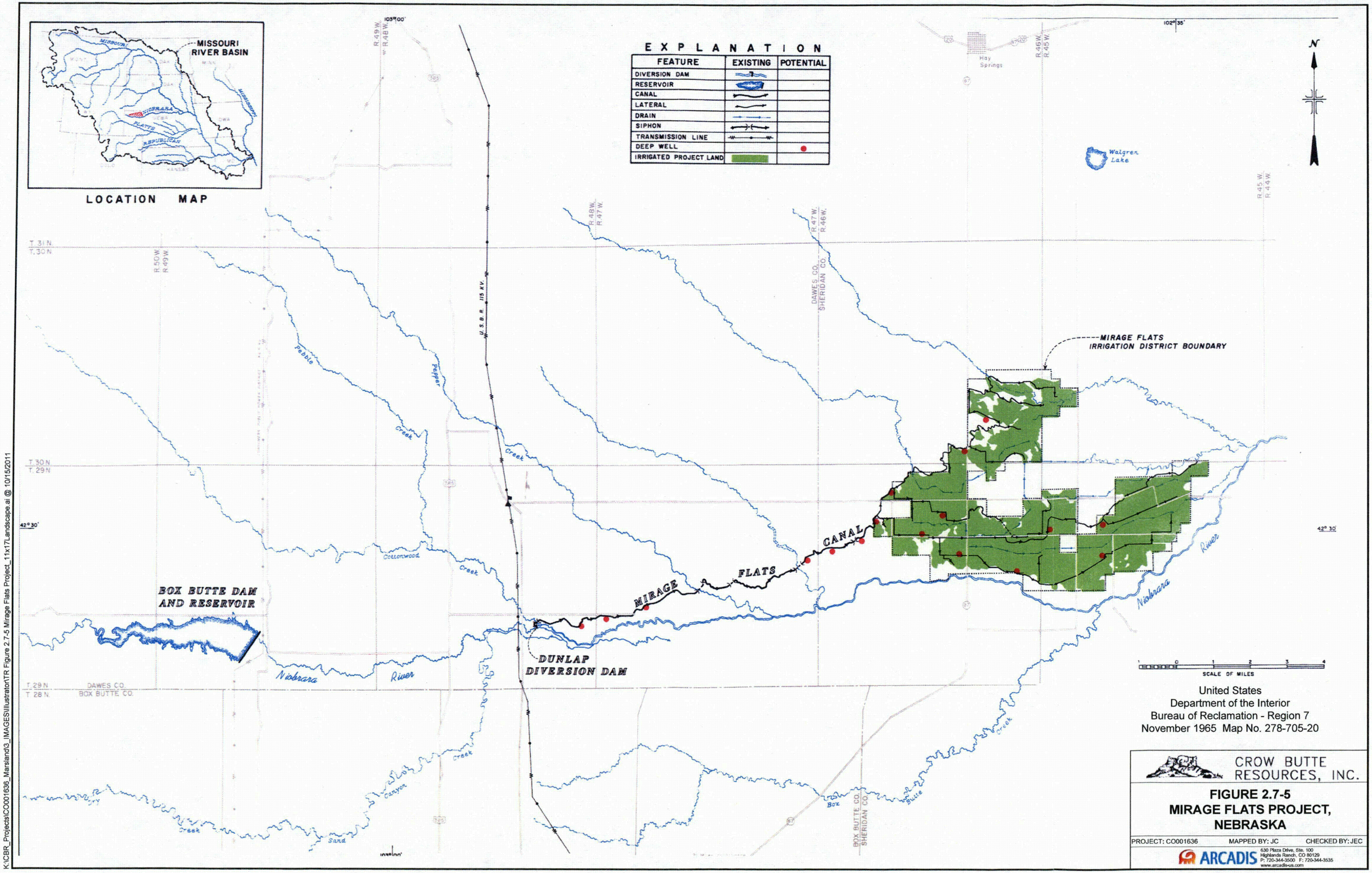
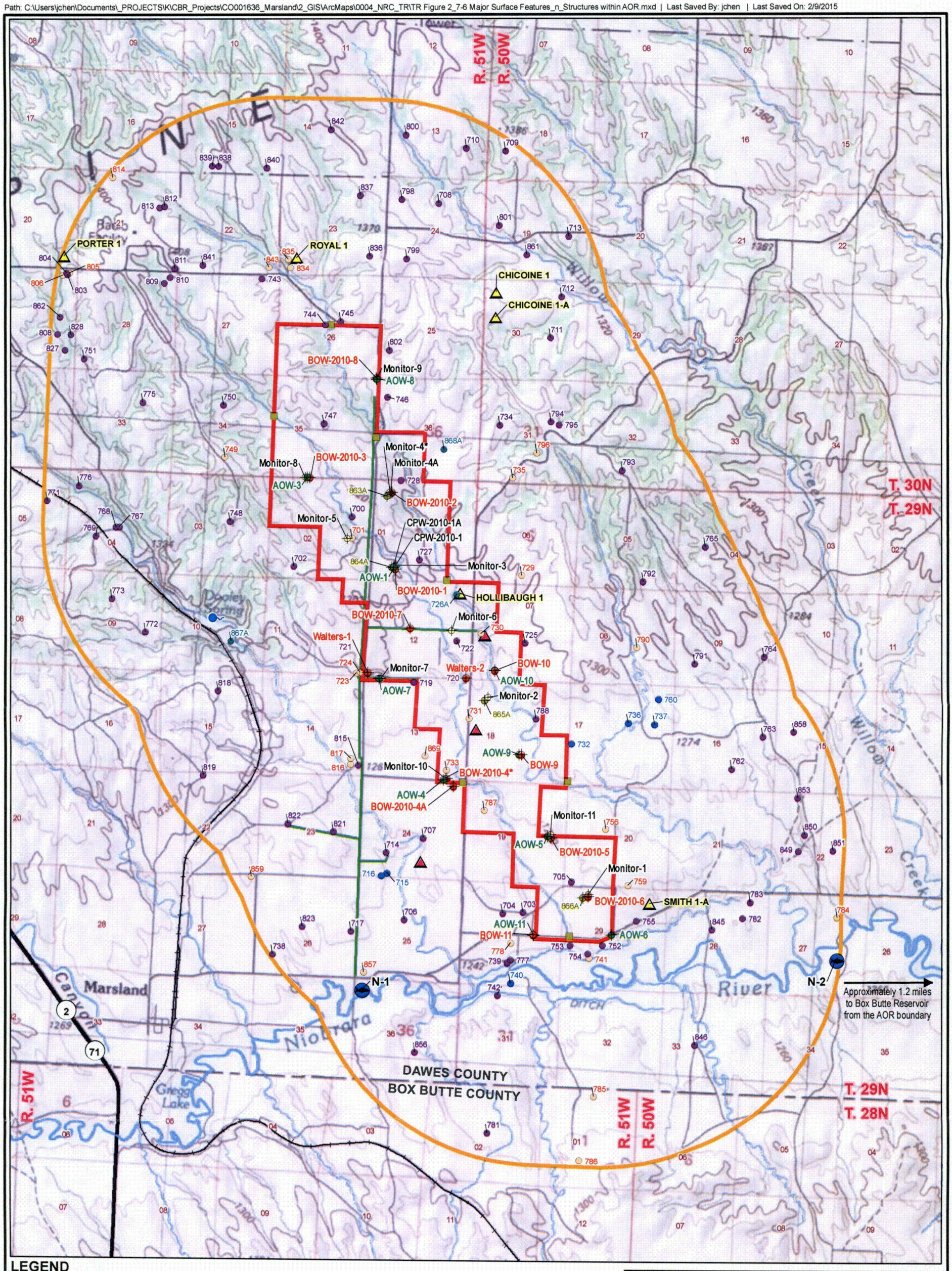


K:\CBR_Projects\CO001636_Marsland\3_IMAGES\Illustrator\TR Figure 2.7-5 Mirage Flats Project_11x17Landscape.ai @ 10/15/2011

Path: C:\Users\jchen\Documents_PROJECTS\K\CBR_Projects\CO001636_Marsland\2_GIS\ArcMaps\0004_NRC_TR\TR Figure 2_7-6 Major Surface Features_n_Structures within AOR.mxd | Last Saved By: jchen | Last Saved On: 2/9/2015



LEGEND

- Proposed Marsland Expansion Area
- Area of Review (AOR)
- Surface Water/Fish Sampling Location
- Ephemeral Drainage Sediment Sampling Point
- Natural Spring

Pumping Test Monitoring Wells

- Monitor-5 Basal Sandstone of the Chadron Formation Well and Well ID
- BOW-2010-6 Brule Formation Well and Well ID
- AOW-3 Arikaree Group Well and Well ID
- 865A Abandoned Chadron Monitor Well and Well ID
- Sand/Gravel Pit, Inactive
- Dry Hole, Dry and Abandoned

Private Water Supply Wells

- 732 Seasonal Well and Well ID
- 781 Active Well and Well ID
- 786 Inactive Well and Well ID
- 726A Abandoned Well and Well ID
- Powerline
- Railroad

* BOW-2010-4 and Monitor-4 are inactive and scheduled to be abandoned.

