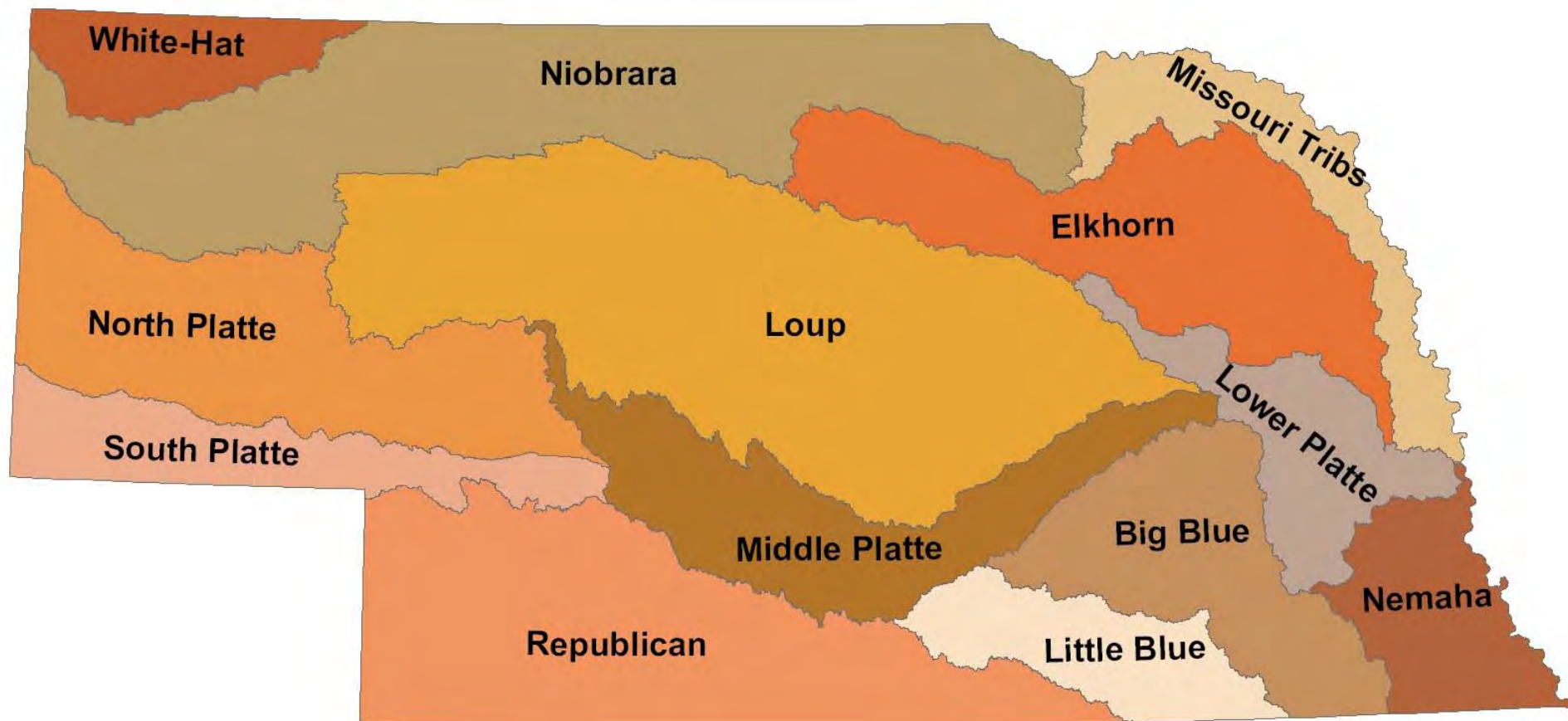




Camenco Resources Crow Butte Operation

Cross Section R2 - R2'

Figure 2.6-24



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**FIGURE 2.7-1
NEBRASKA'S MAJOR RIVER BASINS**

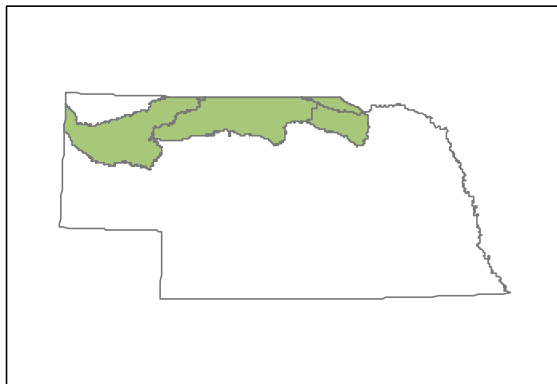
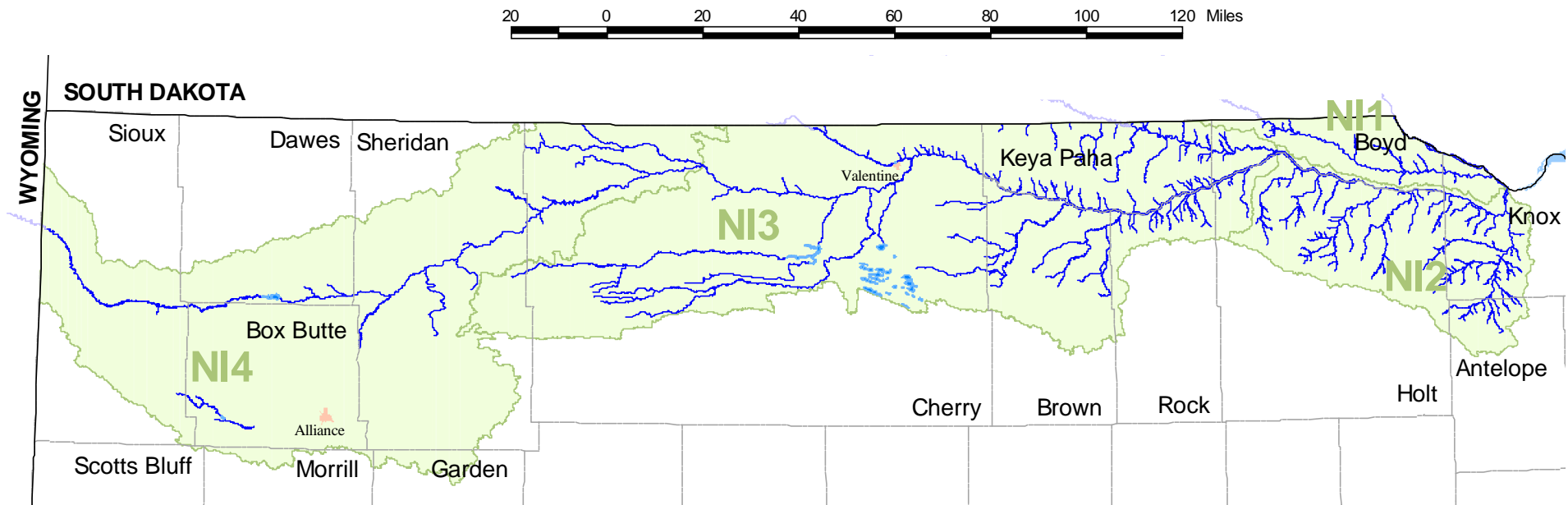
PROJECT: CO001636

MAPPED BY: JC

CHECKED BY: JEC



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Source: NDEQ, 2009



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**FIGURE 2.7-2
NIOBRARA RIVER BASIN
(AND SUBBASINS)**

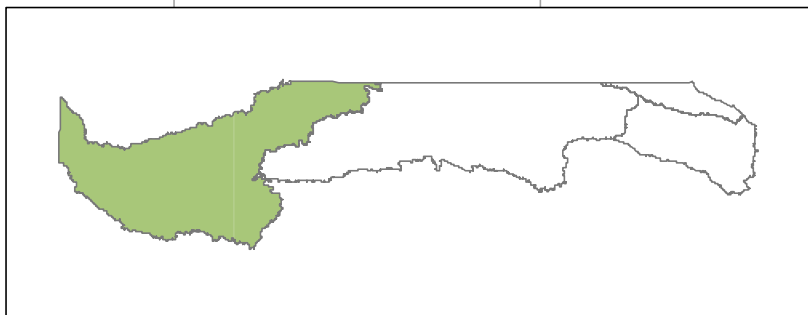
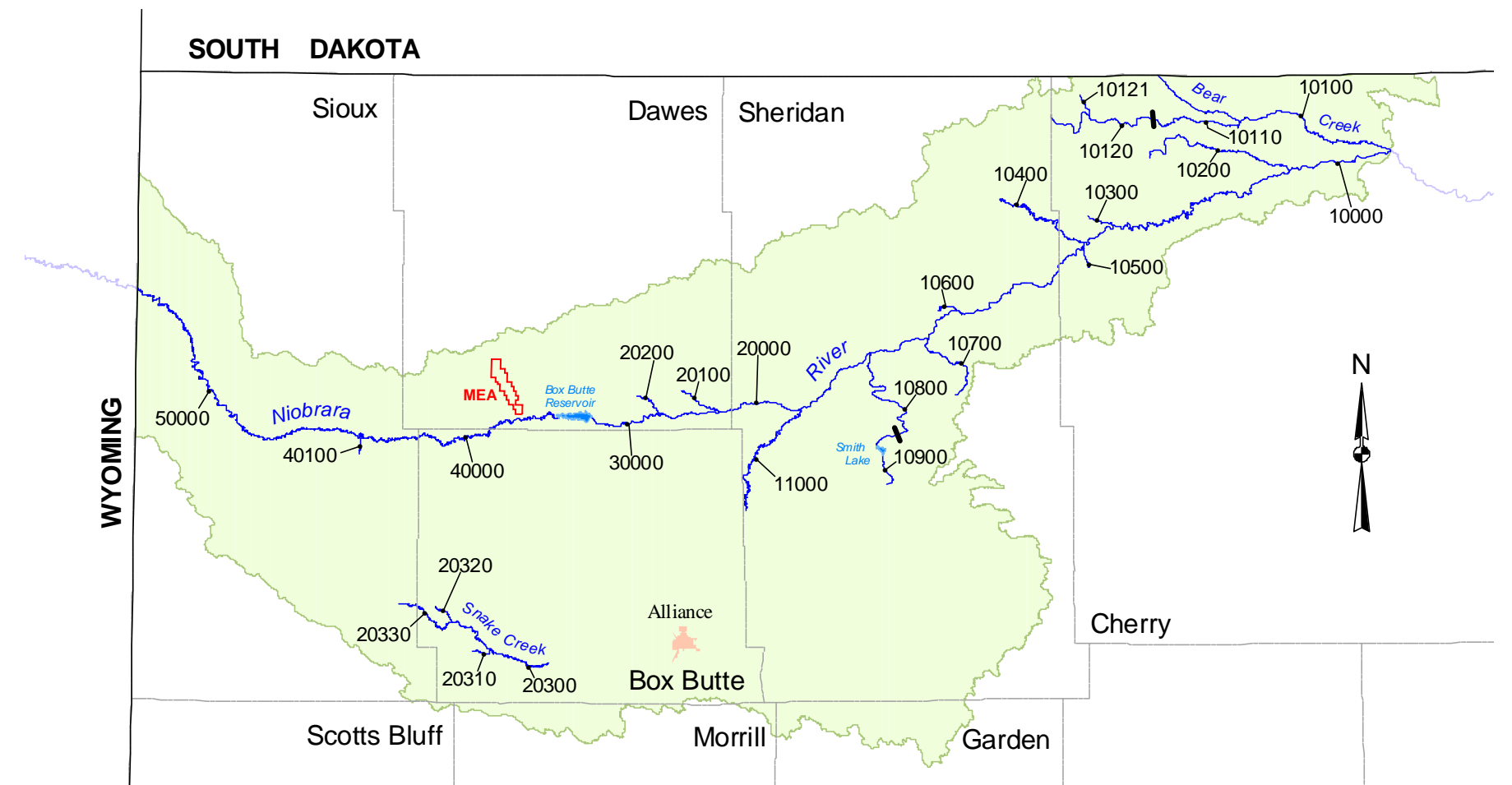
PROJECT: CO001636

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Source: NDEQ, 2009



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**FIGURE 2.7-3
NIOBRARA RIVER SUBBASIN N14**

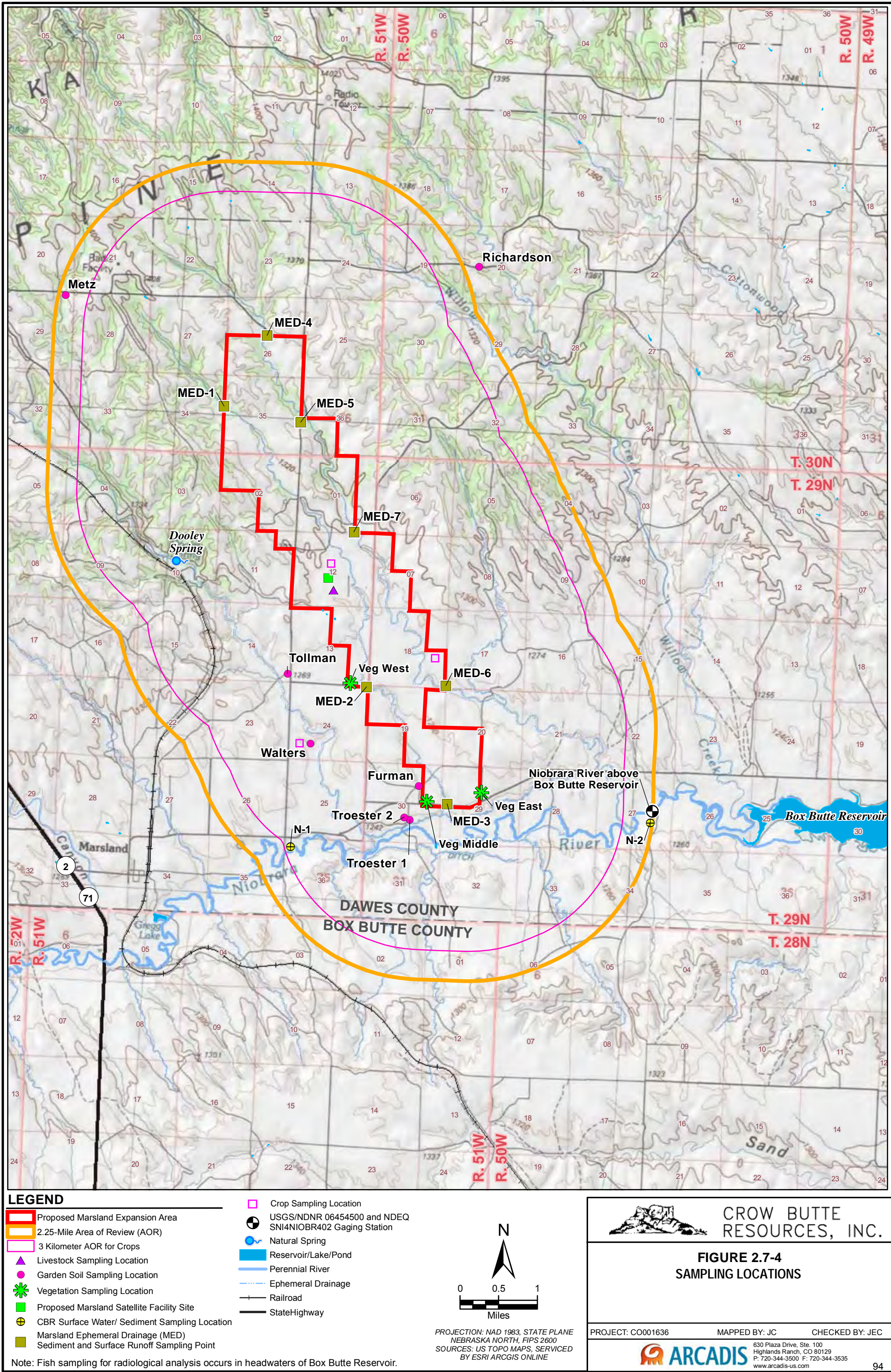
PROJECT: CO001636

MAPPED BY: JC

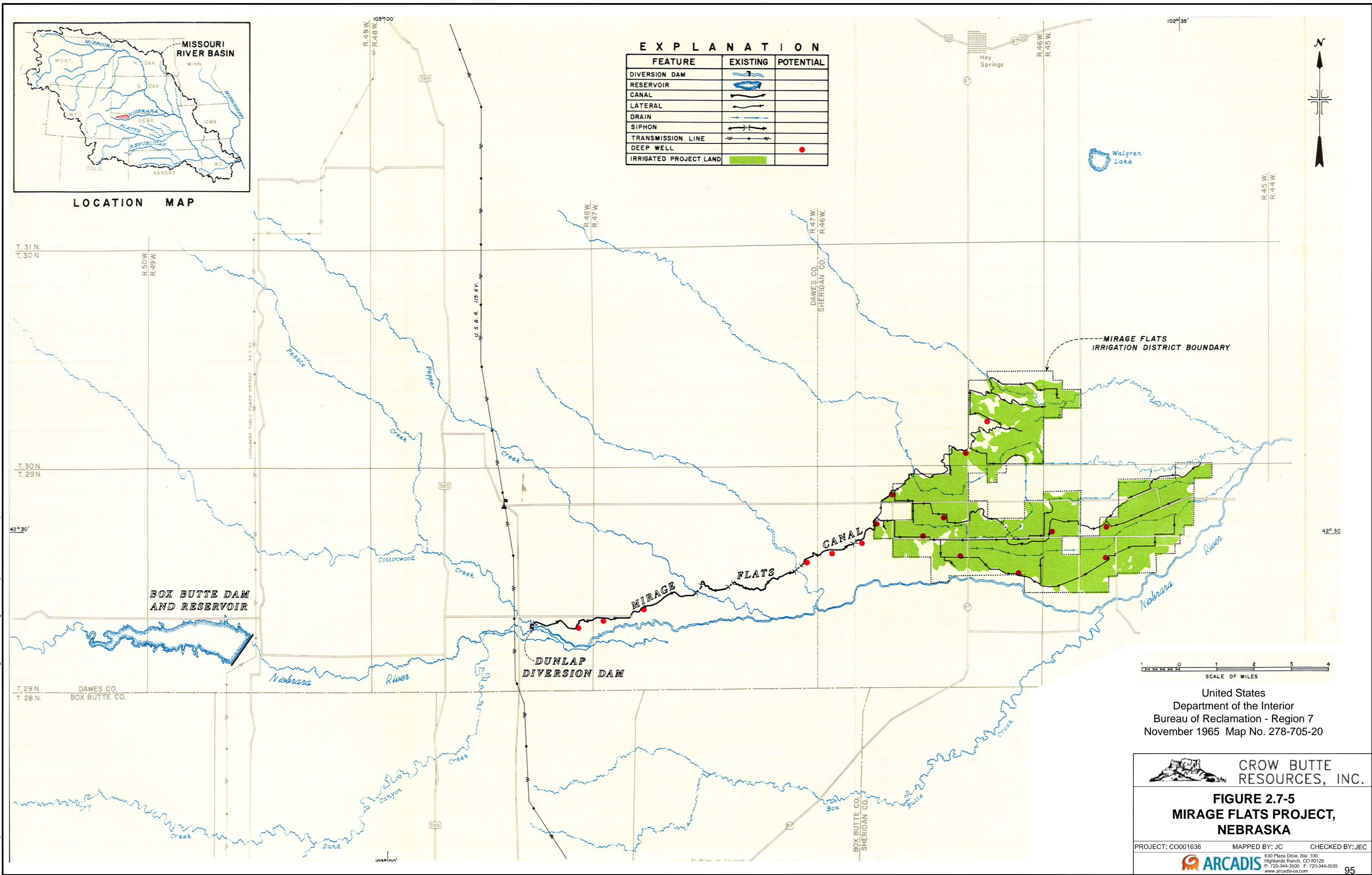
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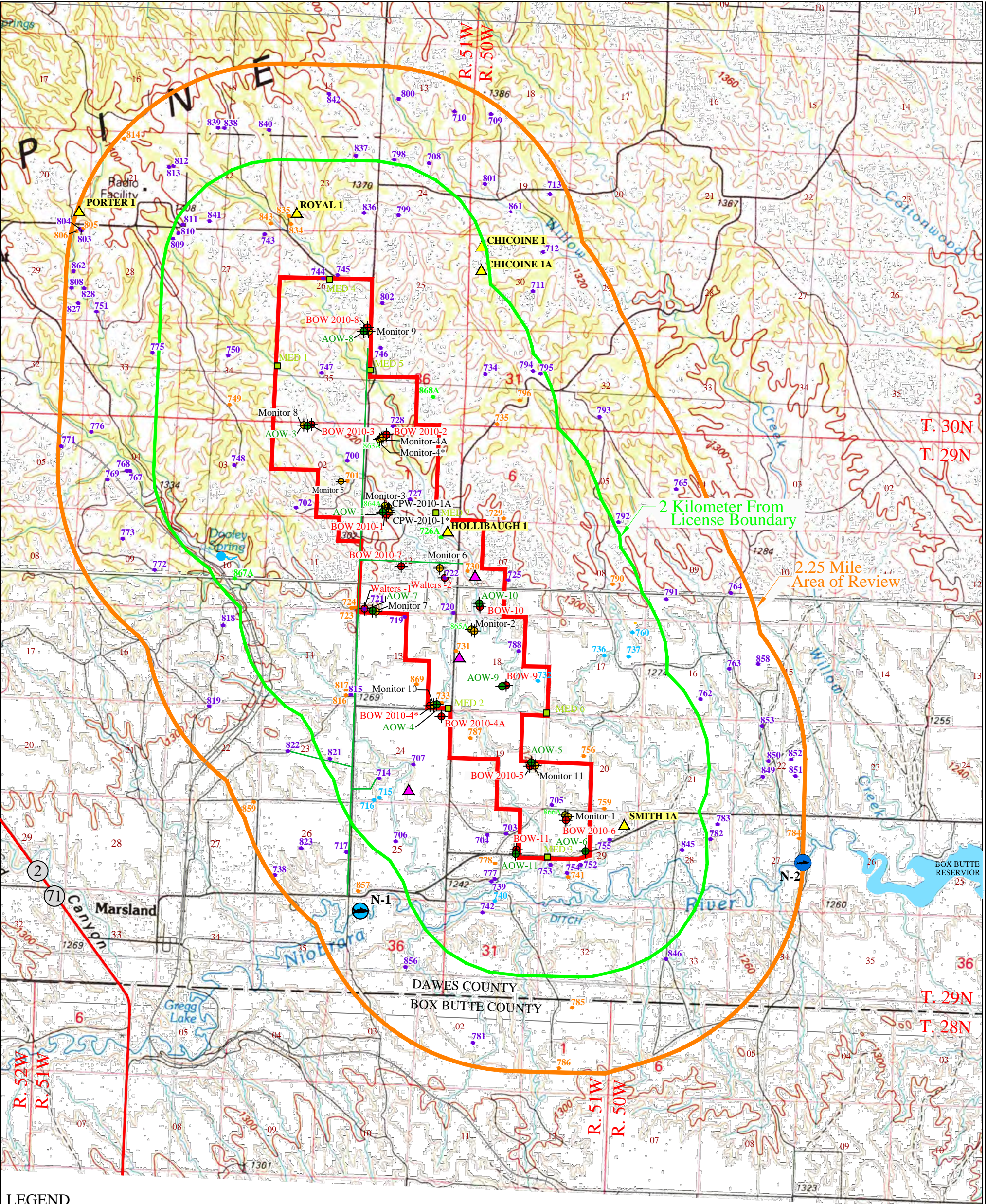


