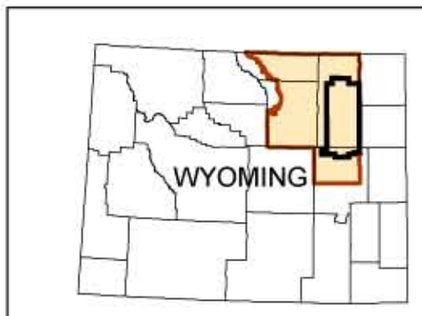
APPENDIX D

MODELED GROUNDWATER LEVELS



Coal Mine Groundwater Model

Legend

- Existing unreclaimed surface coal mine disturbance
- Groundwater model domain
- Groundwater level contours (feet)
- Wasatch no flow boundary

Coal Mine Subregions

- 1 Subregion 1 (North Gillette)
- 2 Subregion 2 (South Gillette)
- 3 Subregion 3 (Wright)

Note:
The Wasatch is not a true regional aquifer. It consists of local water-saturated sands that are usually not hydraulically interconnected. Consequently, the groundwater model figures present only an approximate estimate of water levels and drawdown in the Wasatch.

N W E S

0 2 4 6 Miles

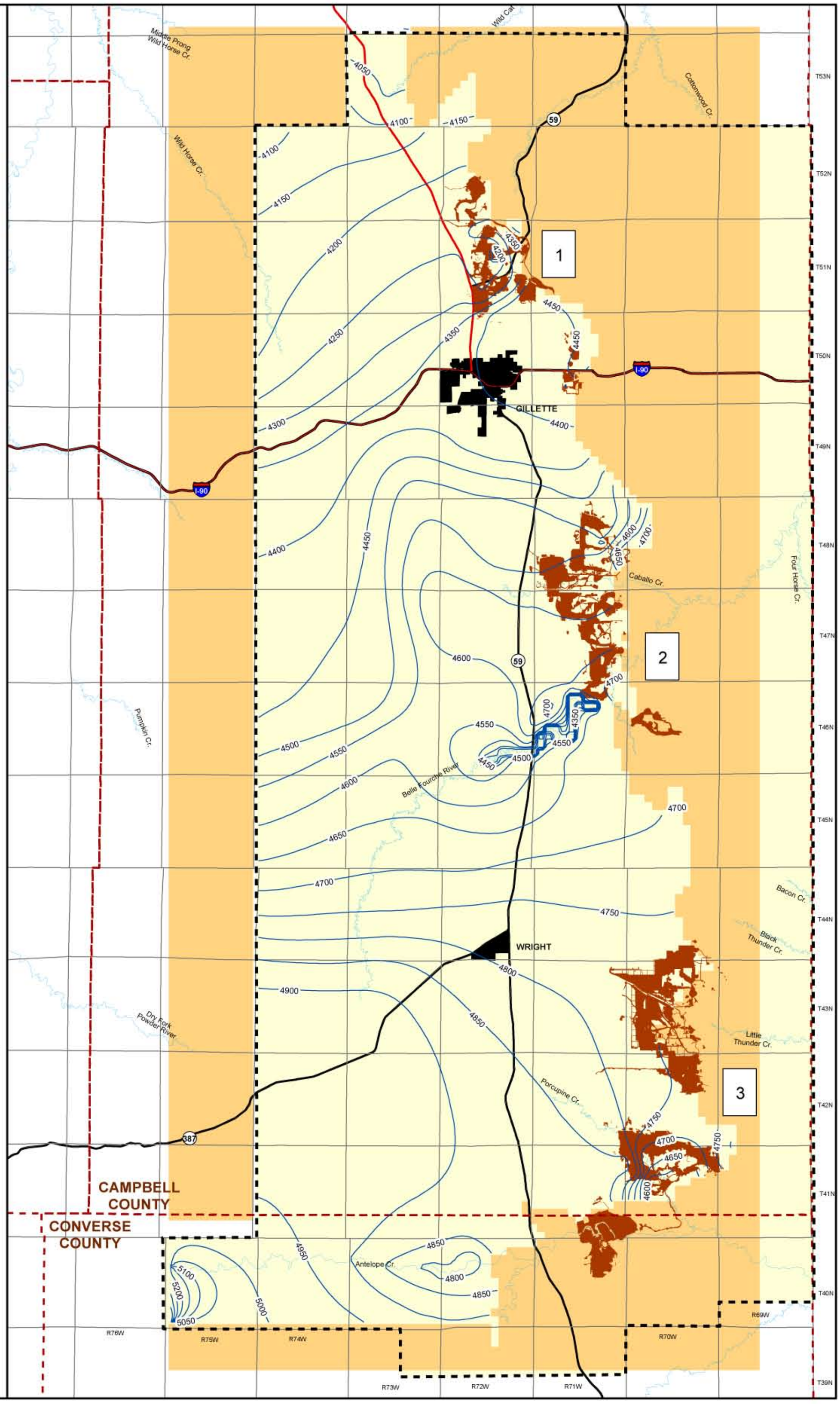
0 2 4 6 Kilometers

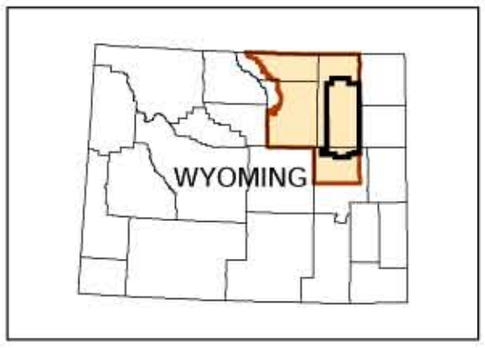
Powder River Basin Coal Review

Figure D-1

1990 Water Levels - Wasatch Formation

09/19/06





Coal Mine Groundwater Model

Legend

- Existing unreclaimed surface coal mine disturbance
- Groundwater model domain
- Groundwater level contours (feet)
- Wasatch no flow boundary

Coal Mine Subregions

- 1 Subregion 1 (North Gillette)
- 2 Subregion 2 (South Gillette)
- 3 Subregion 3 (Wright)

Note:
The Wasatch is not a true regional aquifer. It consists of local water-saturated sands that are usually not hydraulically interconnected. Consequently, the groundwater model figures present only an approximate estimate of water levels and drawdown in the Wasatch.

