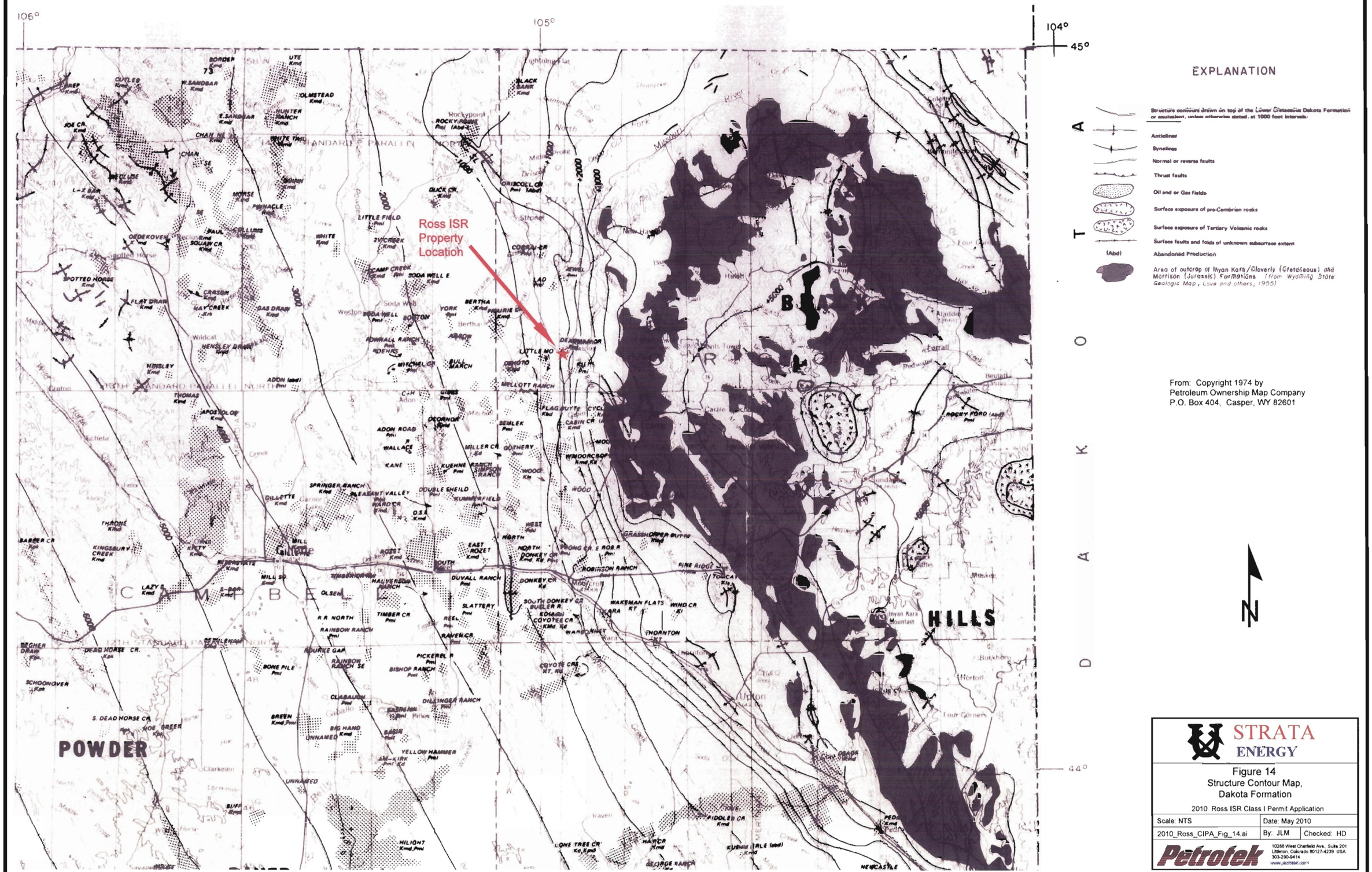

STRATA ENERGY

Figure 14
Structure Contour Map,
Dakota Formation

2010 Ross ISR Class I Permit Application

Scale: NTS	Date: May 2010	
2010_Ross_CIPA_Fig_14.ai	By: JLM	Checked: HD

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710,000 720,000

1,490,000 1,480,000 1,470,000

UNIT OUTLINE

ZONE OF STEEP DIPS

53N 68W

53N 67W

A A' B B'

BNI 11-17 Wesley -1791

BNI 12-16 Dalport-State +1636

BNI-PET. INC. 22-18 State -1916

BETA EXPL. 1-Allen -1999

BNI-PET. INC. 23-18 State -1945

BNI 33-18 Federal -1892

BNI 13-17 Berger -1862

BNI 34-18 Robinson

(Disc) BNI 24-18 State -1946

BNI Federal 44-13 -1993

BNI Robinson 44-18 -1898

-1868

TRUE 24-17 BN -1804

BNI 11-19 Reynolds -1956

RAINBOW 31-19 U. S. A.-Robinson -1905

BNI-CARDINAL-HUDSON 22-19 Reynolds -1935

EXETER Allen 8-24 -2002

TRUE 22-20 H-T-Federal -1818

DAVIS Fed.-Reynolds-1 -2014

CARDINAL 14-19 Reynolds -1968

DAVIS 1-Evans +828

AMBASSADOR 1-Reynolds -1992

UNIVERSAL 13-30 Reynolds -1996

PET. INC. 4-Kiehl -1942

PETRO.-ANSCHUTZ 1-Hahn -1877

PET. INC. 2-Kiehl -1971

PET. INC. 3-Kiehl -1919

R. T. DUNCAN 1-31 Reynolds -1975

(Disc) PET. INC. 1-Kiehl -1942

R. T. DUNCAN Reynolds 2-31 -1941

ANSCHUTZ Dickenson Est. 31-1 -1974

LOTUS 1-Reynolds -2013

-2097

-1800 -1850 -1900 -1950 -2000 -2050

12 7 8 9

13 18 17 16

24 19 20 21

25 30 29 28

36 31 32 33

From: E. Arro, April 1976

Legend

Ross ISR Permit Boundary

Contour Interval = 50ft.