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K:\CBR_Projects\CO001636_Marland\3_IMAGES\Illustrator\TR Figure 2.7-5 Mirage Flats Project_11x17Landscape.ai @ 10/15/2011





Proposed Marsland Expansion Area

Area of Review (AOR)

2 Kilometer Boundary From License Boundary

Surface Water/Fish Sampling Location

Ephemeral Drainage Sediment Sampling Point

Natural Spring

Pumping Test Monitoring Wells

Monitor-1 Basal Sandstone of the Chadron Formation Well and Well ID

BOW-2010-1 Brule Formation Well and Well ID

AOW-1 Arikaree Group Well and Well ID

866A Abandoned Chadron Monitor Well and Well ID

Sand/Gravel pit, Inactive

Oil/Gas Test holes

Private Water Supply Wells

781 Active Well and Well ID

786 Inactive Well and Well ID

732 Seasonal 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.

CAMECO RESOURCES

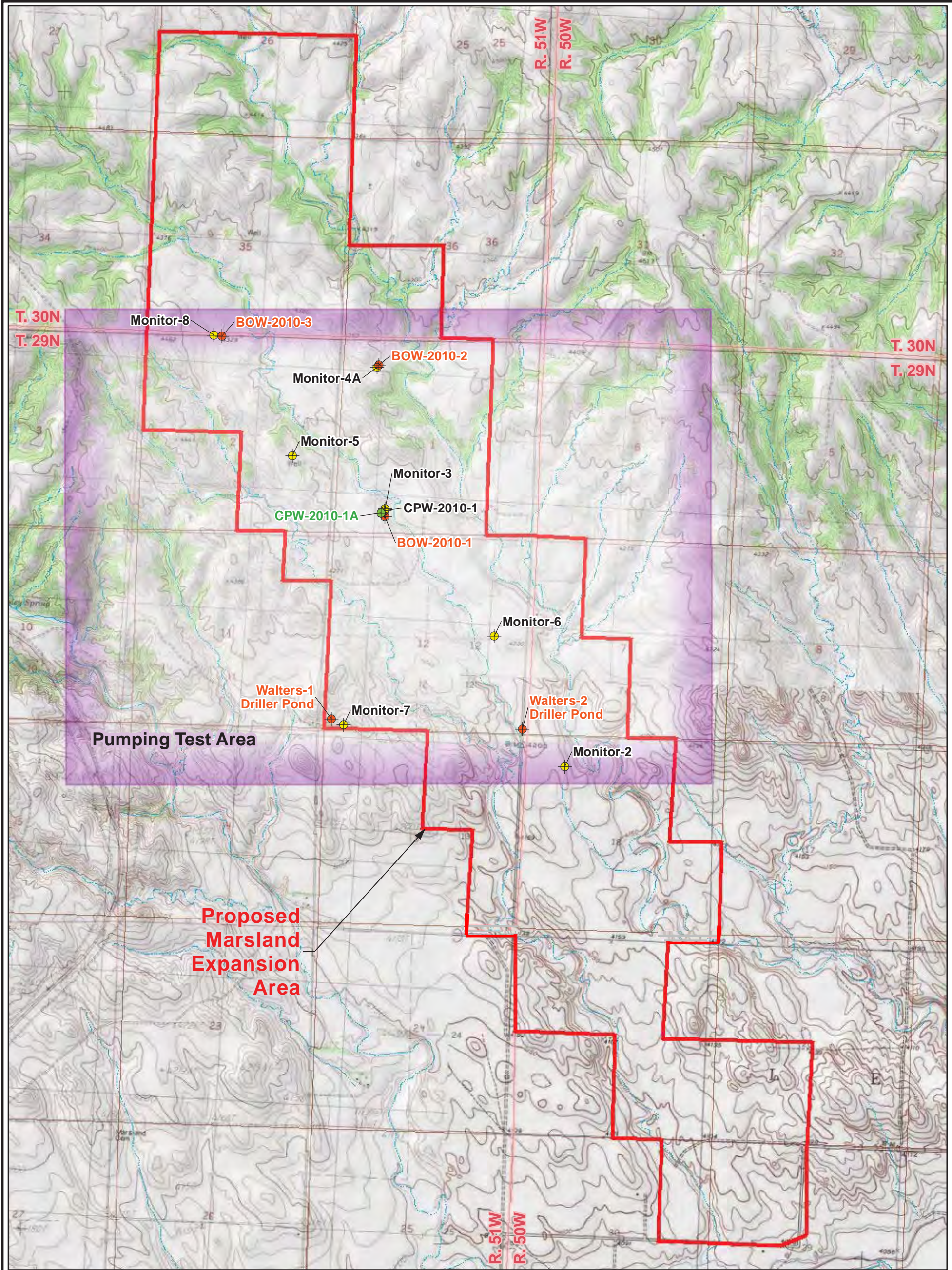
CROW BUTTE OPERATIONS

Figure 2.7-6

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

File C:\Users\ca200049\Desktop\Marsland Permitting\NRC TR Figure 2.7-6.dwg

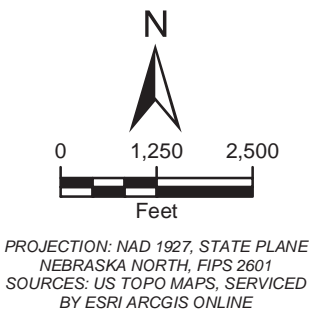
PROJECTION: NAD 1983, STATE PLANE NEBRASKA NORTH, FIPS 2600
SOURCES: US TOPO MAPS - USGS



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



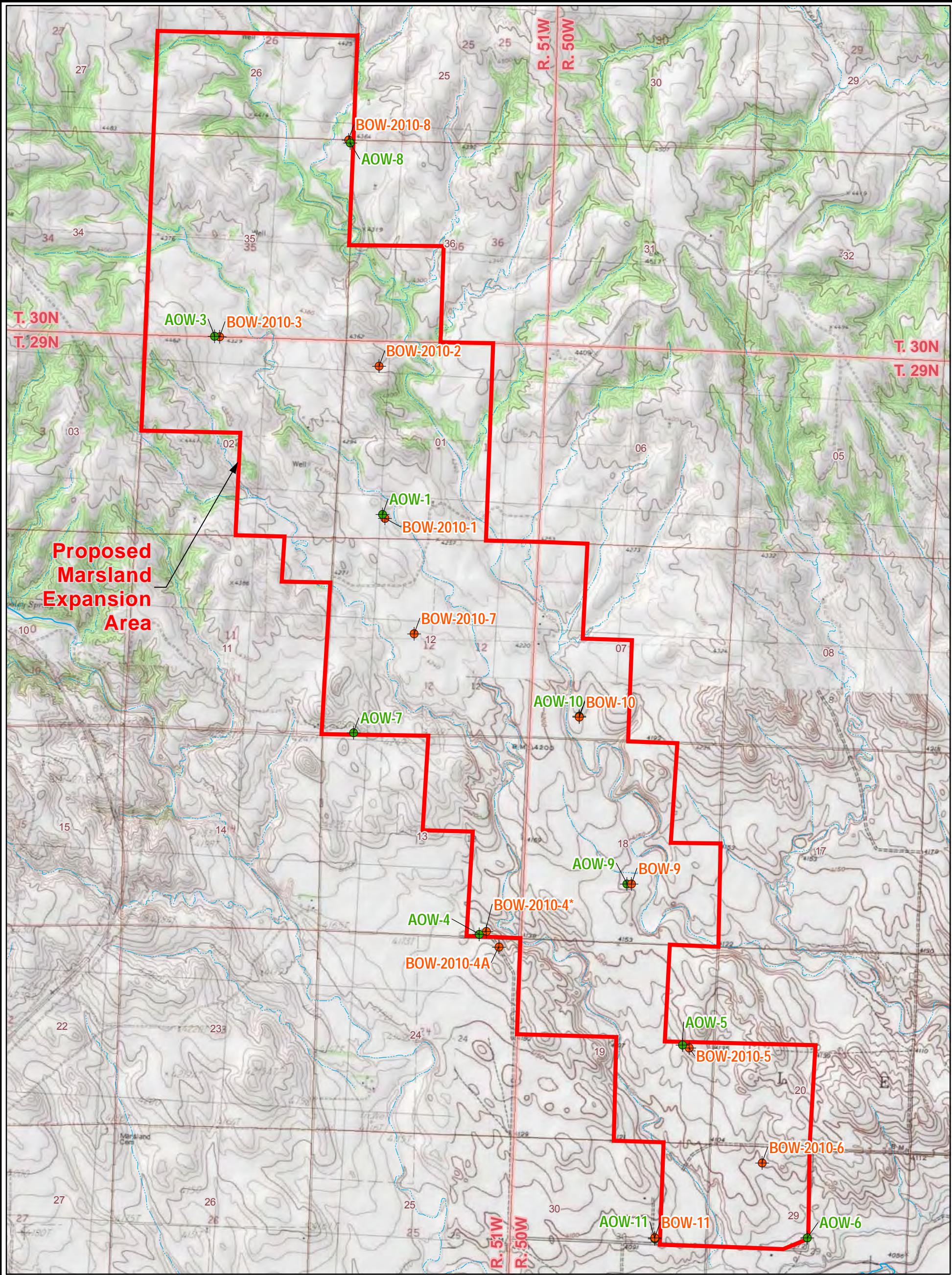
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FIGURE 2.7-7
MARSLAND EXPANSION AREA
PUMPING TEST WELL LOCATIONS

PROJECT: CO001636 MAPPED BY: JC CHECKED BY: MS



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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

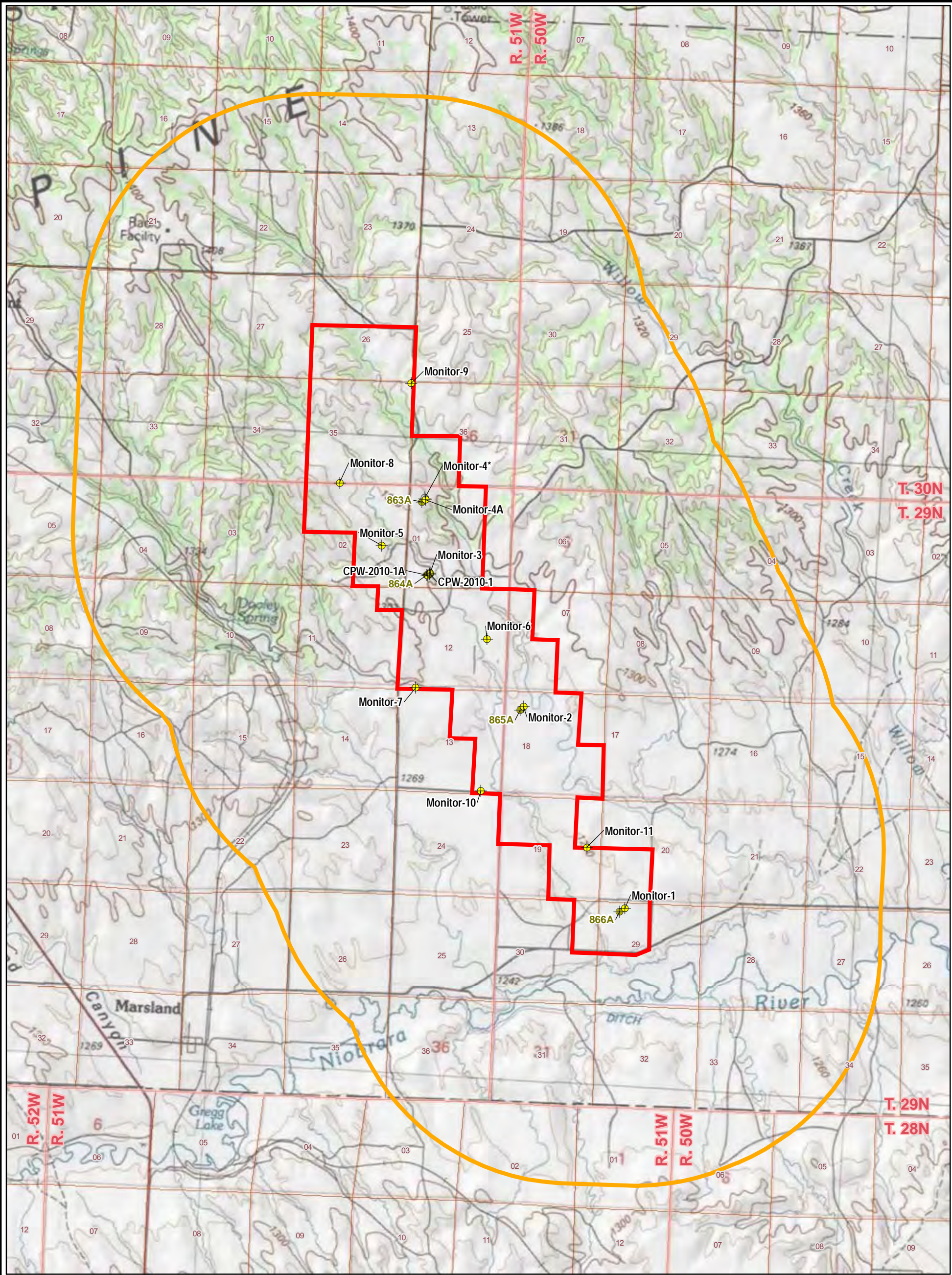
MAPPED BY: JC

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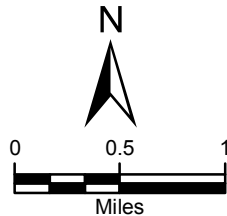


LEGEND

- 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



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



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

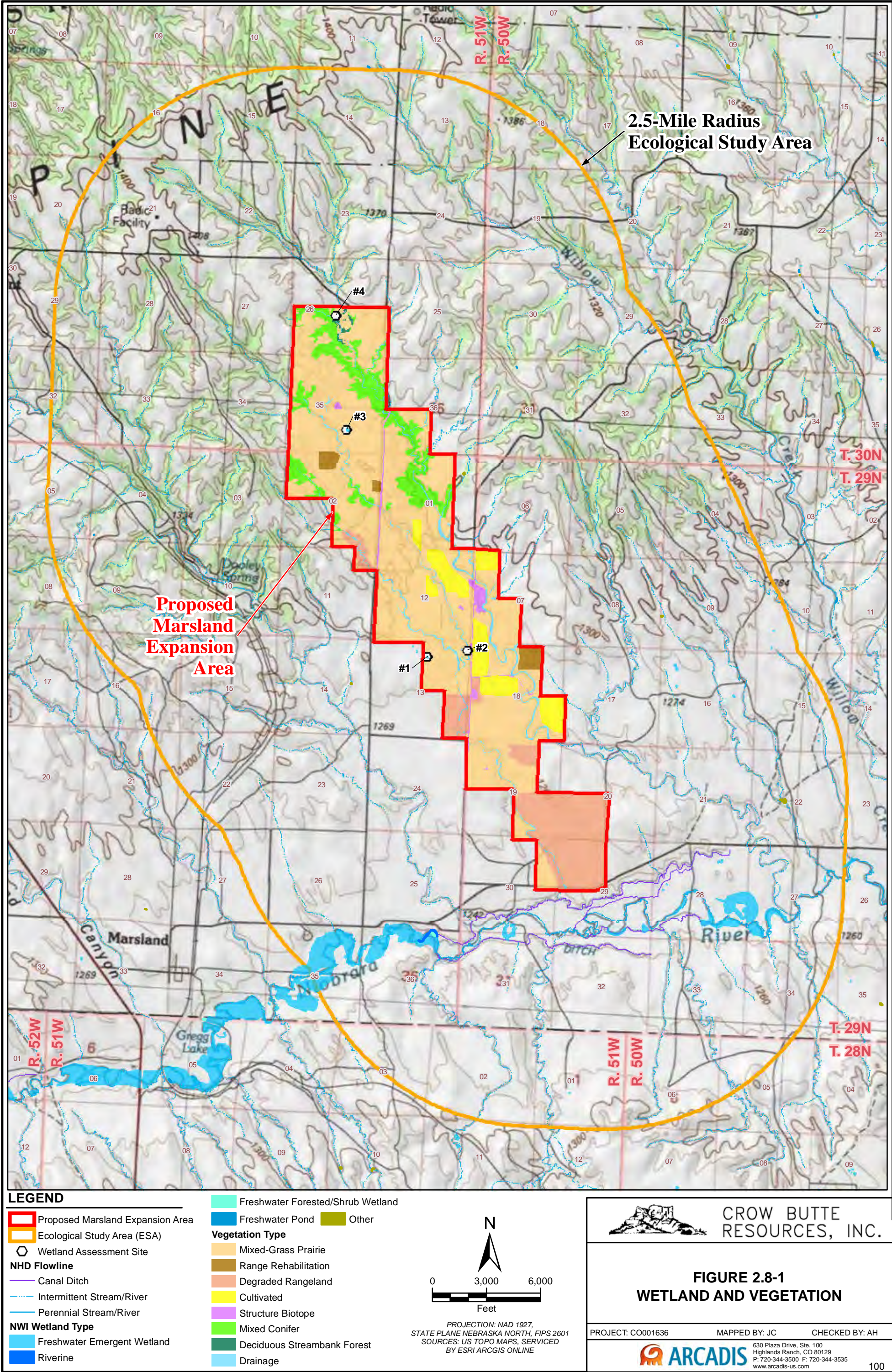
PROJECT: CO001636

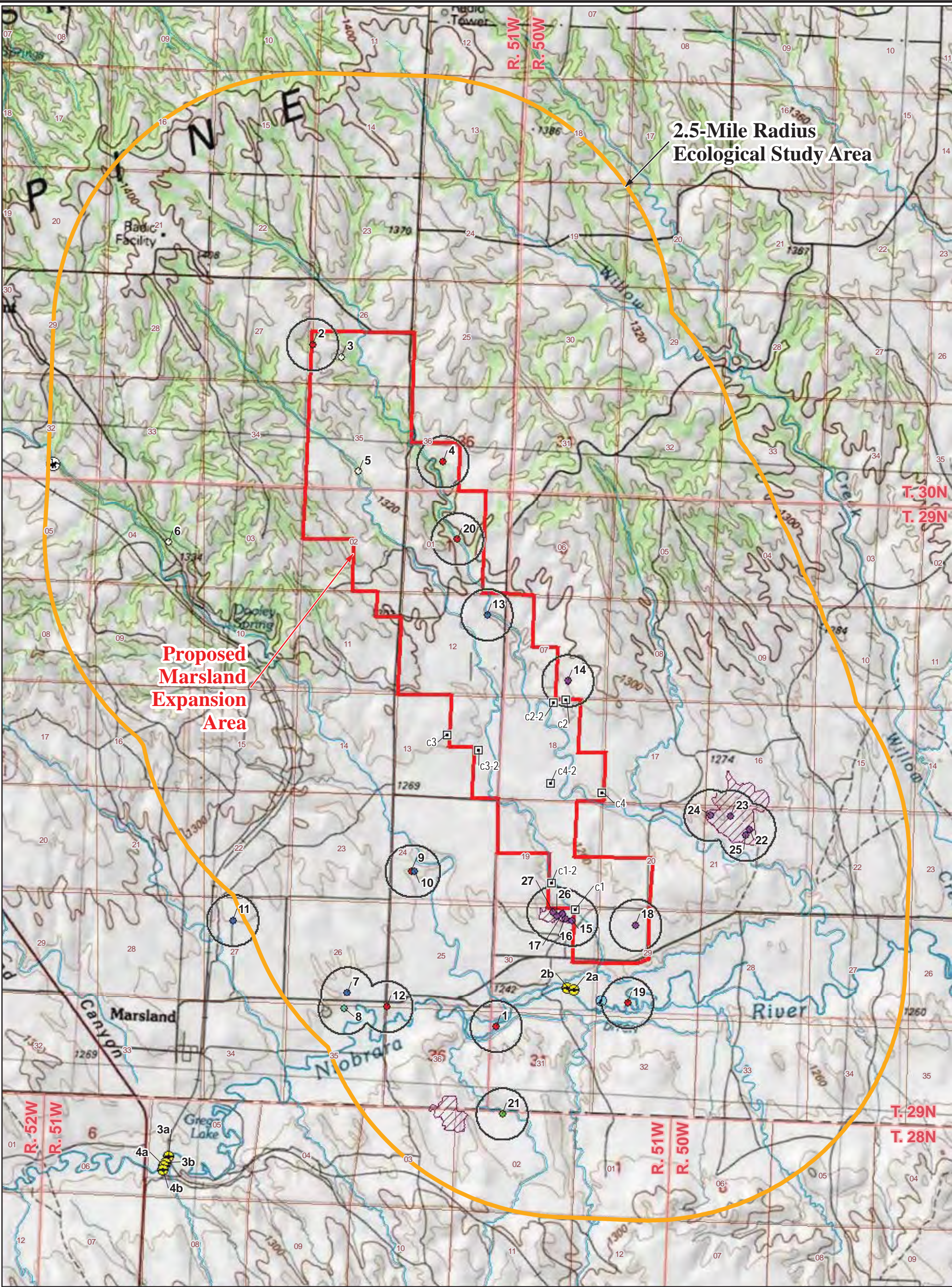
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LEGEND