N

0 0.5 1
Miles

PROJECTION: NAD 1983, STATE PLANE NEBRASKA NORTH, FIPS 2600
SOURCES: US TOPO MAPS, SERVICED BY ESRI ARCGIS ONLINE

CROW BUTTE RESOURCES, INC.

FIGURE 2.7-6
MAJOR SURFACE FEATURES/STRUCTURES WITHIN AOR AS PER TITLE 122, CHAPTER 11, SECTION 006.09

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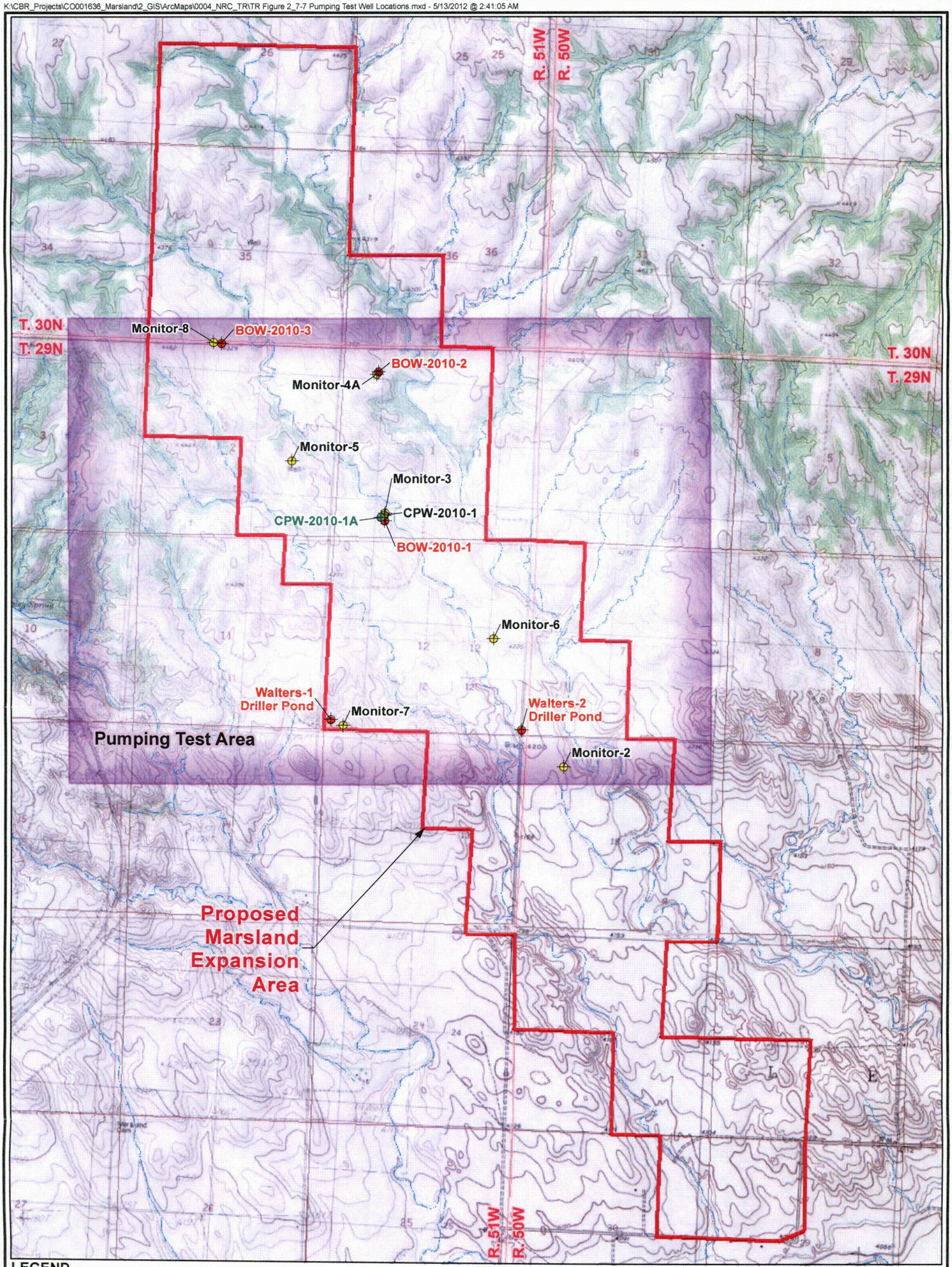
K:\CBR_Projects\CO001636_Marsland\2_GIS\ArcMaps\0004_NRC_TR\TR Figure 2_7-7 Pumping Test Well Locations.mxd - 5/13/2012 @ 2:41:05 AM



LEGEND

Pumping Test Monitoring Wells

- Basal Chadron Sandstone Well
- Basal Chadron Sandstone Well (Pumping Well)
- Brule Formation Well
- Proposed Marsland Expansion Area
- Pumping Test Area
- Intermittent Stream/River