N W E S

0 2 4 6 Miles

0 2 4 6 Kilometers

Powder River Basin Coal Review

Figure D-2

2002 Water Levels - Wasatch Formation

09/19/06

GILLETTE

WRIGHT

CAMPBELL COUNTY

CONVERSE COUNTY

Middle Prong Wild Horse Cr.

Wild Horse Cr.

Cottonwood Cr.

Caballo Cr.

Four Horse Cr.

Pumpkin Cr.

Belle Fourche River

Dry Fork Powder River

Antelope Cr.

Porcupine Cr.

Bacon Cr.

Black Thunder Cr.

Little Thunder Cr.

I-90

59

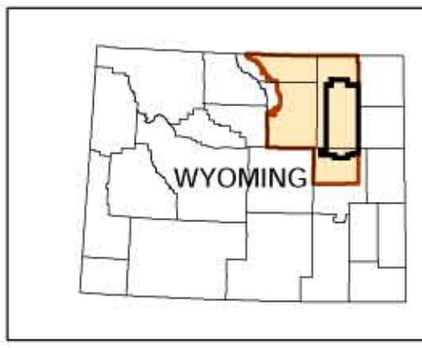
387

T53N T52N T51N T50N T49N T48N T47N T46N T45N T44N T43N T42N T41N T40N T39N

R76W R75W R74W R73W R72W R71W R70W R69W

1 2 3

4050 4100 4150 4200 4250 4300 4350 4400 4450 4500 4550 4600 4650 4700 4750 4800 4850 4900 4950 5000 5050 5100 5200



Coal Mine Groundwater Model

Legend

- Existing unreclaimed surface coal mine disturbance
- Groundwater model domain
- -20 = Drawdown of 20 feet
- Groundwater drawdown level contours (feet)
- Wasatch no flow boundary
- Wasatch Formation model dry cells

Coal Mine Subregions

- 1 Subregion 1 (North Gillette)
- 2 Subregion 2 (South Gillette)
- 3 Subregion 3 (Wright)

Note:
The Wasatch is not a true regional aquifer. It consists of local water-saturated sands that are usually not hydraulically interconnected. Consequently, the groundwater model figures present only an approximate estimate of water levels and drawdown in the Wasatch.