- 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
- Burrowing Owl

Ferruginous Hawk

Great Horned Owl

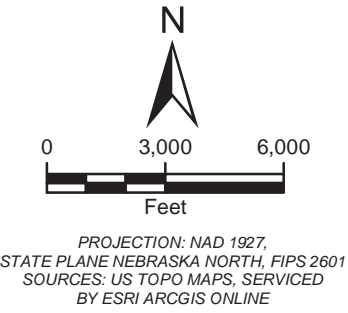
Red-Tailed Hawk


Swainson's Hawk

Unknown Raptor

0.25-Mile Buffer of Active Raptor Nest

River/Stream






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FIGURE 2.8-2
WILDLIFE MAP

PROJECT: CO001636

MAPPED BY: JC

CHECKED BY: AH


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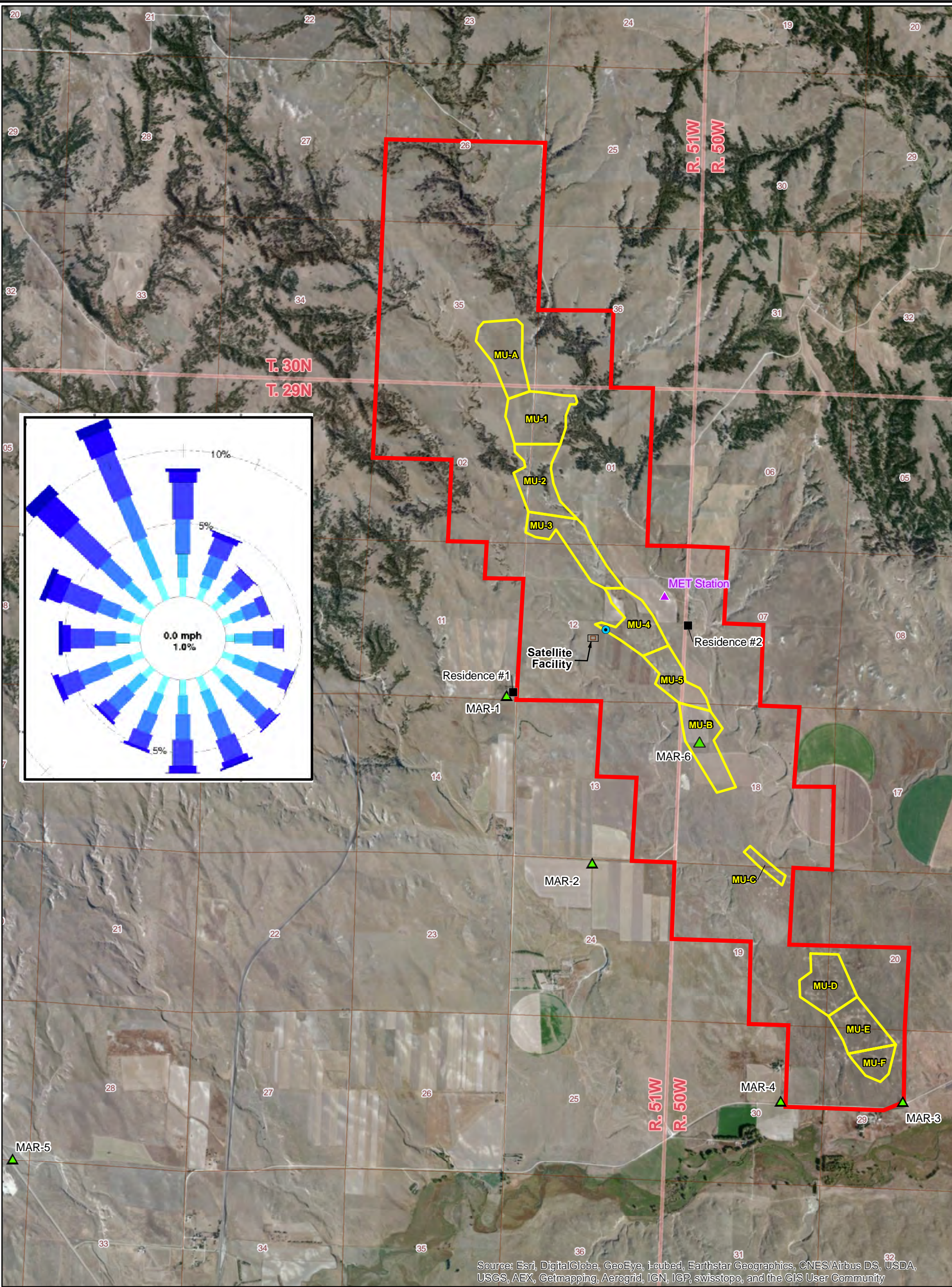
101

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																														

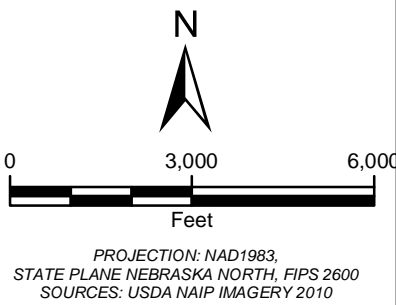
 Samples will be collected when water flow becomes available

 Sampling completed



LEGEND

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



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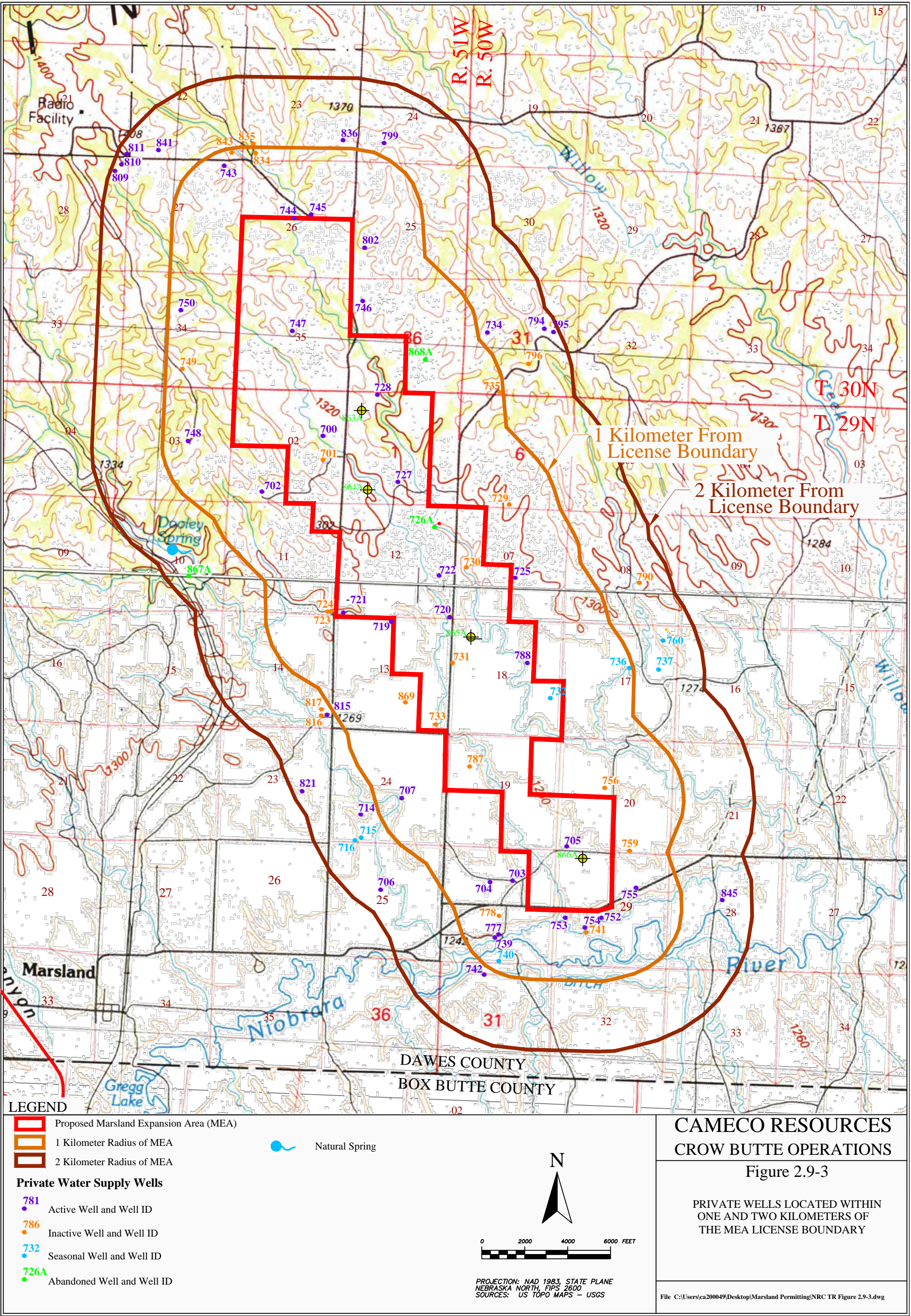
FIGURE 2.9-2
LOCATION OF ENVIRONMENTAL AIR
SAMPLING STATIONS AT MARSLAND
EXPANSION AREA

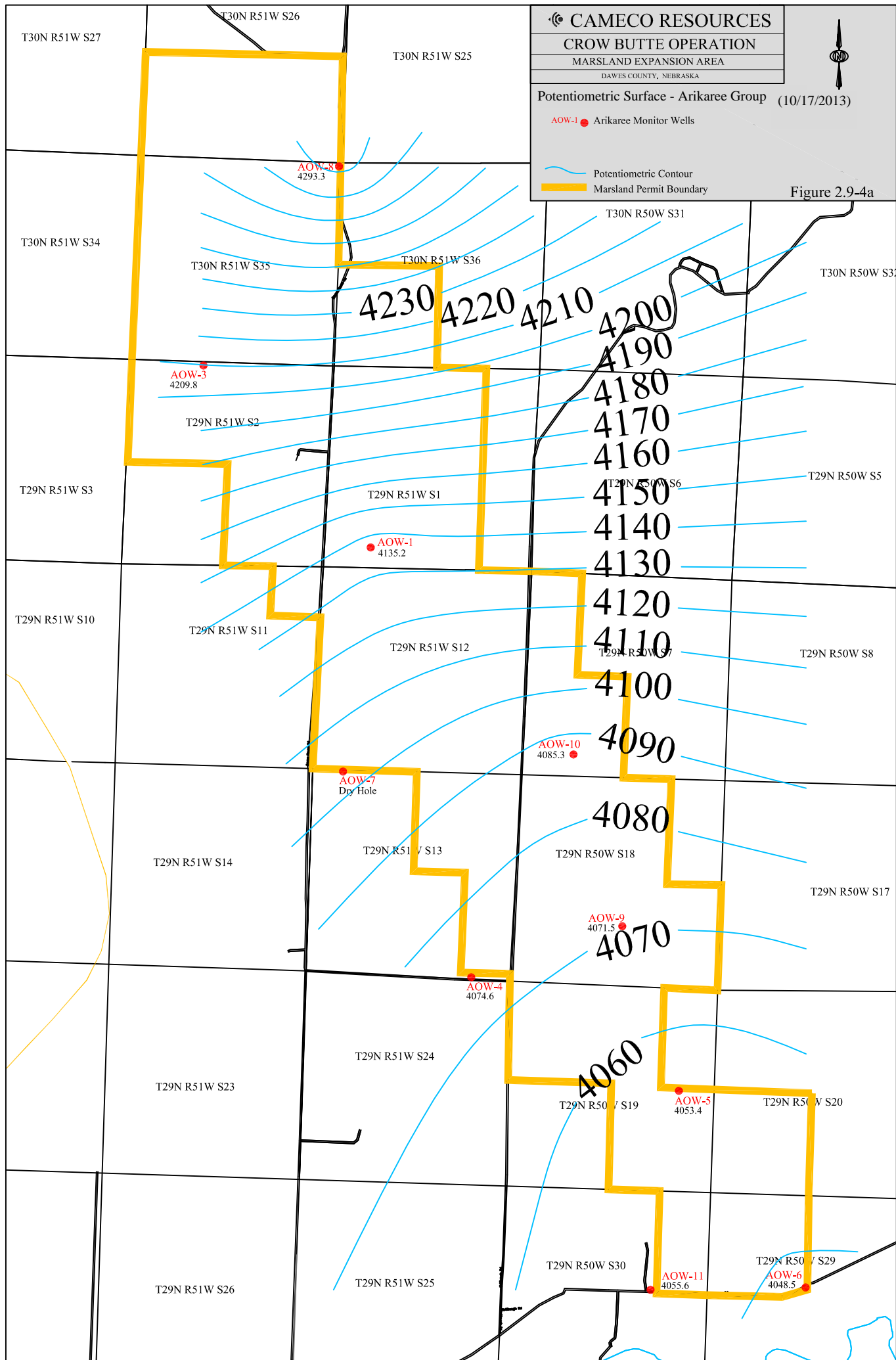
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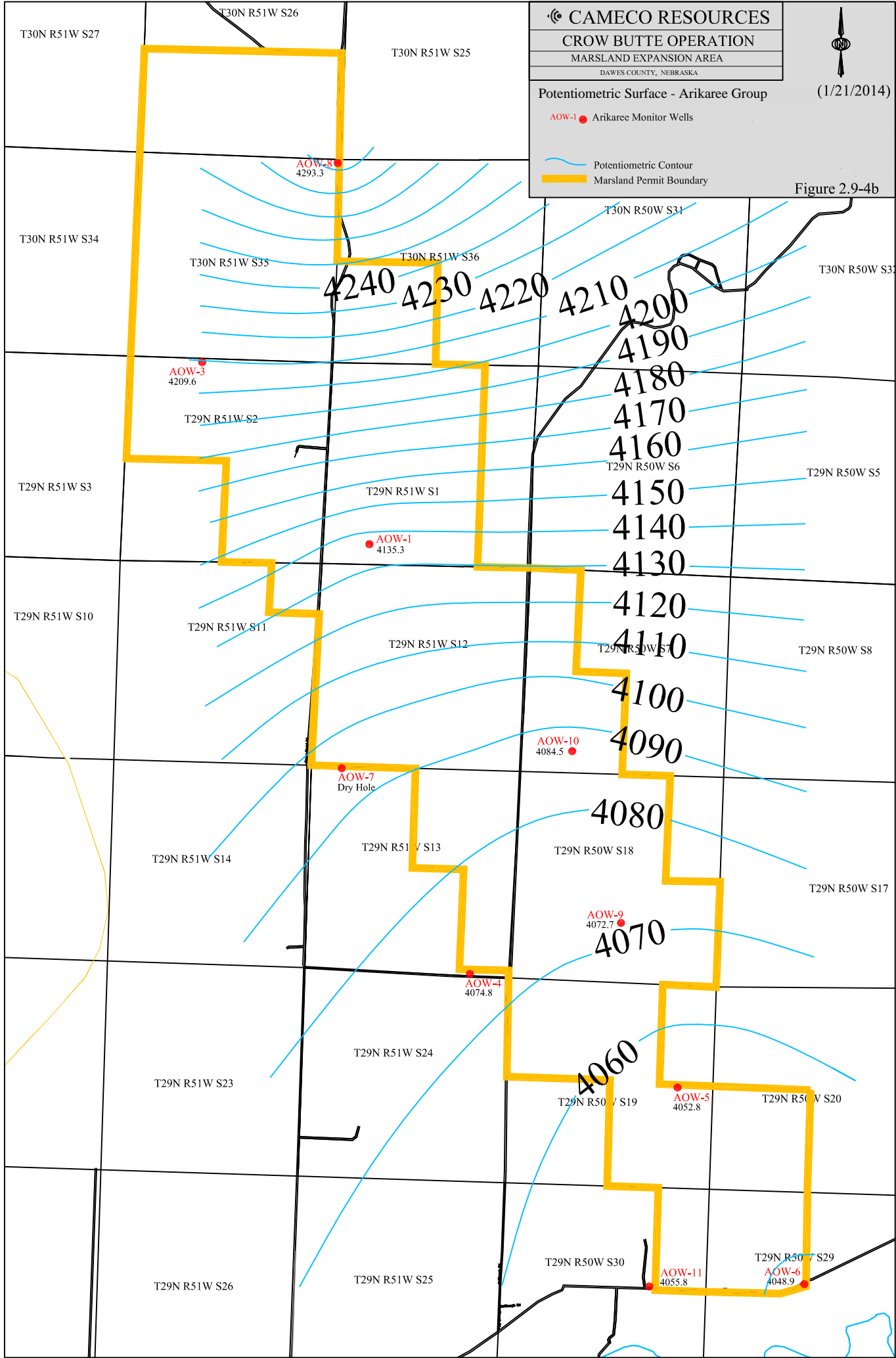


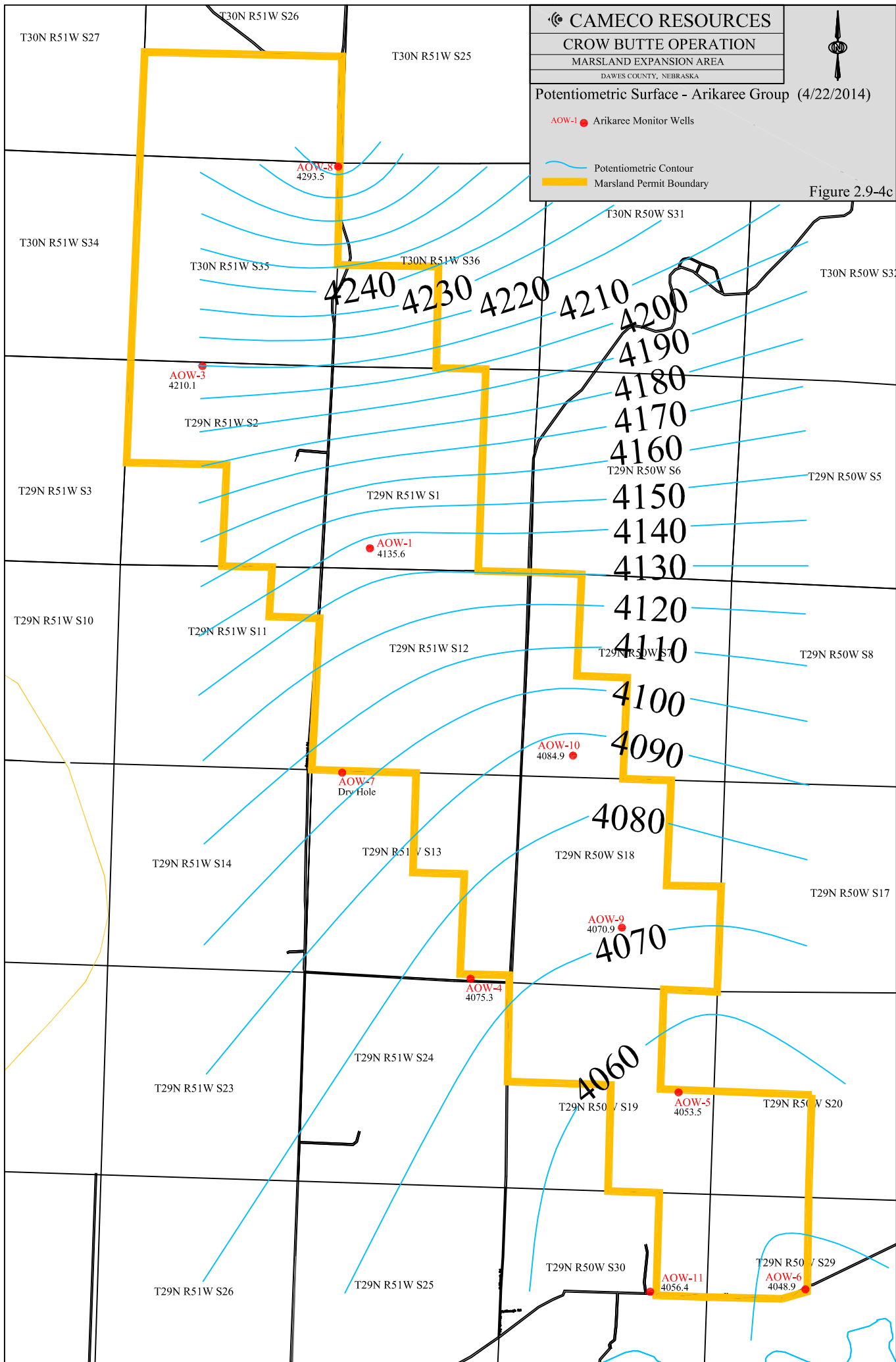
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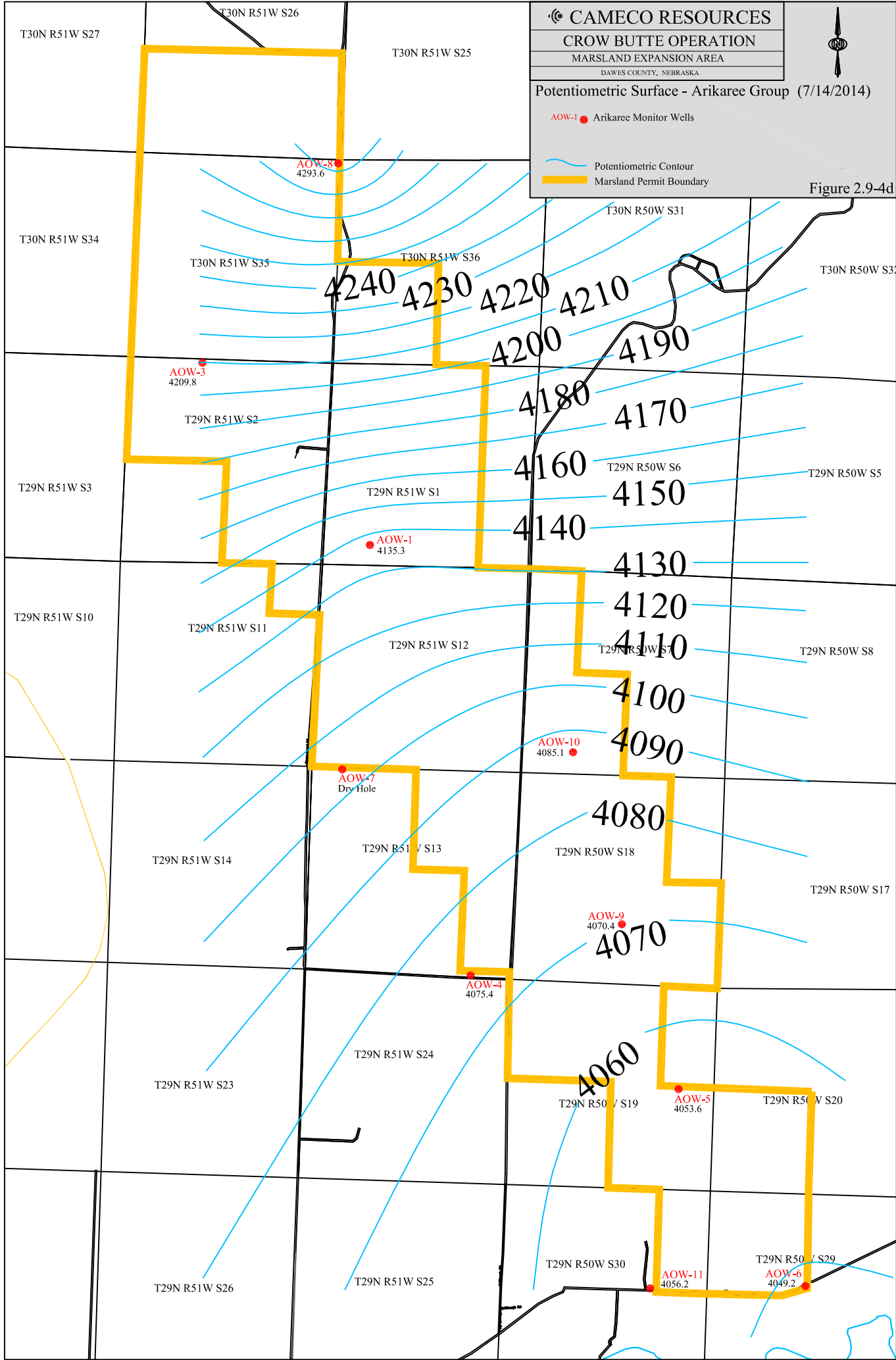
Map Updated on: 10/9/2014