N

0 1,250 2,500
Feet

PROJECTION: NAD 1927, STATE PLANE NEBRASKA NORTH, FIPS 2601
SOURCES: US TOPO MAPS, SERVICED BY ESRI ARCGIS ONLINE

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FIGURE 2.7-7
MARSLAND EXPANSION AREA
PUMPING TEST WELL LOCATIONS

PROJECT: CO001636 MAPPED BY: JC CHECKED BY: MS

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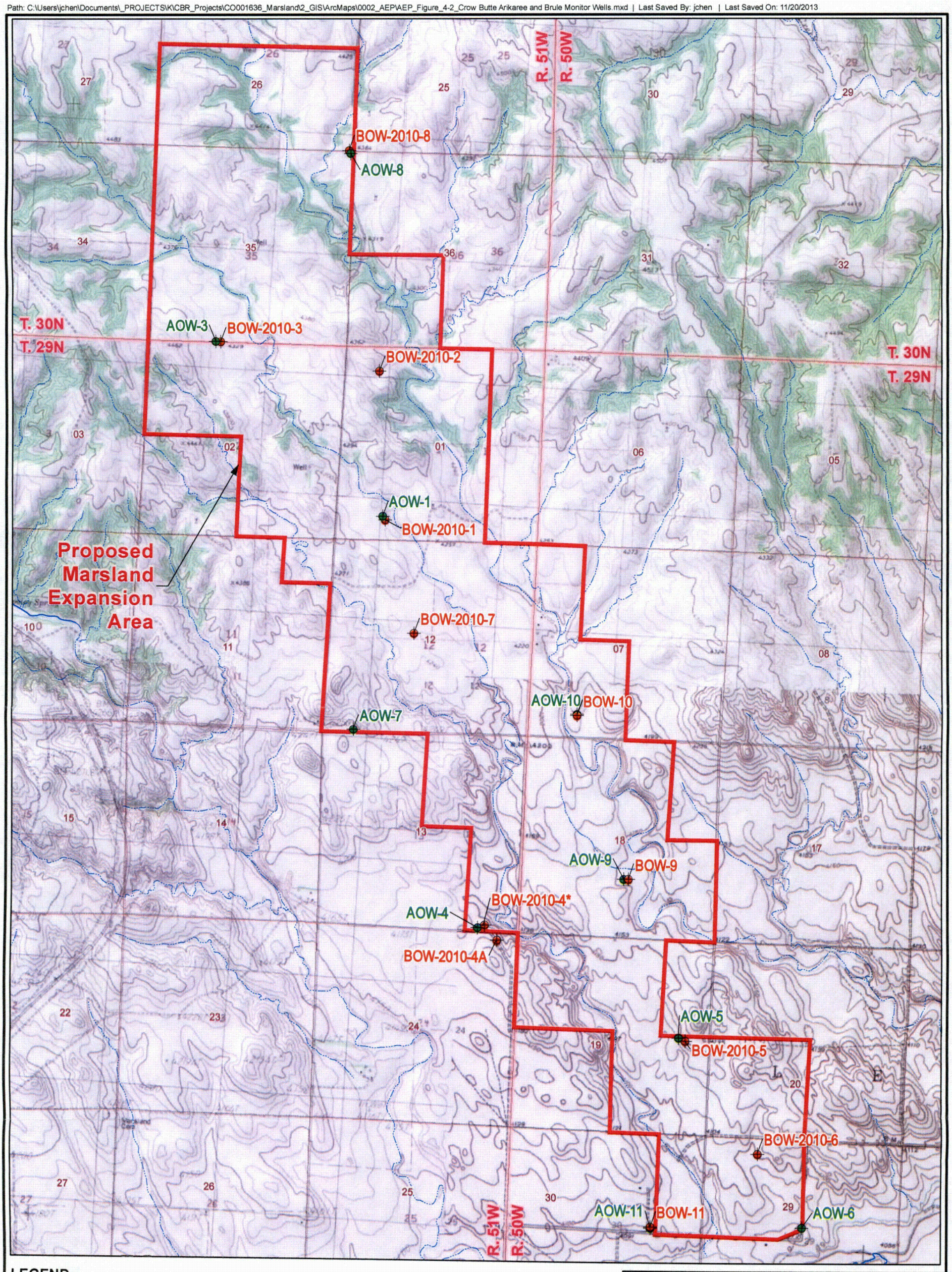
Path: C:\Users\jchen\Documents_PROJECTS\K\CBR_Projects\CO001636_Marsland\2_GIS\ArcMaps\0002_AEP\AEP_Figure_4-2_Crow Butte Arikaree and Brule Monitor Wells.mxd | Last Saved By: jchen | Last Saved On: 11/20/2013



LEGEND

- Arikaree Group Well
- Brule Formation Well
- Proposed Marsland Expansion Area
- Intermittent Stream/River

* BOW-2010-4 is inactive and scheduled to be abandoned.

N

0 1,250 2,500

Feet

PROJECTION: NAD 1983, STATE PLANE NEBRASKA NORTH, FIPS 2600
SOURCES: US TOPO MAPS, SERVICED BY ESRI ARCGIS ONLINE

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Figure 2.7-8
MARSLAND
ARIKAREE AND BRULE MONITOR WELLS

PROJECT: CO001636 MAPPED BY: JC CHECKED BY: MS

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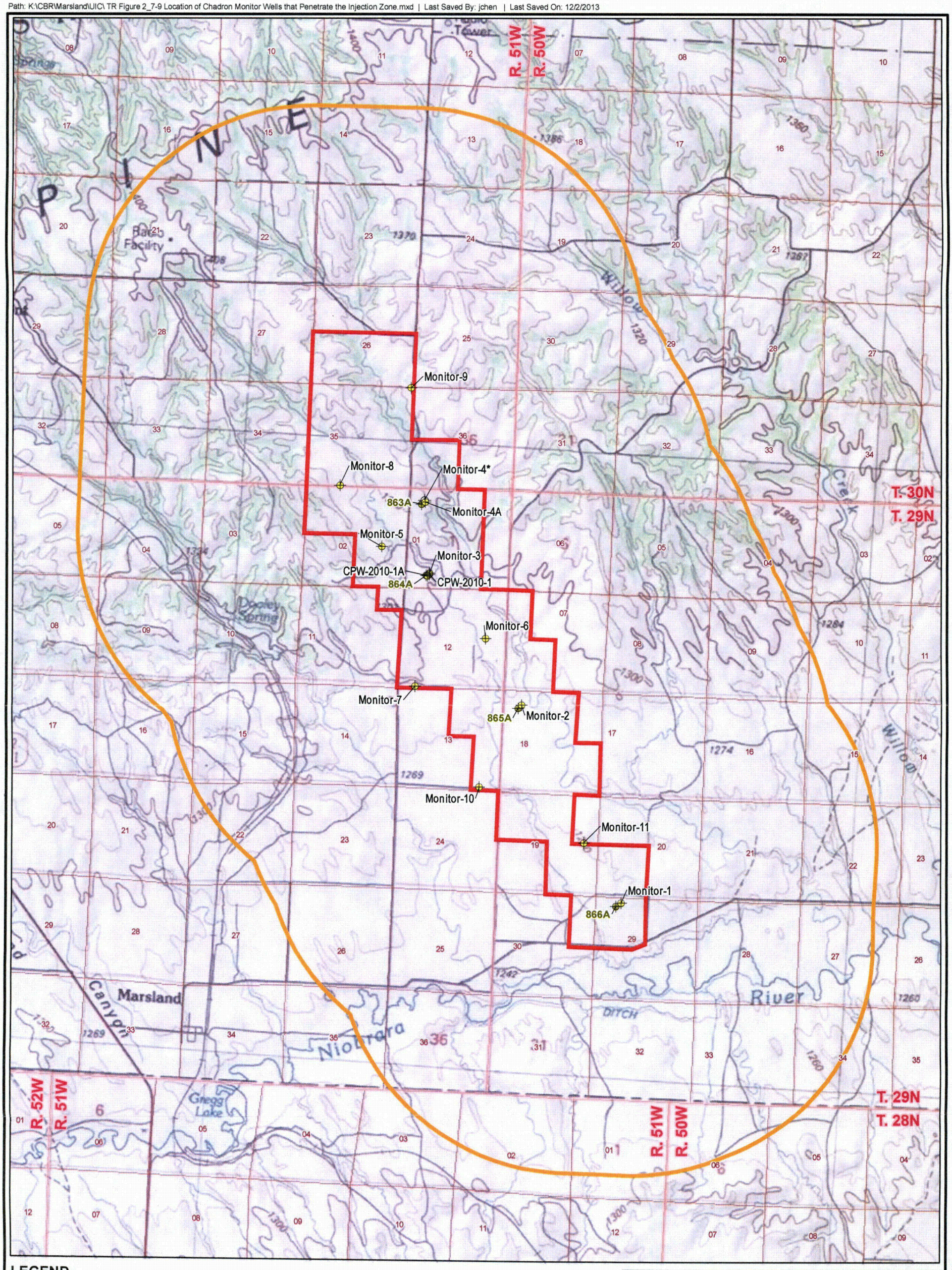
Path: K:\CBR\Marsland\UIC\ TR Figure 2_7-9 Location of Chadron Monitor Wells that Penetrate the Injection Zone.mxd | Last Saved By: jchen | Last Saved On: 12/2/2013



LEGEND

Proposed Marsland Expansion Area

Area of Review (AOR)

Pumping Test Monitoring Wells

- Monitor-5 — Active Basal Sandstone of the Chadron Formation Well and Well ID
- Monitor-4* — Inactive Basal Sandstone of the Chadron Formation Well and Well ID
- 865A — Abandoned Chadron Monitor Well and Well ID

N

0 0.5 1
Miles

PROJECTION: NAD 1983, STATE PLANE NEBRASKA NORTH, FIPS 2600
SOURCES: US TOPO MAPS, SERVICED BY ESRI ARCGIS ONLINE

CROW BUTTE RESOURCES, INC.