N W E S

0 2 4 6 Miles

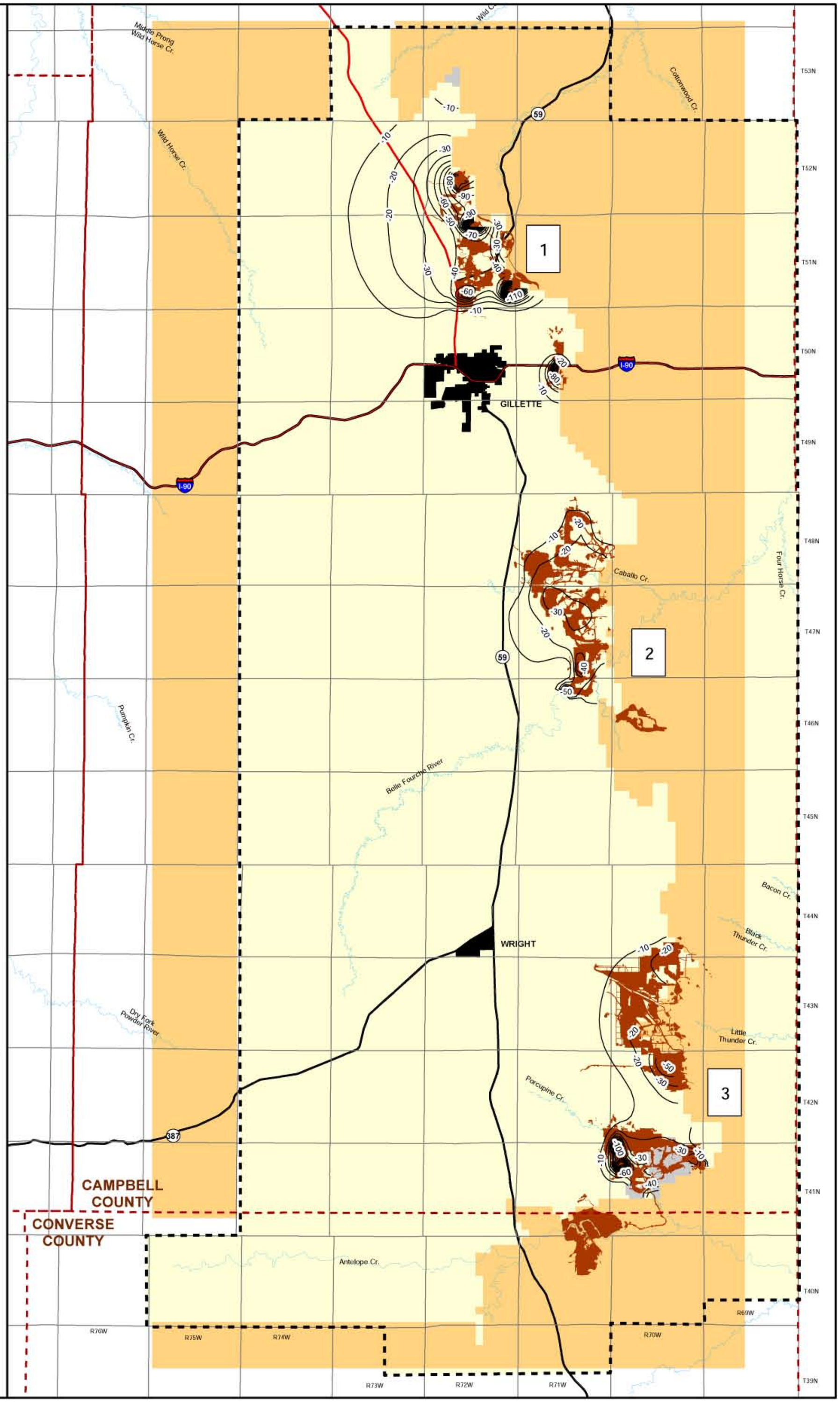
0 2 4 6 Kilometers

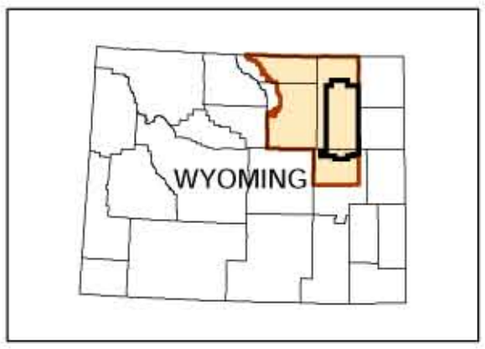
Powder River Basin Coal Review

Figure D-3

2002 Coal Mine-related Groundwater Drawdown Levels-Wasatch Formation

09/19/06





Coal Mine Groundwater Model

Legend

- Existing unreclaimed surface coal mine disturbance
- Groundwater model domain
- -20 = Drawdown of 20 feet
- 10 with blue contour = groundwater mounding of 10 feet
- Groundwater drawdown level contours (feet)
- Groundwater mounding level contours (feet)
- Wasatch no flow boundary
- Wasatch Formation model dry cells

Coal Mine Subregions

- 1 Subregion 1 (North Gillette)
- 2 Subregion 2 (South Gillette)
- 3 Subregion 3 (Wright)

Note 1:
Includes effects of CBNG groundwater pumping and CBNG water discharge.

Note 2:
The Wasatch is not a true regional aquifer. It consists of local water-saturated sands that are usually not hydraulically interconnected. Consequently, the groundwater model figures present only an approximate estimate of water levels and drawdown in the Wasatch.