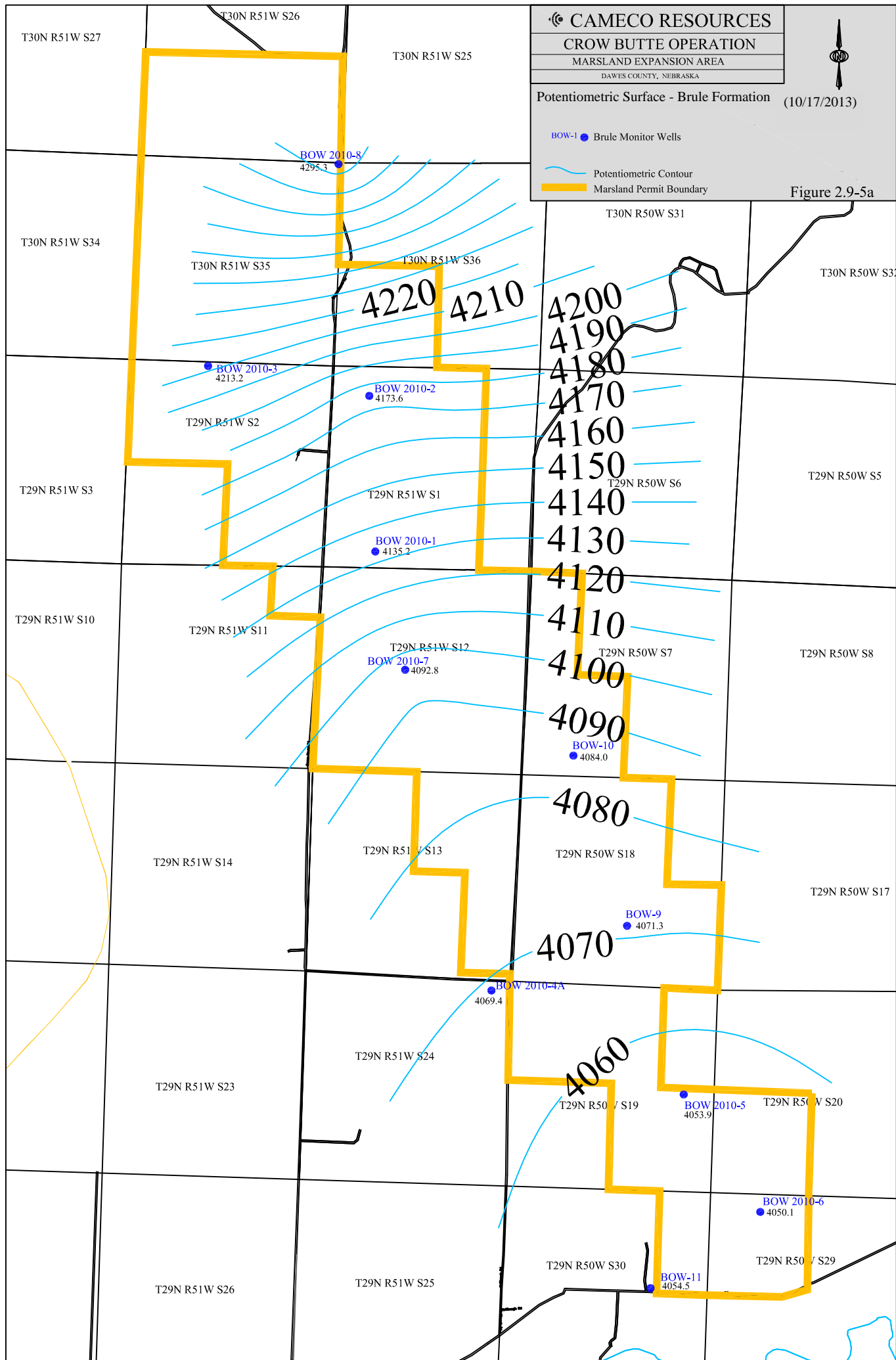


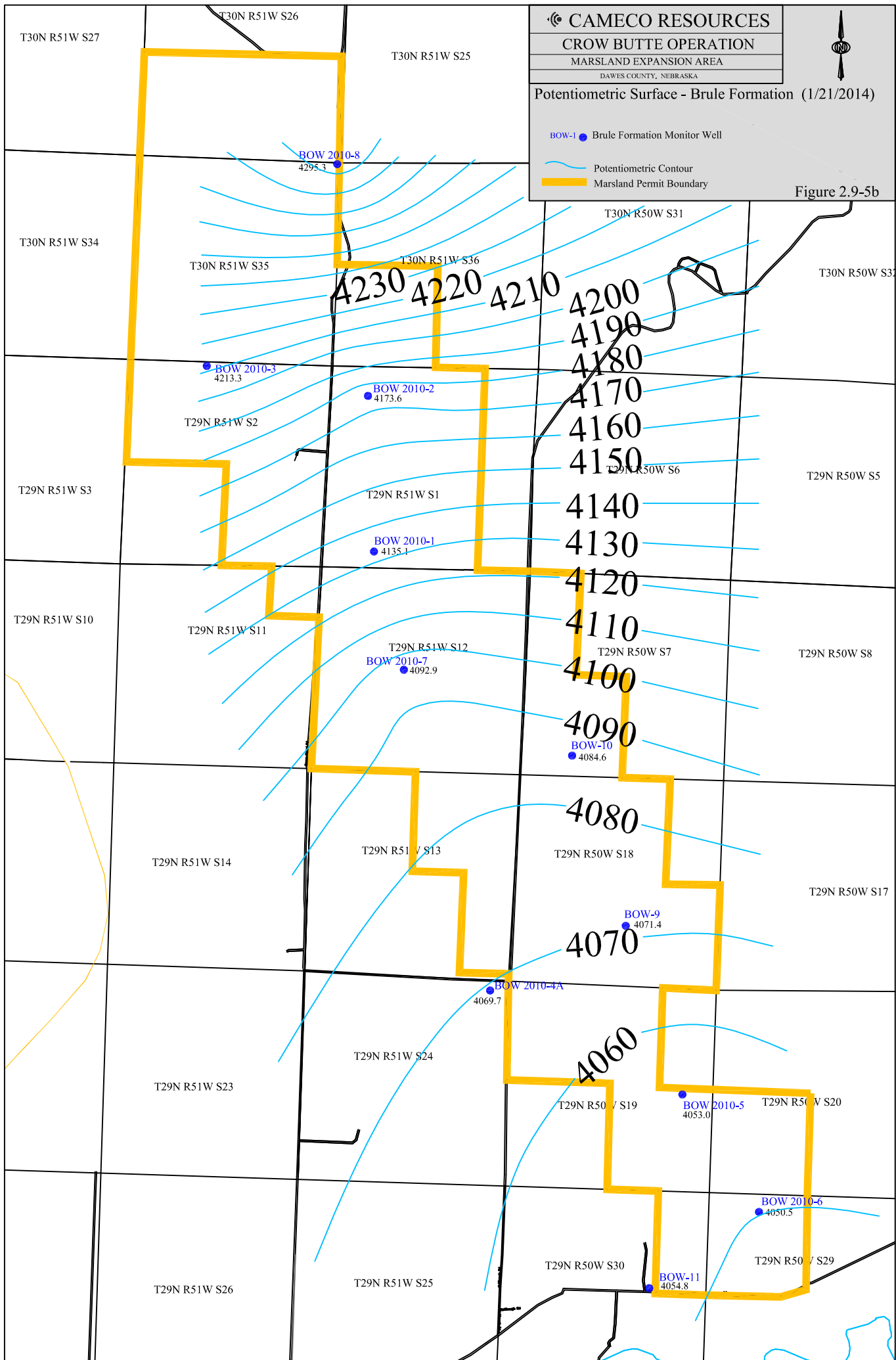


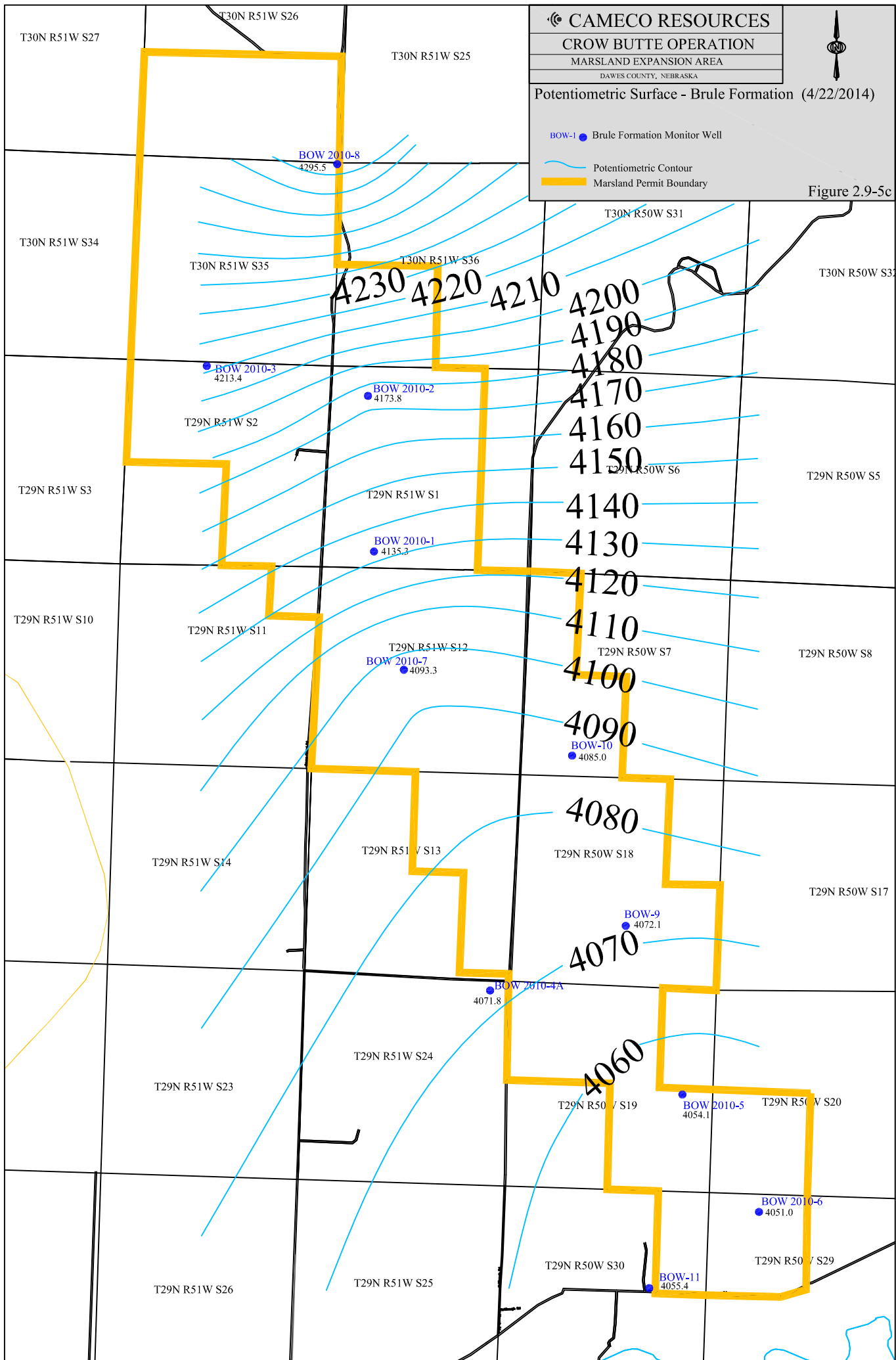


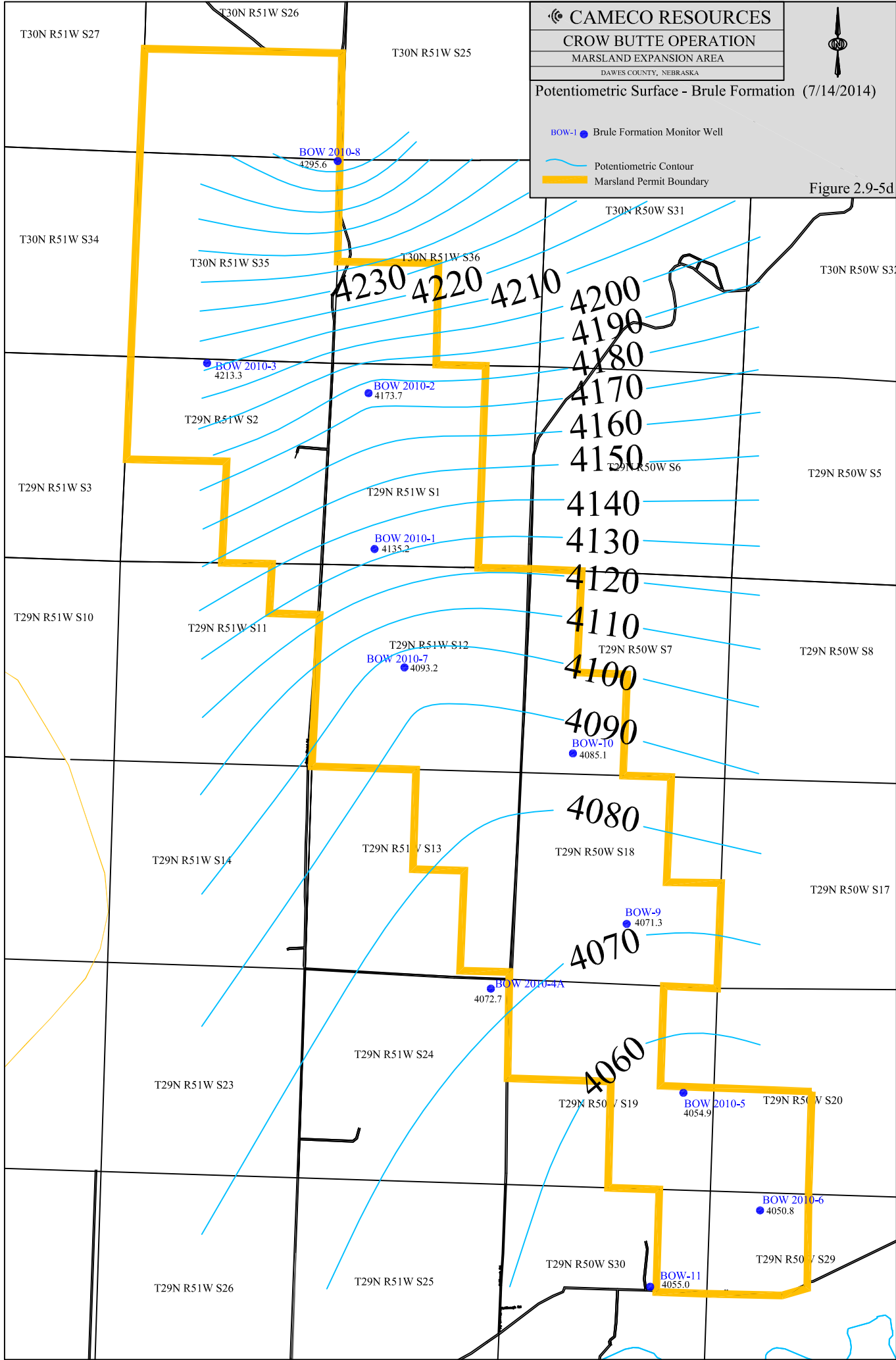










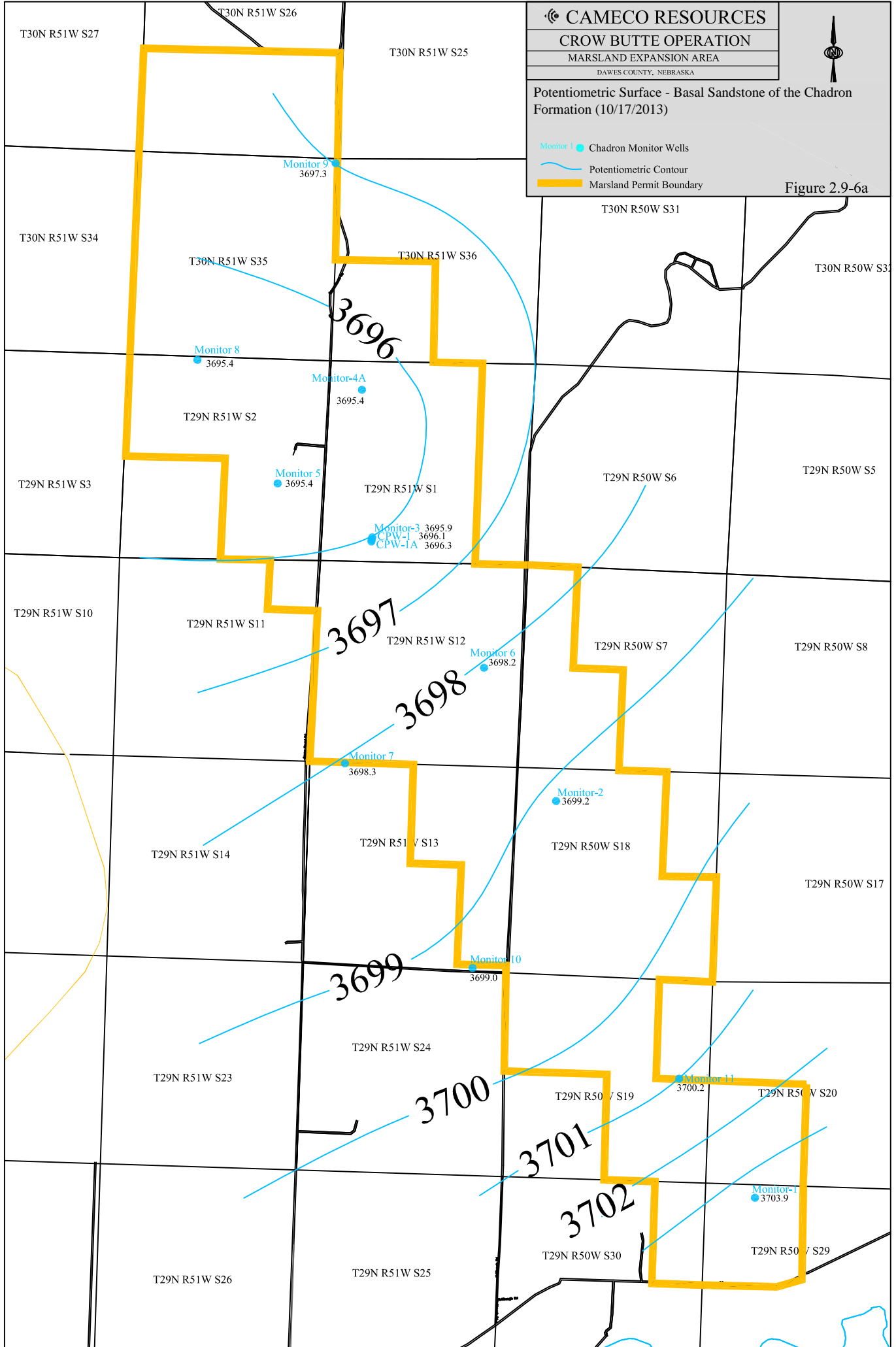




Potentiometric Surface - Basal Sandstone of the Chadron Formation (10/17/2013)