N

0 0.25 0.5 0.75 1 Miles

Projection: Wyoming State Plane East, NAD 83, (feet)

STRATA ENERGY

Figure 15
Stucture Contour,
Minnekahta Formation
2010 Ross ISR Class I Permit Application

Scale: 1:20,000	Date: May 2010	
2010_Ross_CIPA_Fig_15.mxd	By: JLM	Checked: KC

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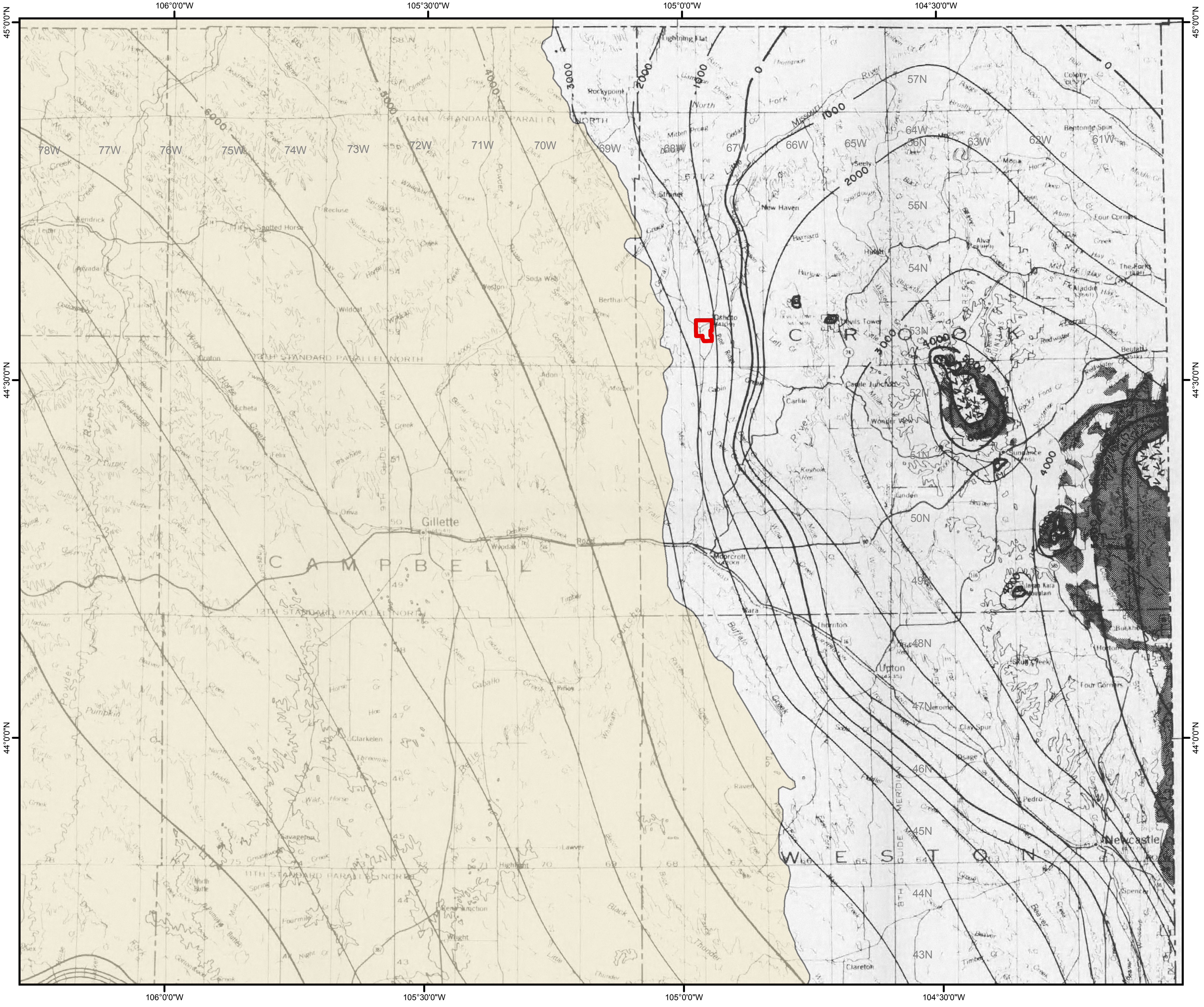

Projection: Wyoming State Plane East, NAD 83, (feet)

Legend

🟥 Ross ISR Permit Boundary

▨ Powder River Basin Outline

EXPLANATION

3000 Structure contours drawn on top of the Madison Limestone (in feet, contour interval 1000 ft.)

Area of outcrop of Paleozoic rocks comprising the Madison aquifer system

Precambrian rocks, undivided

Tertiary volcanic rocks

Structure contours from Swenson and others, 1976

Area of outcrop of Paleozoic rocks from Wyoming State Geologic Map, Love and others, 1955