N W E S

0 2 4 6 Miles

0 2 4 6 Kilometers

Powder River Basin Coal Review

Figure D-4

2002 CBNG-related Groundwater Level Changes-Wasatch Formation

09/19/06

GILLETTE

WRIGHT

CAMPBELL COUNTY

CONVERSE COUNTY

Middle Prong Wild Horse Cr.

Wild Horse Cr.

Cottonwood Cr.

Caballo Cr.

Four Horse Cr.

Pumpkin Cr.

Belle Fourche River

Bacon Cr.

Black Thunder Cr.

Little Thunder Cr.

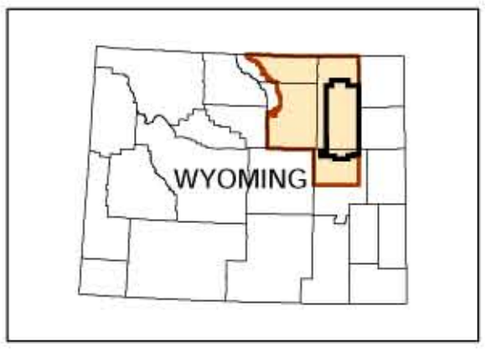
Porcupine Cr.

Dry Fork Powder River

Antelope Cr.

T53N T52N T51N T50N T49N T48N T47N T46N T45N T44N T43N T42N T41N T40N T39N

R76W R75W R74W R73W R72W R71W R70W R69W



Coal Mine Groundwater Model

Legend

- Existing unreclaimed surface coal mine disturbance
- Groundwater model domain
- -20 = Drawdown of 20 feet
- 10 with blue contour = groundwater mounding of 10 feet
- Groundwater drawdown level contours (feet)
- Groundwater mounding level contours (feet)
- Wasatch no flow boundary
- Wasatch Formation model dry cells

Coal Mine Subregions

- 1 Subregion 1 (North Gillette)
- 2 Subregion 2 (South Gillette)
- 3 Subregion 3 (Wright)