- Monitor 1 ● Chadron Monitor Wells
- Potentiometric Contour
- Marsland Permit Boundary

Figure 2.9-6a

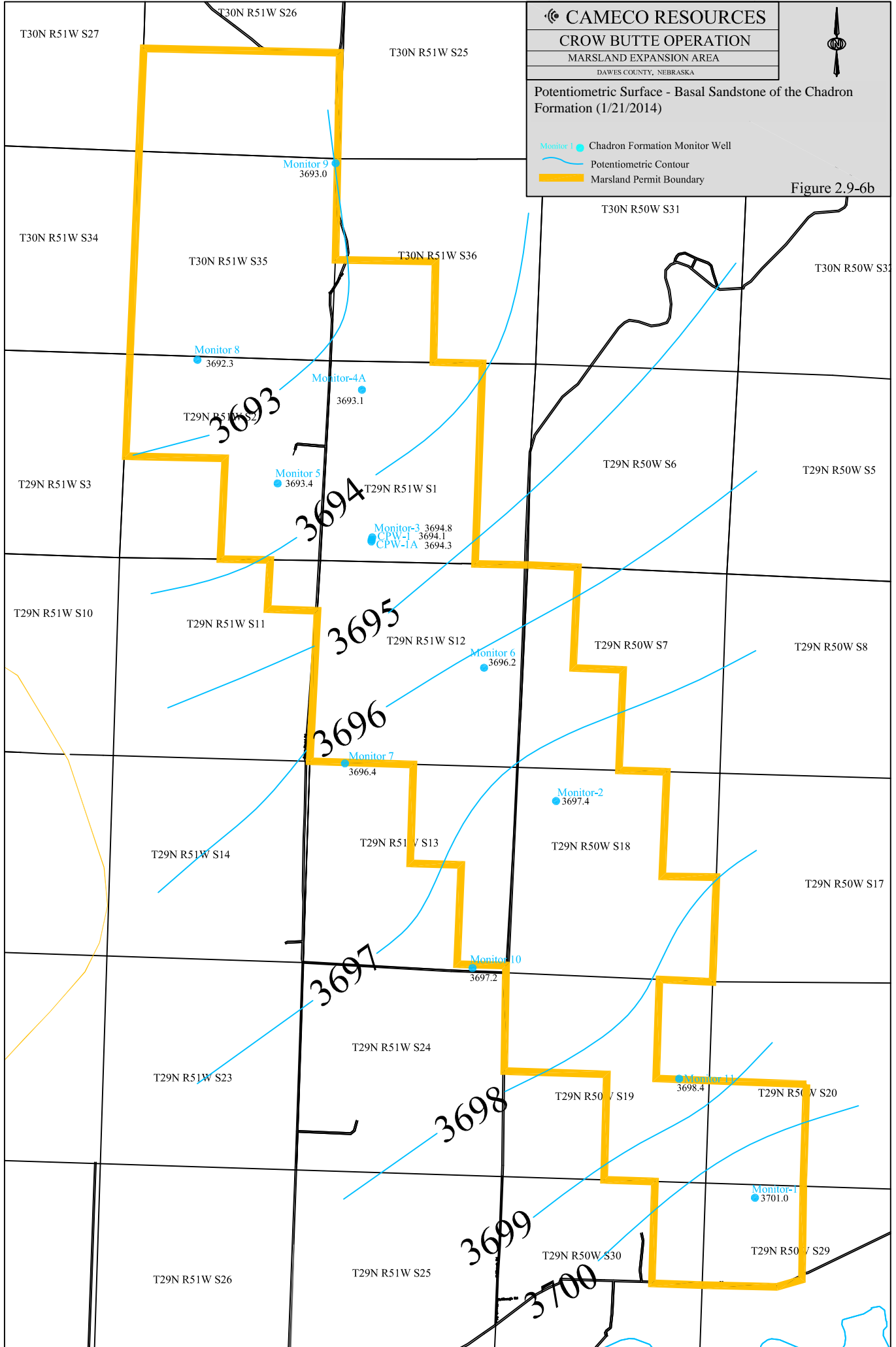




Potentiometric Surface - Basal Sandstone of the Chadron Formation (1/21/2014)

- Monitor 1 ● Chadron Formation Monitor Well
- Potentiometric Contour
- Marsland Permit Boundary

Figure 2.9-6b

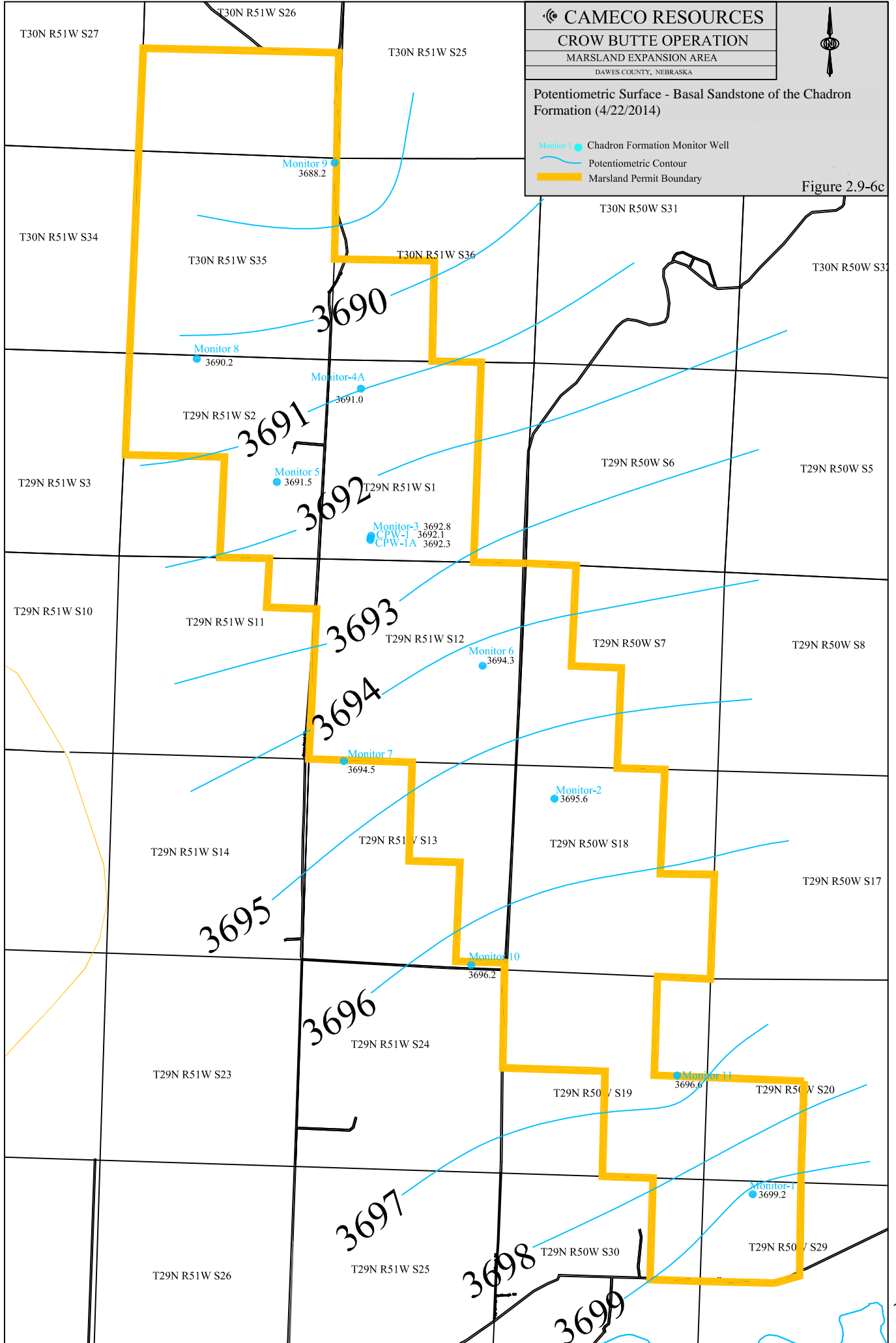


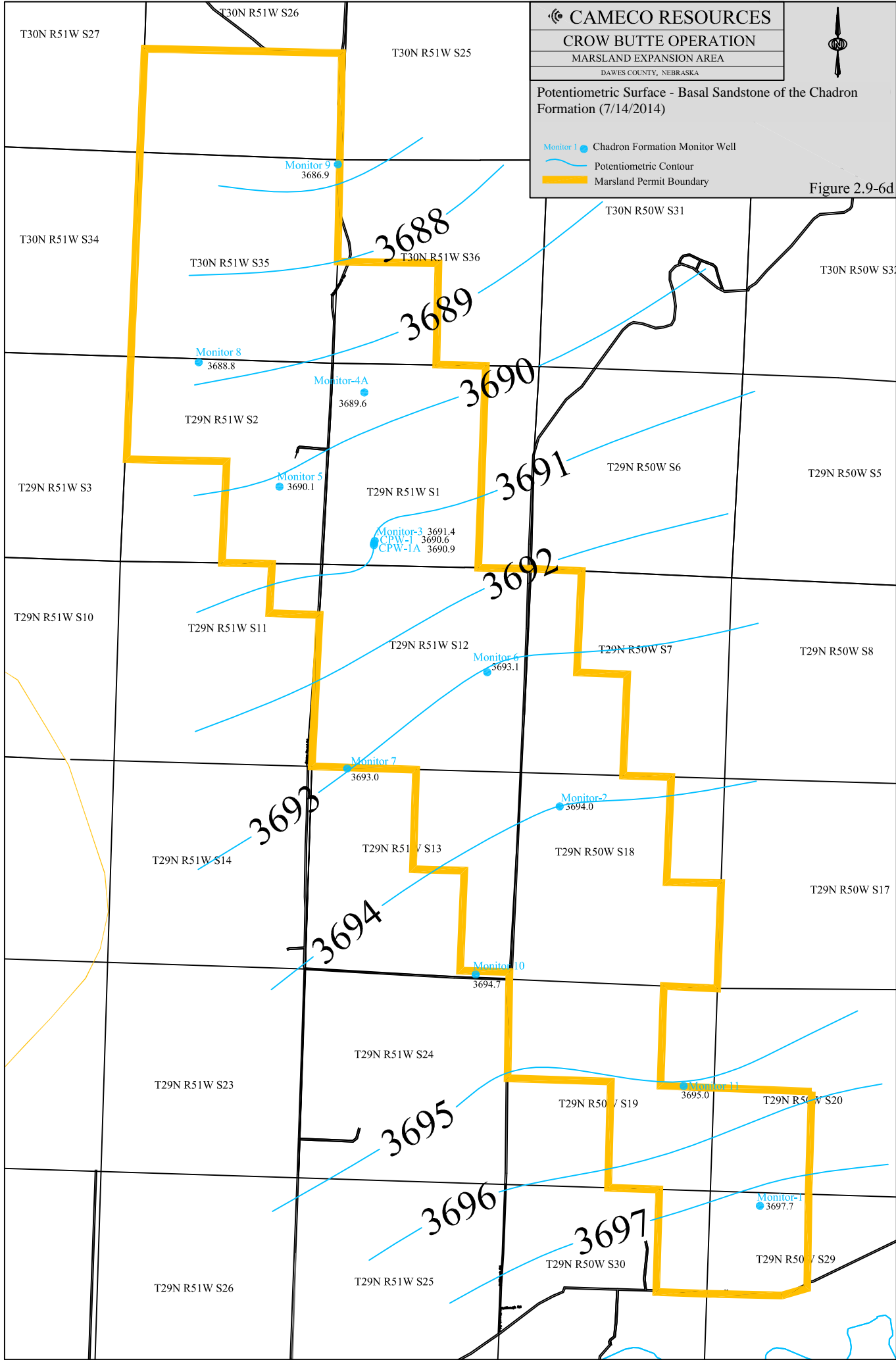


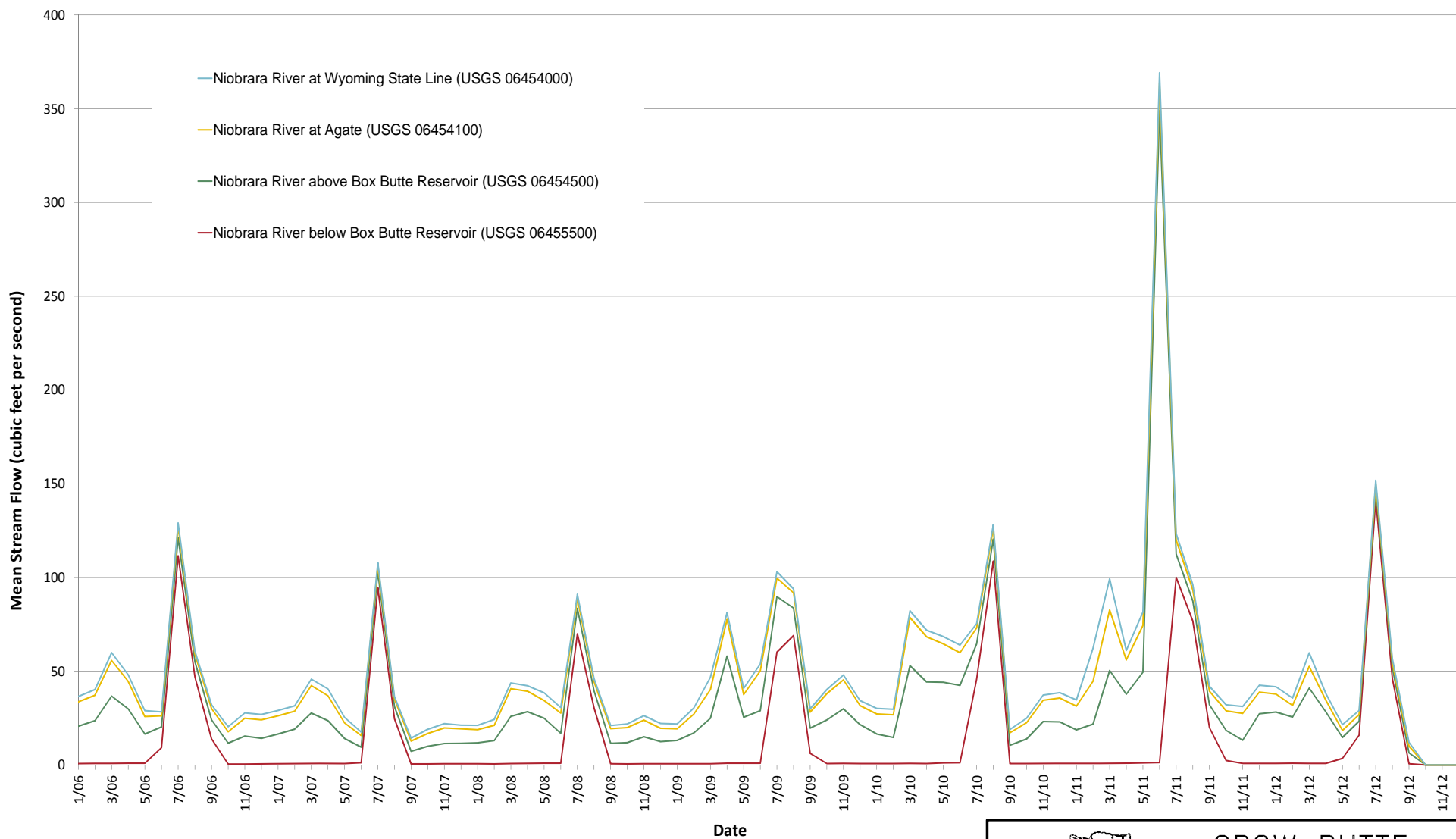
Potentiometric Surface - Basal Sandstone of the Chadron Formation (4/22/2014)

- Monitor 1 Chadron Formation Monitor Well
- Potentiometric Contour
- Marsland Permit Boundary

Figure 2.9-6c







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FIGURE 2.9-7
UPPER NIOBRARA RIVER
AVERAGE FLOWS AT
USGS/NDNR STREAM GAGING STATIONS

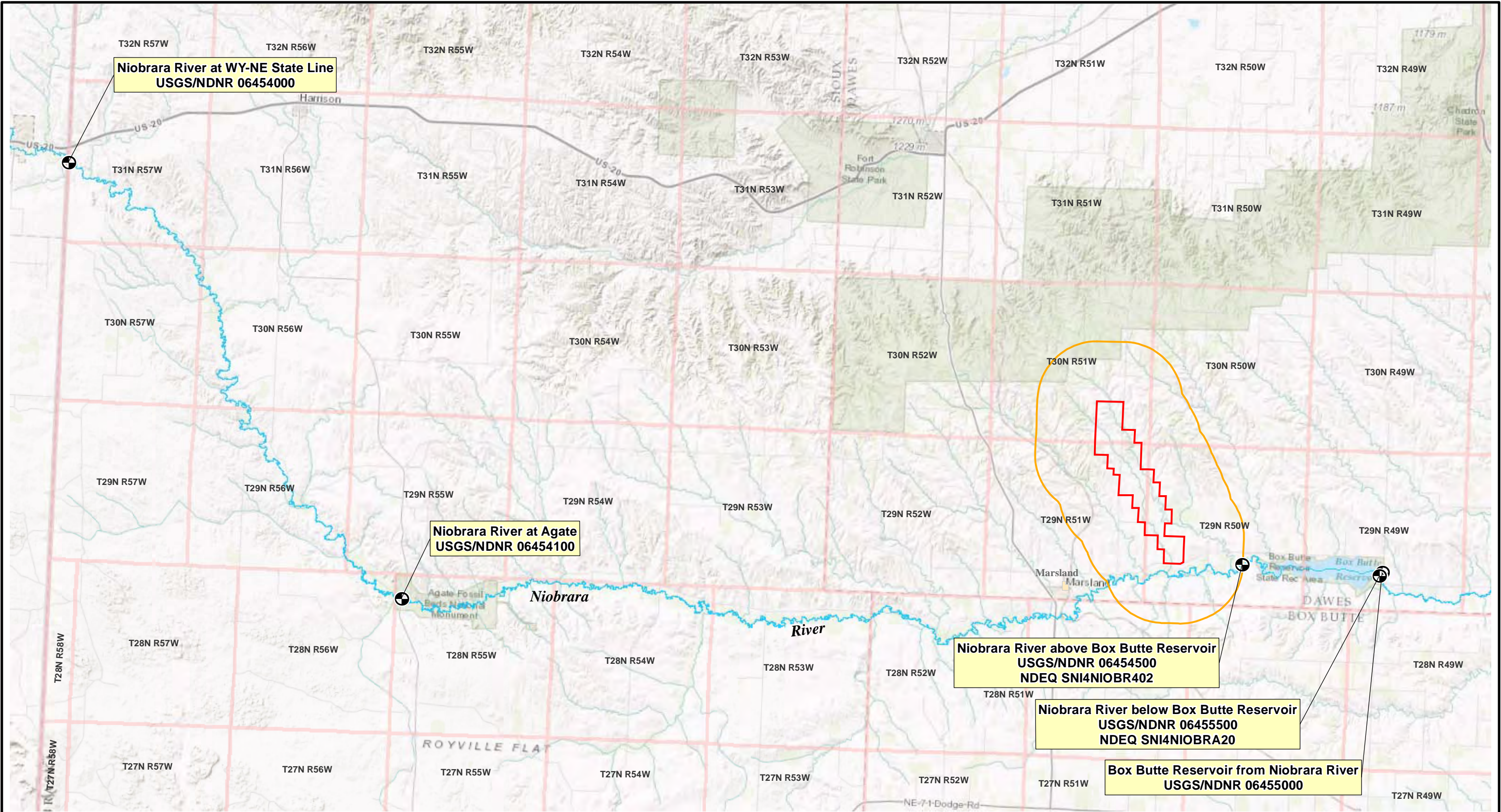
PROJECT: CO001636

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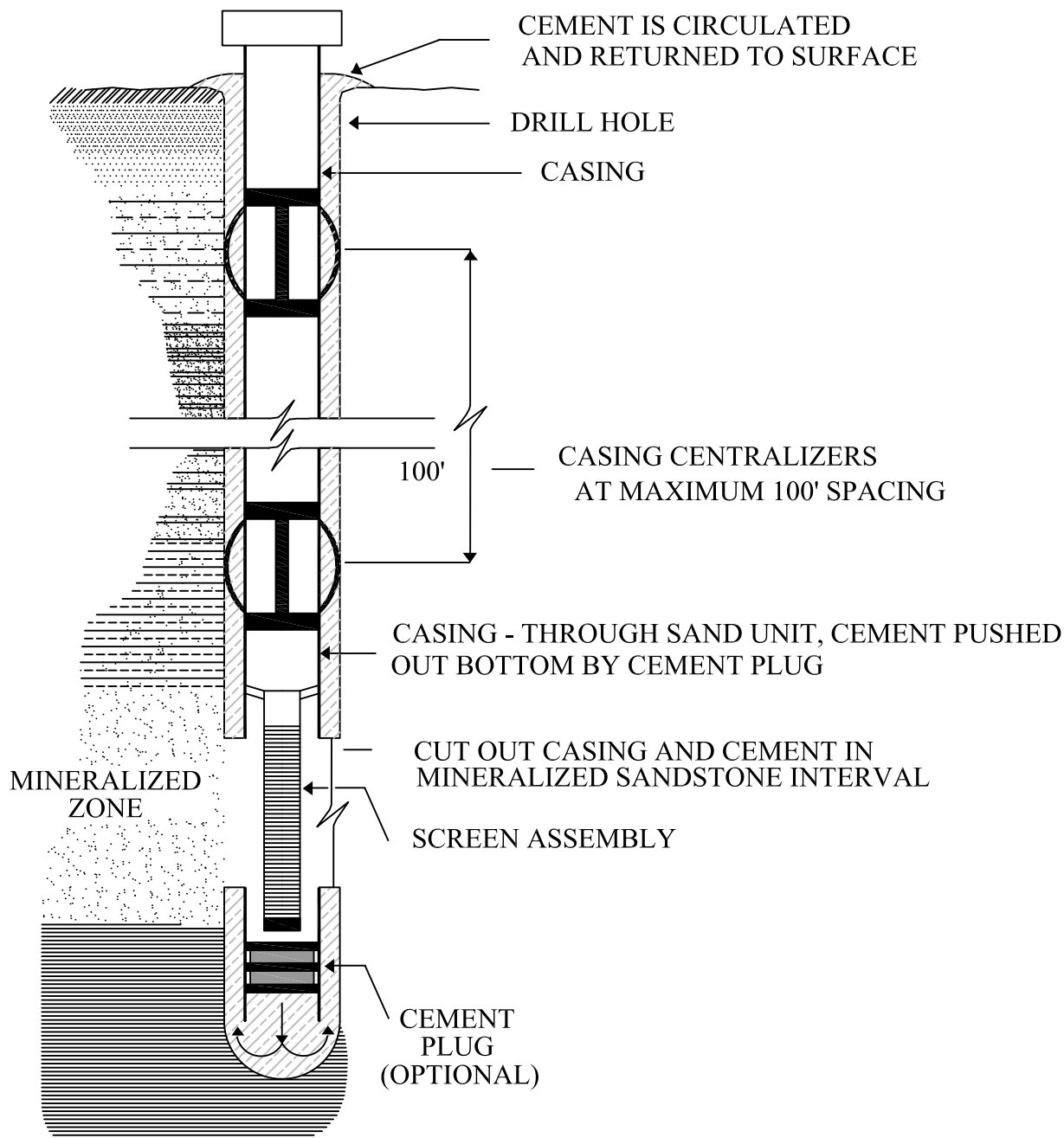
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LEGEND USGS/NDNR Stream Gaging Station and NDEQ Sampling Location Niobrara River Proposed Marsland Expansion Area Area of Review (AOR)		 0 2 4 Miles	
<p>PROJECTION: NAD 1983, STATE PLANE NEBRASKA NORTH FIPS 2600 SOURCE: TOPOGRAPHIC MAP, SERVICED BY ESRI ARCGIS ONLINE</p>		 FIGURE 2.9-8 USGS/NDNR STREAM GAGING STATIONS AND NDEQ SAMPLING LOCATIONS FOR NIOBRARA RIVER	
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FIGURE 3.1-1
TYPICAL MINERALIZED ZONE COMPLETION FOR
INJECTION/PRODUCTION WELLS
METHOD NO.1