N

0 5 10 15 20 Miles

STRATA ENERGY

Figure 16
Structure Contour Map
of the Madison Limestone

2010 Ross ISR Class I Permit Application

Scale: 1:600,000	Date: May 2010
2010_Ross_CIPA_Fig_16.mxd	By: JLM Checked: HD

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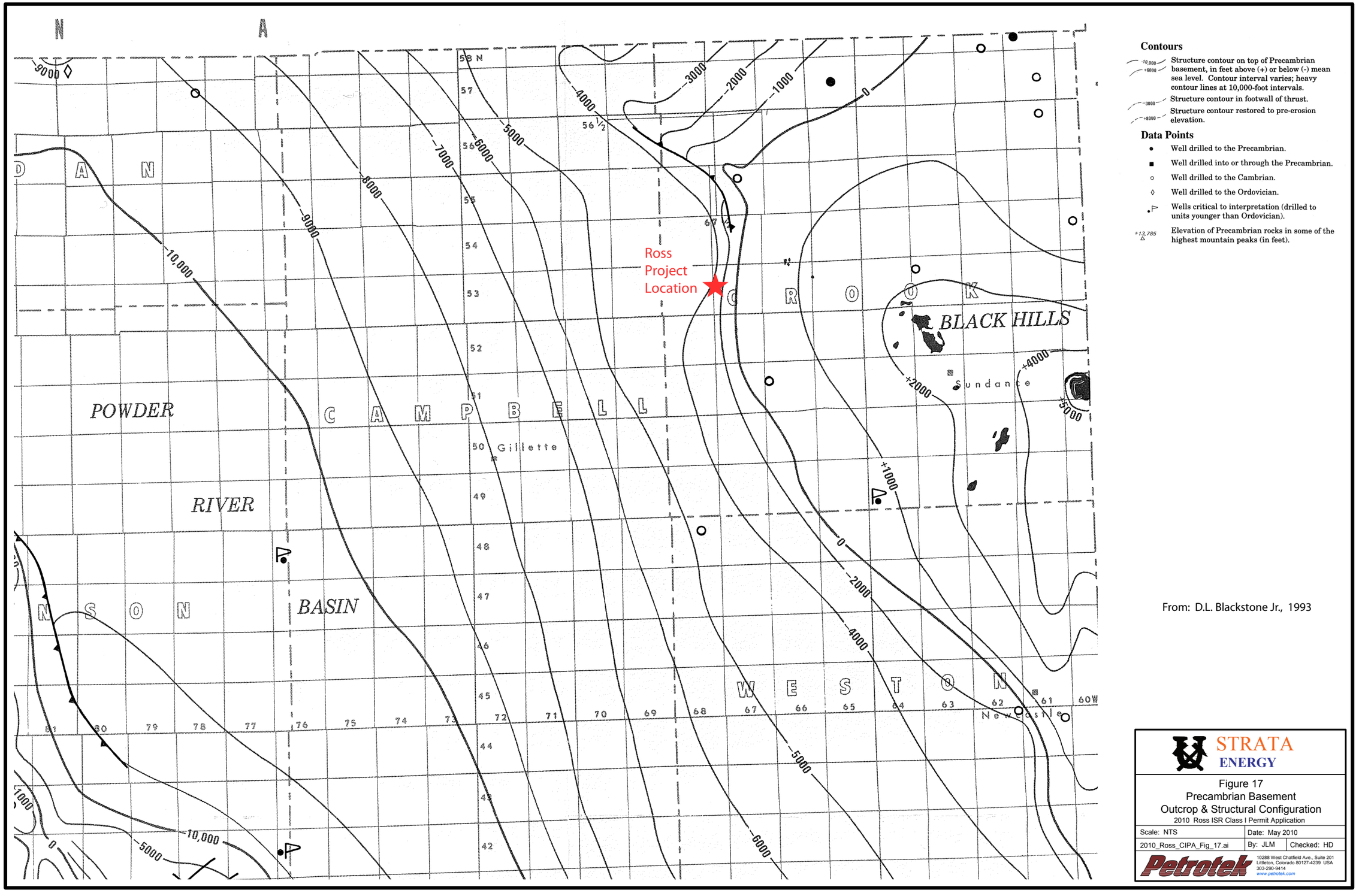

Contours

- Structure contour on top of Precambrian basement, in feet above (+) or below (-) mean sea level. Contour interval varies; heavy contour lines at 10,000-foot intervals.
- Structure contour in footwall of thrust.
- Structure contour restored to pre-erosion elevation.

Data Points

- Well drilled to the Precambrian.
- Well drilled into or through the Precambrian.
- Well drilled to the Cambrian.
- Well drilled to the Ordovician.
- Wells critical to interpretation (drilled to units younger than Ordovician).
- Elevation of Precambrian rocks in some of the highest mountain peaks (in feet).

From: D.L. Blackstone Jr., 1993

STRATA ENERGY

Figure 17
Precambrian Basement
Outcrop & Structural Configuration
2010 Ross ISR Class I Permit Application