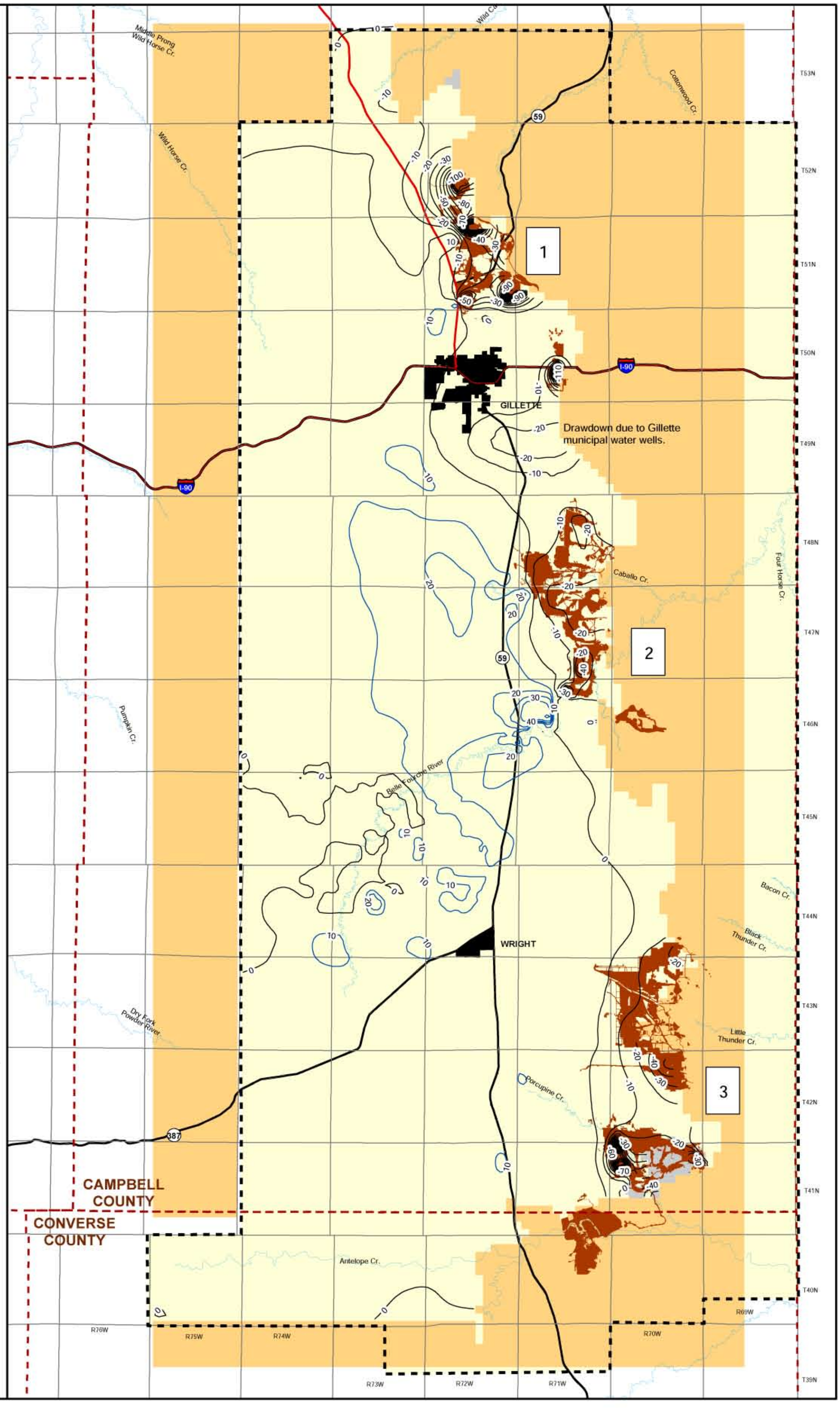
Note 1:
Includes effects of CBNG groundwater pumping and CBNG water discharge.

Note 2:
The Wasatch is not a true regional aquifer. It consists of local water-saturated sands that are usually not hydraulically interconnected. Consequently, the groundwater model figures present only an approximate estimate of water levels and drawdown in the Wasatch.