FIGURE 2.7-9
LOCATION OF MEA ACTIVE, INACTIVE AND ABANDONED CHADRON MONITOR WELLS THAT PENETRATE THE INJECTION ZONE

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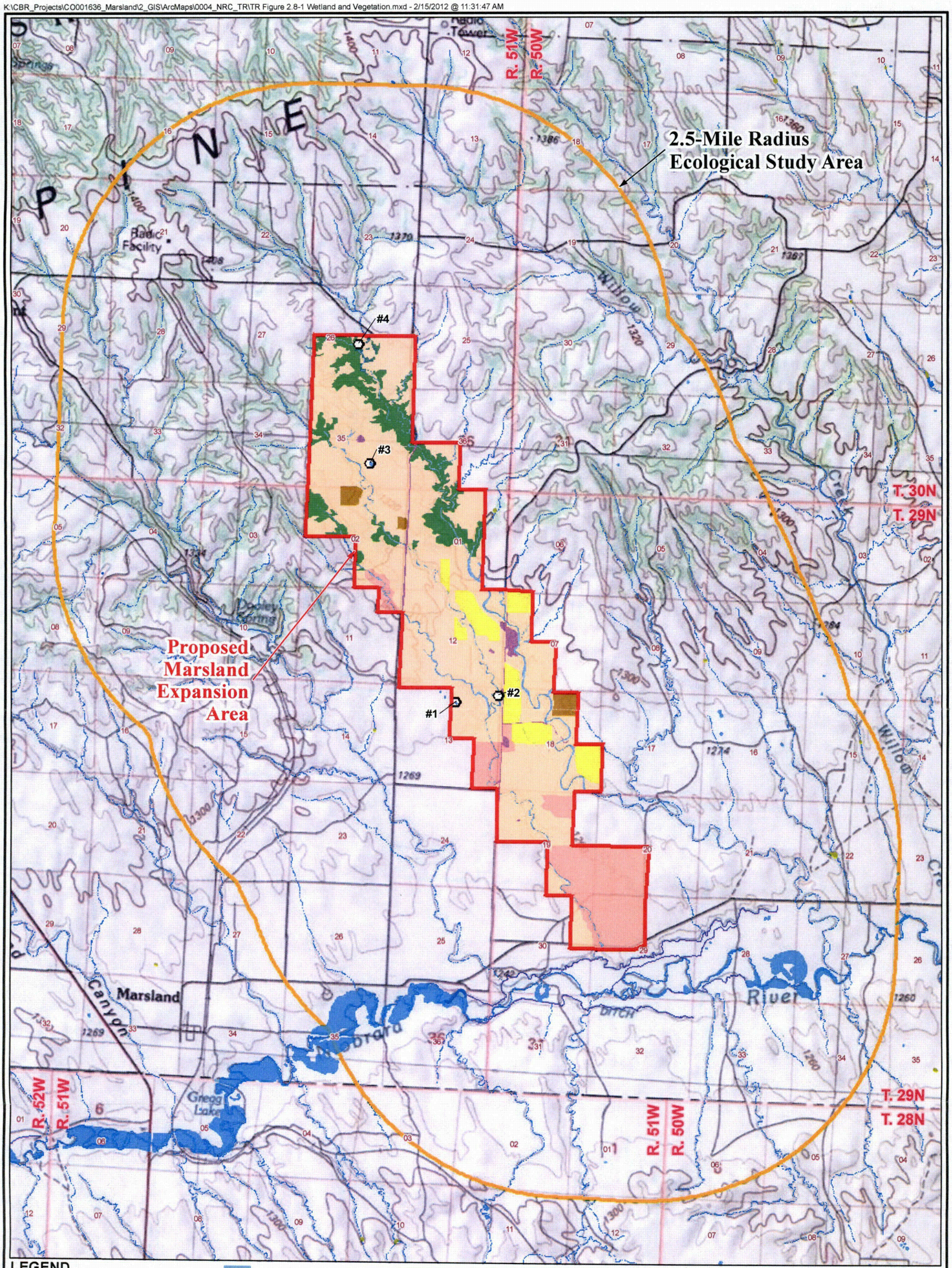
K:\CBR_Projects\CO001636_Marsland\2_GIS\ArcMaps\0004_NRC_TR\TR Figure 2.8-1 Wetland and Vegetation.mxd - 2/15/2012 @ 11:31:47 AM



LEGEND

- Proposed Marsland Expansion Area
- Ecological Study Area (ESA)
- Wetland Assessment Site

NHD Flowline

- Canal Ditch
- Intermittent Stream/River
- Perennial Stream/River

NWI Wetland Type

- Freshwater Emergent Wetland
- Riverine
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Other

Vegetation Type

- Mixed-Grass Prairie
- Range Rehabilitation
- Degraded Rangeland
- Cultivated
- Structure Biotope
- Mixed Conifer
- Deciduous Streambank Forest
- Drainage

N

0 3,000 6,000
Feet

PROJECTION: NAD 1927, STATE PLANE NEBRASKA NORTH, FIPS 2601
SOURCES: US TOPO MAPS, SERVICED BY ESRI ARCGIS ONLINE

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FIGURE 2.8-1
WETLAND AND VEGETATION

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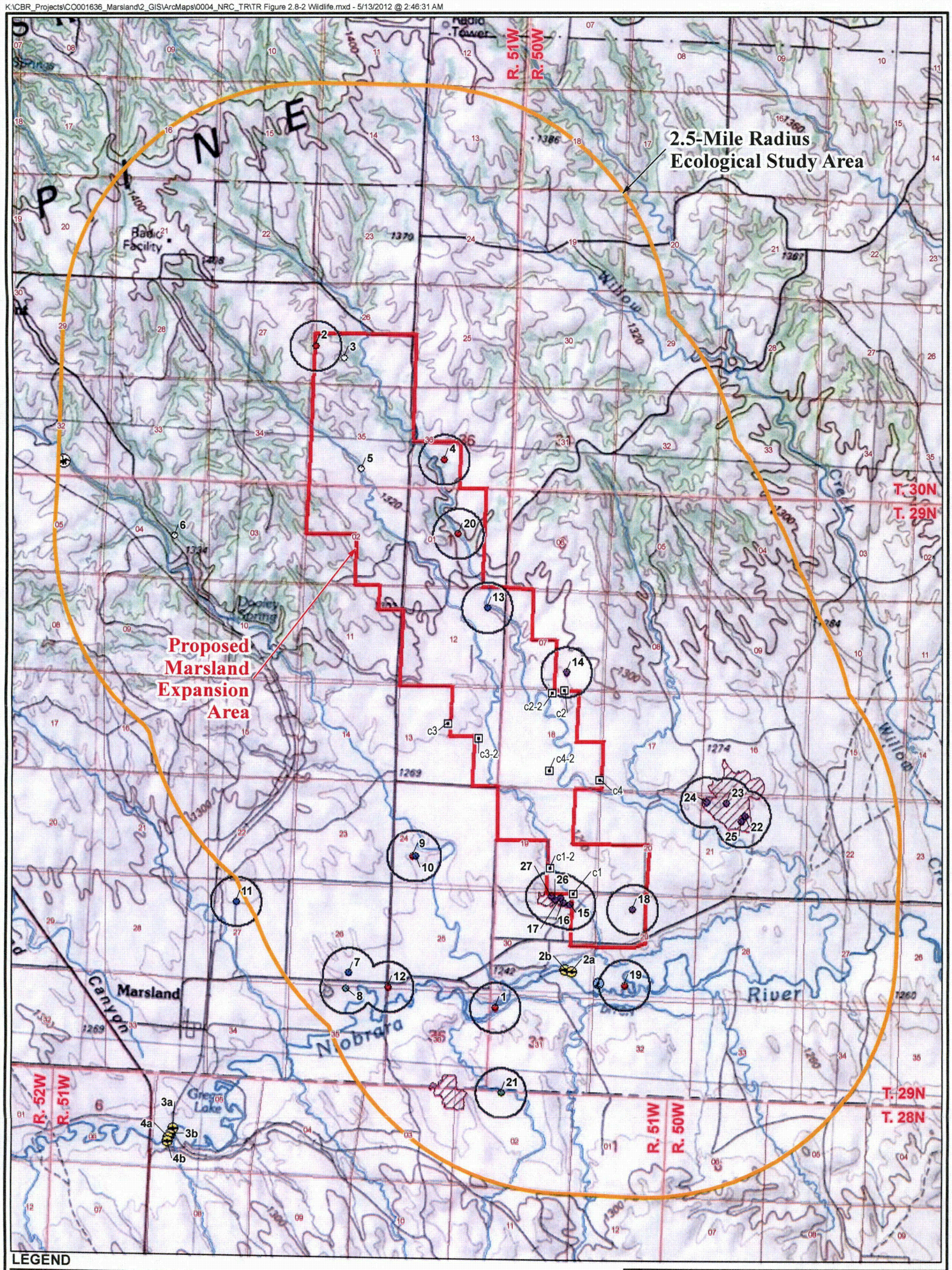
K:\CBR_Projects\CO001636_Marsland\2_GIS\ArcMaps\0004_NRC_TR\TR Figure 2.8-2 Wildlife.mxd - 5/13/2012 @ 2:46:31 AM