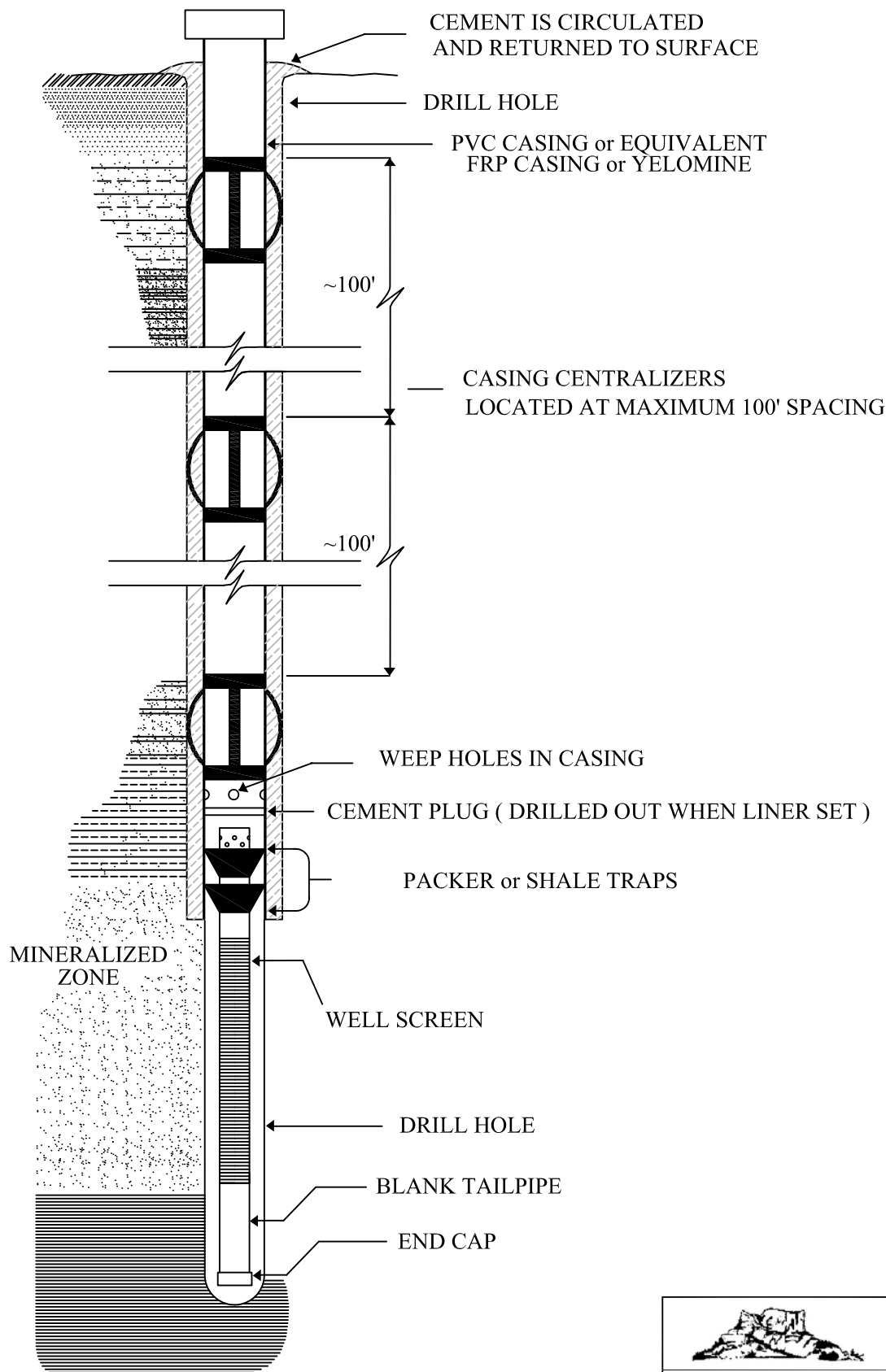
PROJECT: CO001396.02

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FIGURE 3.1-2
TYPICAL LINER COMPLETION FOR MONITOR OR
INJECTION/PRODUCTION WELLS
METHOD NO.2

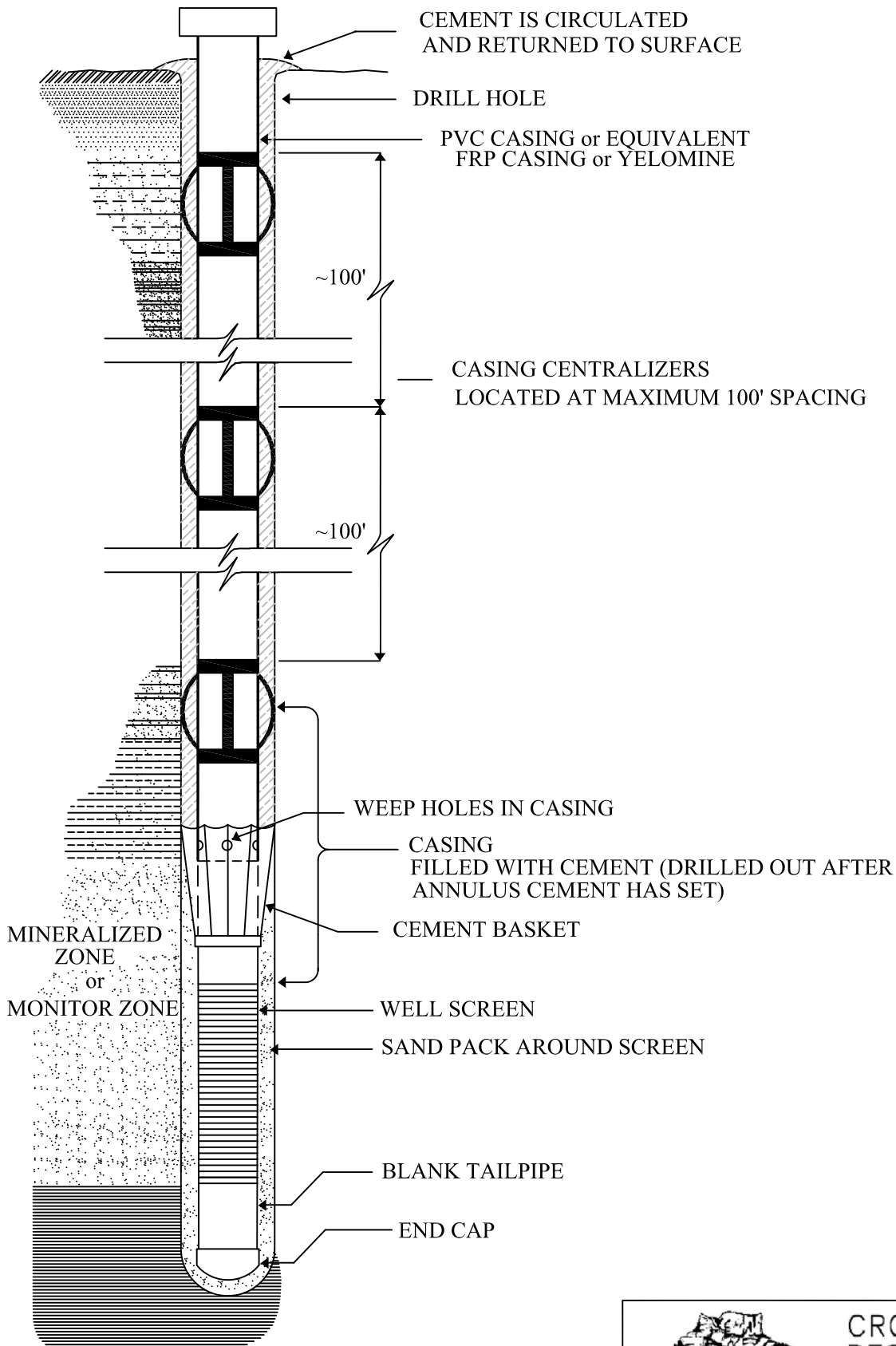
PROJECT: CO001396.02

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**FIGURE 3.1-3
TYPICAL CEMENT BASKET COMPLETION FOR
MONITOR OR INJECTION/PRODUCTION WELLS
METHOD NO.3**

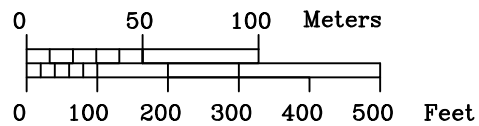
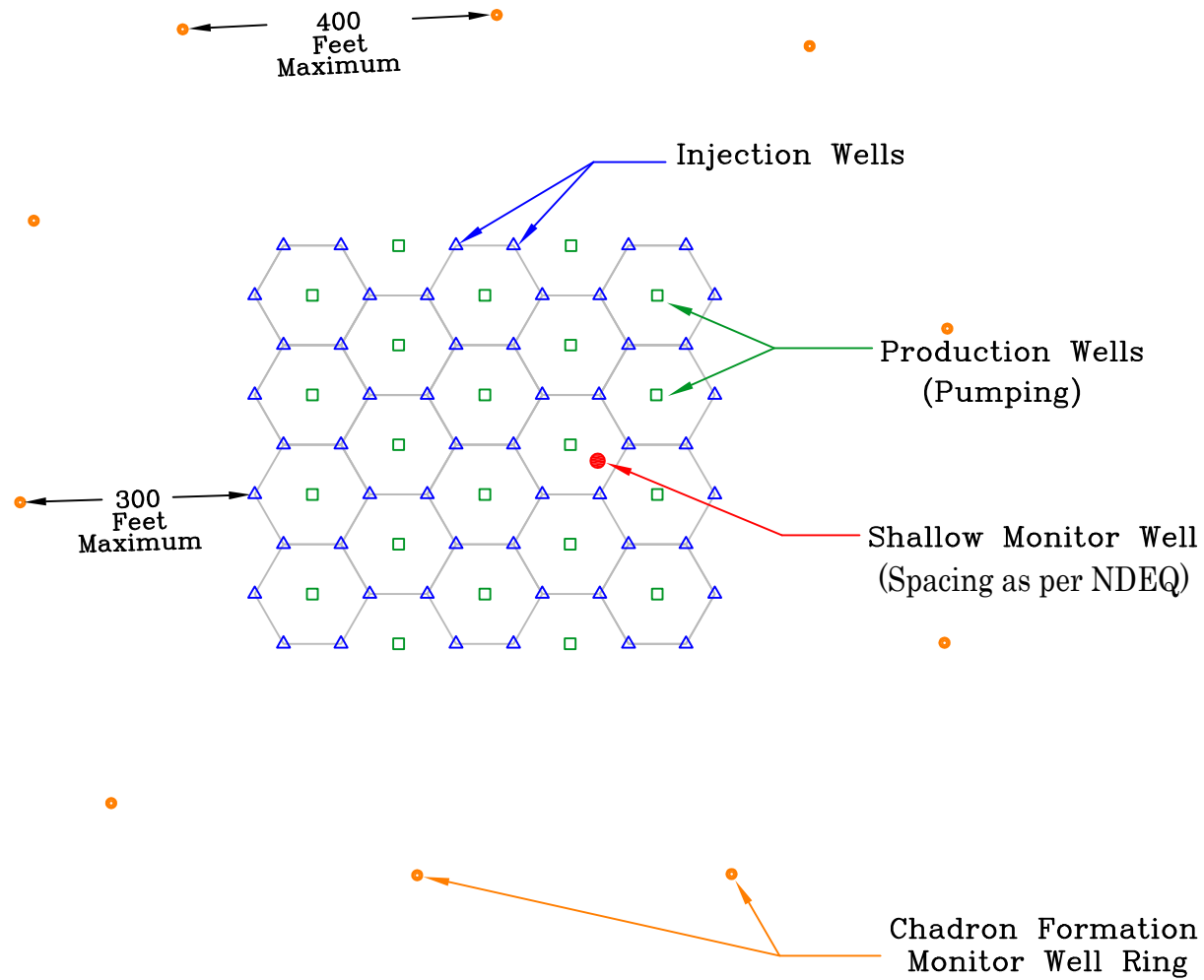
PROJECT: CO001396.02

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FIGURE 3.1-4
TYPICAL WELLFIELD LAYOUT

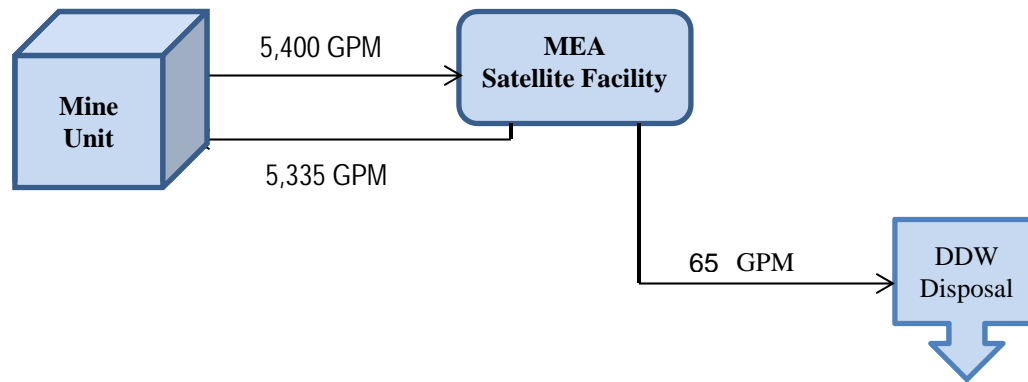
PROJECT: CO001636

MAPPED BY: JC

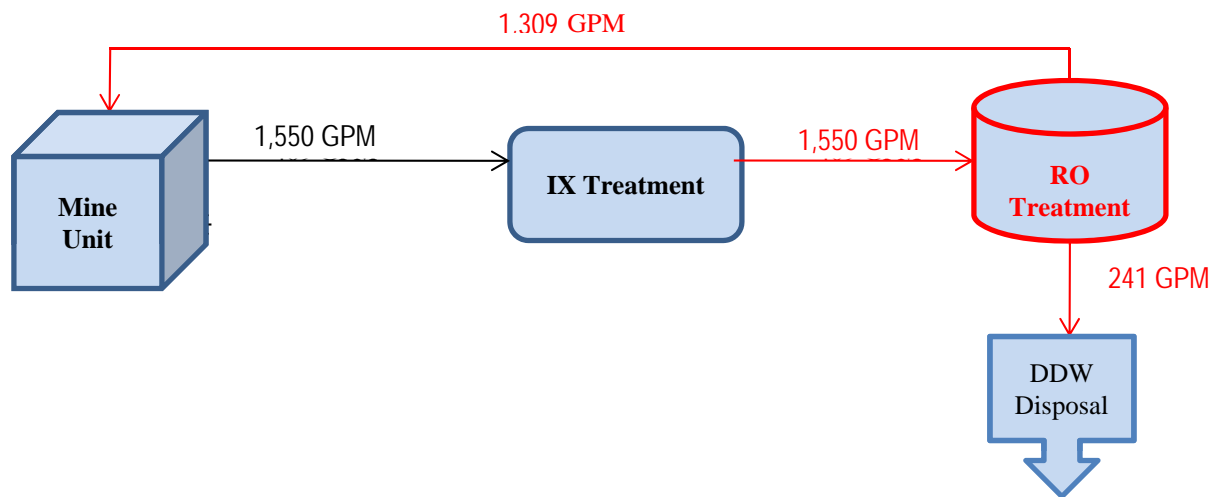
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Water Balance Flow Example for Production



Water balance Flow Example: Restoration – IX Treatment & RO Treatment Phase



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**FIGURE 3.1-5
WATER BALANCE FOR
MARSLAND FACILITY**

PROJECT: CO001636.00001

MAPPED BY: JC

CHECKED BY: JEC

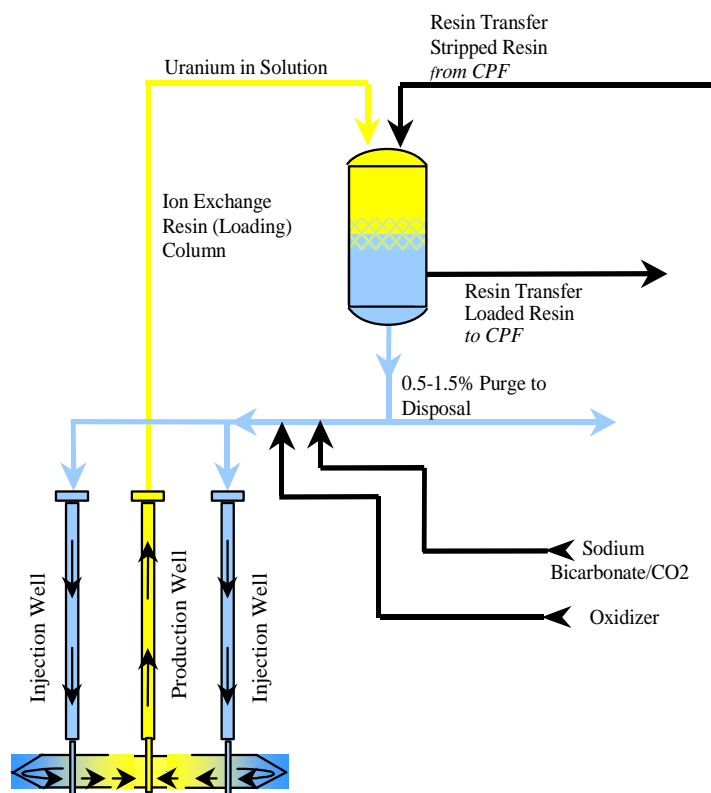


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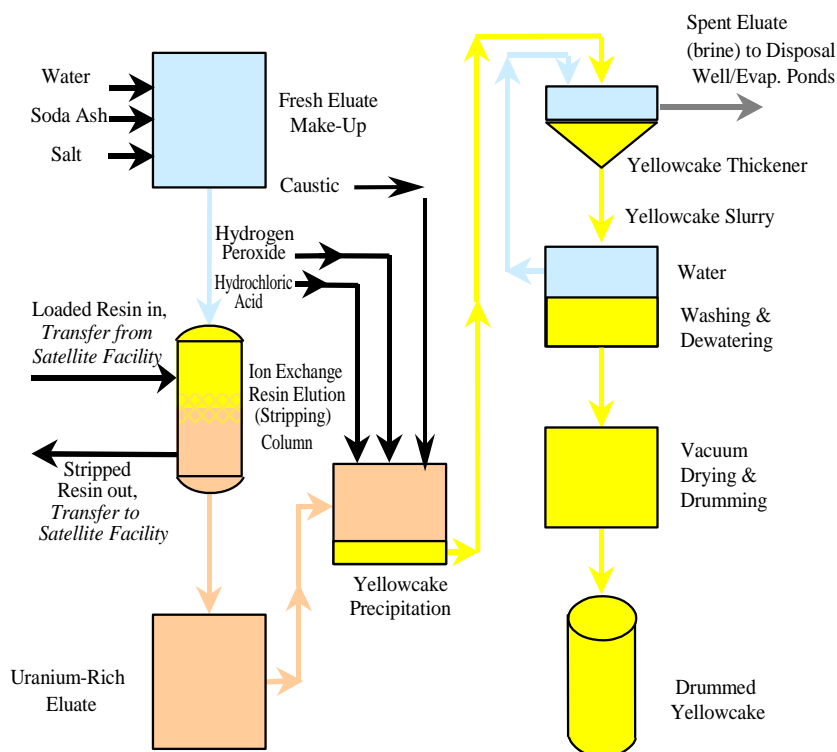
123

