

APPENDIX A
OWNERS OF RECORD OF SURFACE
AND MINERAL RIGHTS WITHIN THE PERMIT AREA
(REYNOLDS RANCH)

Township 36 North, Range 73 West
Section 5: Lots 3, SE²NW⁴
Section 6: Lots 6, 7, W²SE⁴, SE⁴SE⁴
Section 18: NE⁴

SURFACE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:

All Leasable Minerals, including Coal, Oil and Gas:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals, including Uranium:

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

LEASE OWNER:

(oil & gas)

BLACK ISLAND RESOURCES (USA) INC.
105 305-10th St. NW
Calgary Alberta T2N 4F6
Canada

Township 36 North, Range 73 West
Section 5: Lot 4, SW²NW⁴, W²SW⁴
Section 6: Lots 1-3, 5, SE⁴NW⁴, S²NE⁴, E²SW⁴, NE⁴SE⁴
Section 18: Lots 1, 2, E²NW⁴
Township 37 North, Range 73 West
Section 30: Lot 3

SURFACE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:

All Leasable Minerals, including Coal, Oil and Gas:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals, including Uranium:

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

Township 36 North, Range 73 West
Section 6: Lot 4

SURFACE OWNER:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

GRAZING LEASE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:

All Leasable Minerals, including Coal, Oil and Gas:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals, including Uranium:

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

Township 36 North, Range 73 West

Section 7: Lots 1-4, E²W²

Section 17: N², NW⁴SW⁴

Township 36 North, Range 74 West

Section 1: S²SE⁴

Section 11: Lot 14, fka SE⁴SW⁴

Section 12: NW⁴NW⁴

Section 14: NE⁴NW⁴

Township 37 North, Range 74 West

Section 25: W²SW⁴, SE⁴SW⁴

Section 26: E²SE⁴

Section 35: E²NE⁴

SURFACE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:

All Minerals including Coal, Oil & Gas

FAMILY TRUST
Jeffrey Reynolds & Evelyn Reynolds, Trustees
P.O. Box 146
Douglas, Wyoming 82633

LEASE OWNER:

(uranium)

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

RIGHT-OF-WAY OWNER:

(T37N, R74W, Sec. 35: E²NE⁴)

PACIFIC POWER & LIGHT
825 NE Multnomah
Portland, Oregon 97232

Township 36 North, Range 73 West

Section 17: W²SE⁴, SE⁴SE⁴

SURFACE OWNER:

VOLLMAN RANCHES, INC.
P.O. Box 13
Douglas, Wyoming 82633

MINERAL OWNER:

All Leasable Minerals, including Coal, Oil and Gas:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals, including Uranium:

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

LEASE OWNER:
(oil & gas)

BLACK ISLAND RESOURCES (USA) INC.
105 205-10th St. NW
Calgary Alberta T2N 4F6
Canada

Township 36 North, Range 73 West
Section 17: NE⁴SE⁴, E²SW⁴, N²SW⁴SW⁴

SURFACE OWNER:

VOLLMAN RANCHES, INC.
P.O. Box 13
Douglas, Wyoming 82633

MINERAL OWNER:
All Leasable Minerals, including Coal, Oil and Gas:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals, including Uranium:

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

Township 36 North, Range 73 West
Section 18: Lots 3, 4, E²SW⁴, SE⁴

SURFACE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals including Coal, Oil & Gas

MARY JANE IRWIN
7550 N. 16th Street, Apt. 210-4
Phoenix, Arizona 85020-4643

LEASE OWNER:
(uranium)

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

RIGHT-OF-WAY OWNER:
(Lot 4)

KN GAS GATHERING, INC.
252 State Highway 59
Douglas, Wyoming 82633

Township 36 North, Range 74 West
Section 1: Lots 5-12, 15, that part of MS 749 lying in the
W² fka N², NE⁴SW⁴

Section 2: Lots 5-12, fka E²
Section 11: Lots 1, 8, 9, 16, fka E²E²
Section 13: Lot 3 fka NE⁴NW⁴
Section 14: Lot 2 fka NW⁴NE⁴

SURFACE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:
All Leasable Minerals, including Coal, Oil and Gas:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals, including Uranium:

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

LEASE OWNER:
(oil & gas)

ANDEX RESOURCES LLC
1001 Fannin S-2000
Houston, Texas 77026

Township 36 North, Range 74 West
Section 1: Lots 16, 17, 18, fka W²SW⁴, SE⁴SW⁴
Section 14: Lot 1 fka NE⁴NE⁴

SURFACE OWNER:

LINDA KAY BIRKNER
2908 Briggs Place
Lexington, Kentucky 40511-8874

MINERAL OWNER:
All Leasable Minerals, including Coal, Oil and Gas:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals, including Uranium:

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

LEASE OWNER:
(oil & gas)

ANDEX RESORUCES LLC
1001 Fannin S-2000
Houston, Texas 77026

Township 36 North, Range 74 West
Section 1: Lots 13 & 14, fka N²SE⁴
Section 12: Lots 1, 2, 4-9, 11, 12, 14, 15,
fka E², SE⁴NW⁴, W²SW⁴, SW⁴NW⁴
Section 13: Lots 1, 2, 4-8, fka NE⁴, NW⁴NW⁴, S²NW⁴

SURFACE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:
All Leasable Minerals, including Coal, Oil and Gas:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals, including Uranium:

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

LEASE OWNER:
(oil & gas)

BP AMERICA PRODUCTION COMPANY
P.O. Box 3092
Houston, Texas 77253

RIGHT-OF-WAY OWNER:
(Section 13: S²NW⁴)

KN GAS GATHERING, INC.
252 State Highway 59
Douglas, Wyoming 82633

Township 36 North, Range 74 West
Section 2: Lot 3, SE⁴NW⁴, E²SW⁴

SURFACE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals including Coal, Oil & Gas

CRAIG BREHM
5960 W. Canyon Dr.
Littleton, Colorado 80128-5910

LEASE OWNER:
(uranium)

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

Township 36 North, Range 74 West
Section 11: Lots 2, 3, 6, 7, 10, 11, 15,
flka W²E², E²NW⁴, NE⁴SW⁴

SURFACE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals including Coal, Oil & Gas

EDWARD A. JOCHUMSEN
P.O. Box 127
Cora, Wyoming 82925-0127

LEASE OWNER:
(uranium)

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

(oil & gas)

ANSCHUTZ WESTERN CORPORATION
555 17th Street, Suite 2400
Denver, Colorado 80202

Township 36 North, Range 74 West
Section 12: Lots 3, 10, 13, flka NE⁴NW⁴, E²SW⁴

SURFACE OWNER:

LINDA KAY BIRKNER
2908 Briggs Place
Lexington, Kentucky 40511-8874

MINERAL OWNER:
All Leasable Minerals, including Coal, Oil and Gas:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals, including Uranium:

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

LEASE OWNER:
(oil & gas)

BP AMERICA PRODUCTION COMPANY
P.O. Box 3092
Houston, Texas 77253

**Township 36 North, Range 74 West
Section 14: Lot 7, fka SE⁴NE⁴**

SURFACE OWNER:

**LINDA KAY BIRKNER
2908 Briggs Place
Lexington, Kentucky 40511-8874**

MINERAL OWNER:

All Leasable Minerals, including Coal, Oil and Gas:

**THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003**

All Locatable Minerals, including Uranium:

**POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637**

**RIGHT-OF-WAY OWNER:
(all above described lands)**

**KN GAS GATHERING, INC.
252 State Highway 59
Douglas, Wyoming 82633**

**Township 36 North, Range 74 West
Section 14: Lots 5, 6, fka SW⁴NE⁴, SE⁴NW⁴**

SURFACE OWNER:

**DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633**

MINERAL OWNER:

All Leasable Minerals, including Coal, Oil and Gas:

**THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003**

All Locatable Minerals, including Uranium:

**POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637**

**RIGHT-OF-WAY OWNER:
(all above described lands)**

**KN GAS GATHERING, INC.
252 Highway 59
Douglas, Wyoming 82633**

**Township 37 North, Range 73 West
Section 30: NE⁴SW⁴
Section 31: Lots 2, 4, E²SW, SE⁴, SE⁴NW⁴, SW⁴NE⁴
Section 32: SW⁴**

SURFACE OWNER:

**DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633**

MINERAL OWNER:

All Leasable Minerals, including Coal, Oil and Gas:

**THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003**

All Locatable Minerals, including Uranium:

**POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637**

LEASE OWNER:
(oil & gas)

BLACK ISLAND RESOURCES (USA) INC.
105 305-10th St. NW
Calgary Alberta T2N 4F6
Canada

RIGHT-OF-WAY OWNER:
(Section 31: Lot 4, NE⁴SW⁴, N²SE⁴, Section 32: N²SW⁴)

PACIFIC POWER & LIGHT
825 NE Multnomah
Portland, Oregon 97232

Township 37 North, Range 73 West
Section 30: W²SE⁴

SURFACE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals including Coal, Oil & Gas

HORNBUCKLE IRREVOCABLE MINERAL
TRUST I
1558 Ross Road
Douglas, Wyoming 82633

LEASE OWNER:
(uranium)

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

Township 37 North, Range 73 West
Section 30: W²NE⁴

SURFACE OWNER:

HORNBUCKLE RANCH, INC.
1558 Ross Road
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals including Coal, Oil & Gas

HORNBUCKLE IRREVOCABLE MINERAL
TRUST I
1558 Ross Road
Douglas, Wyoming 82633

RIGHT-OF-WAY OWNER:
(SW⁴NE⁴)

MIGC, INC.
P.O. Box 3099
Casper, Wyoming 82602

Township 37 North, Range 73 West
Section 30: Lots 1, 2, E²NW⁴

SURFACE OWNER:

HORNBUCKLE RANCH INC.
1558 Ross Road
Douglas, Wyoming 82633

MINERAL OWNER:
All Leasable Minerals, including Coal, Oil and Gas:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals, including Uranium:

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

LEASE OWNER:
(oil & gas)

PIONEER NATURAL RESOURCES USA,
INC.
P.O. Box 3178
Midland, Texas 79702

THE LOUISIANA LAND & EXPLORATION
COMPANY
1560 Broadway, S-1200
Denver, Colorado 80202

I.C. GAS AMCANA, INC.
320 S. Boston S-600
Tulsa, Oklahoma 74103

RAM ENERGY, INC.
5100 E. Kelly Dr. Suite 650
Tulsa, Oklahoma 74135

RB OPERATING COMPANY
5100 e. Kelly Dr. Suite 650
Tulsa, Oklahoma 74135

RIGHT-OF-WAY OWNER:
(Lot 1, E²NW⁴)

MIGC, INC.
P.O. Box 3099
Casper, Wyoming 82602

Township 37 North, Range 73 West
Section 30: S²SW⁴
Section 31: Lot 1, NE⁴NW⁴, NW⁴NE⁴

SURFACE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals including Coal, Oil & Gas

FAMILY TRUST
Jeffrey Reynolds & Evelyn Reynolds, Trustees
P.O. Box 146
Douglas, Wyoming 82633

LEASE OWNER:
(uranium)

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

Township 37 North, Range 73 West
Section 31: Lot 3

SURFACE OWNER:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

GRAZING LEASE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:
All Leasable Minerals, including Coal, Oil and Gas:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals, including Uranium:

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

LEASE OWNER:
(oil & gas)

BLACK ISLAND RESOURCES (USA) INC.
105 305-10th St. NW
Calgary Alberta T2N 4F6
Canada

Township 37 North, Range 74 West
Section 25: Lots 9, 12, fka E²SE⁴

SURFACE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:
All Leasable Minerals, including Coal, Oil and Gas:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals, including Uranium:

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

LEASE OWNER:
(oil & gas)

YATES DRILLING COMPANY
105 S. 4th St.
Artesia, New Mexico 88210

ABO PETROLEUM CORPORATION
105 S. 4th St.
Artesia, New Mexico 88210

MYCO INDUSTRIES, INC.
105 S. 4th St.
Artesia, New Mexico 88210

YATES PETROLEUM CORPORATION
105 S. 4th St.
Artesia, New Mexico 88210

SHARBRO OIL, LTD. CO.
105 S. 4th ST.
Artesia, New Mexico 88210

Township 37 North, Range 74 West
Section 26: Lots 1, 2, 5, part of MS 717 fka NE⁴
Section 34: Lots 1, 4, 5, 8, part of MS 717 fka E²E²

SURFACE OWNER:

HENRY LAND COMPANY
1320 Nottingham Drive
Casper, Wyoming 82609

MINERAL OWNER:
All Leasable Minerals, including Coal, Oil and Gas:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals, including Uranium:

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

LEASE OWNER:
(oil & gas)

YATES DRILLING COMPANY
105 S. 4th St.
Artesia, New Mexico 88210

ABO PETROLEUM CORPORATION
105 S. 4th St.
Artesia, New Mexico 88210

MYCO INDUSTRIES, INC.
105 S. 4th St.
Artesia, New Mexico 88210

YATES PETROLEUM CORPORATION
105 S. 4th St.
Artesia, New Mexico 88210

SHARBRO OIL, LTD. CO.
105 S. 4th ST.
Artesia, New Mexico 88210

RIGHT-OF-WAY OWNER:
(Section 26: Lots 5, Part of MS717, fka S²NE⁴)

THE UNITED STATES OF AMERICA
Department of Energy
907 North Poplar
Casper, Wyoming 82601

(Section 26: Lot 2, Part of MS717, fka W²NE⁴)

CONVERSE COUNTY COMMISSIONERS
107 North 5th
Douglas, Wyoming 82633

(Section 26: Lots 1, 5, SW⁴NE⁴)

MIGC, INC.
P.O. Box 3099
Casper, Wyoming 82602

Township 37 North, Range 74 West
Section 26: Lots 3, 4, 6, 7, part of MS 717, fka W², W²SE⁴
Section 35: Part of MS 717; fka NW⁴, W²NE⁴

SURFACE OWNER:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

GRAZING LEASE OWNER:
(all except Section 26: NW⁴NW⁴)