LEGEND

- Ecological Study Area (ESA)
- Fish Sampling Location
- Great Blue Heron Rookery
- Remote Camera Location
- Winter Bald Eagle Sighting
- Prairie Dog Colony
- Proposed Marsland Expansion Area

Raptor Nests

- Burrowing Owl
- Ferruginous Hawk
- Great Horned Owl
- Red-Tailed Hawk
- Swainson's Hawk
- Unknown Raptor
- 0.25-Mile Buffer of Active Raptor Nest
- River/Stream

N

0 3,000 6,000
Feet

PROJECTION: NAD 1927, STATE PLANE NEBRASKA NORTH, FIPS 2601
SOURCES: US TOPO MAPS, SERVICED BY ESRI ARCGIS ONLINE

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FIGURE 2.8-2
WILDLIFE MAP

PROJECT: CO001636 MAPPED BY: JC CHECKED BY: AH

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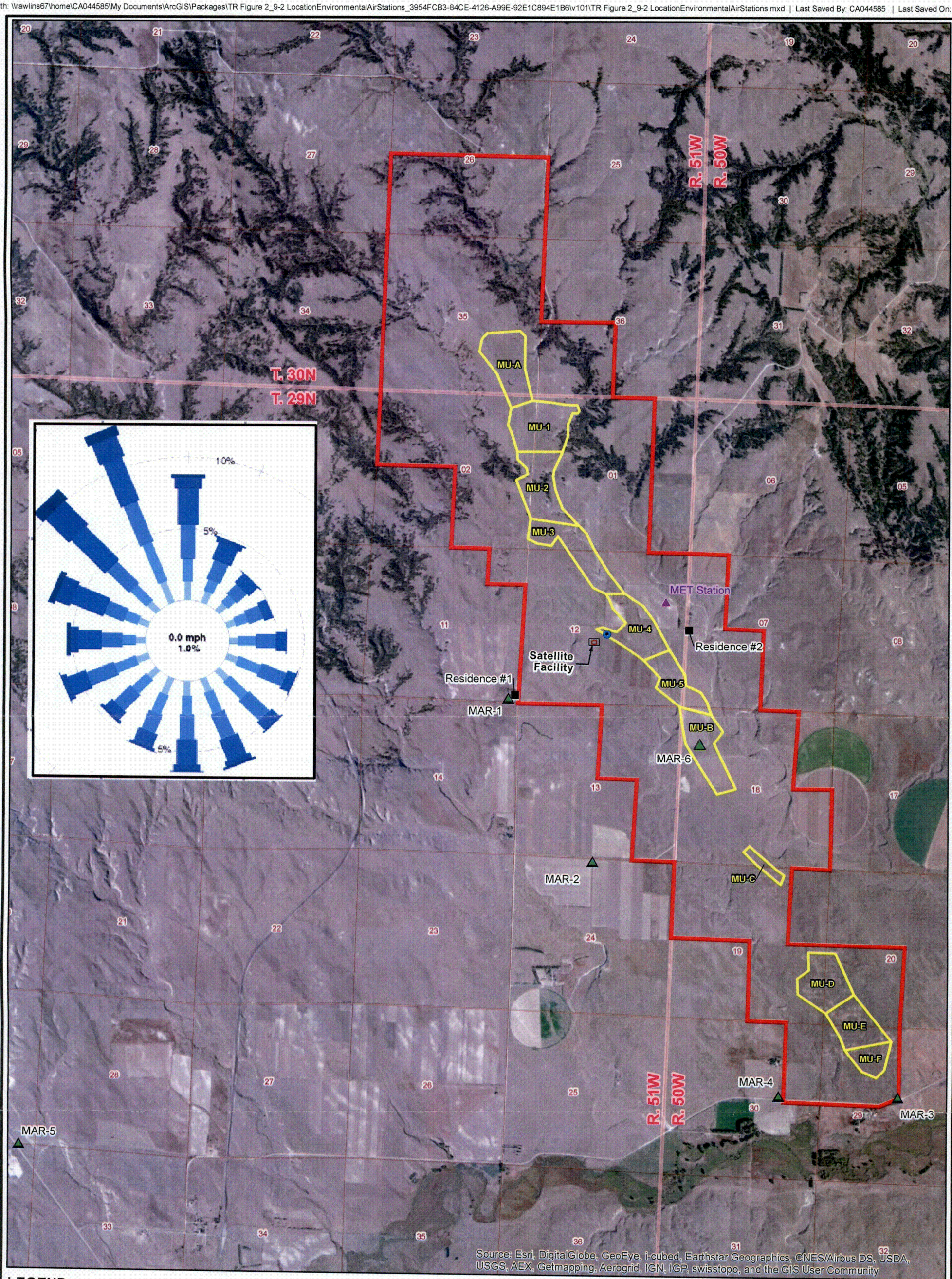
Figure 2.9-1 Marsland Expansion Area Preoperational/Preconstruction Monitoring Program Timeline

Task	Start	Finish	2013												2014												2015					
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6
Surface Water (Niobrara River N-1 & N-2)	Sep-13	Sep-14																														
Surface Water (Ephemeral Drainages)	Apr-13	Continuing																														
Vegetation (Forage)	Jun-13	Sep-13																														
Food (Fish)	May-14	Sep-14																														
Food (Livestock)	Mar-14	Mar-14																														
Food (Crops/Alternate Soil Sampling)	Aug-13	Aug-13																														
Soil	Jun-14	Nov-14																														
Sediment (MED-1 through MED-6)	Oct-13	May-14																														
Sediment (MED-7)	Oct-14	Apr-15																														
Direct Radiation	May-14	Nov-14																														

Samples will be collected when water flow becomes available

Sampling completed

Path: \\rawlins67\home\CA044585\My Documents\ArcGIS\Packages\TR Figure 2_9-2 LocationEnvironmentalAirStations_3954FCB3-84CE-4126-A99E-92E1C894E1B6\v101\TR Figure 2_9-2 LocationEnvironmentalAirStations.mxd | Last Saved By: CA044585 | Last Saved On: 10/9/



LEGEND

- Proposed Deep Disposal Well
- Pre-operational Baseline/ Operational Air Sampling Station
- Residence
- Mine Unit
- Proposed Marsland Expansion Area

Map Updated on: 10/9/2014

N

0 3,000 6,000
Feet

PROJECTION: NAD1983, STATE PLANE NEBRASKA NORTH, FIPS 2600
SOURCES: USDA NAIP IMAGERY 2010

CROW BUTTE RESOURCES, INC.