N W E S

0 2 4 6 Miles

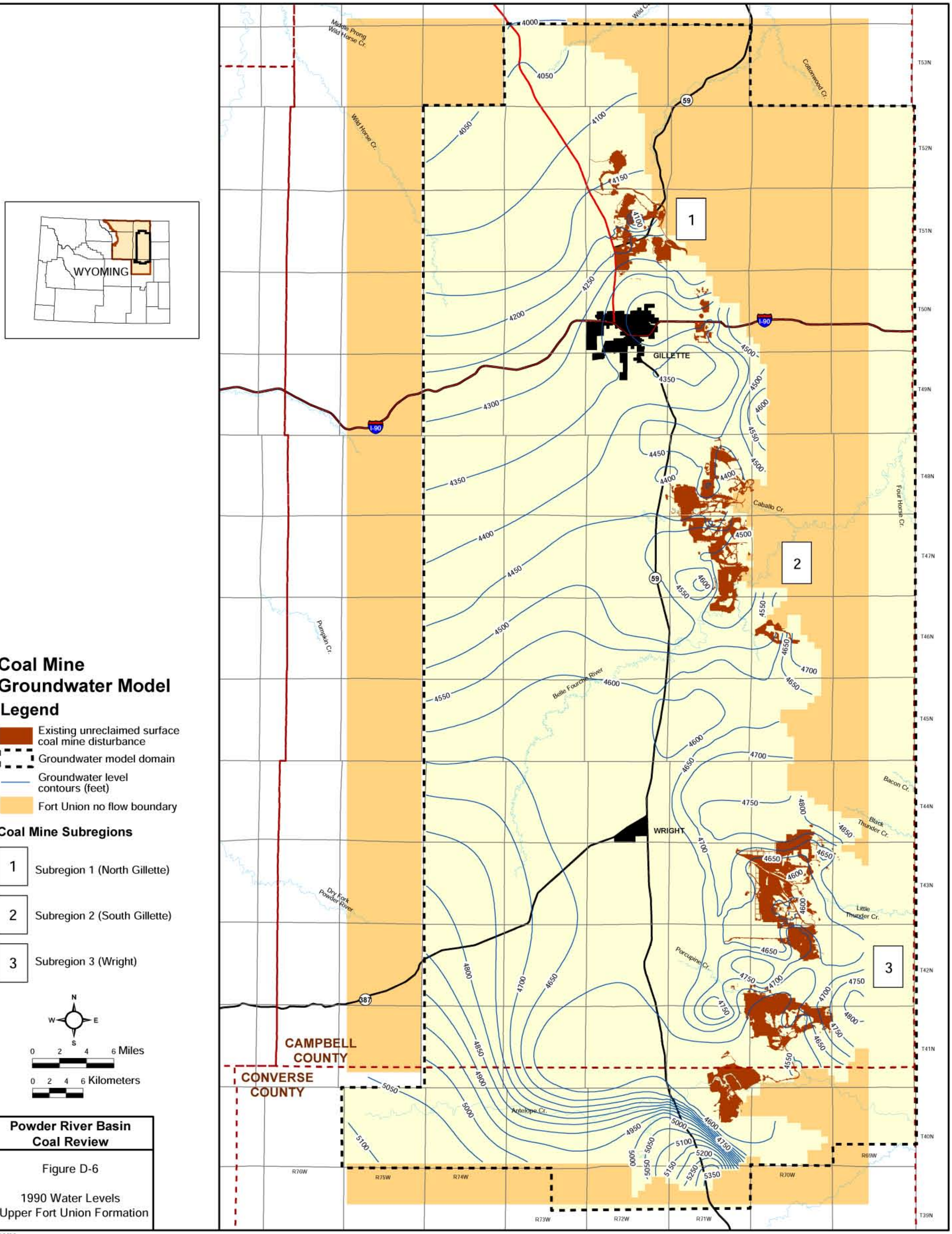
0 2 4 6 Kilometers



Powder River Basin Coal Review

Figure D-5
2002 Coal Mine- and CBNG-related and Water Supply Groundwater Level Changes-Wasatch Formation

09/19/06

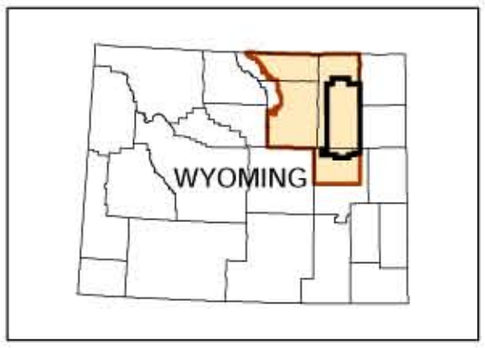


Powder River Basin Coal Review

Figure D-6

1990 Water Levels
- Upper Fort Union Formation

09/19/06



Coal Mine Groundwater Model

Legend

- Existing unreclaimed surface coal mine disturbance
- Groundwater model domain
- Groundwater level contours (feet)
- Fort Union no flow boundary

Coal Mine Subregions

- 1 Subregion 1 (North Gillette)
- 2 Subregion 2 (South Gillette)
- 3 Subregion 3 (Wright)