SMITH SHEEP COMPANY
1744 Highway 93
Douglas, Wyoming 82633

MINERAL OWNER:
All Leasable Minerals, including Coal, Oil and Gas:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals, including Uranium:

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

LEASE OWNER:
(oil & gas)

YATES DRILLING COMPANY
105 S. 4th St.
Artesia, New Mexico 88210

ABO PETROLEUM CORPORATION
105 S. 4th St.
Artesia, New Mexico 88210

MYCO INDUSTRIES, INC.
105 S. 4th St.
Artesia, New Mexico 88210

YATES PETROLEUM CORPORATION
105 S. 4th St.
Artesia, New Mexico 88210

SHARBRO OIL, LTD. CO.
105 S. 4th ST.
Artesia, New Mexico 88210

RIGHT-OF-WAY OWNER:
(Section 26: Lot 4, SE⁴NW⁴)

MIGC, INC.
P.O. Box 3099
Casper, Wyoming 82602

(Section 26: E²W², W²SE⁴, Section 35: E²NW⁴, W²NE⁴)

CONVERSE COUNTY COMMISSIONERS
107 North 5th
Douglas, Wyoming 82633

Township 37 North, Range 74 West, 6th P.M.
Section 35: S²

SURFACE OWNER:

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

MINERAL OWNERS:
All Minerals, including Coal, Oil and Gas

MACHELLE MASON
2147 Flora Ave.
Fort Myers, FL 33907-4129

BETTY GWARTNEY
1895 Baker Avenue
Payette, Idaho 83661

LAURA MASON
P.O. Box 148
Douglas, Wyoming 82633

LEASE OWNER:
(uranium)

ORVILLE & LOIS HAKLO
P.O. Box 773
Glenrock, Wyoming 82637

RIGHT-OF-WAY OWNER:
(E²SW⁴, W²SE⁴)

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

(SE⁴, SE⁴SW⁴)

CONVERSE COUNTY COMMISSIONERS
107 North 5th
Douglas, Wyoming 82633

Township 37 North, Range 74 West, 6th P.M
Section 36: All

PACIFIC POWER & LIGHT
825 NE Multnomah
Portland, Oregon 97232

SURFACE OWNER:

STATE OF WYOMING
Office of State Lands and Investments
122 West 25th Street
Cheyenne, Wyoming 82002-0600

GRAZING LEASE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals including Coal, Oil & Gas

STATE OF WYOMING
Office of State Lands and Investments
122 West 25th Street
Cheyenne, Wyoming 82002-0600

LEASE OWNER:
(uranium)

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

(oil & gas)

YATES PETROLEUM CORPORATION
105 S. 4th St.
Artesia, New Mexico 88210

RIGHT-OF-WAY OWNER:
(N²S²)

PACIFIC POWER & LIGHT
825 NE Multnomah
Portland, Oregon 97232

APPENDIX B
OWNERS OF RECORD OF SURFACE
AND MINERAL RIGHTS ADJACENT TO THE PERMIT AREA
(REYNOLDS RANCH)

Township 36 North, Range 73 West, 6th P.M.
Section 5: S²NE⁴

SURFACE OWNER:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

GRAZING LEASE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:

All Minerals including Coal, Oil & Gas

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals including uranium

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

LEASE OWNER
(oil & gas)

Nola Grace Ptasynski
P.O. Box 43
Casper, Wyoming 82602

Township 36 North, Range 73 West, 6th P.M.
Section 5: Lots 1, 2

SURFACE OWNER:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

GRAZING LEASE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:

All Minerals including Coal, Oil & Gas

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals including uranium

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

LEASE OWNER:
(oil & gas)

BLACK ISLAND RESOURCES (USA) Inc.
105 305-10TH St. NW
Calgary Alberta T2N 4F6
Canada

Township 36 North, Range 73 West
Section 5: SE⁴, E²SW⁴
Section 8: N²NW⁴

SURFACE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals, including Coal, Oil and Gas:

JORDAN HUNTINGTON NICHOLS CROUCH
DAVID EARL CROUCH
509 W. Dodds Street
Bloomington, Indiana 47403-4713

MELVIN EARL HENDERSON
303 East Ohio Avenue
Lenox, Iowa 50851

VERYLE LOU CROUCH
509 W. Dodds Street
Bloomington, Indiana 47403-4713

Township 36 North, Range 73 West
Section 7: E²
Section 16: W²

SURFACE OWNER:

STATE OF WYOMING
Office of State Lands and Investments
122 West 25th Street
Cheyenne, Wyoming 82002-0600

GRAZING LEASE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals, including Coal, Oil and Gas:

STATE OF WYOMING
Office of State Lands and Investments
122 West 25th Street
Cheyenne, Wyoming 82002-0600

LEASE OWNER:
(uranium)

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82633

(oil & gas)

AMERICAN GENERAL PARTNERSHIP
717.17th St. S-1435
Denver, Colorado 80202

Township 36 North, Range 73 West
Section 8: S²S², NW⁴SW⁴

SURFACE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:

All Leasable Minerals, including Coal, Oil and Gas:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals, including Uranium

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

LEASE OWNER:
(oil & gas)

BLACK ISLAND RESOURCES (USA) INC.
105 305-10th St. NW
Calgary Alberta T2N 4F6
Canada

Township 36 North, Range 73 West
Section 8: W²NE⁴, SE⁴NW⁴
Section 9: SW⁴
Section 20 E²NE⁴

SURFACE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals, including Coal, Oil and Gas:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

Township 36 North, Range 73 West
Section 8: N²SE⁴, NE⁴SW⁴
Township 37 North, Range 73 West
Section 29: W²SW⁴

SURFACE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals, including Coal, Oil and Gas:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

LEASE OWNER:
(oil & gas)

BLACK ISLAND RESOURCES (USA) INC.
105 305-10th St. NW
Calgary Alberta T2N 4F6
Canada

Township 36 North, Range 73 West
Section 8: SW⁴NW⁴
Section 20: NW⁴, W²NE⁴
Township 36 North, Range 74 West
Section 14: SW⁴NW⁴

SURFACE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:
All Leasable Minerals, including Coal, Oil and Gas:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals, including Uranium

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

RIGHT-OF-WAY OWNERS:
(Section 14)

CONVERSE COUNTY COMMISSIONERS
107 North 5th
Douglas, Wyoming 82633

(Section 14)

KN GAS GATHERING, INC.
252 State Highway 59
Douglas, Wyoming 82633

Township 36 North, Range 73 West
Section 17: S²SW⁴SW⁴
Section 19: E²NW⁴, SW⁴NE⁴

SURFACE OWNER:

VOLLMAN RANCHES, INC.
P.O. Box 13
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals, including Coal, Oil and Gas:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals, including Uranium

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

RIGHT-OF-WAY OWNERS:
(Section 19: S²NE⁴)

KN GAS GATHERING, INC.
252 State Highway 59
Douglas, Wyoming 82633

Township 36 North, Range 73 West
Section 19: SE⁴NE⁴

SURFACE OWNER:

VOLLMAN RANCHES, INC.
P.O. Box 13
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals, including Coal, Oil and Gas:

ESTATE OF EILEEN D. BRANCH
c/o William Branch
6279 S. Fenton Ct.
Littleton, Colorado 80123

HARVIE DOMSALLA
671 Longview Drive
Douglas, Wyoming 82633

DOMSALLA LIMITED PARTNERSHIP
P.O. Box 909
Mills, Wyoming 82644

DON HELDT
JASON HELDT
DOREEN HELDT
HCR 88, Box 89
Lisco, Nebraska 69148

EILEEN D. MILAM LIVING TRUST
4302 Cheyenne Drive
Laramie, Wyoming 82070

LEASE OWNER:
(uranium)

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

RIGHT-OF-WAY OWNERS:
(Section 19: S²NE⁴)

KN GAS GATHERING, INC.
252 State Highway 59
Douglas, Wyoming 82633

Township 36 North, Range 73 West
Section 19: Lots 1, 2

SURFACE OWNER:

VOLLMAN RANCHES, INC.
P.O. Box 13
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals, including Coal, Oil and Gas:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals, including Uranium

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

LEASE OWNER:
(oil & gas)

BLACK ISLAND RESOURCES (USA) INC.
105 305-10th St. NW
Calgary Alberta T2N 4F6
Canada

RIGHT-OF-WAY OWNERS:
(Lot 1)

KN GAS GATHERING, INC.
252 State Highway 59
Douglas, Wyoming 82633

Township 36 North, Range 73 West
Section 19: N²NE⁴

SURFACE OWNER:

VOLLMAN RANCHES, INC.
P.O. Box 13
Douglas, Wyoming 82633

MINERAL OWNER:

All Minerals, including Coal, Oil and Gas:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals, including Uranium

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

LEASE OWNER:
(oil & gas)

BP AMERICA PRODUCTION COMPANY
P.O. Box 3092
Houston, Texas 77253

RIGHT-OF-WAY OWNERS:
(NW⁴NE⁴)

KN GAS GATHERING, INC.
252 State Highway 59
Douglas, Wyoming 82633

Township 36 North, Range 73 West
Section 21: NW⁴
Township 36 North, Range 74 West
Section 11: Lots 5, 12, 13 fka SW⁴NW⁴, W²SW⁴
Section 13: SE⁴
Section 14: Lot 3 fka NW⁴NW⁴
Township 37 North, Range 74 West
Section 25: NE⁴SW⁴

SURFACE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals, including Coal, Oil and Gas:

FAMILY TRUST
Jeffrey Reynolds & Evelyn Reynolds, Trustees
P.O. Box 146
Douglas, Wyoming 82633

LEASE OWNER:
(uranium)

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

RIGHT-OF-WAY OWNER:
(Sections 11 & 14)

CONVERSE COUNTY COMMISSIONERS
107 North 5th
Douglas, Wyoming 82633

(Section 13: E²SE⁴, NW⁴SE⁴)

KN GAS GATHERING, INC.
252 State Highway 59
Douglas, Wyoming 82633

Township 36 North, Range 74 West
Section 2: Lot 4, SW⁴NW⁴, W²SW⁴

SURFACE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals, including Coal, Oil and Gas:

CRAIG BREHM
5960 W. Canyon Dr.
Littleton, Colorado 80128-5910

LEASE OWNER:
(uranium)

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

(oil & gas)

LOUIS S. MADRID TRUST
410 17th Street, Suite 110
Denver, Colorado 80202

RIGHT-OF-WAY OWNER:
(all above described lands)

CONVERSE COUNTY COMMISSIONERS
107 North 5th
Douglas, Wyoming 82633

Township 36 North, Range 74 West
Section 3: Lots 7, 8 fka S²NW⁴

SURFACE OWNER:

HORNBUCKLE RANCH INC.
1558 Ross Road
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals including Coal, Oil & Gas

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals including uranium

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

LEASE OWNER:
(oil & gas)

ANSCHUTZ EXPLORATION CORPORATION
555 17th St. S-2400
Denver, Colorado 80202

DEVON ENERGY PRODUCTION COMPANY, LP
20 North Broadway S-1500
Oklahoma City, Oklahoma 73102

RIGHT-OF-WAY OWNERS:
(all above described lands)

PACIFIC POWER & LIGHT
825 NE Multnomah
Portland, Oregon 97232

Township 36 North, Range 74 West
Section 3: Lots 1, 2, S²NE⁴, E²SE⁴

SURFACE OWNER:

HENRY LAND COMPANY
1320 Nottingham Drive
Casper, Wyoming 82609

MINERAL OWNERS:
All Minerals including Coal, Oil & Gas

MOORE MINERAL TRUST
P.O. Box 161
Douglas, Wyoming 82633

LEASE OWNER:
(uranium)

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 92637

(oil & gas)

ANSCHUTZ WESTERN CORPORATION
555 17th Street, Suite 2400
Denver, Colorado 80202

DEVON ENERGY PRODUCTION COMPANY L.P.
20 North Broadway, Suite 1500
Oklahoma City, Oklahoma 73102

RIGHT-OF-WAY OWNERS:
(Lots 1, 2, S²NE⁴)

PACIFIC POWER & LIGHT
825 NE Multnomah
Portland, Oregon 97232

Township 36 North, Range 74 West
Section 3: Lots 5, 6 fka Lots 3, 4

SURFACE OWNER:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

GRAZING LEASE OWNER:

HORNBUCKLE RANCH, INC.
1558 Ross Road
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals including Coal, Oil & Gas

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals including uranium

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

RIGHT-OF-WAY OWNER:
(all above described lands)

PACIFIC POWER & LIGHT
825 NE Multnomah
Portland, Oregon 97232

LEASE OWNER:
(oil & gas)

ANSCHUTZ EXPLORATION CORPORATION
555 17th ST. S-2400
Denver, Colorado 80202

DEVON ENERGY PRODUCTION COMPANY, LP
20 North Broadway S-1500
Oklahoma City, Oklahoma 73102

Township 36 North, Range 74 West, 6th P.M.
Section 10: Lots 1, 8 fka E²NE⁴

SURFACE OWNER:

SCOTT T. HORNBUCKLE
1556 Ross Road
Douglas, Wyoming 82633

MINERAL OWNER:

All Minerals, including Coal, Oil and Gas:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals, including Uranium

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

LEASE OWNER:
(oil & gas)

ANSCHUTZ EXPLORATION CORPORATION
555 17th St. S-2400
Denver, Colorado 80202

DEVON ENERGY PRODUCTION COMPANY, LP
20 North Broadway S-1500
Oklahoma City, Oklahoma 73102

RIGHT-OF-WAY OWNERS:
(all above described lands)

AMERICAN TELEPHONE & TELEGRAPH CO.
931 14th Street
Denver, Colorado 80202

Township 36 North, Range 74 West, 6th P.M.
Section 10: Lots 9, 16 fka E²SE⁴

SURFACE OWNER:

SCOTT T. HORNBuckle
1556 Ross Road
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals including Coal, Oil & Gas