FIGURE 2.9-2
LOCATION OF ENVIRONMENTAL AIR SAMPLING STATIONS AT MARSLAND EXPANSION AREA

PROJECT: CO001636 MAPPED BY: JC CHECKED BY: MS

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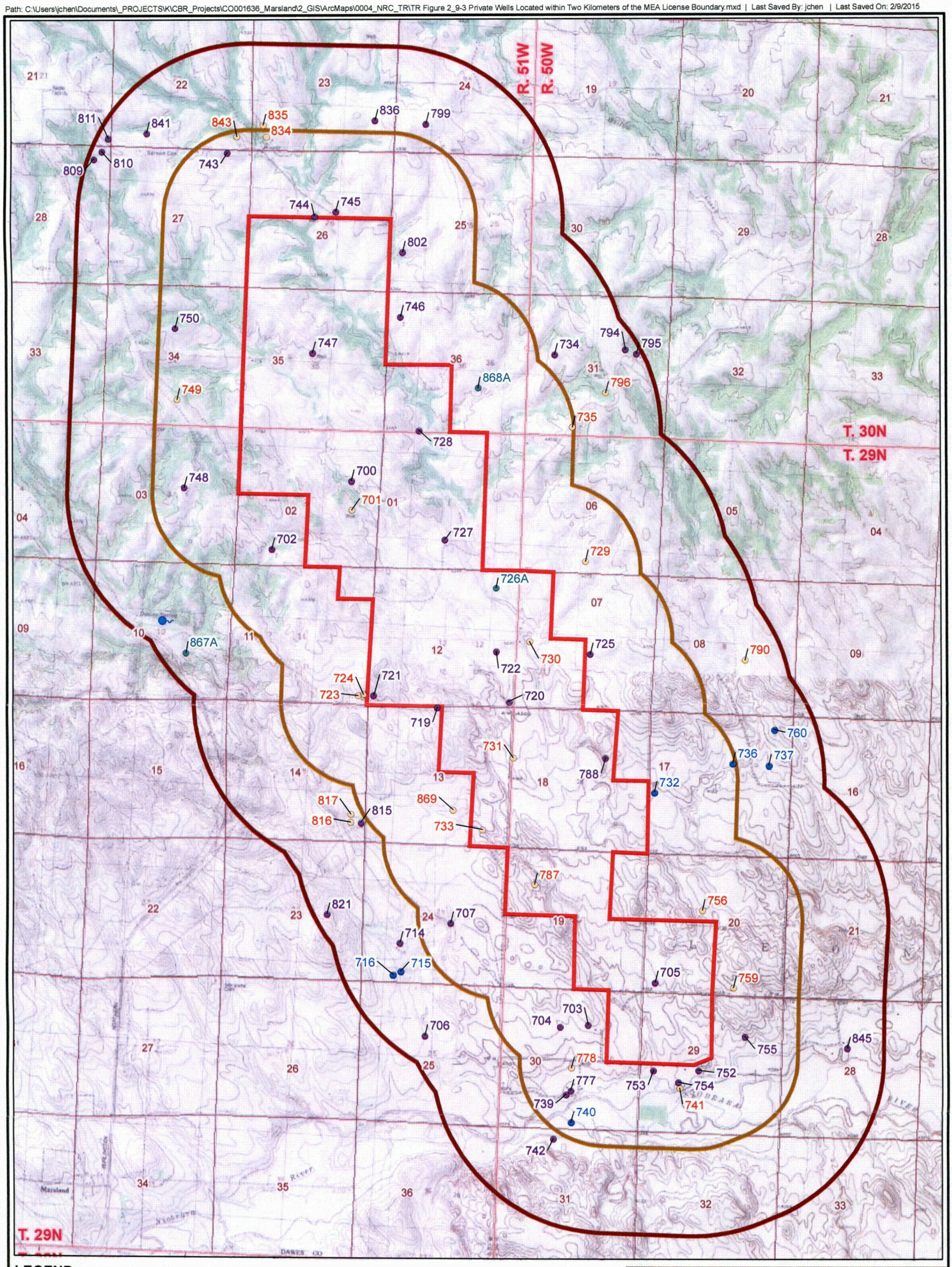
Path: C:\Users\jchen\Documents_PROJECTS\K\CBR_Projects\CO001636_Marsland\2_GIS\ArcMaps\0004_NRC_TR\TR Figure 2_9-3 Private Wells Located within Two Kilometers of the MEA License Boundary.mxd | Last Saved By: jchen | Last Saved On: 2/9/2015



LEGEND

- Proposed Marsland Expansion Area (MEA)
- 1-Kilometer Radius of MEA
- 2-Kilometer Radius of MEA

Private Water Supply Wells

- 732 Seasonal Well
- 706 Active Well
- 733 Inactive Well
- 726A Abandoned Well

Natural Spring

N

PROJECTION: NAD 1983, STATE PLANE NEBRASKA NORTH, FIPS 2600
SOURCES: US TOPO MAPS, SERVICED BY ESRI ARCGIS ONLINE

0 1,750 3,500 Feet

0 500 1,000 Meters

CROW BUTTE RESOURCES, INC.