N W E S

0 2 4 6 Miles

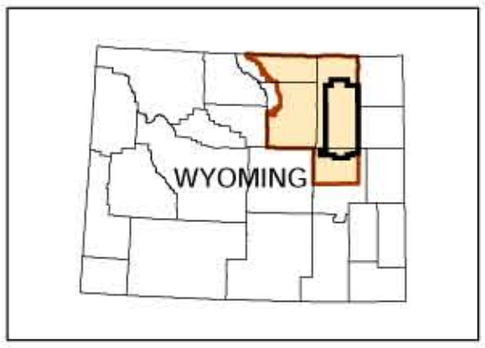
0 2 4 6 Kilometers

Powder River Basin Coal Review

Figure D-7

2002 Water Levels - Upper Fort Union Formation

09/19/06



Coal Mine Groundwater Model

Legend

- Existing unreclaimed surface coal mine disturbance
- Groundwater model domain
- -20 = Drawdown of 20 feet
- Groundwater drawdown level contours (feet)
- Fort Union no flow boundary
- Fort Union model dry cells

Coal Mine Subregions

- 1 Subregion 1 (North Gillette)
- 2 Subregion 2 (South Gillette)
- 3 Subregion 3 (Wright)

N W E S

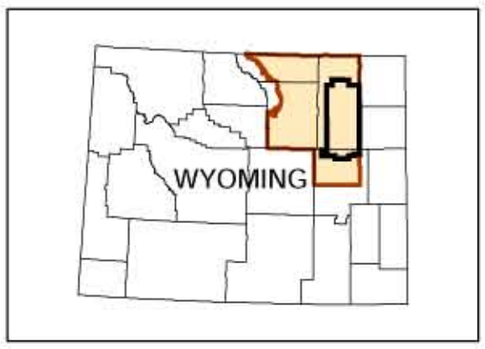
0 2 4 6 Miles

0 2 4 6 Kilometers

Powder River Basin Coal Review

Figure D-8
2002 Coal Mine-related Groundwater Drawdown Levels-Upper Fort Union Formation

09/19/06



Coal Mine Groundwater Model

Legend

- Existing unreclaimed surface coal mine disturbance
- Groundwater model domain
- -20 = Drawdown of 20 feet
- Groundwater drawdown level contours (feet)
- Fort Union no flow boundary
- Fort Union model dry cells

Coal Mine Subregions

- 1 Subregion 1 (North Gillette)
- 2 Subregion 2 (South Gillette)
- 3 Subregion 3 (Wright)