MOORE MINERAL TRUST
P.O. Box 161
Douglas, Wyoming 82633

LEASE OWNER:
(uranium)

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

(oil & gas)

ANSCHUTZ WESTERN CORPORATION
555 17th Street, Suite 2400
Denver, Colorado 80202

DEVON ENERGY PRODUCTION COMPANY L.P.
20 North Broadway, Suite 1500
Oklahoma City, Oklahoma 73102

RIGHT-OF-WAY OWNER:
(all above described lands)

CONVERSE COUNTY COMMISSIONERS
107 North 5th
Douglas, Wyoming 82633

AMERICAN TELEPHONE & TELEGRAPH CO.
931 14th Street
Denver, Colorado 80202

Township 36 North, Range 74 West
Section 11: Lot 4 fka NW⁴NW⁴

SURFACE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals, including Coal, Oil and Gas:

EDWARD A. JOCHUMSEN
P.O. Box 127
Cora, Wyoming 82925-0127

LEASE OWNER:
(uranium)

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

(oil & gas)

ANSCHUTZ WESTERN CORPORATION
555 17th Street, Suite 2400
Denver, Colorado 80202

RIGHT-OF-WAY OWNER:
(all above described lands)

CONVERSE COUNTY COMMISSIONERS
107 North 5th
Douglas, Wyoming 82633

Township 36 North, Range 74 West
Section 13: SW⁴

SURFACE OWNER:

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

MINERAL OWNER:
All Minerals, including Coal, Oil and Gas:

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

Township 36 North, Range 74 West
Section 14: Lots 8-15 fka S²

SURFACE OWNER:

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

MINERAL OWNER:
All Leasable Minerals, including Coal, Oil and Gas:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals, including Uranium

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

LEASE OWNER:
(oil & gas)

ANDEX RESOURCES LLC
1001 Fannin S-2000
Houston, Texas 77026

RIGHT-OF-WAY OWNERS:
(Lots 11, 12, fka W²SW⁴)

CONVERSE COUNTY COMMISSIONERS
107 North 5th
Douglas, Wyoming 82633

(Lots 12 & 13, fka S²SW⁴)

AMERICAN TELEPHONE & TELEGRAPH CO.
931 14th Street
Denver, Colorado 80202

Township 36 North, Range 74 West
Section 15: Lots 8, 9, 16 fka E²SE⁴, SE⁴NE⁴

SURFACE OWNER:

SMITH SHEEP COMPANY
1744 Highway 93
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals including Coal, Oil & Gas

Wells Fargo Bank, Wyoming and
Marialyce Tobin, Trustees of the
Grace A. Werner Testamentary Trust
P.O. Box 2799
Casper, Wyoming 82602

Eleanor M. Judson, Life Tenant
Rebecca Judson Ball, Remainderman
127 N. Loomis Street
Ft. Collins, Colorado 80521

Meredith Judson
851 County Road 768
Livermore, Colorado 80536

Arthur Whitaker Judson
2259 28th Avenue
San Francisco, California 94116

Nina Ruth Judson
P.O. Box 45
Livermore, Colorado 80536

Fred Osburn
P.O. Box 565
Guernsey, Wyoming 82214

Ogle Corporation
P.O. Box 992
Casper, Wyoming 82602

LEASE OWNER:
(uranium)

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

RIGHT-OF-WAY OWNER:
(all above described lands)

AMERICAN TELEPHONE & TELEGRAPH CO.
931 14th Street
Denver, Colorado 80202

(SE⁴NE⁴)

KN GAS GATHERING, INC.
252 State Highway 59
Douglas, Wyoming 82633

Township 36 North, Range 74 West, 6th P.M.
Section 15: Lot 1 fka NE⁴NE⁴

SURFACE OWNER:

HORNBUCKLE RANCH INC.
1558 Ross Road
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals including Coal, Oil & Gas

MOORE MINERAL TRUST
P.O. Box 161
Douglas, Wyoming 82633

LEASE OWNER:
(uranium)

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

(oil & gas)

ANSCHUTZ WESTERN CORPORATION
555 17th Street, Suite 2400
Denver, Colorado 80202

DEVON ENERGY PRODUCTION COMPANY L.P.
20 North Broadway, Suite 1500
Oklahoma City, Oklahoma 73102

RIGHT-OF-WAY OWNER:
(all above described lands)

CONVERSE COUNTY COMMISSIONERS
107 North 5th
Douglas, Wyoming 82633

AMERICAN TELEPHONE & TELEGRAPH CO.
931 14th Street
Denver, Colorado 80202

KN GAS GATHERING, INC.
252 State Highway 59
Douglas, Wyoming 82633

Township 36 North, Range 74 West
Section 24: NE⁴

SURFACE OWNER:

SMITH SHEEP COMPANY
1744 Highway 93
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals including Coal, Oil & Gas

GRACE AMSPOKER TRUST
Wells Fargo Bank, Trustee
P.O. Box 2977
Casper, Wyoming 82602

SMITH MINERAL TRUST
Converse County Bank, Trustee
P.O. Box 689
Douglas, Wyoming 82633

WILLIAM JAY SMITH
#1 Hilltop Addition
Douglas, Wyoming 82633

LEASE OWNER:
(uranium)

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82633

Township 37 North, Range 73 West
Section 19: Lots 3, 4, E²SW⁴

SURFACE OWNER:

BERNARD MOORE RAVENNA &
JOAN F. RAVENNA
No. 1 Margaux Court
Woodbury, New Jersey 08096

MINERAL OWNER:
All Minerals including Coal, Oil & Gas

BERNARD MOORE RAVENNA &
JOAN F. RAVENNA
No. 1 Margaux Court
Woodbury, New Jersey 08096

Township 37 North, Range 73 West, 6th P.M.
Section 19: SE⁴
Section 29: W²NW⁴

SURFACE OWNER:

HORNBUCKLE RANCH INC.
1558 Ross Road
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals including Coal, Oil & Gas

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

RIGHT-OF-WAY OWNERS:
(Section 29: SW⁴NW⁴)

MIGC, INC.
P.O. Box 3099
Casper, Wyoming 82602

LEASE OWNER:
(oil & gas)

BLACK ISLAND RESOURCES (USA) INC.
105 305-10th St. NW
Calgary Alberta T2N 4F6
Canada

Township 37 North, Range 73 West, 6th P.M.
Section 20: W²SW⁴
Section 30: E²NE⁴

SURFACE OWNER:

HORNBUCKLE RANCH INC.
1558 Ross Road
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals including Coal, Oil & Gas

HORNBUCKLE IRREVOCABLE MINERAL
TRUST I
1558 Ross Road
Douglas, Wyoming 82633

RIGHT-OF-WAY OWNERS:
(Section 30: SE⁴NE⁴)

MIGC, INC.
P.O. Box 3099
Casper, Wyoming 82602

Township 37 North, Range 73 West
Section 30: E²SE⁴

SURFACE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals, including Coal, Oil and Gas:

HORNBUCKLE IRREVOCABLE MINERAL
TRUST I
1558 Ross Road
Douglas, Wyoming 82633

LEASE OWNER:
(uranium)

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82633

Township 37 North, Range 73 West
Section 31: NE⁴NE⁴

SURFACE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNERS:
All Minerals, including Coal, Oil and Gas:

FAMILY TRUST
Jeffrey Reynolds & Evelyn Reynolds, Trustees
P.O. Box 146
Douglas, Wyoming 82633

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

LEASE OWNER:
(uranium)

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82633

Township 37 North, Range 73 West
Section 31: SE⁴NE⁴
Section 32: S²NW⁴

SURFACE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:
All Leasable Minerals, including Coal, Oil and Gas:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals, including Uranium

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

LEASE OWNER:
(oil & gas)

BLACK ISLAND RESOURCES (USA) INC.
105 305-10th St. NW
Calgary Alberta T2N 4F6
Canada

Township 37 North, Range 73 West
Section 32: N²NW⁴

SURFACE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:

All Minerals, including Coal, Oil and Gas:

FAMILY TRUST
Jeffrey Reynolds & Evelyn Reynolds, Trustees
P.O. Box 146
Douglas, Wyoming 82633

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

LEASE OWNER:
(uranium)

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82633

Township 37 North, Range 73 West
Section 32: E⁴

SURFACE OWNER:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

GRAZING LEASE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals including Coal, Oil & Gas

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals including uranium

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

LEASE OWNER:
(oil & gas)

BLACK ISLAND RESOURCES (USA) INC.
105 305-10th St. NW
Calgary Alberta T2N 4F6
Canada

RIGHT-OF-WAY OWNER:
(N²SE⁴)

PACIFIC POWER & LIGHT
825 NE Multnomah
Portland, Oregon 97232

Township 37 North, Range 73 West
Section 33: W²SW⁴

SURFACE OWNER:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

GRAZING LEASE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals including Coal, Oil & Gas

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals including uranium

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

LEASE OWNER:
(oil & gas)

PIONEER NATURAL RESOURCES USA, INC.
P.O. Box 3178
Midland, Texas 79702

THE LOUISIANA LAND & EXPLORATION
COMPANY
1560 Broadway S-1200
Denver, Colorado 80202

I.C. GAS AMCANA, INC.
320 S. Boston S-600
Tulsa, Oklahoma 74103

RAM ENERGY INC.
5100 E. Kelly Dr. Suite 650
Tulsa, Oklahoma 74135

RB OPERATING COMPANY
5100 E. Kelly Dr. Suite 650
Tulsa, Oklahoma 74135

RIGHT-OF-WAY OWNER:
(NW⁴SW⁴)

PACIFIC POWER & LIGHT
825 NE Multnomah
Portland, Oregon 97232

Township 37 North, Range 74 West, 6th P.M.
Section 22: S²SE⁴

SURFACE OWNER:

STATE OF WYOMING
Office of State Lands and Investments
122 West 25th Street
Cheyenne, Wyoming 82002-0600

GRAZING LEASE OWNER:

WILLIAM HENRY, ET UX
1320 Nottingham
Casper, Wyoming 82609

MINERAL OWNER:
All Minerals, including Coal, Oil and Gas:

STATE OF WYOMING
Office of State Lands and Investments
122 West 25th Street
Cheyenne, Wyoming 82002-0600

LEASE OWNER:
(oil & gas)

YATES PETROLEUM CORPORATION
105 S. 4th St.
Artesia, New Mexico 88210

NPC, INC.
550 N. 31st St. S-500
Billings, Montana 59101

KEY PRODUCTION COMPANY, INC.
1700 Lincoln St. S-2050
Denver, Colorado 80203

Township 37 North, Range 74 West, 6th P.M.
Section 22: Lot 9, NE⁴SE⁴ fka N²SE⁴
Section 23: N²SW⁴

SURFACE OWNER:

HENRY LAND COMPANY
1320 Nottingham Drive
Casper, Wyoming 82609

MINERAL OWNER:
All Minerals, including Coal, Oil and Gas:

HENRY LAND COMPANY
1320 Nottingham Drive
Casper, Wyoming 82609

LEASE OWNER
(oil & gas)

KEY PRODUCTION COMPANY
707 17th Street, Suite 3300
Denver, Colorado 80202

RIGHT-OF-WAY OWNER:
(part of MS 717, fka NE⁴SW⁴)

CONVERSE COUNTY COMMISSIONERS
107 North 5th
Douglas, Wyoming 82633

Township 37 North, Range 74 West
Section 23: Lots 3-8, that part of MS 717 lying in the
SE⁴SW⁴, W²SE⁴ fka S²S², N²SE⁴
Section 27: Lots 1, 4, 5, 6, 7 fka E²E², SW⁴SE⁴

SURFACE OWNER:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

GRAZING LEASE OWNER:
(Section 23)

WILLIAM HENRY, ET UX
1320 Nottingham
Casper, Wyoming 82609

(Section 27)

SMITH SHEEP COMPANY
1744 Highway 93
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals including Coal, Oil & Gas

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals including uranium

LEASE OWNER:
(oil & gas)

RIGHT-OF-WAY OWNER:
(Section 23: Lots 4, 7, 6 part of MS 717,
fka W²SE⁴, SE⁴SW⁴)

(Section 27: Lot 4)

Township 37 North, Range 74 West
Section 24: S²

SURFACE OWNER:

MINERAL OWNER:
All Minerals including Coal, Oil & Gas

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

YATES DRILLING COMPANY
105 S. 4th St.
Artesia, New Mexico 88210

ABO PETROLEUM CORPORATION
105 S. 4th St.
Artesia, New Mexico 88210

MYCO INDUSTRIES, INC.
105 S. 4th St.
Artesia, New Mexico 88210

YATES PETROLEUM CORPORATION
105 S. 4th St.
Artesia, New Mexico 88210

SHARBRO OIL, LTD. CO.
105 S. 4th ST.
Artesia, New Mexico 88210

CONVERSE COUNTY COMMISSIONERS
107 North 5th
Douglas, Wyoming 82633

MIGC, INC.
P.O. Box 3099
Casper, Wyoming 82602

HORNBUCKLE RANCH INC.
1558 Ross Road
Douglas, Wyoming 82633

HORNBUCKLE MINERAL MINERAL
TRUST I
1558 Ross Road
Douglas, Wyoming 82633

JAMES B. CARPENTER
GLENN TURNER
EVA T. COOK
EDNA J. STEVENS
LARRY E. TURNER
EARL A. TURNER
EVELYN RUTH STALLMACH
MARY ELLEN CRUMMER
HENRY W. & FAYETTE M. TURNER TRUST
324 North 7th Street
Douglas, Wyoming 82633

RIGHT-OF-WAY OWNER:
(SW⁴)

THE UNITED STATES OF AMERICA
Department of Energy
907 N. Poplar
Casper, Wyoming 82601

Township 37 North, Range 74 West
Section 25: Lots 10, 11 fka W²SE⁴

SURFACE OWNER:

DUCK CREEK RANCHES, INC.
P.O. Box 146
Douglas, Wyoming 82633

MINERAL OWNER:
All Leasable Minerals, including Coal, Oil and Gas:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals, including Uranium