FIGURE 2.9-3
PRIVATE WELLS LOCATED WITHIN ONE AND TWO KILOMETERS OF THE MEA LICENSE BOUNDARY

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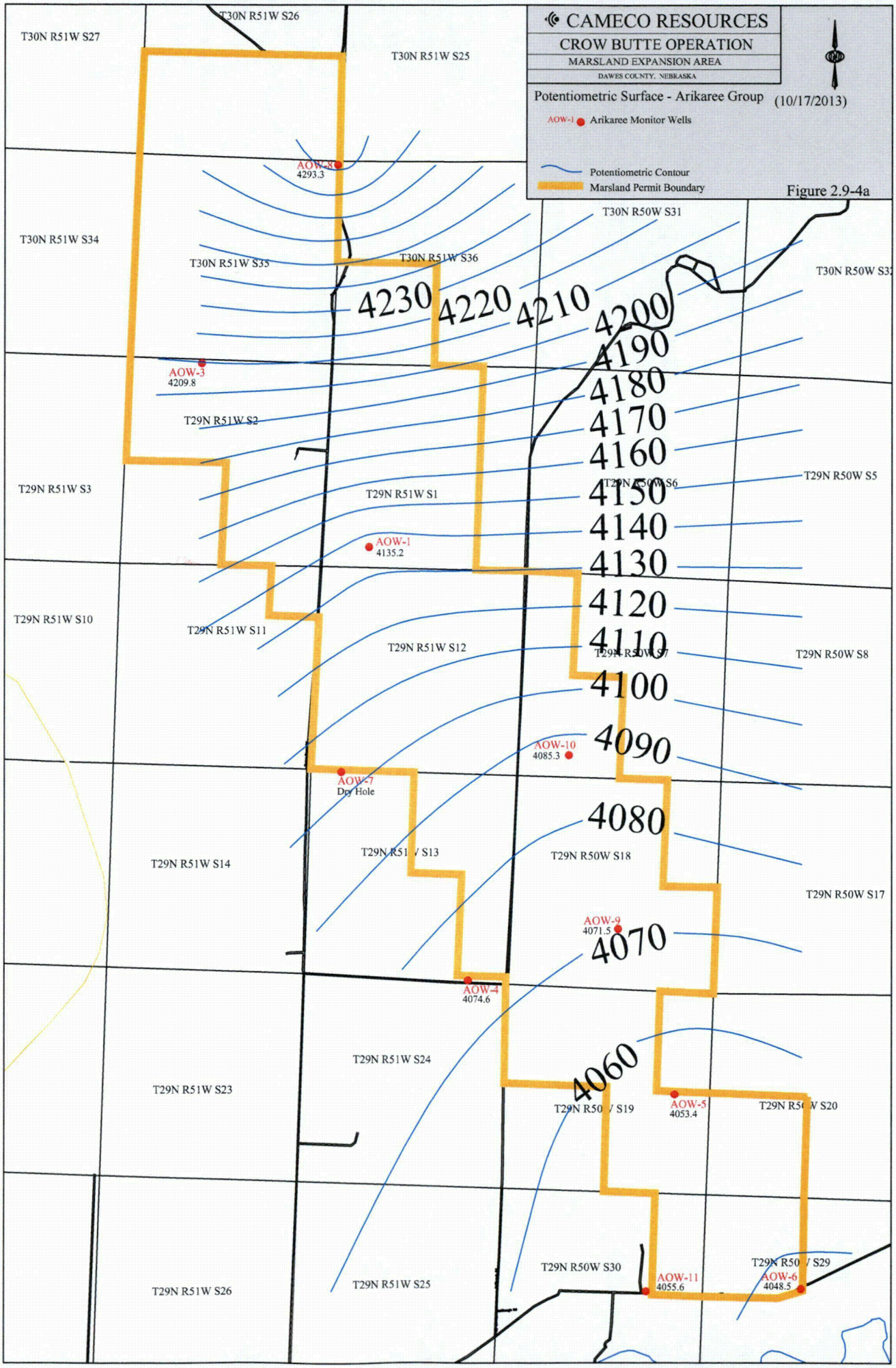
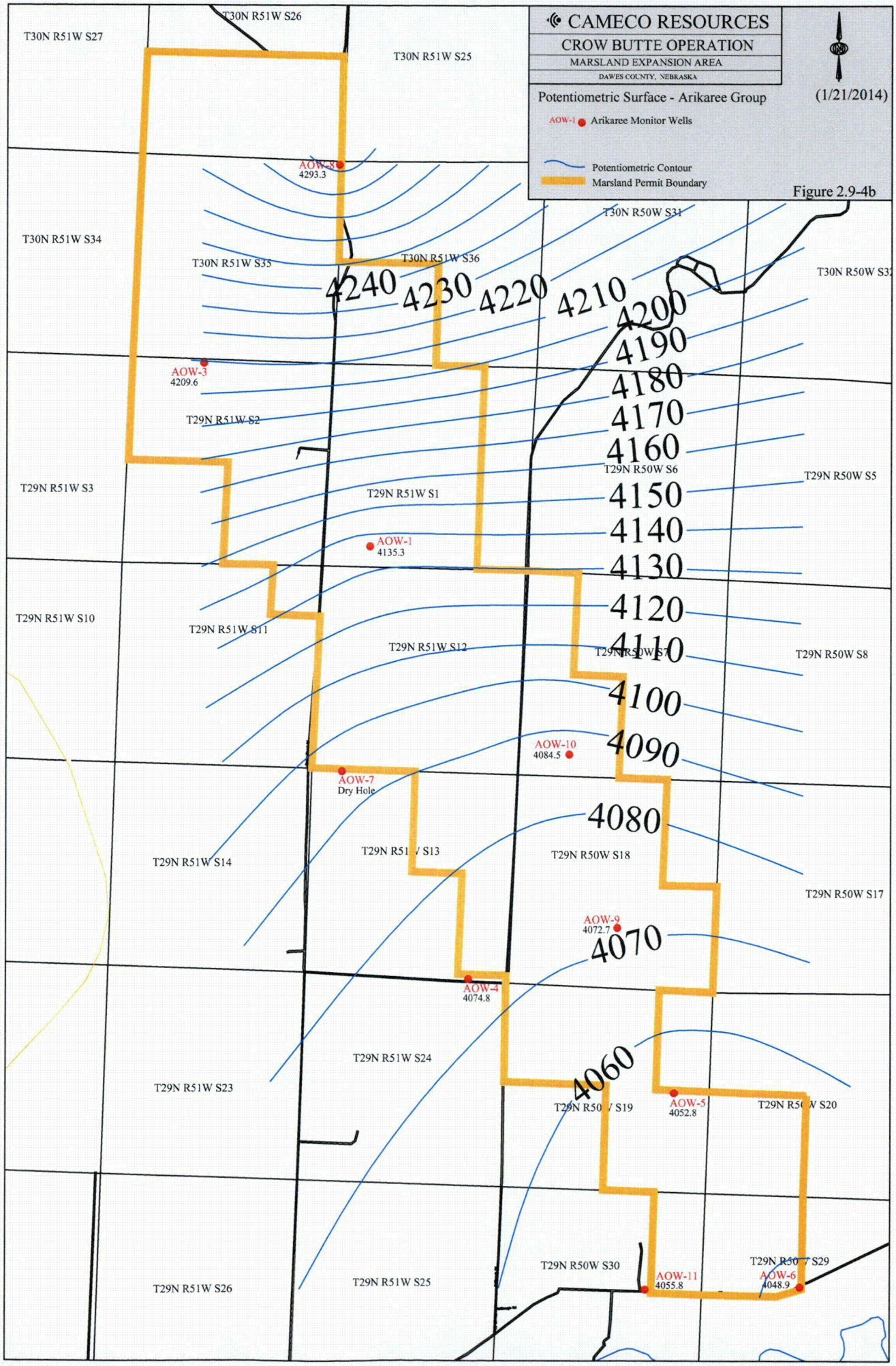
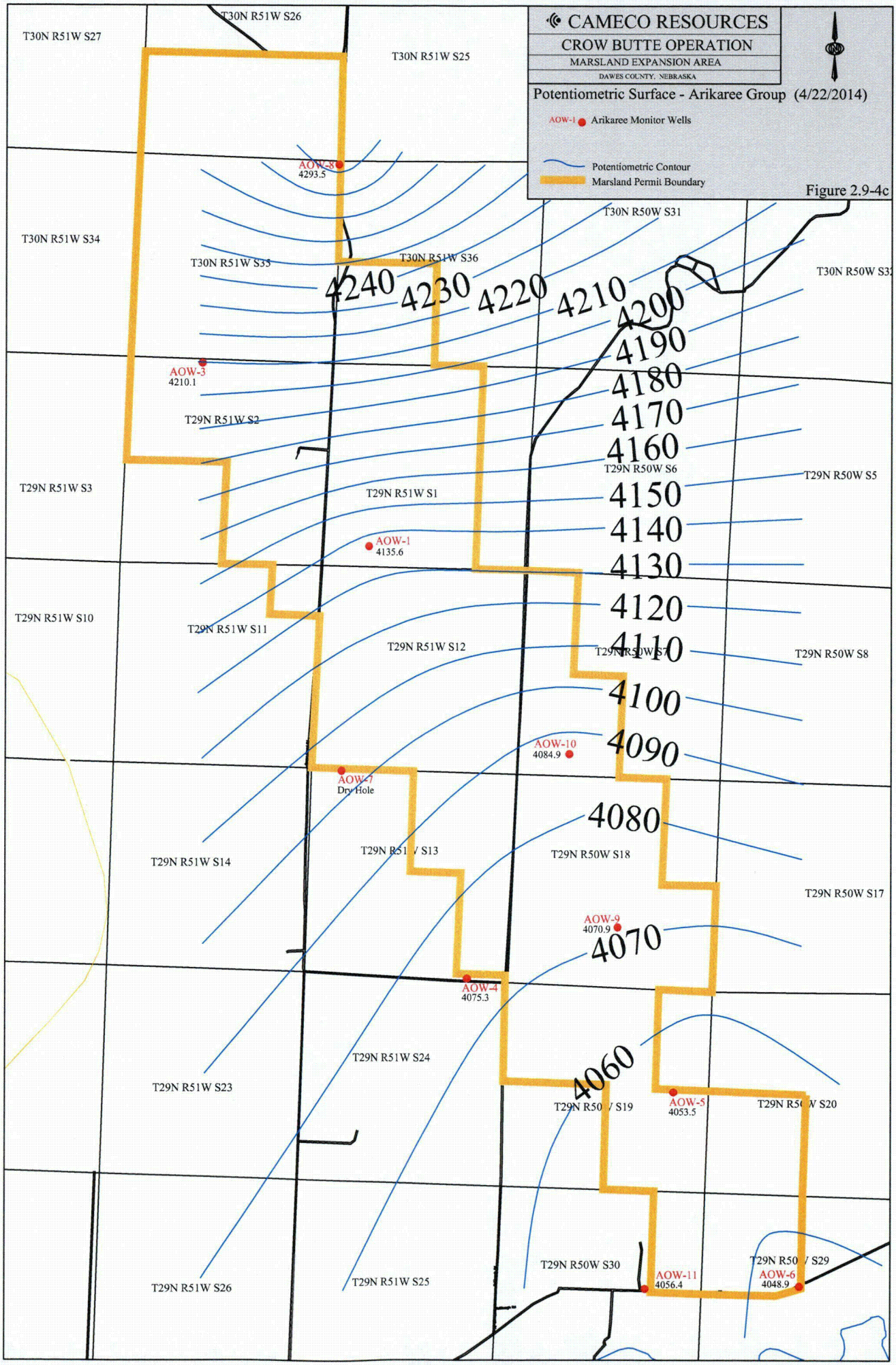

CAMECO RESOURCES
CROW BUTTE OPERATION
MARSLAND EXPANSION AREA
DAWES COUNTY, NEBRASKA
Potentiometric Surface - Arikaree Group
(10/17/2013)
AOW-1 Arikaree Monitor Wells
Potentiometric Contour
Marsland Permit Boundary
Figure 2.9-4a
T30N R51W S27
T30N R51W S26
T30N R51W S25
T30N R51W S34
T30N R51W S35
T30N R51W S36
T30N R50W S31
T30N R50W S32
AOW-8
4293.3
AOW-3
4209.8
T29N R51W S2
T29N R51W S3
T29N R51W S1
T29N R50W S6
T29N R50W S5
AOW-1
4135.2
T29N R51W S10
T29N R51W S11
T29N R51W S12
T29N R50W S7
T29N R50W S8
AOW-10
4085.3
AOW-7
Dry Hole
T29N R51W S14
T29N R51W S13
T29N R50W S18
T29N R50W S17
AOW-9
4071.5
AOW-4
4074.6
T29N R51W S24
T29N R51W S23
T29N R50W S19
AOW-5
4053.4
T29N R50W S20
T29N R51W S26
T29N R51W S25
T29N R50W S30
AOW-11
4055.6
T29N R50W S29
AOW-6
4048.5
4230
4220
4210
4200
4190
4180
4170
4160
4150
4140
4130
4120
4110
4100
4090
4080
4070
4060