Scale: NTS	Date: May 2010	
2010_Ross_CIPA_Fig_17.ai	By: JLM	Checked: HD

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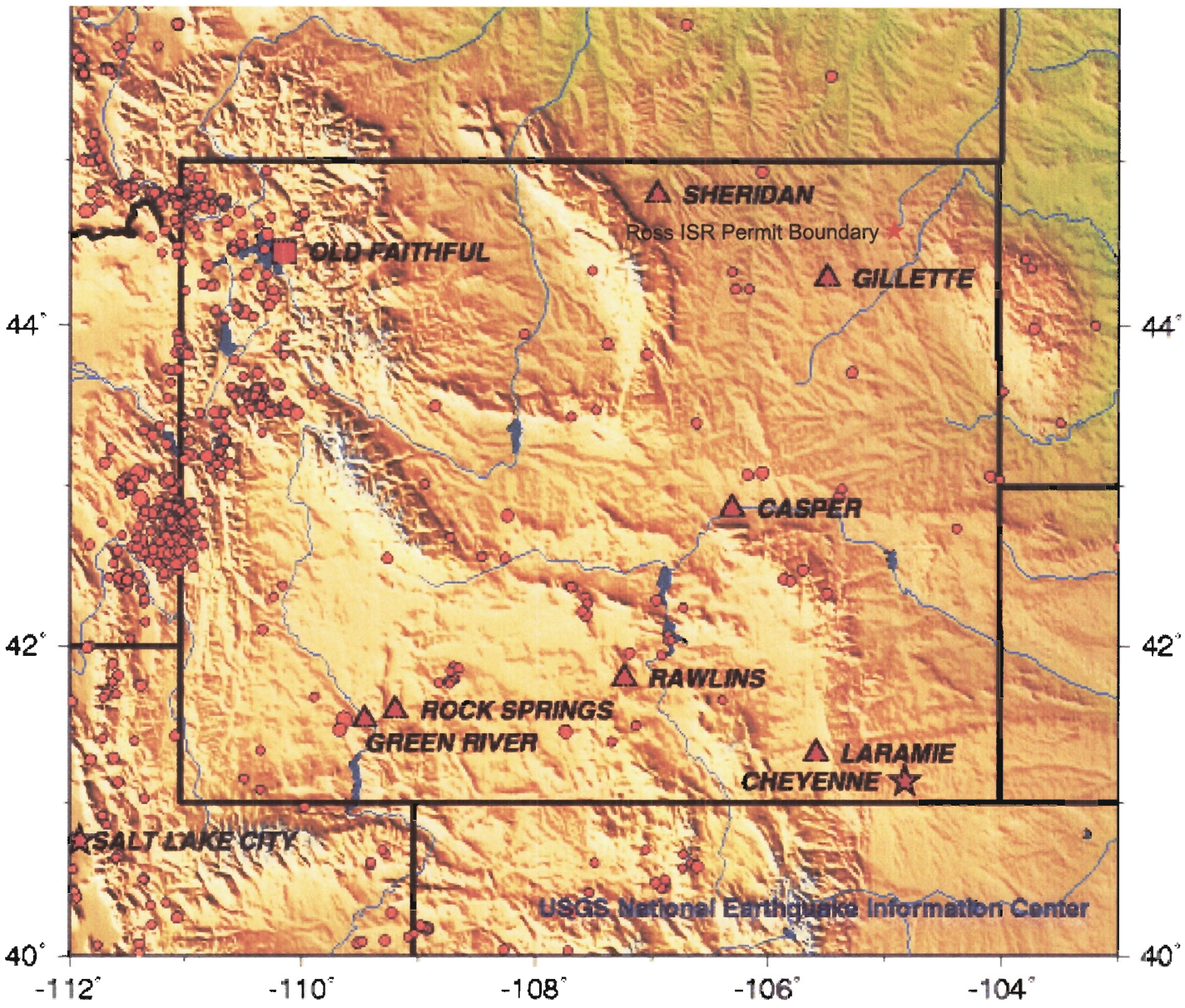
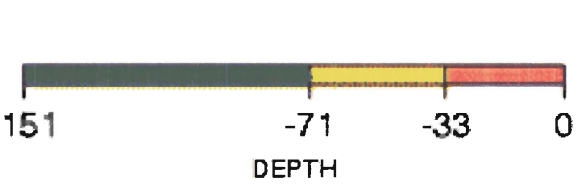
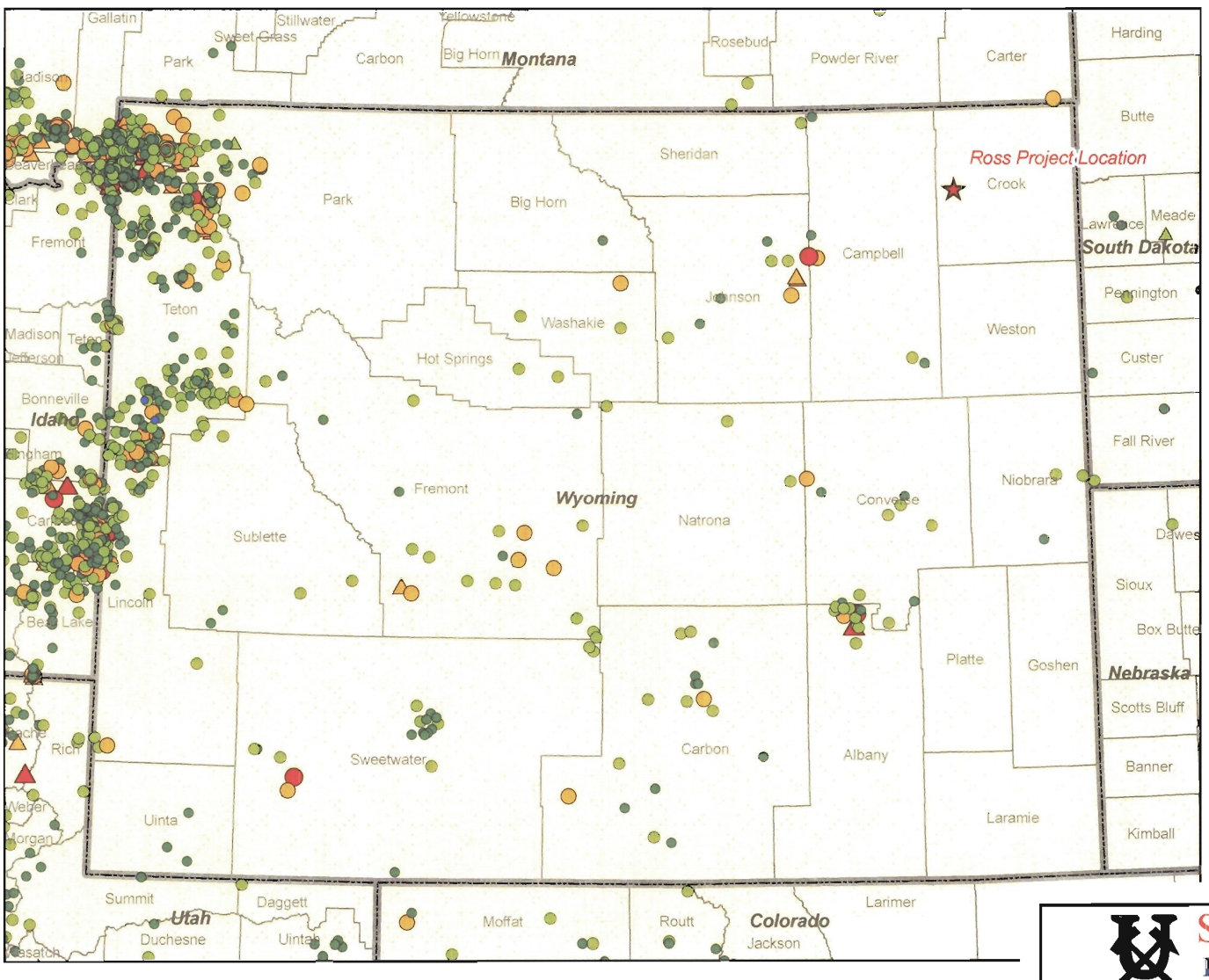
Seismicity of Wyoming
1990 - 2006