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

LEASE OWNER:
(oil & gas)

YATES DRILLING COMPANY
105 S. 4th St.
Artesia, New Mexico 88210

ABO PETROLEUM CORPORATION
105 S. 4th St.
Artesia, New Mexico 88210

MYCO INDUSTRIES, INC.
105 S. 4th St.
Artesia, New Mexico 88210

YATES PETROLEUM CORPORATION
105 S. 4th St.
Artesia, New Mexico 88210

SHARBRO OIL, LTD. CO.
105 S. 4th ST.
Artesia, New Mexico 88210

Township 37 North, Range 74 West
Section 25: Lots 7, 8 fka S²NE⁴

SURFACE OWNER:

RICHARD QUAY HORNBUCKLE
1149 Mesa Ct.
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals including Coal, Oil & Gas

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

LEASE OWNER:
(oil & gas)

YATES DRILLING COMPANY
105 S. 4th St.
Artesia, New Mexico 88210

ABO PETROLEUM CORPORATION
105 S. 4th St.
Artesia, New Mexico 88210

MYCO INDUSTRIES, INC.
105 S. 4th St.
Artesia, New Mexico 88210

YATES PETROLEUM CORPORATION
105 S. 4th St.
Artesia, New Mexico 88210

SHARBRO OIL, LTD. CO.
105 S. 4th ST.
Artesia, New Mexico 88210

RIGHT-OF-WAY OWNER:
(all above described lands)

MIGC, INC.
P.O. Box 3099
Casper, Wyoming 82602

Township 37 North, Range 74 West
Section 25: Lots 1-6 fka N²N², S²NW⁴

SURFACE OWNER:

HORNBUCKLE RANCH INC.
1558 Ross Road
Douglas, Wyoming 82633

MINERAL OWNER:
All Minerals including Coal, Oil & Gas

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

LEASE OWNER:
(oil & gas)

YATES DRILLING COMPANY
105 S. 4th St.
Artesia, New Mexico 88210

ABO PETROLEUM CORPORATION
105 S. 4th St.
Artesia, New Mexico 88210

MYCO INDUSTRIES, INC.
105 S. 4th St.
Artesia, New Mexico 88210

YATES PETROLEUM CORPORATION
105 S. 4th St.
Artesia, New Mexico 88210

SHARBRO OIL, LTD. CO.
105 S. 4th ST.
Artesia, New Mexico 88210

RIGHT-OF-WAY OWNERS:
(all above described lands)

MIGC, INC.
P.O. Box 3099
Casper, Wyoming 82602

(Lots 4, 5, fka W²NW⁴)

THE UNITED STATES OF AMERICA
Department of Energy
907 N. Poplar
Casper, Wyoming 82601

Township 37 North, Range 74 West, 6th P.M.
Section 27: W²NE⁴, NW⁴SE⁴, E²SW⁴

SURFACE OWNER:

STATE OF WYOMING
Office of State Lands and Investments
122 West 25th Street
Cheyenne, Wyoming 82002-0600

GRAZING LEASE OWNER:

WILLIAM HENRY, ET UX
1320 Nottingham
Casper, Wyoming 82609

MINERAL OWNER:
All Minerals, including Coal, Oil and Gas:

STATE OF WYOMING
Office of State Lands and Investments
122 West 25th Street
Cheyenne, Wyoming 82002-0600

LEASE OWNER:
(oil & gas)

RINCON EXPLORATION, LLC
700 17th St. S-1100
Denver, Colorado 80202

RIGHT-OF-WAY OWNER:
(SW⁴NE⁴)

MIGC, INC.
P.O. Box 3099
Casper, Wyoming 82602

Township 37 North, Range 74 West, 6th P.M.
Section 34: E²W²

SURFACE OWNER:

HENRY LAND COMPANY
1320 Nottingham Drive
Casper, Wyoming 82609

GRAZING LEASE OWNER:

WILLIAM HENRY, ET UX
1320 Nottingham Drive
Douglas, Wyoming 82609

MINERAL OWNER:
All Minerals, including Coal, Oil and Gas:

LOUIS S. MADRID TRUST
410 17th Street, Suite 2050
Denver, Colorado 80202

PABLO & LUCILLE MARES REVOCABLE TRUST
6320 Loftus NE
Albuquerque, New Mexico 87109

LEASE OWNER:
(oil & gas)

ANSCHUTZ WESTERN CORPORATION
555 17th Street, Suite 2400
Denver, Colorado 80202

DEVON ENERGY PRODUCTION COMPANY L.P.
20 North Broadway, Suite 1500
Oklahoma City, Oklahoma 73102

Township 37 North, Range 74 West, 6th P.M.
Section 34: Lots 2, 3, 6, 7, that part of MS 717 lying
in Lots 2 & 3, fka W²E²

SURFACE OWNER:

HENRY LAND COMPANY
1320 Nottingham Drive
Casper, Wyoming 82609

MINERAL OWNER:
All Leasable Minerals, including Coal, Oil and Gas:

THE UNITED STATES OF AMERICA
Bureau of Land Management
P.O. Box 1828
Cheyenne, Wyoming 82003

All Locatable Minerals, including Uranium:

POWER RESOURCES, INC.
P.O. Box 1210
Glenrock, Wyoming 82637

LEASE OWNER:
(oil & gas)

YATES DRILLING COMPANY
105 S. 4th St.
Artesia, New Mexico 88210

ABO PETROLEUM CORPORATION
105 S. 4th St.
Artesia, New Mexico 88210

MYCO INDUSTRIES, INC.
105 S. 4th St.
Artesia, New Mexico 88210

YATES PETROLEUM CORPORATION
105 S. 4th St.
Artesia, New Mexico 88210

SHARBRO OIL, LTD. CO.
105 S. 4th ST.
Artesia, New Mexico 88210

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APPENDIX "C"

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RIGHT TO MINE

| | | | | |
|---|-------------------|-----------------|-----------------|---------------------|
| Lots 3, 4, S ² NW ⁴ , W ² SW ⁴ | Section <u>5</u> | T. <u>36</u> N. | R. <u>73</u> W. | Acres <u>244.04</u> |
| All | Section <u>6</u> | T. <u>36</u> N. | R. <u>73</u> W. | Acres <u>630.60</u> |
| Lots 1-4, E ² W ² | Section <u>7</u> | T. <u>36</u> N. | R. <u>73</u> W. | Acres <u>306.01</u> |
| N ² , N ² S ² , S ² SE ⁴ , SE ⁴ SW ⁴ , N ² SW ⁴ SW ⁴ | Section <u>17</u> | T. <u>36</u> N. | R. <u>73</u> W. | Acres <u>620.00</u> |
| All | Section <u>18</u> | T. <u>36</u> N. | R. <u>73</u> W. | Acres <u>625.40</u> |
| Lots 5-18, S ² SE ⁴ , fka All | Section <u>1</u> | T. <u>36</u> N. | R. <u>74</u> W. | Acres <u>644.24</u> |
| Lots 3, 5-12, SE ⁴ NW ⁴ , E ² SW ⁴ , fka Lots 1-3, SE ⁴ NW ⁴ , S ² NE ⁴ , SE ⁴ , E ² SW ⁴ | Section <u>2</u> | T. <u>36</u> N. | R. <u>74</u> W. | Acres <u>479.97</u> |
| Lots 1-3, 6-11, 14-16, fka E ² , E ² W ² | Section <u>11</u> | T. <u>36</u> N. | R. <u>74</u> W. | Acres <u>479.34</u> |
| Lots 1-15, NW ⁴ NW ⁴ , fka All | Section <u>12</u> | T. <u>36</u> N. | R. <u>74</u> W. | Acres <u>628.91</u> |
| Lots 1-8, fka N ² | Section <u>13</u> | T. <u>36</u> N. | R. <u>74</u> W. | Acres <u>325.43</u> |
| Lots 1, 2, 5-7, NE ⁴ NW ⁴ , fka NE ⁴ , E ² NW ⁴ | Section <u>14</u> | T. <u>36</u> N. | R. <u>74</u> W. | Acres <u>242.26</u> |
| Lots 1-4, E ² W ² , W ² SE ⁴ | Section <u>30</u> | T. <u>37</u> N. | R. <u>73</u> W. | Acres <u>398.45</u> |
| Lots 1-4, E ² W ² , SE ⁴ , W ² NE ⁴ | Section <u>31</u> | T. <u>37</u> N. | R. <u>73</u> W. | Acres <u>559.64</u> |
| SW ⁴ | Section <u>32</u> | T. <u>37</u> N. | R. <u>73</u> W. | Acres <u>160.00</u> |

Subtotal Above Acres 6,344.29

COUNTY of Converse

Total Permit (Amendment) Acres 8,703.98

Municipal Corporation _____

Reviewed (compiled), DEQ/LQD _____

Applicant Signature Stephen P. Collins

Date _____

Date 1-6-05

Checked, DEQ/LQD _____

Permit No. 633

Date _____

TFN _____

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RIGHT TO MINE

| | | | | |
|---|-------------------|-----------------|-----------------|---------------------|
| Lots 9, 12, fka E ² SE ⁴ and W ² SW ⁴ , SE ⁴ SW ⁴ | Section <u>25</u> | T. <u>37</u> N. | R. <u>74</u> W. | Acres <u>199.69</u> |
| Lots 1-7, Part of MS 717, fka All | Section <u>26</u> | T. <u>37</u> N. | R. <u>74</u> W. | Acres <u>640.00</u> |
| Lots 1, 4, 5, 8, Part of MS 717, fka E ² E ² | Section <u>34</u> | T. <u>37</u> N. | R. <u>74</u> W. | Acres <u>160.00</u> |
| All | Section <u>35</u> | T. <u>37</u> N. | R. <u>74</u> W. | Acres <u>640.00</u> |
| All | Section <u>36</u> | T. <u>37</u> N. | R. <u>74</u> W. | Acres <u>640.00</u> |
| | Section | T. <u> </u> N. | R. <u> </u> W. | Acres |
| | Section | T. <u> </u> N. | R. <u> </u> W. | Acres |
| | Section | T. <u> </u> N. | R. <u> </u> W. | Acres |
| | Section | T. <u> </u> N. | R. <u> </u> W. | Acres |
| | Section | T. <u> </u> N. | R. <u> </u> W. | Acres |
| | Section | T. <u> </u> N. | R. <u> </u> W. | Acres |
| | Section | T. <u> </u> N. | R. <u> </u> W. | Acres |
| | Section | T. <u> </u> N. | R. <u> </u> W. | Acres |
| | Section | T. <u> </u> N. | R. <u> </u> W. | Acres |

Subtotal Above Acres 2,279.69

COUNTY of Converse

Total Permit (Amendment) Acres 8,703.98

Municipal Corporation _____

Reviewed (compiled), DEQ/LQD _____

Applicant Signature Stephen P. Colleys

Date _____

Date _____

Checked, DEQ/LQD _____

Permit No. 633

Date _____

TFN _____

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APPENDIX "C"

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NO RIGHT TO MINE

W²NE⁴

| | | | |
|-------------------|-----------------|-----------------|--------------------|
| Section <u>30</u> | T. <u>37</u> N. | R. <u>73</u> W. | Acres <u>80.00</u> |
| Section | T. _N. | R. _W. | Acres |
| Section | T. _N. | R. _W. | Acres |
| Section | T. _N. | R. _W. | Acres |
| Section | T. _N. | R. _W. | Acres |
| Section | T. _N. | R. _W. | Acres |
| Section | T. _N. | R. _W. | Acres |
| Section | T. _N. | R. _W. | Acres |
| Section | T. _N. | R. _W. | Acres |
| Section | T. _N. | R. _W. | Acres |
| Section | T. _N. | R. _W. | Acres |
| Section | T. _N. | R. _W. | Acres |
| Section | T. _N. | R. _W. | Acres |
| Section | T. _N. | R. _W. | Acres |

Subtotal Above Acres 80.00

COUNTY of Converse

Total Permit (Amendment) Acres 8,703.98

Municipal Corporation _____

Reviewed (compiled), DEQ/LQD _____

Applicant Signature Stephen P. Collyer

Date _____

Date _____

Checked, DEQ/LQD _____

Permit No. 633

Date _____

TFN _____

APPENDIX D-1

LAND USE

REYNOLDS RANCH AMENDMENT AREA CONVERSE COUNTY, WYOMING

1.0 General

Converse County contains approximately 2.74 million acres of land. Agricultural uses account for approximately 98% of the total surface area, with unirrigated grazing (2.4 million acres) being the dominant use (see Table D-1.1). Sheep and cattle grazing comprise the major past and present. Wildlife habitat is also part of the land use in the proposed amendment area and mule deer and pronghorn antelope are primarily hunted in the area. A generalized land use map for Converse County is presented in Figure D1-1.

While there are several ranch houses in the surrounding area, there are no active residents within the proposed amendment area boundaries. Likewise, there are some producing oil wells in the surrounding area, but there are no producing oil wells within the amendment area.

2.0 Grazing Activities

The land surface within the existing and proposed permit area is predominantly in private ownership (see Appendix A) and is used for the grazing of mostly cattle. Grazing activities, although some sheep grazing takes place. The land is fenced to accommodate such activities. Four area ranches predominantly conduct grazing activities.

BLM land ownership within the proposed amendment area constitutes approximately 720 acres and State of Wyoming land ownership constitutes approximately 640 acres of the proposed total 8,704 acres. The remaining 7,134 acres is privately owned. BLM and State of Wyoming lands are leased for grazing.

3.0 Post-Mining Land Use

Since the area has proven to be marginal for dryland farming because of limited rainfall, domestic livestock grazing with concurrent wildlife useage is the highest use for the land unless irrigation could be developed to supplement normal

rainfall. Even production from native range fluctuates widely between years of moderate rainfall and years of drought. For these reasons, reclaimed lands will be returned to the pre-mining use of domestic livestock grazing and wildlife habitat. Since the affected areas will be relatively small, impacts to livestock grazing and wildlife habitat during mining and after reclamation will be limited.