September 2015

Satellite Facility (Uranium Extraction)



Current CBR Production Facility (CPF) (Uranium Recovery)



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**FIGURE 3.1-6
MARSLAND EXPANSION AREA
SATELLITE FACILITY AND
CURRENT CBR PRODUCTION FACILITY
PROCESS FLOW DIAGRAM**

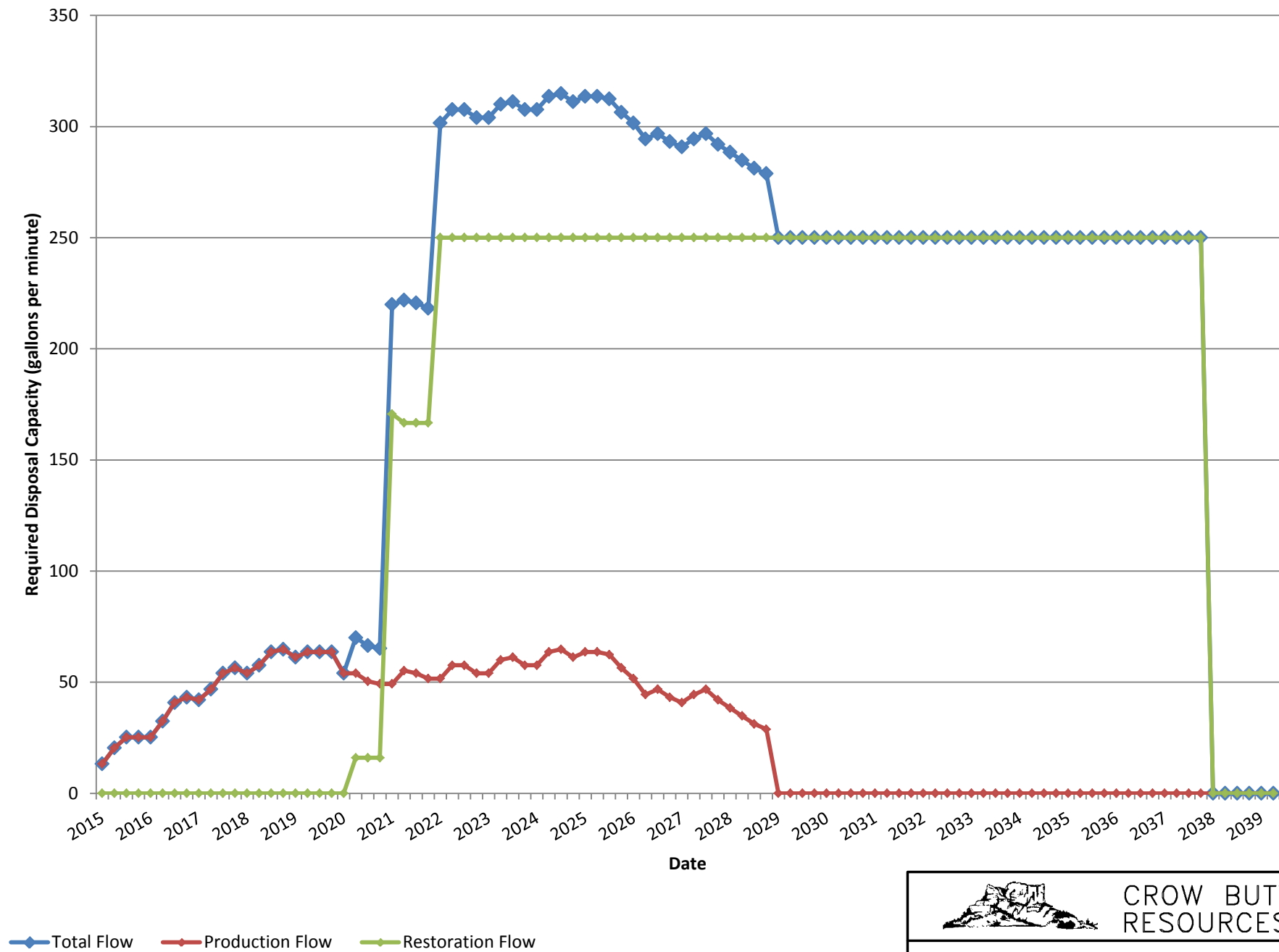
PROJECT: CO001636.00001

MAPPED BY: JC

CHECKED BY: JEC



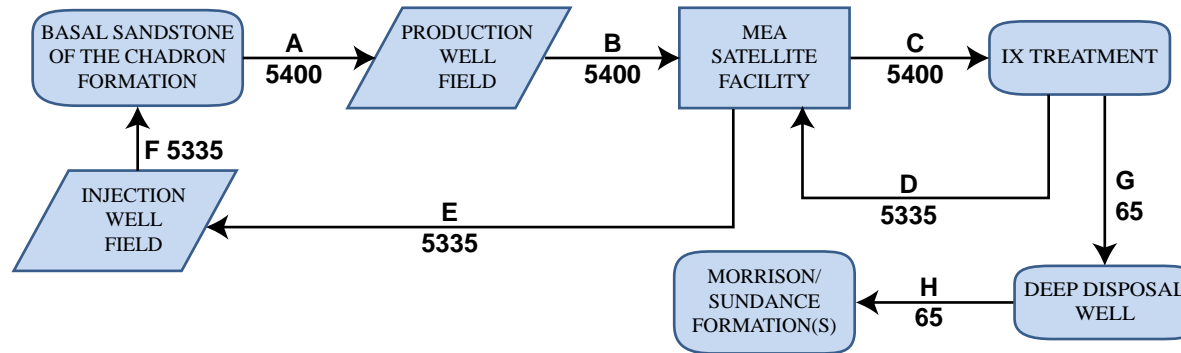
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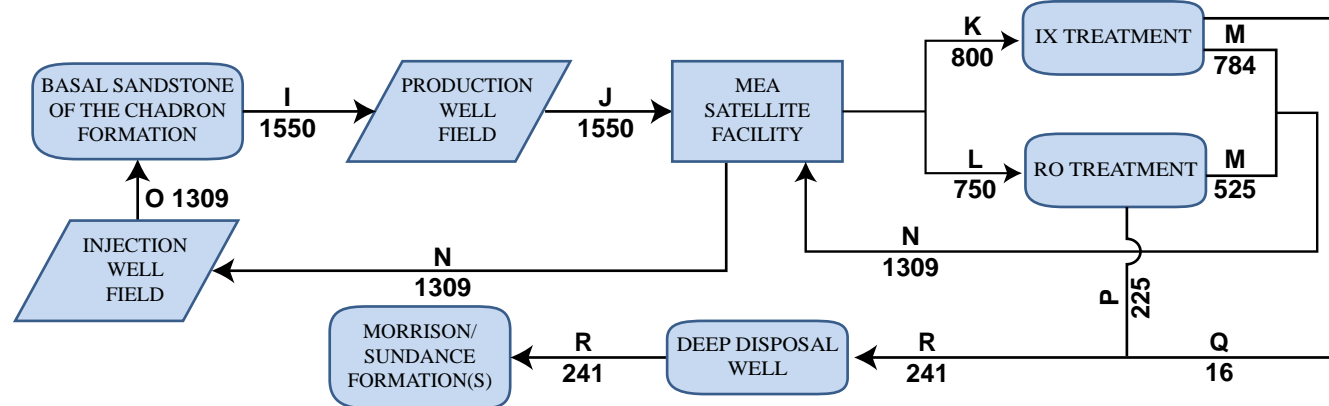
**CROW BUTTE
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**FIGURE 3.1-7
DISPOSAL WATER BALANCE
MARSLAND EXPANSION AREA**

PRODUCTION



RESTORATION



Stream ID	Description
A	Extraction from Basal Sandstone of the Chadron Formation 850-1,200 ft bgs
B	Extraction solution piped from production well field to satellite facility
C	Sent for IX Treatment
D	Recovered solution
E	Recovered solution piped from satellite facility to injection well field
F	Injection into Basal Sandstone of the Chadron Formation
G	Production bleed (1.2%) sent to deep disposal well
H	Injection into Morrison/Sundance Formations 3,400-3,700 ft bgs
I	Extraction from Basal Sandstone of the Chadron Formation
J	Extraction solution piped from production well field to satellite facility
K	Sent for IX Treatment
L	Sent for RO Treatment
M	Recovered solution
N	Recovered solution piped from satellite facility to injection well field
O	Injection into Basal Sandstone of the Chadron Formation
P	RO Bleed sent to deep disposal well
Q	IX Bleed sent to deep disposal well
R	Injection into Morrison/Sundance Formations

NOTES:

1. Balanced for maximum flow rates projected to occur during 3Q 2024.
2. All flow rates are in gallons per minute.

ABBREVIATIONS:

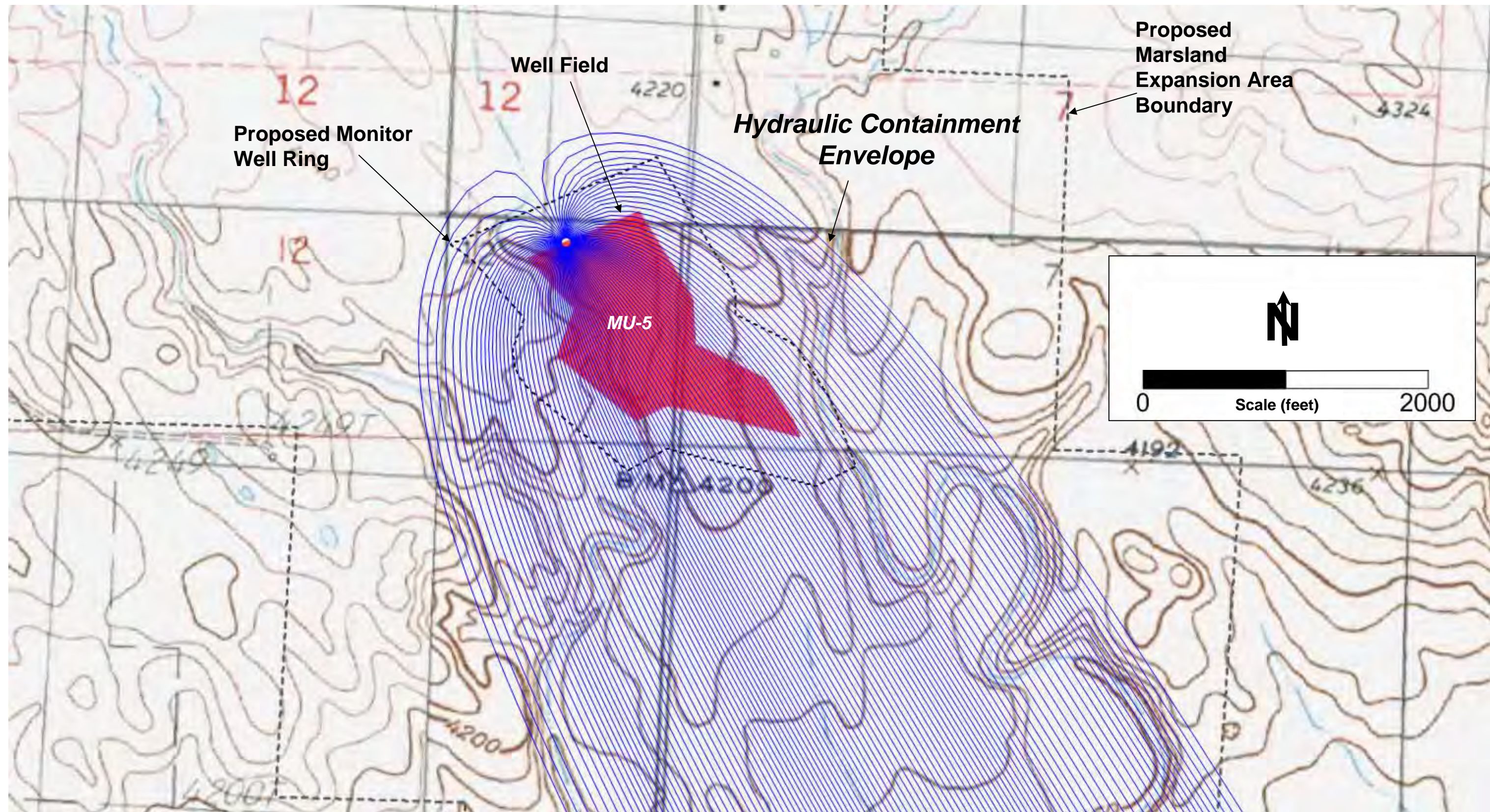
- IX Ion Exchange
- RO Reverse Osmosis
- MEA Marsland Expansion Area



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FIGURE 3.1-8
MARSLAND EXPANSION AREA
WATER BALANCE AND
PROCESS FLOW DIAGRAM

September 2015



Source: AQUI-VER, INC., 5/30/2013

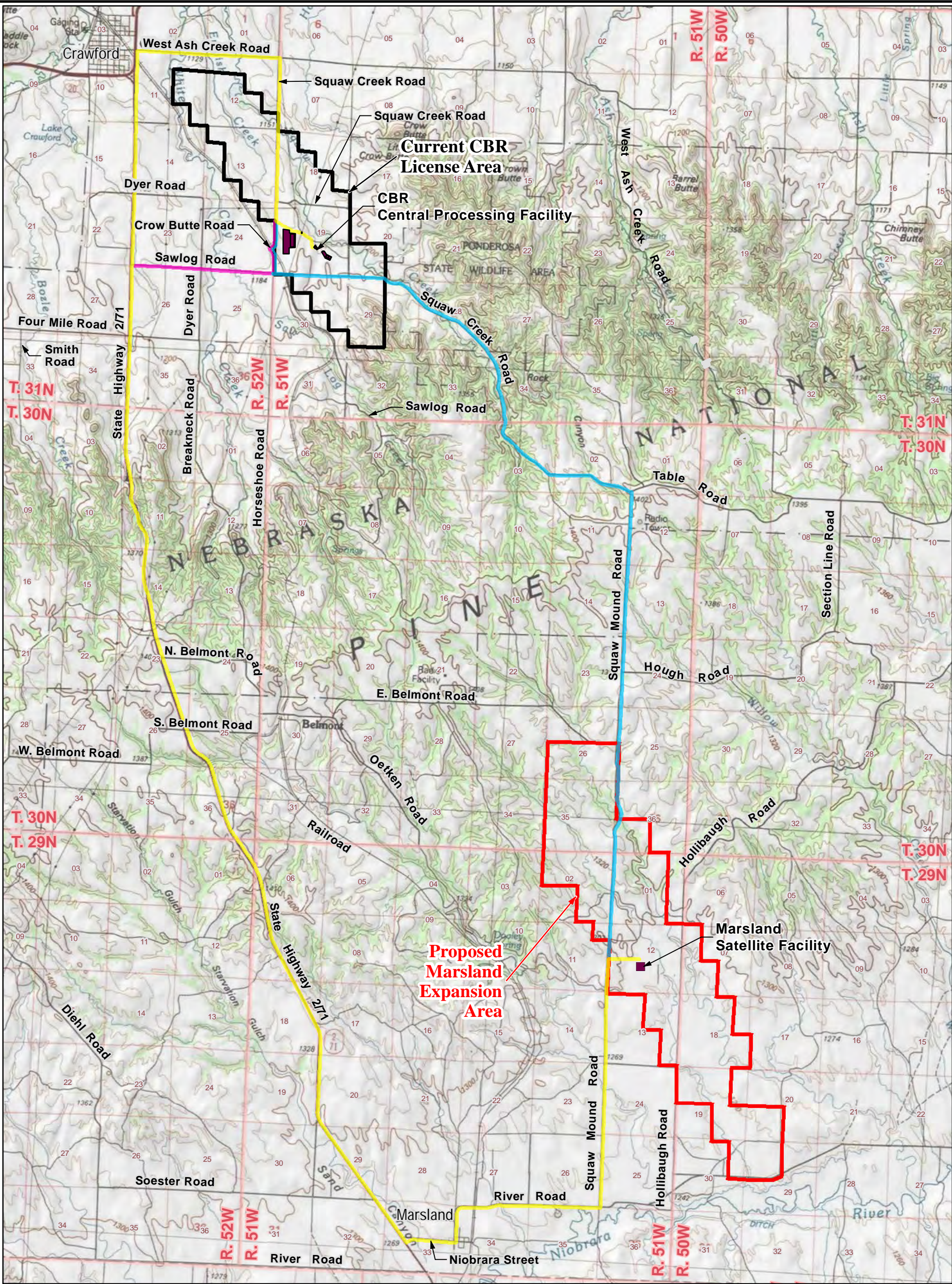


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**FIGURE 3.1-9
MARSLAND HYDRAULIC
CONTAINMENT ANALYSES**

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LEGEND


- Primary Access Route
- Alternative Route A
- Alternative Route B

N

0 3,500 7,000

Feet

PROJECTION: NAD1927,
STATE PLANE NEBRASKA NORTH, FIPS 2601
SOURCES: USA TOPO MAPS, SERVICED
BY ESRI ARCGIS ONLINE

 **CROW BUTTE
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**FIGURE 4.2-1
PROPOSED ACCESS ROUTE
BETWEEN MARSLAND EXPANSION AREA
SATELLITE FACILITY AND CROW BUTTE
CENTRAL PROCESSING FACILITY**

PROJECT: CO001636 MAPPED BY: JC CHECKED BY: JEC


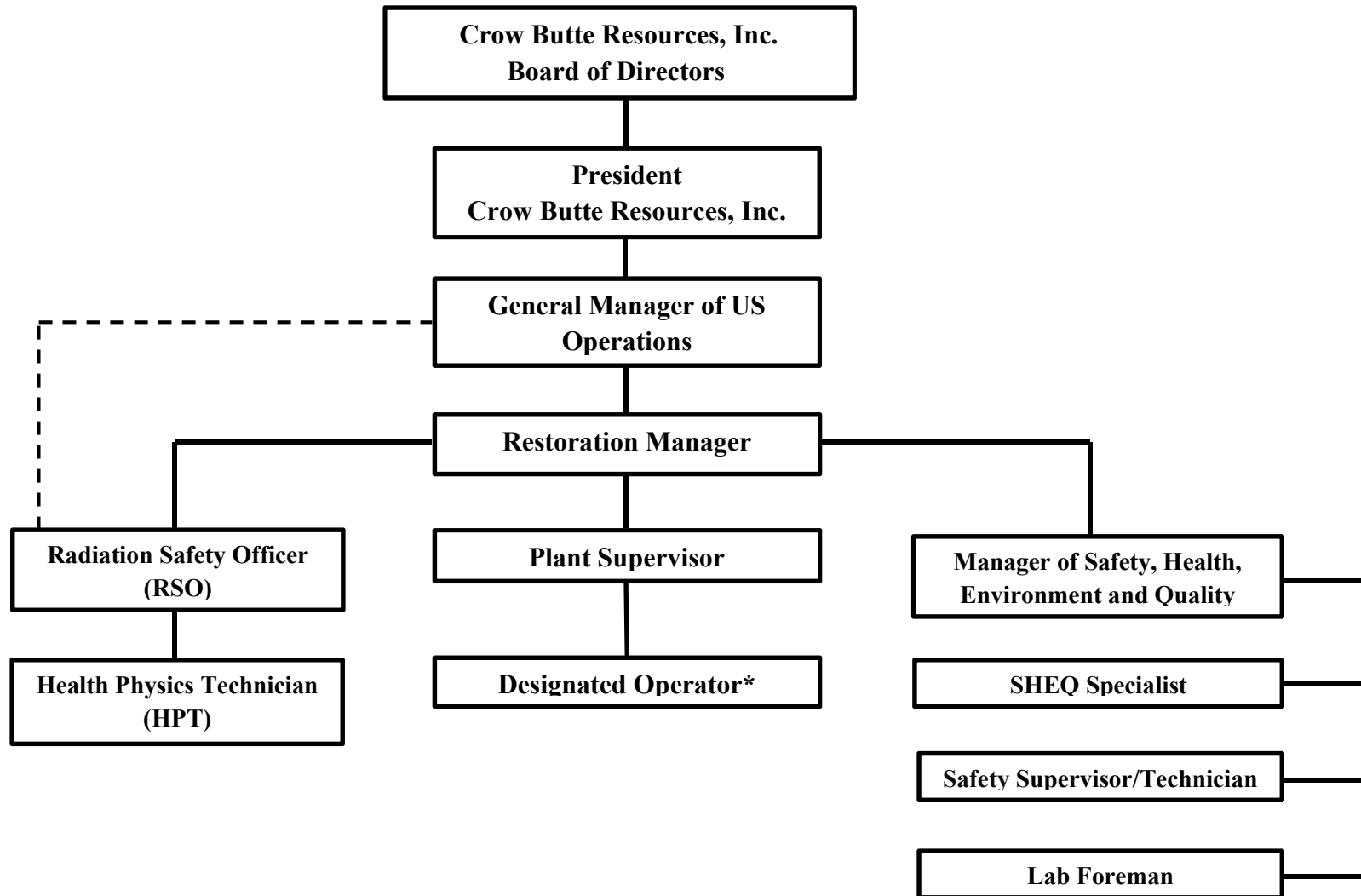
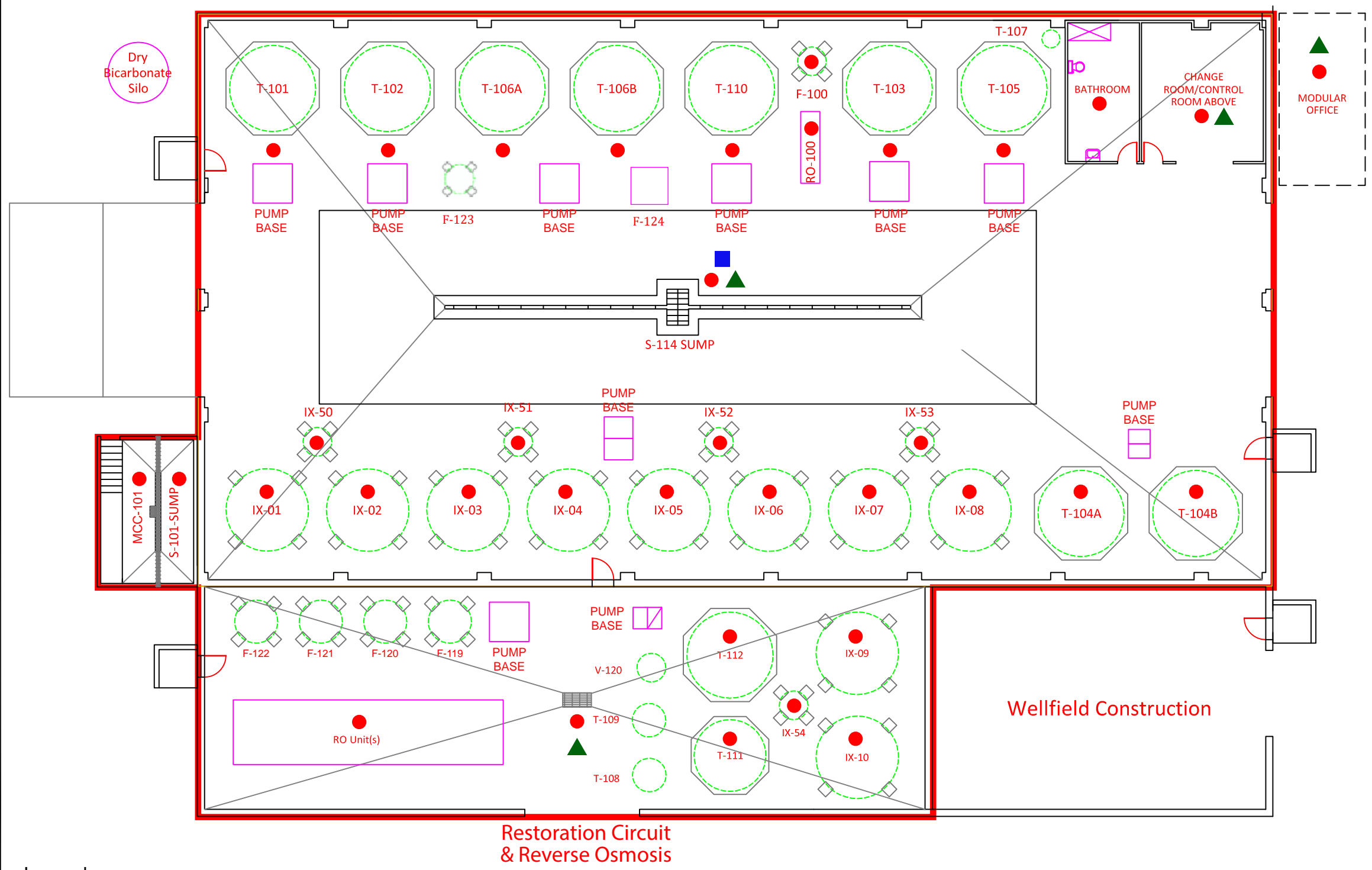
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Figure 5.1-1: Crow Butte Resources Organizational Chart