Depth is in kilometers.
Purple Triangles: Cities
Purple Star: Capital City
Circles: Earthquakes
(color represents depth range)



Legend

WY_1973-Present
Magnitude
- 1.5 - 2.0
- 2.1 - 3.0
- 3.1 - 4.0
- 4.1 - 5.0
- 5.1 - 6.1

WY_EQ_1882-1989
Magnitude
- 1.5 - 2.0
- 2.1 - 3.0
- 3.1 - 4.0
- 4.1 - 5.0
- 5.1 - 6.1

Earthquakes of Wyoming
1882 - Present

Map Source: USGS website
Earthquake locations are from the USGS/NEIC PDE catalog.

STRATA ENERGY

Figure 18
Seismicity of Wyoming, 1990-2006; and Earthquakes in Wyoming, 1882-Present
2010 Ross ISR Class I Permit Application

Scale: NTS	Date: May 2010	
2010_Ross_CIPA_Fig_F-18.ai	By: JLM	Checked: HD

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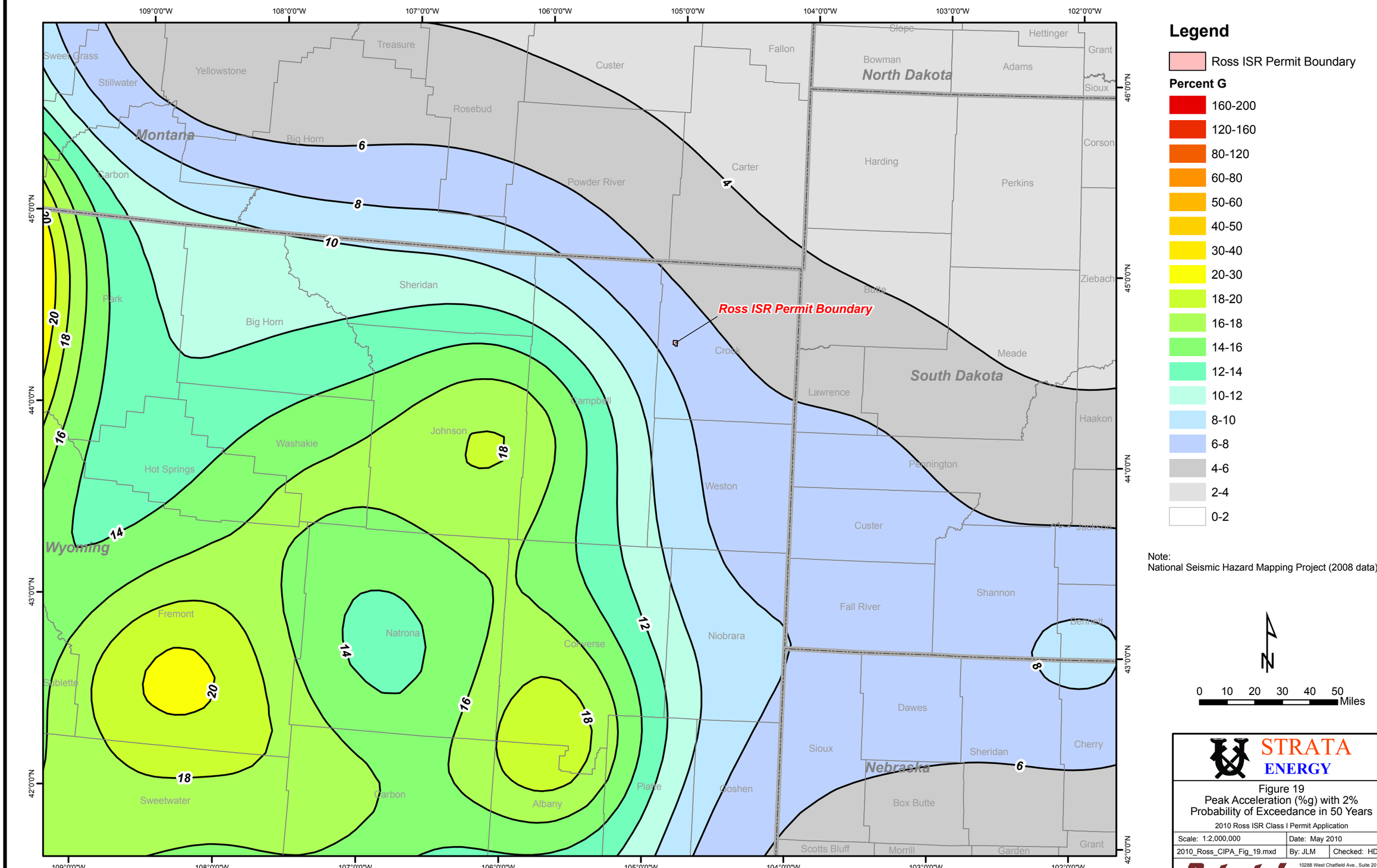