N W E S

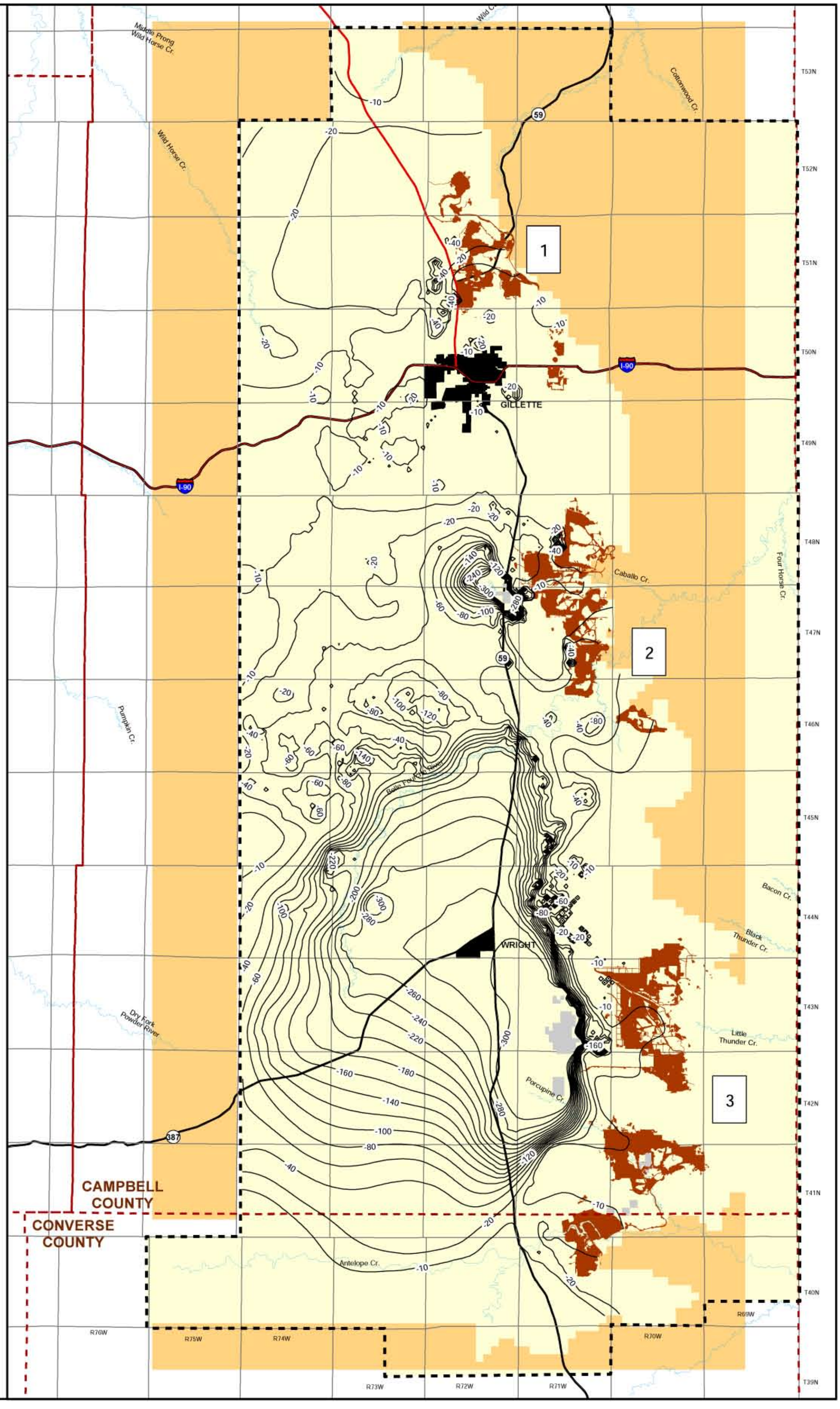
0 2 4 6 Miles

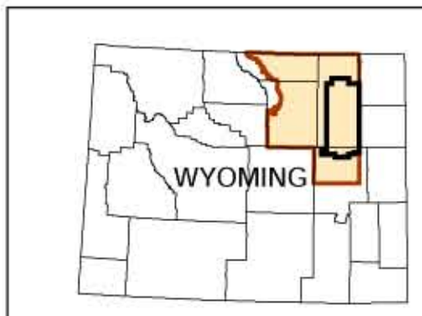
0 2 4 6 Kilometers

Powder River Basin Coal Review

Figure D-9
2002 CBNG-related Groundwater Level Changes-Upper Fort Union Formation

09/21/06





Coal Mine Groundwater Model

Legend

- Existing unreclaimed surface coal mine disturbance
- Groundwater model domain
- -20 = Drawdown of 20 feet
- Groundwater drawdown level contours (feet)
- Fort Union no flow boundary
- Fort Union model dry cells

Coal Mine Subregions

- 1 Subregion 1 (North Gillette)
- 2 Subregion 2 (South Gillette)
- 3 Subregion 3 (Wright)

N W E S

0 2 4 6 Miles

0 2 4 6 Kilometers

Powder River Basin Coal Review

Figure D-10

2002 Coal Mine- and CBNG-related and Water Supply Groundwater Drawdown Levels-Upper Fort Union Formation

09/21/06

Middle Prong Wild Horse Cr.
Wild Horse Cr.
Cottonwood Cr.
Pumpkin Cr.
Belle Fourche River
Dry Fork Powder River
Caballo Cr.
Four Horse Cr.
Bacon Cr.
Black Thunder Cr.
Little Thunder Cr.
Porcupine Cr.
Antelope Cr.
GILLETTE
WRIGHT
I-90
59
387
1
2
3
Drawdown due to Gillette municipal water wells.
CAMPBELL COUNTY
CONVERSE COUNTY
T53N
T52N
T51N
T50N
T49N
T48N
T47N
T46N
T45N
T44N
T43N
T42N
T41N
T40N
T39N
R76W
R75W
R74W
R73W
R72W
R71W
R70W
R69W