TABLE D-1.1

CONVERSE COUNTY LAND USE IN ACRES¹

Urban Areas

| | | |
|-------------|------------|-------|
| Douglas | 3,840 | |
| Glenrock | <u>800</u> | |
| Total Urban | | 4,640 |

Rural Housing

| | | |
|--------------------------|-----|--|
| (536 Units @ 1 ac./Unit) | 536 | |
|--------------------------|-----|--|

Rural Recreational

| | | |
|-------------------------|------------|-----|
| (83 Units @ 5 ac./Unit) | <u>415</u> | |
| Total Housing | | 951 |

Agricultural

| | | |
|---------------------------------|----------------|-----------|
| Irrigated Cropland | 68,316 | |
| Dry Cropland | 20,702 | |
| Irrigated Pasture (Seasonal) | 16,735 | |
| Unirrigated Grazing | 2,420,199 | |
| Tree Covered | <u>142,437</u> | |
| Total Agricultural | | 2,668,389 |

| | | |
|------------|--|--------|
| Industrial | | 31,010 |
|------------|--|--------|

| | | |
|-------------|--|-------|
| Water Areas | | 4,082 |
|-------------|--|-------|

Rural Business

| | | |
|---|--|-----|
| (Highway Convenience, Guest Areas and Mobile Home Parks) | | 815 |
|---|--|-----|

Local Government

| | | |
|---------------------|--|-------|
| (Parks and Schools) | | 2,535 |
|---------------------|--|-------|

Transportation

| | | |
|-------------------------|-------|--------|
| Interstate Highway | 1,543 | |
| State & Federal Highway | 3,528 | |
| County Roads | 4,737 | |
| Railroads | 2,330 | |
| Total Transportation | | 12,138 |

| | | |
|--------------|--|-----------|
| Total County | | 2,724,560 |
|--------------|--|-----------|

1. Converse County Land Use Plan August 3, 1978, Converse County Planning Commission.

CAMPBELL COUNTY
CONVERSE COUNTY

MATRONA COUNTY
CONVERSE COUNTY

REYNOLDS RANCH PROJECT

SMITH RANCH
HIGHLAND
URANIUM PROJECT

BILL



GLENROCK

DOUGLAS

LEGEND

-  DRYLAND GRAZING
-  DRY CROPLAND
-  IRRIGATED GRAZING
-  IRRIGATED CROPLAND
-  TREE COVERED



FIGURE D-1.1

POWER RESOURCES, INC.
P.O. Box 1216 Cheyenne, WY 82002 (307) 233-4244

| REVISIONS | | | REYNOLDS RANCH PROJECT | |
|-----------|------|----|------------------------|--|
| NO. | DATE | BY | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

CONVERSE COUNTY
LAND USE MAP

Land Use Data provided by Converse County.

APPENDIX D2

HISTORY

REYNOLDS RANCH AMENDMENT AREA CONVERSE COUNTY, WYOMING

HISTORY OF THE AREA

The Reynolds Ranch Amendment Area is located in the northern part of Converse County, Wyoming. The area is in the western part of the Great Plains in a region referred to as the short-grass prairie.

The Bozeman Trail, a major route for cattle drives between Texas and Montana in the mid-1800's roughly parallels the Ross Road through the amendment area. However, the segments of the Bozeman Trail in the amendment area have been impacted by the construction of the Ross Road and have relatively minor historic value. The Holdup Hollow segment of the Bozeman Trail is located adjacent to the Ross Road and the southwest portion of the amendment area. The amendment area boundary does not overlap any area of the Holdup Hollow Segment of the Bozeman Trail. No other sites of historic value are known to exist within the amendment area boundary.

In the late 1800's, the Powder River Basin became open to settlement under the various Land Purchase and Homestead Laws. Due to the arid climate and lack of surface water resources, the area was unsuitable for small scale ranching and farming. Today, larger scale ranching operations predominate the region. Coal, oil, uranium, and methane were subsequently discovered and these four energy resources along with cattle and sheep production provide the basic economic structure of the area today.

Converse County is crossed by both Oregon and Bozeman Trails, and also Pony Express Routes. Two sites in the county, Fort Fetterman and Glenrock Buffalo Jump, are enrolled in the National Register of Historic Places (NRHP). In addition, the Holdup Hollow Segment of the Bozeman Trail is also listed in the NRHP.

Cultural resource surveys were conducted for the proposed amendment area and for segments of the Bozeman Trail near or within the proposed amendment area. These surveys are contained in Appendix D-3.

APPENDIX D-4

CLIMATOLOGY

REYNOLDS RANCH AMENDMENT AREA CONVERSE COUNTY, WYOMING

1.0 General

The Reynolds Ranch amendment area is located in east-central Wyoming. The climate can generally be classified as semiarid and cool. Mountain ranges to the west of the project area restrict precipitation to this portion of the state. The area is subject to periodic high winds as well as droughts.

The official National Weather Service weather station closest to the proposed amendment area is located at the Natrona County International Airport at Casper, Wyoming. A 2003 annual weather summary for Casper, Wyoming is shown on Table D4-1 and a summary of normals, means, and extremes is shown in Table D4-2. Precipitation, temperature, and wind summaries can be found in Chapter 2 of the Operations and Reclamation Plan.

Addendum D4-1 includes a more detailed description of climate characteristics of the Southern Powder River Basin, Converse County, Wyoming.

TABLE D4-1

2003 ANNUAL SUMMARY FOR CASPER, WYOMING

For the year 2003, Casper Wyoming was slightly warmer than normal, slightly wetter than normal, with below normal snowfall. This is based on comparing averages of the daily values with the 30 year normals from 1971-2000.

TEMPERATURE

Even though the year 2003 was warmer than normal, four months during the year were colder than normal. The yearly average for 2003 was 46.3 degrees, which was 0.8 degrees above the 30 year normal of 45.5 degrees. Compared with the POR (Period of Record - 1940-2003), 2003 was 0.8 degrees above the average of 45.5 degrees.

| Month | Feb | Jun | Sep | Nov |
|-------------|------|------|------|------|
| Average | 22.2 | 59.5 | 55.3 | 29.5 |
| 30yr Normal | 27.2 | 63.2 | 58.3 | 32.6 |
| Dep/Normal | -5.0 | -3.7 | -3.0 | -3.1 |

February had the greatest departure from normal with 5 degrees below normal.

| Year | 2000 | 2001 | 2002 | 2003 |
|-------------|------|------|------|------|
| Temperature | 45.7 | 47.0 | 44.4 | 46.3 |
| 30yr Norm | 45.5 | 45.5 | 45.5 | 45.5 |
| Dep/Norm | +0.2 | +1.5 | -1.1 | +0.8 |

PRECIPITATION

The year 2003 received 13.11 inches of precipitation, which was 0.10 inches above the 30 year normal of 13.01 inches. Compared with the POR average, the year was 1.19 inches above the long term average. June had the greatest monthly departure from normal with 4.71 inches, which was 3.28 inches above the 30 year normal of 1.43. Compared with the POR average, June was 3.28 inches above normal.

2003 in Casper was noticeably wetter than any of the past 4 years.

| Year | 2000 | 2001 | 2002 | 2003 |
|---------------|-------|-------|-------|-------|
| Precipitation | 10.70 | 6.76 | 7.05 | 13.11 |
| 30yr Norm | 13.01 | 13.01 | 13.01 | 13.01 |
| Dep/Norm | -2.31 | -6.25 | -5.96 | +0.10 |

TABLE D4-1 (Cont.)

SNOWFALL

For the year, 47.6 inches of snow fell in Casper. This was 16.7 inches below the 30 year normal of 64.3 inches. Compared to the POR average of 58.1 inches, this was 10.5 inches below normal. October was the snowiest month in 2003 with 21.0 inches of snowfall.

| Year | 2000 | 2001 | 2002 | 2003 |
|-----------|------|-------|-------|-------|
| Snowfall | 62.0 | 30.8 | 43.5 | 47.6 |
| 30yr Norm | 64.3 | 64.3 | 64.3 | 64.3 |
| Dep/Norm | -2.3 | -33.5 | -20.8 | -16.7 |

TEMPERATURES - 2003

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | ANN |
|-----------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 2003 | 31.2 | 22.2 | 35.4 | 45.5 | 53.3 | 59.5 | 73.3 | 72.2 | 55.3 | 49.0 | 29.5 | 29.0 | 46.3 |
| 30yr Norm | 22.9 | 27.2 | 35.3 | 43.0 | 52.5 | 63.2 | 70.6 | 69.3 | 58.3 | 46.3 | 32.6 | 24.5 | 45.5 |
| Dep/Norm | 8.3 | -5.0 | 0.1 | 2.5 | 0.8 | -3.7 | 2.7 | 2.9 | -3.0 | 2.7 | -3.1 | 4.5 | 0.8 |
| POR Norm | 23.3 | 26.9 | 33.2 | 42.9 | 52.6 | 62.6 | 70.9 | 69.4 | 58.4 | 46.8 | 33.1 | 25.6 | 45.5 |
| Dep/Norm | 7.9 | -4.7 | 2.2 | 2.6 | 0.7 | -3.1 | 2.4 | 2.8 | -3.1 | 2.2 | -3.6 | 3.4 | 0.8 |

PRECIPITATION - 2003

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | ANN |
|-----------|-------|-------|------|------|-------|------|-------|------|------|-------|-------|-------|-------|
| 2003 | 0.10 | 0.50 | 0.97 | 1.54 | 0.51 | 4.71 | 0.41 | 1.69 | 1.38 | 0.61 | 0.30 | 0.39 | 13.11 |
| 30yr Norm | 0.58 | 0.64 | 0.90 | 1.52 | 2.38 | 1.43 | 1.29 | 0.73 | 0.98 | 1.14 | 0.82 | 0.62 | 13.01 |
| Dep/Norm | -0.48 | -0.14 | 0.07 | 0.02 | -1.87 | 3.28 | -0.88 | 0.96 | 0.40 | -0.53 | -0.52 | -0.23 | 0.10 |
| POR Norm | 0.51 | 0.56 | 0.88 | 1.47 | 2.08 | 1.43 | 1.10 | 0.66 | 0.95 | 0.99 | 0.73 | 0.54 | 11.92 |
| Dep/Norm | -0.41 | -0.06 | 0.09 | 0.07 | -1.57 | 3.28 | -0.69 | 1.03 | 0.43 | -0.38 | -0.43 | -0.15 | 1.19 |

SNOWFALL - 2003

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | ANN |
|-----------|-------|------|------|------|------|------|-----|-----|-----|------|------|------|-------|
| 2003 | 0.4 | 9.2 | 19.4 | 7.0 | 0.4 | 0.0 | 0.0 | 0.0 | 2.5 | 21.0 | 5.2 | 11.2 | 47.6 |
| 30yr Norm | 11.1 | 10.8 | 12.5 | 13.9 | 4.4 | 0.1 | 0.0 | 0.0 | 1.4 | 7.4 | 11.4 | 11.6 | 64.3 |
| Dep/Norm | -10.7 | -1.6 | 6.9 | -6.9 | -4.0 | -0.1 | 0.0 | 0.0 | 1.1 | 13.6 | -6.2 | -0.4 | -16.7 |
| POR Norm | 9.7 | 9.8 | 12.5 | 11.9 | 4.1 | 0.3 | 0.0 | 0.0 | 1.3 | 6.1 | 10.3 | 9.8 | 58.1 |
| Dep/Norm | -9.3 | -0.6 | 6.9 | -4.9 | -3.7 | -0.3 | 0.0 | 0.0 | 1.2 | 14.9 | -5.1 | 1.4 | -10.5 |