Legend

Ross ISR Permit Boundary

Percent G

- 160-200
- 120-160
- 80-120
- 60-80
- 50-60
- 40-50
- 30-40
- 20-30
- 18-20
- 16-18
- 14-16
- 12-14
- 10-12
- 8-10
- 6-8
- 4-6
- 2-4
- 0-2

Note:
National Seismic Hazard Mapping Project (2008 data)

N

0 10 20 30 40 50 Miles

Projection: Wyoming State Plane East, NAD 83, (feet)

STRATA ENERGY

Figure 19
Peak Acceleration (%g) with 2% Probability of Exceedance in 50 Years

2010 Ross ISR Class I Permit Application

Scale: 1:2,000,000	Date: May 2010	
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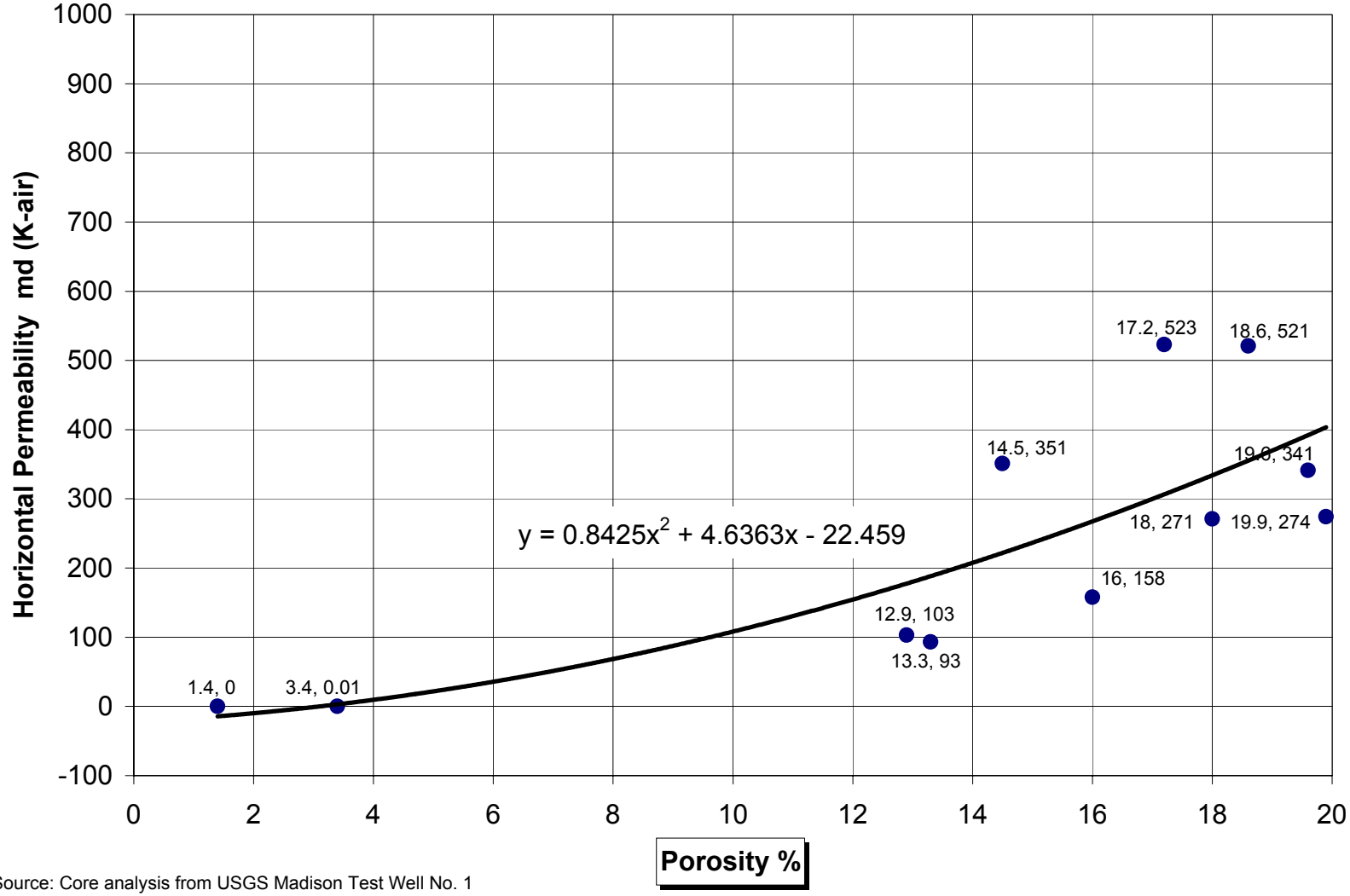
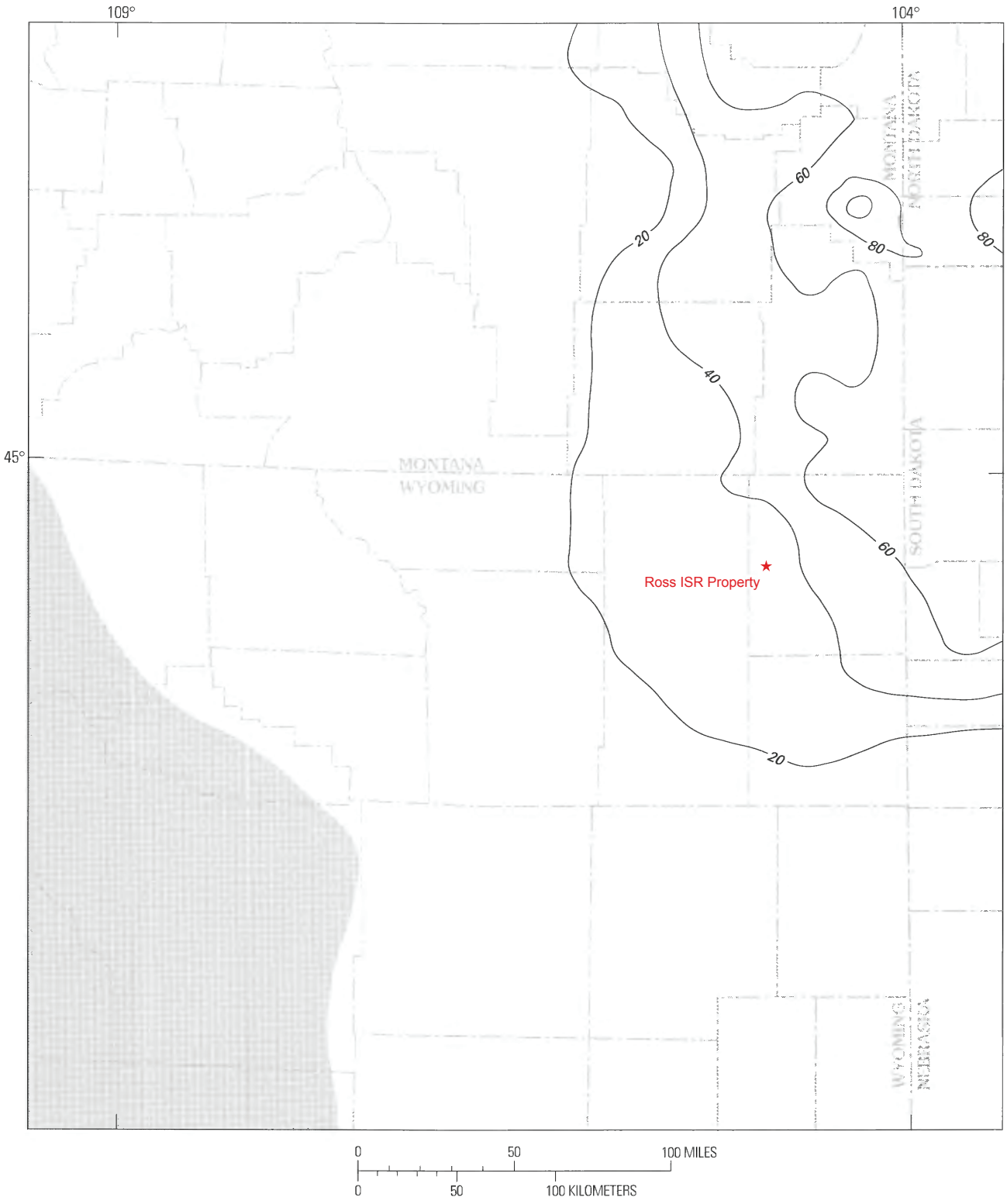
Figure 20
Horizontal Permeability vs. Porosity in Flathead Formation