CAMECO RESOURCES
CROW BUTTE OPERATION
MARSLAND EXPANSION AREA
DAWES COUNTY, NEBRASKA
Potentiometric Surface - Arikaree Group
(1/21/2014)
AOW-1 Arikaree Monitor Wells
Potentiometric Contour
Marsland Permit Boundary
Figure 2.9-4b
T30N R51W S27
T30N R51W S26
T30N R51W S25
T30N R51W S34
T30N R51W S35
T30N R51W S36
T30N R50W S31
T30N R50W S32
AOW-8
4293.3
AOW-3
4209.6
T29N R51W S2
T29N R51W S3
T29N R51W S1
T29N R50W S6
T29N R50W S5
AOW-1
4135.3
T29N R51W S10
T29N R51W S11
T29N R51W S12
T29N R50W S7
T29N R50W S8
AOW-10
4084.5
AOW-7
Dry Hole
T29N R51W S14
T29N R51W S13
T29N R50W S18
T29N R50W S17
AOW-9
4072.7
AOW-4
4074.8
T29N R51W S24
T29N R51W S23
T29N R50W S19
AOW-5
4052.8
T29N R50W S20
T29N R51W S26
T29N R51W S25
T29N R50W S30
AOW-11
4055.8
T29N R50W S29
AOW-6
4048.9
4240
4230
4220
4210
4200
4190
4180
4170
4160
4150
4140
4130
4120
4110
4100
4090
4080
4070
4060


CAMECO RESOURCES
CROW BUTTE OPERATION
MARSLAND EXPANSION AREA
DAWES COUNTY, NEBRASKA
Potentiometric Surface - Arikaree Group (4/22/2014)
AOW-1 Arikaree Monitor Wells
Potentiometric Contour
Marsland Permit Boundary
Figure 2.9-4c
T30N R51W S27
T30N R51W S26
T30N R51W S25
T30N R51W S34
T30N R51W S35
T30N R51W S36
T30N R50W S31
T30N R50W S32
AOW-8
4293.5
AOW-3
4210.1
T29N R51W S2
T29N R51W S3
T29N R51W S1
T29N R50W S6
T29N R50W S5
AOW-1
4135.6
T29N R51W S10
T29N R51W S11
T29N R51W S12
T29N R50W S7
T29N R50W S8
AOW-10
4084.9
AOW-7
Dry Hole
T29N R51W S14
T29N R51W S13
T29N R50W S18
T29N R50W S17
AOW-9
4070.9
AOW-4
4075.3
T29N R51W S24
T29N R51W S23
T29N R50W S19
AOW-5
4053.5
T29N R50W S20
T29N R51W S26
T29N R51W S25
T29N R50W S30
AOW-11
4056.4
T29N R50W S29
AOW-6
4048.9
4240
4230
4220
4210
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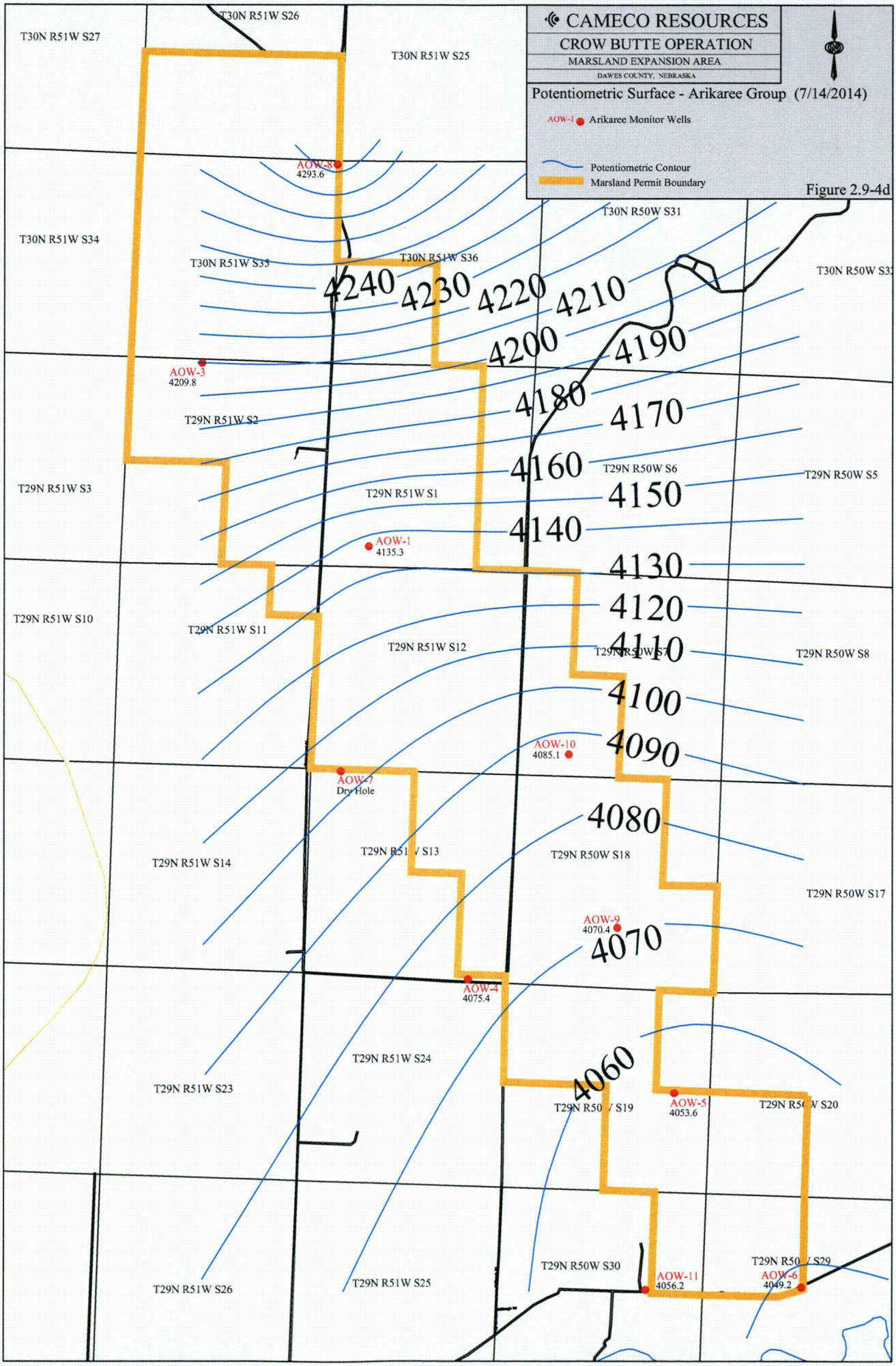
CAMECO RESOURCES
CROW BUTTE OPERATION
MARSLAND EXPANSION AREA
DAWES COUNTY, NEBRASKA
Potentiometric Surface - Arikaree Group (7/14/2014)
AOW-1 Arikaree Monitor Wells
Potentiometric Contour
Marsland Permit Boundary
Figure 2.9-4d
T30N R51W S27
T30N R51W S26
T30N R51W S25
T30N R51W S34
T30N R51W S35
T30N R51W S36
T30N R50W S31
T30N R50W S32
AOW-8
4293.6
AOW-3
4209.8
T29N R51W S2
T29N R51W S3
T29N R51W S1
T29N R50W S6
T29N R50W S5
AOW-1
4135.3
T29N R51W S10
T29N R51W S11
T29N R51W S12
T29N R50W S8
AOW-10
4085.1
AOW-7
Dry Hole
T29N R51W S14
T29N R50W S18
T29N R50W S17
AOW-9
4070.4
AOW-4
4075.4
T29N R51W S24
T29N R51W S23
AOW-5
4053.6
T29N R50W S20
T29N R50W S30
T29N R50W S29
AOW-11
4056.2
AOW-6
4049.2
T29N R51W S26
T29N R51W S25
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