TABLE D4-2

CASPER, WYOMING

NORMALS, MEANS, AND EXTREMES

ALTITUDE: 4265 55' N LONGITUDE: 10668 28' W ELEVATION: FT. GRND 5338 BARO 5323 TIME ZONE: MOUNTAIN WBAN: 24089

| | (a) | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|-------------------------------|-----|------|------|------|------|------|------|------|------|------|------|------|------|
| TEMPERATURE (Deg. F) | | | | | | | | | | | | | |
| Normals | | | | | | | | | | | | | |
| Daily Maximum | | 32.8 | 37.0 | 45.2 | 56.1 | 66.6 | 78.6 | 87.6 | 85.7 | 73.8 | 60.5 | 44.3 | 33.9 |
| Daily Minimum | | 12.0 | 16.0 | 21.8 | 29.5 | 37.9 | 46.9 | 54.0 | 51.8 | 41.6 | 32.2 | 21.8 | 13.7 |
| Monthly | | 22.4 | 26.5 | 33.5 | 42.8 | 52.3 | 62.7 | 70.8 | 68.7 | 57.8 | 46.4 | 33.1 | 23.8 |
| Extremes | | | | | | | | | | | | | |
| Record Highest | 45 | 60 | 68 | 74 | 84 | 92 | 102 | 104 | 102 | 97 | 87 | 71 | 63 |
| Year | | 1971 | 1982 | 1986 | 1992 | 1984 | 1990 | 1954 | 1979 | 1995 | 1993 | 1983 | 1999 |
| Record Lowest | 45 | -40 | -29 | -21 | -4 | 16 | 28 | 30 | 33 | 16 | -3 | -21 | -41 |
| Year | | 1972 | 1989 | 1965 | 1966 | 1953 | 1969 | 1972 | 1977 | 1983 | 1971 | 1985 | 1999 |
| NORMAL DEGREE DAYS | | | | | | | | | | | | | |
| Heating (base 65 Deg. F) | | 1321 | 1078 | 977 | 666 | 394 | 139 | 10 | 36 | 250 | 577 | 957 | 127 |
| Cooling (base 65 Deg. F) | | 0 | 0 | 0 | 0 | 0 | 70 | 190 | 151 | 34 | 0 | 0 | 0 |
| POSSIBLE SUNSHINE | | | | | | | | | | | | | |
| PRECIPITATION (tenths) | | | | | | | | | | | | | |
| Unrise - Sunset | 45 | 6.6 | 6.5 | 6.8 | 6.8 | 6.6 | 5.3 | 4.3 | 4.5 | 4.6 | 5.3 | 6.4 | 6.2 |
| MEAN NUMBER OF DAYS: | | | | | | | | | | | | | |
| Unrise to Sunset | | | | | | | | | | | | | |
| Clear | 45 | 7.0 | 6.3 | 5.6 | 5.5 | 5.7 | 9.9 | 13.8 | 13.2 | 13.1 | 11.3 | 7.2 | 8.2 |
| Partly Cloudy | 45 | 8.1 | 8.5 | 8.9 | 8.9 | 10.6 | 11.2 | 11.0 | 10.9 | 8.7 | 8.1 | 8.5 | 8.3 |
| Cloudy | 45 | 16.0 | 13.5 | 16.4 | 15.6 | 14.8 | 8.9 | 6.2 | 6.9 | 8.2 | 11.6 | 14.4 | 14.5 |
| Precipitation | | | | | | | | | | | | | |
| 1/8 inches or more | 45 | 7.1 | 7.9 | 9.5 | 10.3 | 11.1 | 8.6 | 7.9 | 5.7 | 6.5 | 6.6 | 7.1 | 7.5 |
| Snow, Ice Pellets, Hail | | | | | | | | | | | | | |
| 1/16 inches or more | 45 | 3.5 | 3.6 | 4.0 | 3.3 | 1.0 | 0.1 | 0.0 | 0.0 | 0.4 | 1.8 | 3.3 | 3.1 |
| Thunderstorms | 45 | 0.0 | 0.* | 0.3 | 1.4 | 6.4 | 8.4 | 9.1 | 7.0 | 3.0 | 0.4 | 0.1 | 0.0 |
| Heavy Fog Visibility | | | | | | | | | | | | | |
| 1/4 mile or less | 45 | 0.8 | 0.6 | 0.9 | 1.3 | 0.9 | 0.4 | 0.3 | 0.3 | 0.6 | 0.9 | 0.9 | 0.7 |
| TEMPERATURE DEG. F | | | | | | | | | | | | | |
| Maximum | | | | | | | | | | | | | |
| 30 Deg. F and above | 31 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 4.5 | 12.5 | 11.3 | 1.5 | 0.0 | 0.0 | 0.0 |
| 2 Deg. F and below | 31 | 12.9 | 8.3 | 4.1 | 1.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.8 | 6.0 | 12.3 |
| Minimum | | | | | | | | | | | | | |
| 2 Deg. F and below | 31 | 29.3 | 26.2 | 26.4 | 19.0 | 6.7 | 0.3 | 0.* | 0.0 | 3.8 | 15.4 | 24.8 | 28.6 |
| 1 Deg. F and below | 31 | 6.5 | 3.5 | 1.3 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.11 | 1.8 | 5.1 |

TABLE D4-2 (Cont.)

CASPER, WYOMING

NORMALS, MEANS, AND EXTREMES

ATTITUDE: 42° 55' N LONGITUDE: 106° 28' W ELEVATION: FT. GRND 5338 BARO 5323 TIME ZONE: MOUNTAIN WBAN: 24089

| | (a) | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|------------------------------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| V. STATION PRES. (mb) | 23 | 835.9 | 835.9 | 833.7 | 834.8 | 835.5 | 837.3 | 839.6 | 839.7 | 839.5 | 838.5 | 836.3 | 836. |
| RELATIVE HUMIDITY (%) | | | | | | | | | | | | | |
| Hour 04 | 31 | 69 | 70 | 73 | 75 | 78 | 76 | 70 | 67 | 67 | 68 | 69 | 68 |
| Hour 10 (Local Time) | 31 | 59 | 58 | 52 | 47 | 44 | 38 | 32 | 31 | 36 | 44 | 54 | 58 |
| Hour 16 | 31 | 61 | 57 | 47 | 42 | 40 | 33 | 27 | 25 | 30 | 41 | 57 | 62 |
| Hour 22 | 31 | 69 | 70 | 69 | 68 | 69 | 63 | 55 | 53 | 58 | 64 | 67 | 67 |
| PRECIPITATION (in.) | | | | | | | | | | | | | |
| Water Equivalent | | | | | | | | | | | | | |
| Normal | | 0.55 | 0.60 | 0.95 | 1.56 | 2.13 | 1.46 | 1.26 | 0.67 | 0.94 | 0.97 | 0.77 | 0.66 |
| Maximum Monthly | 45 | 1.42 | 1.42 | 2.43 | 3.92 | 6.46 | 4.15 | 3.05 | 2.66 | 3.40 | 4.17 | 2.72 | 3.71 |
| Year | | 1987 | 1987 | 1954 | 1974 | 1978 | 1982 | 1951 | 1979 | 1982 | 1994 | 1983 | 198 |
| Minimum Monthly | 45 | T | 0.15 | 0.25 | 0.08 | 0.30 | 0.03 | 0.09 | 0.02 | 0.07 | T | 0.07 | 0.03 |
| Year | | 1952 | 1957 | 1953 | 1992 | 1966 | 1956 | 1991 | 1950 | 1956 | 1965 | 1965 | 195 |
| Maximum in 24 hrs | 45 | 0.82 | 0.60 | 1.00 | 3.00 | 2.61 | 2.34 | 2.07 | 1.74 | 2.04 | 2.49 | 1.21 | 1.64 |
| Year | | 1987 | 1995 | 1958 | 1974 | 1978 | 1982 | 1983 | 1979 | 1989 | 1962 | 1983 | 198 |
| Now Snow Pellets, Hail | | | | | | | | | | | | | |
| Maximum Monthly | 45 | 24.0 | 23.8 | 36.2 | 56.3 | 24.6 | 3.0 | T | T | 11.5 | 16.1 | 37.1 | 62.8 |
| Year | | 1987 | 1952 | 1975 | 1973 | 1978 | 1969 | 1994 | 1993 | 1982 | 1986 | 1983 | 198 |
| Maximum in 24 hrs | 45 | 14.0 | 11.0 | 14.6 | 16.5 | 14.1 | 3.0 | T | T | 6.9 | 13.3 | 14.3 | 31.1 |
| Year | | 1987 | 1987 | 1954 | 1973 | 1950 | 1969 | 1994 | 1993 | 1995 | 1986 | 1983 | 198 |
| WIND | | | | | | | | | | | | | |
| Mean Speed (mph) | 45 | 16.3 | 15.0 | 13.8 | 12.6 | 11.6 | 11.0 | 10.1 | 10.3 | 10.9 | 12.0 | 14.4 | 16.0 |
| Prevailing Direction | | | | | | | | | | | | | |
| through 1964 | | SW | SW | SW | WSW | WSW | WSW | WSW | SW | WSW | SW | SW | SW |
| Fastest Mile | | | | | | | | | | | | | |
| Direction(!) | 42 | 20 | 23 | 25 | 25 | 32 | 36 | 25 | 25 | 32 | 25 | 25 | 20 |
| Speed(mph) | | 58 | 58 | 81 | 54 | 58 | 52 | 52 | 50 | 53 | 55 | 49 | 63 |
| Year | | 1954 | 1957 | 1956 | 1967 | 1959 | 1959 | 1974 | 1954 | 1965 | 1954 | 1970 | 195 |
| Peak Gust | | | | | | | | | | | | | |
| Direction(!) | 12 | SW | SW | NW | W | SW | W | NW | SW | SW | SW | SW | SW |
| Speed(mph) | 12 | 67 | 64 | 63 | 60 | 64 | 64 | 60 | 62 | 63 | 62 | 60 | 66 |
| Date | | 1990 | 1986 | 1988 | 1994 | 1985 | 1991 | 1990 | 1988 | 1986 | 1985 | 1984 | 198 |

(a) - Length of Record in Years, although individual months may be missing.

* or * - The value is between 0.0 and 0.05.

Normals - Based on the 1961 - 1990 record period.

Extremes - Dates are the most recent occurrence.

Wind Dir. - Numerals show tens of degrees clockwise from true north. "00" indicates calm.

Speed - Directions are given to whole degrees.

ADDENDUM D4-1

CLIMATOLOGY

**SOUTH POWDER RIVER BASIN
CONVERSE COUNTY, WYOMING**

Climatology

METEOROLOGICAL DATA

The permit area is located in eastern Wyoming, where climate can generally be classified under the Koppen system* as semiarid and cool. The mountain ranges in the west-central portion of the state, which are oriented in a general north-south direction, are perpendicular to the prevailing winds. These ranges tend to restrict the passage of storms and thus restrict precipitation in the eastern part of Wyoming.

The official weather station closest to the permit area is located at the Natrona County International Airport near Casper. Meteorological data in part (wind speed, wind direction, and temperature) was collected during 1977 by Woodward-Clyde Consultants at the Tennessee Valley Authority's (TVA) proposed Morton Ranch uranium mine, located about 8 miles east-southeast of the proposed recovery plant site, indicate that Casper records are reasonably representative of local climate (Attachment A). Preliminary comparisons of meteorological data collected by Sequoyah Fuels with Casper data have also recently been performed. The results of these comparisons, which also indicate general agreement, are discussed further in the following text. Consequently, Casper data were used as the basis for the following discussion:

*The Koppen climatic classification system is described in most general meteorology texts. Critchfield (1974) presents such a description:

Temperature

As indicated above, climate in northeastern Wyoming is generally cool; however, there are considerable seasonal variations. The mean temperature for Casper in January, the coldest month, is 22.3°F (1941-1985); the mean temperature for July, the warmest month, is 70.8°F (1941-1985). The highest temperature reported in the Casper area was 104°F in July 1954, and the lowest was -40°F in January 1972. Monthly means and extremes of temperature are shown in Table D-4.1.

Precipitation

The mean annual precipitation in Casper from 1941 through 1985 was 11.88 inches (Table D-4.2). The wettest month is May, with a mean precipitation of 2.13 inches; and the driest month is December, with a mean precipitation of 0.51 inch. These amounts vary considerably from year to year, which is to be expected in regions having comparatively small average annual precipitation. Between 1940 and 1985 the lowest annual precipitation, 7.34 inches, was reported in 1960, and the highest, 16.24 inches, was reported in 1941. The highest monthly precipitation during this period, 5.75 inches, was reported in April 1941; while the normal precipitation for that month is 1.45 inches. Wide seasonal and annual variations in precipitation are the result of variations in spring and summer thunderstorm activity. Several heavy thunderstorms in a year can produce 25 to 50 percent of the total annual precipitation.

There are no nearby mountain ranges of substantial size to the west or the north of the permit area. Arctic air masses can therefore move unobstructed over the area. These air masses cross the area most often in winter, when they can occur several times a month. They can be accompanied by strong northerly winds, abrupt temperature changes, and snow. As a rule, the cold arctic air masses modify rapidly after they reach Wyoming (Lowers, 1960). Winter snow has a low water content

because of the cold temperatures at which it usually forms, and the very dry, strong, west and southwesterly winds that follow winter storms tend to clear the snow from the ground within several days.

As indicated in Table D-4.2, annual snowfall in the Casper area averaged 80.9 inches between 1951 and 1985. The highest yearly total, 151.6 inches, was reported at Casper during the 1982-83 season; and the lowest, 33.6 inches, was reported during the 1941-42 season. The highest monthly total, 62.8 inches, was reported in December 1982.

Humidity

Table D-4.3 shows the monthly and annual mean relative humidity in Casper, with variations listed by time of day. Although the absolute moisture content of the air in the region is normally quite low, cool temperatures keep the relative humidity at moderate levels, particularly during the winter.

Wind Speed and Direction

Figure D-4.1 presents an annual wind rose for Casper, and Table D-4.4 provides a summary of mean monthly wind speeds and prevailing wind directions. Southwesterly winds predominate throughout the year. The mean annual wind speed is 13.1 mph, with averages during December and January of more than 16 mph.

A preliminary comparison has been performed between two months of site data with concurrent Casper wind data. This comparison indicates general agreement with Casper data, although wind directions at the site show an apparent clockwise shift of 10° to 20° . Average wind speeds at the site also appear to be higher than at Casper by 32 to 37 percent. This has been taken into account in impact analyses. Annual average wind speeds at Casper have been increased by a conservative 25 percent for dispersion calculations.

Severe Weather

The permit area lies within the one-degree square bounded by latitudes 43° and 44° and by longitudes 105° and 106°. From 1953 through 1962, the mean annual frequency of tornadoes in this area was 0.4 (Thom, 1963). Using Thom's method,* the yearly probability of a tornado's striking a point within this one-degree square is calculated at 0.0003. The figure was obtained by using the following equation:

$$p = \frac{\bar{z} \times \bar{t}}{A} = \frac{2.8 \times 0.4}{3500} = 0.0003 \text{ per year}$$

where:

p = the mean annual probability of a tornado's striking a point in a one-degree square of area A

\bar{z} = the mean path area of a tornado, assumed = 2.8 sq mi, as recommended by Thom

\bar{t} = the mean number of tornadoes per year in the one-degree square

A = area of a one-degree square, in square miles

The recurrence interval (1/p) for a tornado's striking a point within this square is about 3000 years.

Lowers (1960), as well as Thom, indicates that, although tornadoes do occur over Wyoming, they are somewhat smaller and less frequent than the ones that occur in the region to the east. Nevertheless, any tornado can be highly destructive.

Thunderstorms are frequent in Wyoming during the spring and summer. Related precipitation is usually light, amounting to only a few hundredths of an inch. However, several heavy local storms occur each year which can be expected to produce 1 or 2

*Thom (1963). This procedure for calculating tornado frequency is confirmed in Markee, Beckerly, and Sanders (n.d.).

inches of rain in a single day. On some occasions, 3 to 5 inches of rain have fallen in 24 hours (Lowers, 1960). The maximum precipitation reported to have fallen within 24 hours at Casper was 3.09 inches in April 1941. Lowers indicates that the principal damage from thunderstorms in Wyoming is caused by hailstones; however, he indicates that most hailstorms pass over open rangeland, where damage is minimal.