Source: Core analysis from USGS Madison Test Well No. 1



From:
Geological Survey Professional Paper 1917
David L. Macke, 1993

N

STRATA ENERGY

Figure 21
Isopach Map,
Ice Box Member of the Winnipeg Group

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Scale: See Bar Scale	Date: May 2010	
2010_Ross_CIPA_Fig_21.ai	By: JLM	Checked: HD

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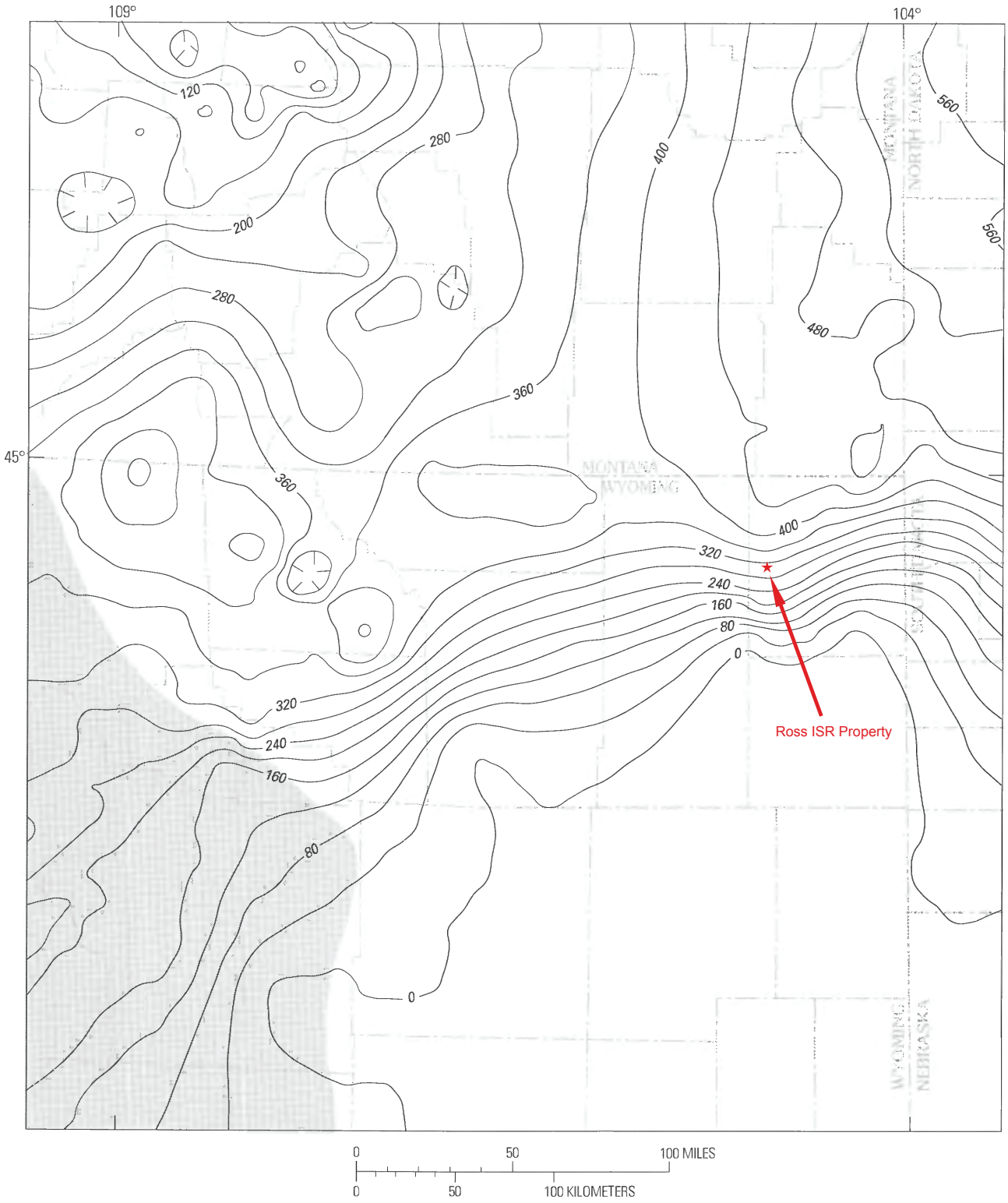