*Qualifications for Designated Operator described in Marsland Expansion Area Technical Report, Section 5.5.4


K:\CBR_Projects\CO001636_Marsland\3_IMAGES\Illustrator\ER Figure 1_1-8 MEA SAT Building Layout_ Revised.ai @ 08/08/2013 By: J.Chen



Tank (# Each)	Description
IX-01 through 08	Ion Exchange
IX-50 through 54	Ion Exchange Resin Trap
IX-09 through 10	Restoration IX Column
T-101	Bicarbonate Mix
T-102	Bicarbonate Storage
T-103	Reverse Osmosis Feed
T-104A	Resin Transfer
T-104B	Resin Transfer
T-105	Water supply/Make-up Water
T-106A	Wastewater
T-106B	Wastewater
T-107	Water Pressure Tank
T-108	Sodium Sulfide Day
T-109	Sodium Sulfide Mix
T-110	Well Work Over Fluid
T-111	RO Cleaning Tank
T-112	Permeate Tank
F-119 through 122	RO Filter
V-120	Degaser
F-100	Sock filters
MCC-101	Injection pumps on trunk lines to wellfield
RO-100	RO Pump Base
F-123	Filter
F-124	Belt Filter

- Legend:
- Gamma Survey Location
 - ▲ Radon Testing Location
 - Airborne Particulate Survey Location
 - Restricted Area


- Notes:
- 1. Illustration only, not to scale.
 - 2. Adapted from Cameco Resources, 2011.



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FIGURE 5.7-2
PROPOSED OPERATIONAL
RADIOLOGICAL MONITORING LOCATIONS
FOR SATELLITE FACILITY

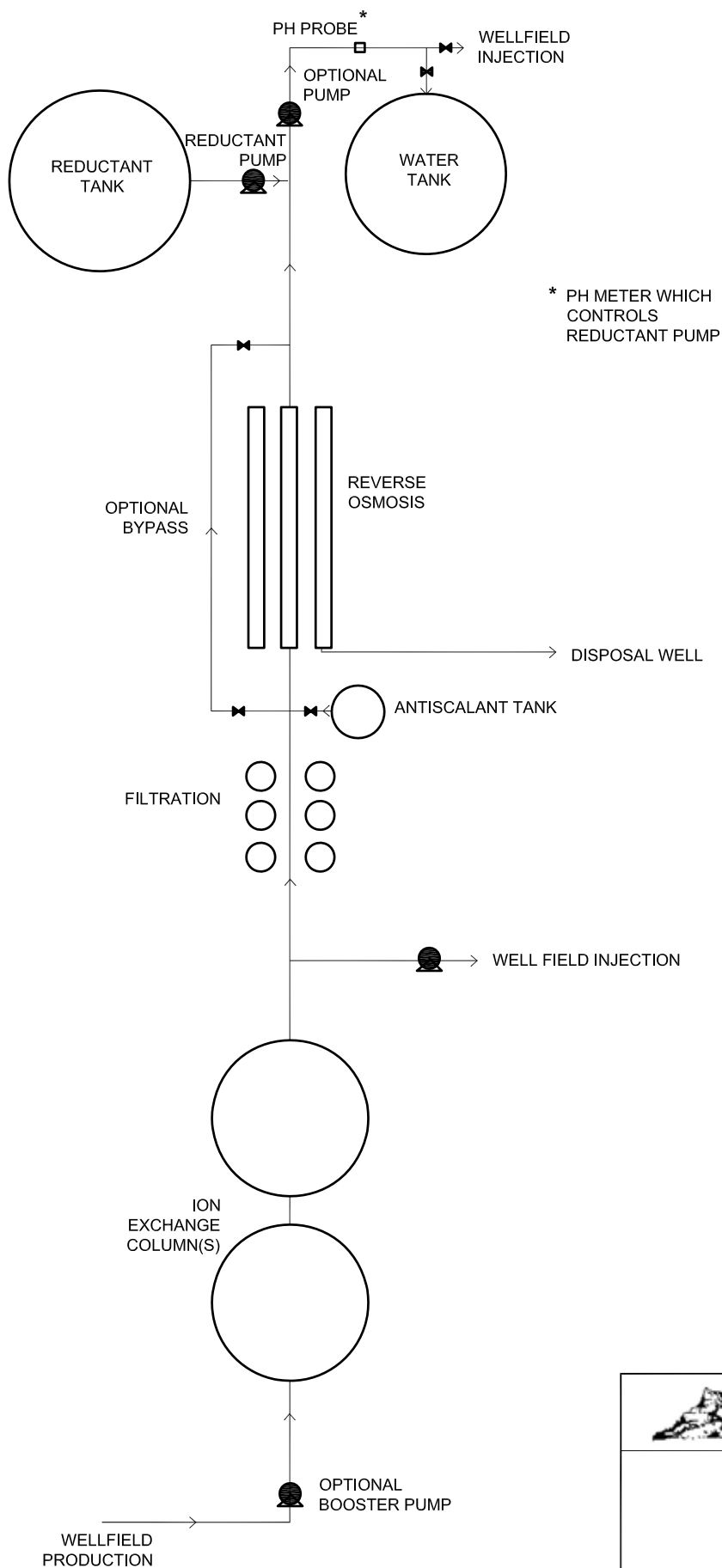
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**FIGURE 6.1-1
RESTORATION PROCESS
FLOW DIAGRAM**

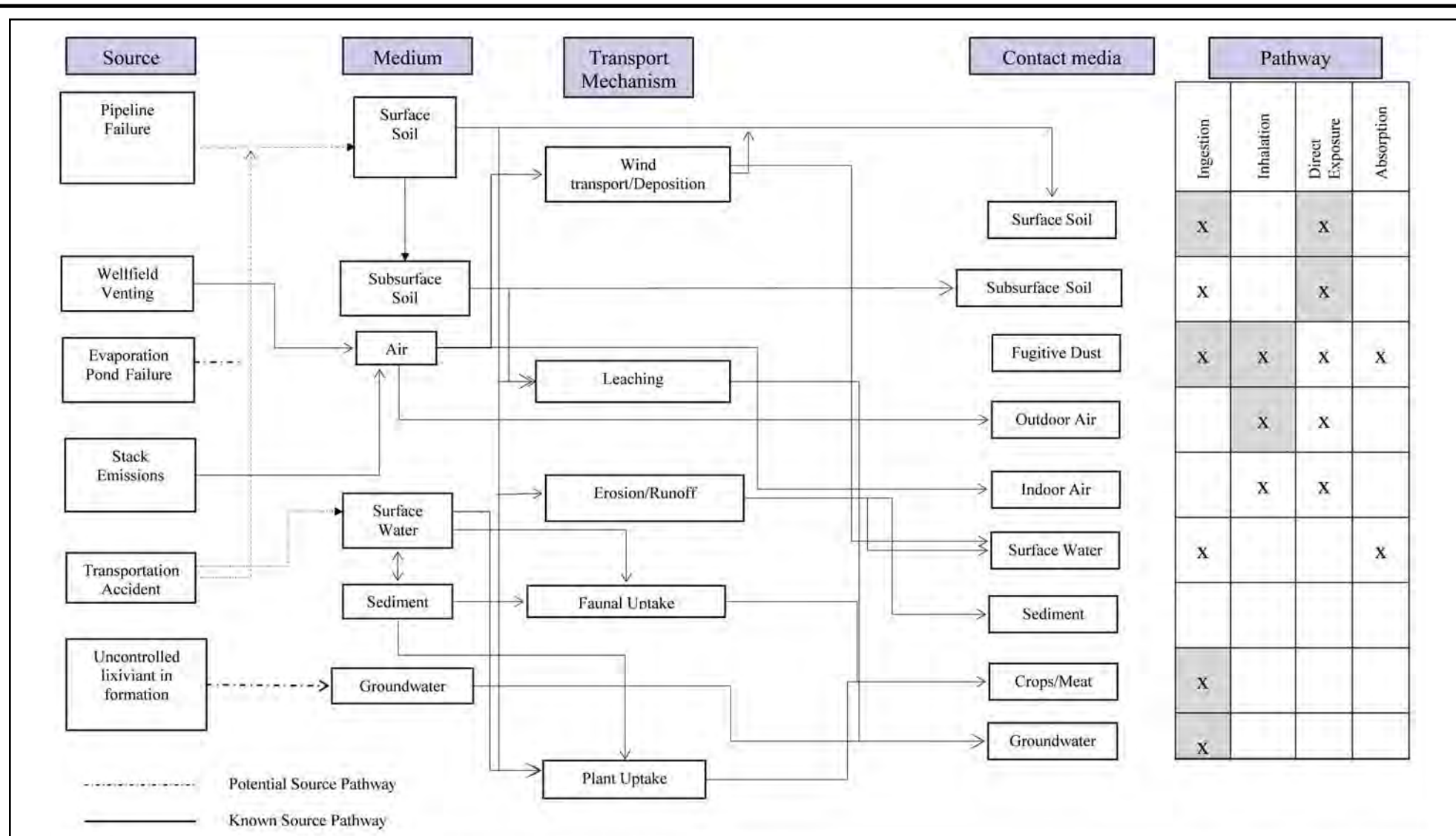
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Note: X depicts the pathway that outlines the route which radiological emissions may follow to reach the public.
 Gray shading depicts predominant pathway.



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**FIGURE 7.3-1
MARSLAND
HUMAN EXPOSURE PATHWAYS FOR
KNOWN AND POTENTIAL SOURCES OF
RADIOLOGICAL EMISSIONS**

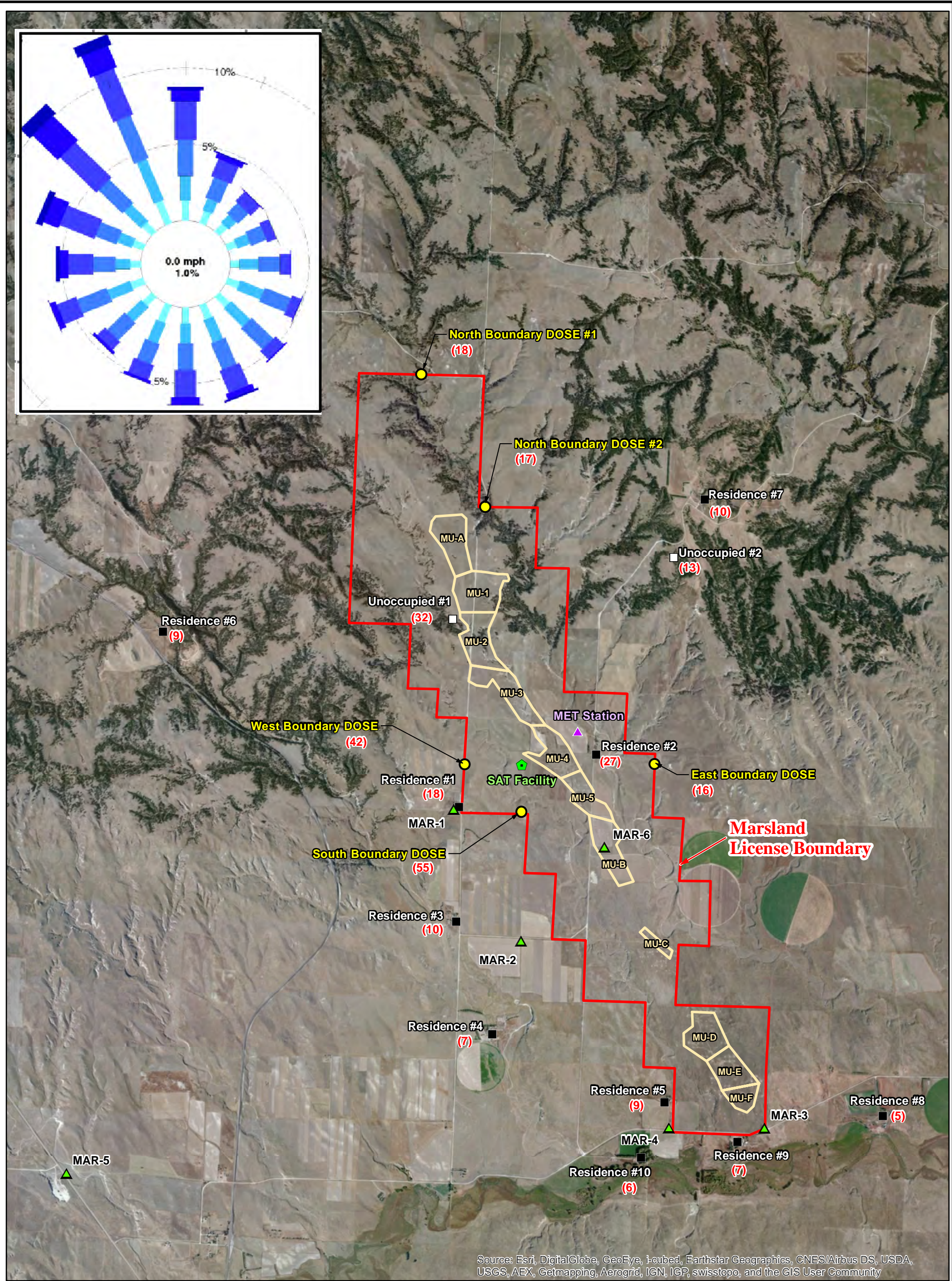
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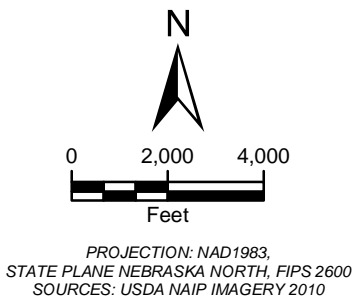
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LEGEND

- | | |
|-------------------------------------|---|
| Air Sample Station | Project Boundary |
| Boundary Dose Point | Mine Unit |
| Residence (Occupiable) | MEA Mildos Estimated Radiation Dose Rate (in mrem/yr) |
| Unoccupied Structure (Unoccupiable) | MEA = Marsland Expansion Area |
| Proposed Satellite Plant Location | mrem = millirems per year |
| MEA Met Station | |

Map Updated on: 10/9/2014



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**FIGURE 7.3-2
MILDOS RECEPTORS
RESIDENCES AND DESIGNATED MEA
LICENSE BOUNDARY LOCATIONS**

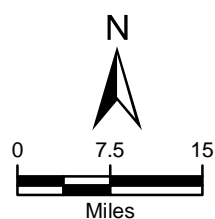
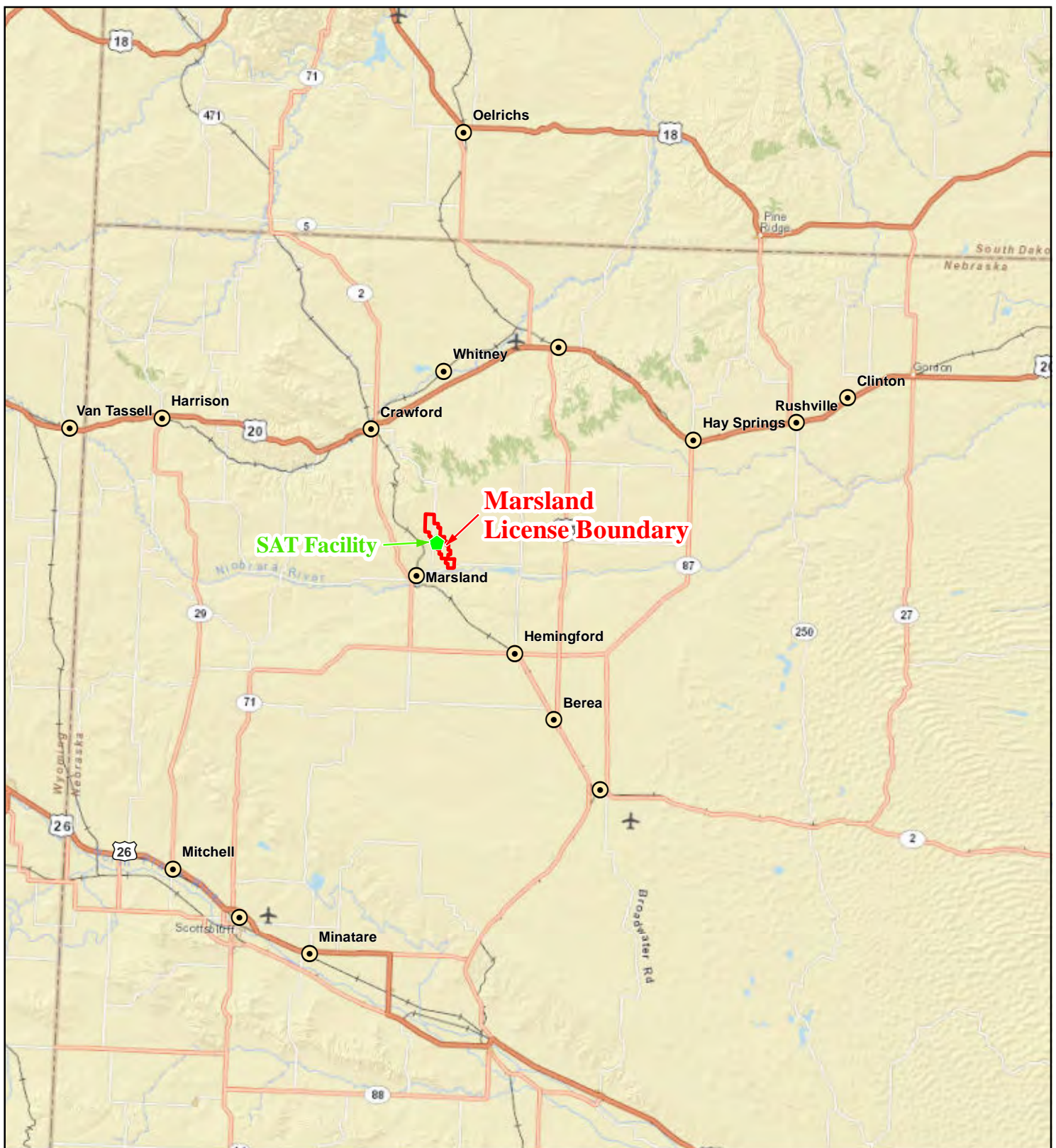
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PROJECTION: NAD 1927,
STATE PLANE NEBRASKA NORTH, FIPS 2601
SOURCES: WORLD STREET MAP SERVICED
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**FIGURE 7.3-3
MILDOS RECEPTORS
CITIES AND TOWNS IN REGION
AROUND MEA**

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