Table D-4.5 shows the maximum precipitation estimated for any given location on the property (point precipitation), for specific durations and recurrence intervals. The table was compiled using technical procedures outlined by Hershfield (1961) and Miller (1964). The probable maximum precipitation to occur in the area as a result of 6-hour precipitation event is 10 inches (U.S. Bureau of Reclamation, 1976).

Strong winds can occur in the project area along with thunderstorm activity in the spring and summer or in the form of intense outbreaks in the winter. Winds of 50 mph or more have been reported at Casper in every month of the year except November. The strongest of these winds was 81 mph in March 1956. Based on computations by Thom (1968), the mean recurrence interval for wind speeds 30 feet above the ground is estimated for the permit area as follows:

| | | | | | |
|-----------------------------|----|----|----|----|-----|
| Maximum speed(mph) | 65 | 70 | 85 | 90 | 100 |
| Recurrence interval (years) | 2 | 10 | 25 | 50 | 100 |

Dispersion Climatology

Pasquill (1961) and Turner (1964) have developed methods for estimating atmospheric stability based on surface meteorological observations. The input parameters for these calculations are solar altitude, cloud cover, ceiling height, and wind speed. The atmospheric stability is classified as follows:

Pasquill
Stability
Classification

Degree of
Atmospheric
Stability

| | |
|---|--------------------|
| A | Extremely unstable |
| B | Unstable |
| C | Slightly unstable |
| D | Neutral |
| E | Slightly stable |
| F | Stable |
| G | Extremely stable |

Table D-4.6 summarizes monthly and annual Pasquill stability levels for Casper, based on the National Climatic Center STAR Program for July 1967 through December 1971 (U.S. Department of Commerce, 1973).

In general, atmospheric dispersion in the area is very good. Good dispersion conditions (Pasquill stability classes A through D) occur 75.7 percent of the time and are the result primarily of the clear skies and moderate-to-strong winds that occur over the rolling hills most of the year. Since initial investigations indicate that wind speeds are somewhat stronger at the permit area than at Casper (also see Attachment A), air pollutant dispersion calculations using Casper data were corrected to allow for 25 percent higher wind speeds.

Low-level nocturnal temperature inversions commonly form in the vicinity of the permit area, particularly in winter. These inversions are usually broken up by colder air near the earth's surface being warmed by solar radiation. Surface wind speeds usually increase after such breakups.

During the winter, upper-level inversions also can occur. If these inversions persist, they can create stagnant surface-air conditions near ground level for extended periods. Table D-4.7 shows mixing heights and wind speeds within the mixing layer in the project area. The diurnal variations and the seasonal afternoon variations in mixing heights are pronounced, but only small variations in seasonal morning heights were noted. The

average morning wind speeds within the mixing layer are less than afternoon wind speeds; and average wind speeds in winter and autumn are generally less than those in summer and spring. The lowest potential for dispersion of atmospheric pollutants often exists in winter, when low wind speed and low mixing height coexist.

AIR QUALITY STANDARDS

Prior to July 1, 1973, the proposed permit area was within the U.S. Environmental Protection Agency's Casper Intrastate Air Quality Region (No. 241). Since that time, the state of Wyoming assumed primacy of the air quality program. They promulgated standards and regulations in accordance with the provisions of Section 35-11-106 of the Wyoming Environmental Quality Act of 1973. The state adopted the Federal secondary standard for the primary pollution standards of the state. This means that in some cases, the state is more stringent in its enforcement than is the Federal Government. The entire area of the Powder River Basin has been classified as a Class II area.

National and state ambient air quality for five major pollutants are presented in Table D-4.8. Federal primary standards are those necessary for protecting public health. Secondary standards, which in some cases are more stringent than primary standards, are those intended to protect public welfare, as well as public health, from any known adverse effects of these air pollutants. In addition to the standards given in Table D-4.8 there is also a primary/secondary standard for nonmethane hydrocarbons (0.24 ppm maximum 3-hour average between 6 a.m. and 9 a.m.). The hydrocarbon standard is intended as a guide for meeting the photochemical oxidant standard. Table D-4.9 presents applicable Wyoming state ambient air quality standards, some of which are more stringent than the national standards.

Table D-4.1. MONTHLY MEANS AND EXTREMES OF TEMPERATURE (°F): CASPER, WYOMING¹

| Month | Mean Daily Max. | Mean Daily Min. | Mean Monthly | Highest Recorded Daily Temperature | | Lowest Recorded Daily Temperature | | Mean Number ² of Days Max. Temp. Is: | | Mean Number ² of Days Min. Temp. Is: | |
|-------------|-----------------|-----------------|--------------|------------------------------------|--------------|-----------------------------------|--------------|---|---------|---|--------|
| | 1985 | 1985 | | °F | Year | °F | Year | ≥ 90° | ≤ 32° F | ≤ 32° F | ≥ 0° F |
| January | 32.5 | 11.9 | 22.2 | 60 | 1971 | -40 | 1972 | 0 | 13 | 29 | 6 |
| February | 37.4 | 16.3 | 26.9 | 68 | 1982 | -27 | 1982 | 0 | 9 | 27 | 3 |
| March | 43.4 | 20.2 | 31.8 | 73 | 1966 | -21 | 1965 | 0 | 6 | 27 | 3 |
| April | 54.9 | 29.3 | 42.1 | 81 | 1980 | -4 | 1966 | 0 | 1 | 21 | * |
| May | 66.2 | 38.9 | 52.5 | 92 | 1984 | 16 | 1953 | * | * | 8 | 0 |
| June | 78.1 | 47.6 | 62.9 | 101 | 1970 | 28 | 1968 | 3 | 0 | 1 | 0 |
| July | 87.1 | 54.7 | 70.9 | 104 | 1954 | 30 | 1972 | 11 | 0 | * | 0 |
| August | 84.8 | 52.8 | 68.8 | 102 | 1979 | 33 | 1977+ | 10 | 0 | 0 | 0 |
| September | 74.2 | 42.5 | 58.4 | 96 | 1983+ | 16 | 1983 | 1 | * | 5 | 0 |
| October | 61.0 | 33.2 | 47.1 | 85 | 1957 | -3 | 1971 | 0 | 1 | 16 | * |
| November | 43.9 | 21.9 | 32.9 | 71 | 1983+ | -21 | 1983 | 0 | 5 | 25 | 2 |
| December | 35.6 | 15.7 | 25.6 | 61 | 1980+ | -39 | 1980 | 0 | 14 | 29 | 5 |
| Annual Mean | 58.3 | 32.1 | 45.2 | 104 | July 1954 | -40 | Jan. 1972 | 24 | 50 | 187 | 19 |

1 National Oceanic and Atmospheric Administration, 1985, Local Climatological Data Annual Summary with comparative data, Casper, Wyoming, p.3.

2 Source: U.S. Department of Commerce, 1975

Period of record: 30 years (1941-1975) for first seven columns; 11 years (1965-1975) for all other columns.

+ = Occurred also in earlier years.

*Less than 0.5.

Table D-4.2. MONTHLY MEANS AND EXTREMES OF PRECIPITATION: CASPER WYOMING

| Month | Precipitation | | | | | | | Snow, Ice Pellets | | | | |
|-----------|---------------------------------------|--------------------|-------------|--------------------|---------------|--------------------|--------------|----------------------------|--------------------|--------------|--------------------|---------------|
| | Average Inches, Monthly 1985 | Maximum Monthly | | Minimum Monthly | | Maximum 24-hour | | Mean Inches, Monthly | Maximum Monthly | | Maximum 24-hour | |
| | | Inches | Year | Inches | Year | Inches | Year | | Inches | Year | Inches | Year |
| January | 0.50 | 1.19 | 1984 | T | 1952 | 0.53 | 1972 | 10.2 | 22.1 | 1980 | 9.7 | 1972 |
| February | 0.56 | 1.01 | 1955 | 0.15 | 1957 | 0.42 | 1977 | 9.7 | 23.8 | 1952 | 10.4 | 1952 |
| March | 0.99 | 2.43 | 1954 | 0.25 | 1953 | 1.00 | 1958 | 15.0 | 36.2 | 1975 | 14.6 | 1954 |
| April | 1.51 | 3.92* | 1974 | 0.20 | 1952 | 3.00* | 1974 | 13.5 | 56.3 | 1973 | 16.5 | 1973 |
| May | 2.13 | 6.46 | 1978 | 0.30 | 1966 | 2.61 | 1978 | 4.0 | 24.6 | 1978 | 14.1** | 1950 |
| June | 1.24 | 4.15 | 1982 | 0.03 | 1956 | 2.34 | 1982 | 0.2 | 3.0 | 1969+ | 3.0 | 1969+ |
| July | 1.06 | 3.05 | 1951 | 0.11 | 1971 | 2.07 | 1983 | 0.0 | 0.0 | | 0.0 | |
| August | 0.63 | 2.66 | 1979 | 0.02 | 1950 | 1.74 | 1979 | T | T | 1964 | T | 1964 |
| September | 0.76 | 3.40 | 1982 | 0.07 | 1956 | 2.01 | 1973 | 1.3 | 11.5 | 1982 | 6.8 | 1982 |
| October | 0.88 | 2.49 | 1962 | T | 1965 | 2.49 | 1962 | 5.0 | 13.1 | 1971 | 8.2 | 1970 |
| November | 0.66 | 2.72 | 1983 | 0.07 | 1965 | 1.21 | 1983 | 10.6 | 37.1 | 1983 | 14.3 | 1983 |
| December | 0.51 | 3.71 | 1982 | 0.30 | 1952 | 1.64 | 1982 | 11.3 | 62.8 | 1982 | 31.1 | 1982 |
| Annual | 11.22 | 6.46 | May 1976 | T | Oct. 1965+ | 3.00 | Apr. 1974 | 80.9 | 62.8 | Dec. 1982 | 31.1+ | Dec. 1982+ |

Source: National Oceanic and Atmospheric Administration, 1985, Local Climatological Data Annual Summary with comparative data, Casper, Wyoming, p.3 and p. 4a.

Period of record: 30 years (1941-1985) for all columns of figures.

T = Trace (0.01) + = Occurred also in earlier years

*A maximum monthly precipitation total of 5.75 inches was reported in April 1941, with a maximum 24-hour precipitation total of 3.09 inches during that same month at another station located in the Casper area.

**A maximum 24-hour snowfall of 20.6 inches was reported in May 1946, at another station located in the Casper vicinity.

Table D-4.3. MONTHLY AND ANNUAL MEAN PERCENT RELATIVE HUMIDITY
BY TIME OF DAY: CASPER, WYOMING

| Month | Mean Percent Relative Humidity by Time of Day (MST)* | | | |
|-----------|---|---------|--------|--------|
| | 5 a.m | 11 a.m. | 5 p.m. | 11p.m. |
| January | 68 | 59 | 61 | 68 |
| February | 70 | 58 | 57 | 70 |
| March | 72 | 54 | 49 | 70 |
| April | 76 | 50 | 45 | 71 |
| May | 77 | 44 | 39 | 68 |
| June | 78 | 40 | 35 | 65 |
| July | 71 | 32 | 26 | 56 |
| August | 65 | 30 | 23 | 51 |
| September | 68 | 37 | 31 | 60 |
| October | 69 | 46 | 41 | 63 |
| November | 69 | 54 | 56 | 67 |
| December | 69 | 59 | 62 | 68 |
| Annual | 71 | 47 | 44 | 65 |

Source: National Oceanic and Atmospheric Administration, 1985, Local Climatological Data Annual Summary with comparative data, Casper, Wyoming,, p.3.

Period of record: 21 years (1965-1985).

*MST = Mountain Standard Time

Table D-4.4. SUMMARY OF MEAN MONTHLY WIND SPEEDS, PREVAILING DIRECTIONS, AND FASTEST MILES: CASPER, WYOMING

| Month | Mean Speed (mph) | Prevailing Direction | Fastest Mile (mph) | | |
|-----------|------------------|----------------------|--------------------|-----------|---------------|
| | | | Speed | Direction | Year |
| January | 16.4 | SW | 58 | 20 | 1954 |
| February | 15.3 | SW | 58 | 23 | 1957 |
| March | 14.0 | SW | 81 | 25 | 1956 |
| April | 12.8 | WSW | 54 | 25 | 1967 |
| May | 11.7 | WSW | 58 | 32 | 1959 |
| June | 11.1 | WSW | 52 | 36 | 1959 |
| July | 10.1 | WSW | 52 | 25 | 1974 |
| August | 10.5 | SW | 50 | 25 | 1954 |
| September | 11.1 | WSW | 53 | 32 | 1965 |
| October | 12.2 | SW | 55 | 25 | 1954 |
| November | 14.4 | SW | 49 | 25 | 1970 |
| December | 16.2 | SW | 63 | 20 | 1955 |
| Annual | 13.0 | SW | 81 | 25 | March 1956 |

Source: National Climatic and Atmospheric Administration, 1985, Local Climatological Data Annual Summary with comparative data, Casper, Wyoming, p.3.
 Period of record: 25 years (1951-1985) for mean speed; 34 years (1951-1985) for prevailing wind direction; 32 years (1954-1985) for fastest mile.

Table D-4.5. ESTIMATED MAXIMUM POINT PERCIPITATION (inches) FOR
 SELECTED DURATIONS AND RECURRENCE INTERVALS FOR THE
 PERMIT AREA

| Duration | Recurrence Interval | | | | |
|----------|---------------------|----------|----------|----------|-----------|
| | 2 years | 10 years | 25 years | 50 years | 100 years |
| 1 hour | 0.9 | 1.4 | 1.8 | 2.0 | 2.3 |
| 12 hours | 1.5 | 2.4 | 2.8 | 3.2 | 3.6 |
| 24 hours | 1.7 | 2.8 | 3.2 | 3.6 | 4.0 |
| 2 days | 1.8 | 3.0 | 3.6 | 4.0 | 4.5 |
| 7 days | 2.5 | 3.9 | 4.5 | 5.4 | 5.8 |
| 10 days | 2.8 | 4.1 | 5.0 | 5.6 | 6.4 |

Sources: Hershfield, 1961; Miller, 1964.