From:
Geological Survey Professional Paper 1917
David L. Macke, 1993

N

STRATA ENERGY

Figure 22
Isopach Map,
Red River Formation

2010 Ross ISR Class I Permit Application

Scale: See Bar Scale	Date: May 2010	
2010_Ross_CIPA_Fig_22.ai	By: JLM	Checked: HD

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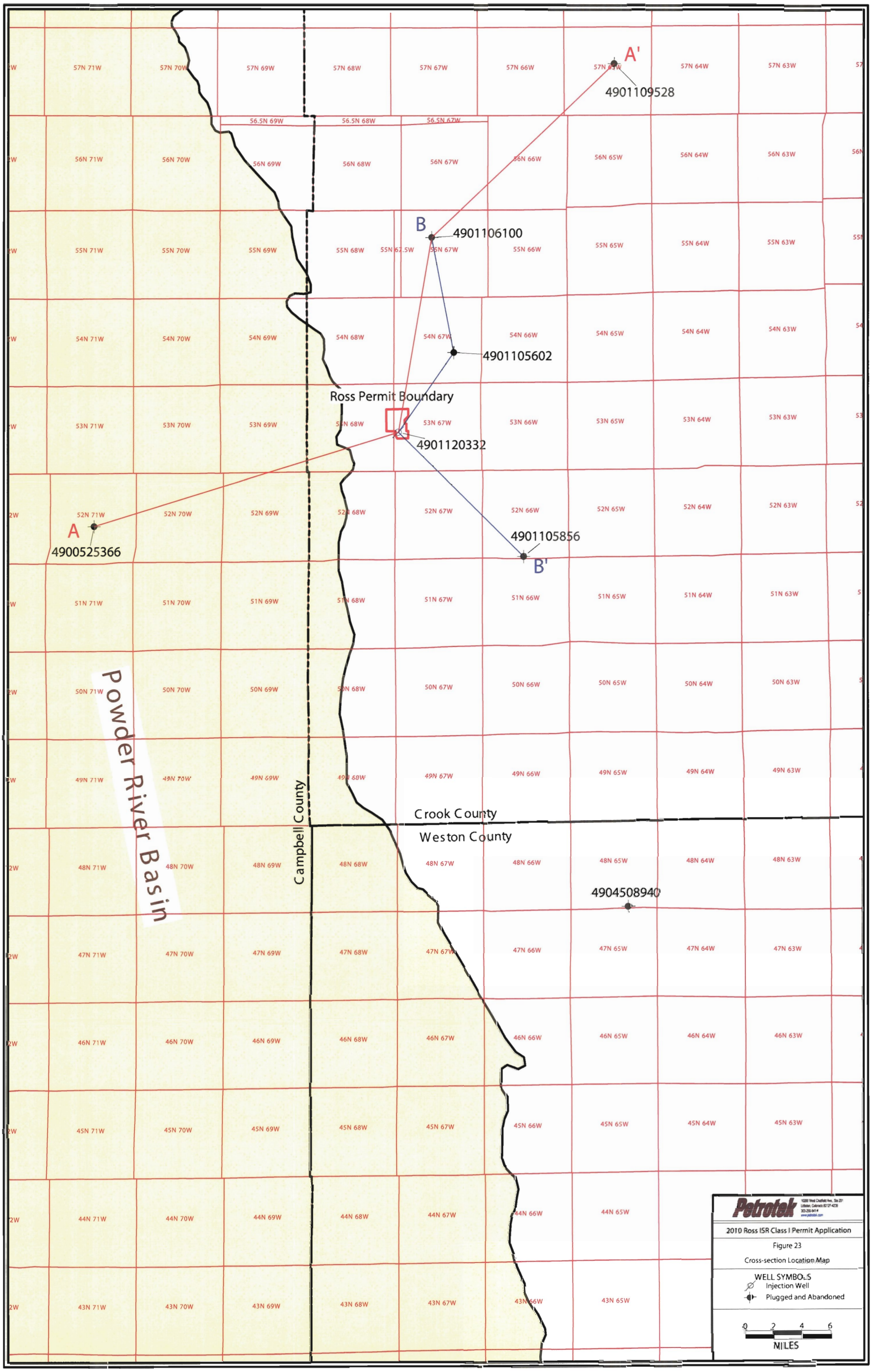
A'
4901109528
B
4901106100
4901105602
Ross Permit Boundary
4901120332
A
4900525366
4901105856
B'
Powder River Basin
Campbell County
Crook County
Weston County
4904508940
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Figure 23
Cross-section Location Map
WELL SYMBOLS
Injection Well
Plugged and Abandoned
0 2 4 6
MILES