Table D-4.6. PERCENT MONTHLY FREQUENCY OF PASQUILL STABILITY CLASSES:
CASPER, WYOMING, 1967-1971

| Month | Class | | | | | |
|-----------|-------|------|------|------|------|------|
| | A | B | C | D | E | F |
| January | 0.0 | 0.1 | 1.4 | 84.6 | 9.8 | 4.2 |
| February | 0.0 | 0.4 | 2.9 | 78.3 | 12.7 | 5.6 |
| March | 0.0 | 1.7 | 2.7 | 80.7 | 10.2 | 4.6 |
| April | 0.0 | 2.4 | 6.3 | 70.3 | 13.3 | 7.8 |
| May | 1.1 | 4.8 | 11.0 | 59.6 | 12.3 | 11.2 |
| June | 1.8 | 9.0 | 12.0 | 47.8 | 15.2 | 14.2 |
| July | 3.5 | 10.8 | 14.9 | 34.4 | 16.9 | 19.5 |
| August | 1.1 | 11.4 | 16.5 | 33.6 | 17.3 | 20.2 |
| September | 0.2 | 4.6 | 8.7 | 52.0 | 18.9 | 15.5 |
| October | 0.0 | 0.1 | 4.5 | 66.9 | 16.3 | 11.3 |
| November | 0.0 | 0.2 | 3.0 | 77.2 | 12.5 | 7.2 |
| December | 0.0 | 0.0 | 1.7 | 82.1 | 11.9 | 4.4 |
| Annual | 0.7 | 3.9 | 7.2 | 63.9 | 13.9 | 10.5 |

Source: U.S. Department of Commerce, 1973.

Table D-4.7. ESTIMATED AVERAGE MIXING HEIGHTS AND WIND SPEEDS IN MIXING LAYERS FOR PROJECT SITE AREA

| | Mixing Heights (meters) | Wind Speeds (mph) |
|---------------|----------------------------|----------------------|
| Annual | | |
| Morning | 300 | 9 |
| Afternoon | 2200 | 15 |
| Winter | | |
| Morning | 300 | 11 |
| Afternoon | 1200 | 13 |
| Spring | | |
| Morning | 400 | 11 |
| Afternoon | 2600 | 17 |
| Summer | | |
| Morning | 300 | 8 |
| Afternoon | 3200 | 15 |
| Autumn | | |
| Morning | 250 | 9 |
| Afternoon | 2000 | 13 |

Source: Holtzworth, 1972.

Table 8. NATIONAL AMBIENT AIR QUALITY STANDARDS FOR POLLUTANTS

| Pollutant | Description ² | Pollutant Standard ¹ | |
|---|---|---|--|
| | | Primary | Secondary ³ |
| Total suspended particulates | Solid and liquid particles in the atmosphere including dust, smoke, mists, fumes and spray | 75 ug/m ³ , annual geometric mean; 260 ug/m maximum 24-hour concentration not to be exceeded more than once per year | 60 ug/m ³ , annual geometric mean; 150 ug/m ³ , maximum 24-hour concentration not to be exceeded more than once per year |
| Sulfur dioxide (SO ₂) | Heavy, pungent, colorless gas formed primarily from combustion of fossil fuels | 80 ug/m ³ (0.03 ppm), annual arithmetic mean; 365 ug/m ³ (0.14 ppm), maximum 24-hour average | 1300 ug/m ³ (0.5 ppm), maximum 3-hour concentration not to be exceeded more than once per year |
| Carbon monoxide (CO) | Colorless, odorless, very toxic gas produced by any process that involves the incomplete combustion of carbon-containing substances; largest man-made fraction comes from automobiles | 10 mg/m ³ (9 ppm), maximum 8-hour average; 40 mg/m ³ (35 ppm), maximum 1-hour average | Same as primary |
| Photochemical oxidants (as O ₃) | Pungent, colorless, toxic gas; one component of photochemical smog | 160 ug/m ³ (0.08 ppm), maximum 1-hour average | Same as primary |
| Nitrogen dioxide | Brown, toxic gas formed during fuel combustion. Under certain conditions, it may be associated with ozone production in the atmosphere | 100 ug/m ³ (0.053 ppm), annual arithmetic mean | Same as primary |

- Sources: 1 Environmental Reporter, The Bureau of National Affairs, 7-12-85
 2 Environmental Glossary, Second Edition, Ed. by G. Williams Frick Government Institutes, Rockville, M.D., 1982
 3 NOTE: THE STATE OF WYOMING DEQ-AQD ENFORCES THE SECONDARY STANDARD WHICH IS MORE STRINGENT THAN THE PRIMARY STANDARD

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Table D-4.9. WYOMING STATE AMBIENT AIR QUALITY STANDARDS

| Pollutant | Averaging Period | Maximum Acceptable Concentration |
|-------------------------------|-------------------------|--|
| Total suspended particulates | Annual (geom. mean) | 60 ug/m ³ |
| | 24 hours | 150 ug/m ^{3a} |
| Total settleable particulates | 30 days | 5 g/m ² /month (residential areas) ^a |
| | 30 days | 10 g/m ² /month (industrial areas) ^a |
| Sulfur dioxide | Annual (arith. mean) | 60 ug/m ³ |
| | 24 hours | 260 ug/m ^{3a} |
| | 3 hours | 1300 ug/m ^{3a} |
| Sulfation rate | Annual | 0.25 mg SO ₃ /100 cm ² /day ^a |
| | 30 days | 0.50 mg SO ₃ /100 cm ² /day ^a |
| Hydrogen sulfide | 0.5 hour | 70 ug/m ^{3b} |
| | 0.5 hour | 40 ug/m ^{3c} |
| Photochemical oxidants | 1 hour | 160 ug/m ^{3a} |
| Nonmethane hydrocarbons | 3 hours (6 a.m.-9 a.m.) | 160 ug/m ^{3a} |
| Nitrogen dioxide | Annual | 100 ug/m ³ |
| Carbon monoxide | 8 hours | 10 mg/m ^{3a} |
| | 1 hour | 40 mg/m ^{3a} |

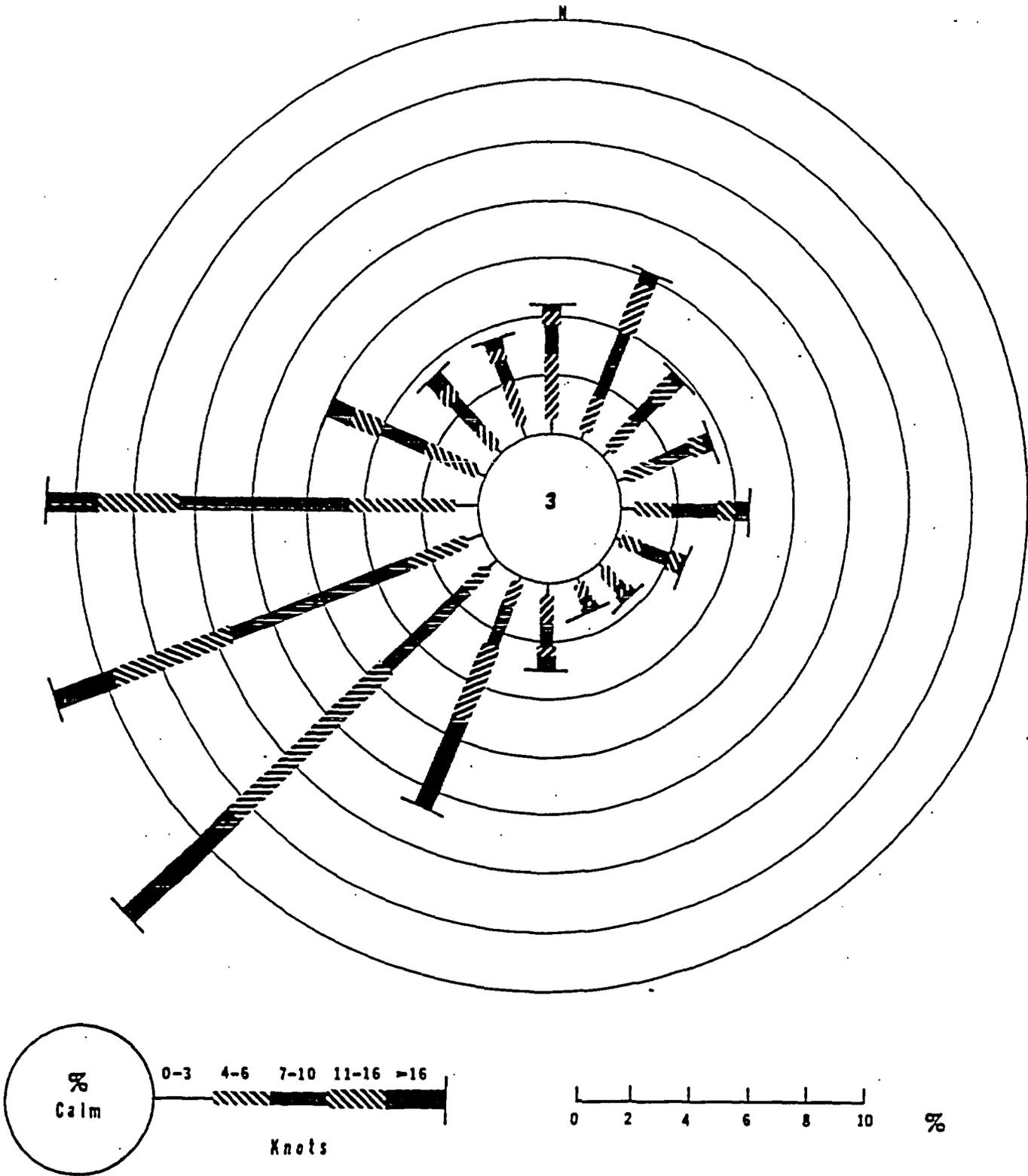
Source: Wyoming Environmental Quality Act (1975), Chapter 1, Sections 3 through 12, Air Quality Standards and Regulations, amended January 31, 1975 and 1978.

^aNot to be exceeded more than once a year.

^bNot to be exceeded more than twice a year.

^cNot to be exceeded more than two times during any 5-day period.

FIGURE D-4.1



WIND ROSE FOR CASPER, WYOMING - SEPTEMBER AND OCTOBER, 1967 THROUGH 1971

ATTACHMENT A

to

APPENDIX D-4

METEOROLOGICAL DATA

METEOROLOGY CONSIDERATIONS

In 1974, Woodward-Clyde Consultants began collecting meteorological data for the Tennessee Valley Authority on its Morton Ranch property. (TVA, 1976). The 10-meter tower and meteorological sensor (measuring wind speed, wind direction, and temperature) were installed about 8 miles east-southeast of the proposed South Powder River Basin uranium facility. Morton Ranch data were compared with concurrent and long-term records available for the National Weather Service station at the Natrona County International Airport near Casper. Reasonable agreement was found. Because topography and elevation are similar, and because the permit area is adjacent to the Morton Ranch property, Casper data are also expected to be reasonably representative of the permit area. Following is a discussion of the comparison that was performed between Casper and TVA data.

Both Casper and the Morton Ranch property are in rolling hill country, at similar altitudes, east of the Continental Divide. The Natrona County International Airport is located at an elevation of 5338 feet, and the base of the Morton Ranch meteorological tower is at 5320 feet.

A 24-hour daily record of temperature for the Morton Ranch site was kept from August 24 through November 4, 1974. Those data were compared with data obtained concurrently at the Natrona County International Airport. Tables A-1 and A-2 show the daily maximum, minimum, and mean temperatures at the two locations for September and October. In general, the average daily minimum temperatures were several degrees lower at Casper than at the

Morton Ranch site, and the average daily maximum temperatures were several degrees higher. However, the mean temperatures for both months showed less than 1^oF difference between the two locations.

The differences in the maximum and minimum temperatures may be explained in part by the different elevations at which the temperature sensors are placed. The extreme thermometers at Casper are located 6 feet above the ground, whereas the mechanical weather station used at the Morton Ranch site is on top of a 10-meter tower (approximately 33 feet above the ground). Nighttime radiational cooling effects close to the ground and daytime insolation can readily account for the differences observed. Additional daily variations in the extremes, as well as in the mean temperatures, can be accounted for by the lag time in movement of weather systems through the area and by the fact that the Morton Ranch site is about 49 miles from Casper. In general, the closeness of the mean values over the two-month test period substantiates the climatic similarity of the two locations.

Figures A-1 and A-2 show the wind roses for the Casper airport and the Morton Ranch site for the concurrent observation period of September-October 1974. Figure A-3 shows a wind rose for September-October obtained from the National Climatic Center STAR Program for Casper, Wyoming, based on data for 1967 through 1971. The 1974 Casper data are in general agreement with the historical data; although in 1974 north-northeasterly winds occurred with approximately 5 percent greater frequency and westerly winds occurred with approximately 6 percent less frequency than in the 1967-1971 record period. However, prevailing winds of almost equal distribution occurred from the west-southwest through the southwest both in 1974 and between 1967 and 1971.

The Morton Ranch site-specific data also show general similarities to historical data, but with some differences. The

Morton Ranch data indicate greater frequencies of north-northwest and north winds than the historical data. Both the Morton Ranch data and the Casper data indicate prevailing winds from the west-southwest for September-October 1974; but the Morton Ranch data show greater frequencies of wind from the west, whereas the Casper data show greater frequencies on wind from the southwest. Also, the wind speeds at the proposed site appear to be, on the average, 2 mph stronger than those at Casper. These differences may be attributed to local variations in terrain. It is also possible that the differences in the elevations of the wind-measuring equipment account for some of the variation. The wind equipment at the Natrona County International Airport is 20 feet above ground level, while the Morton Ranch equipment is about 30 feet above ground level. Nevertheless, the Casper climatological data appear to be adequate for providing calculations of the dispersion of effluents from the proposed operations. Since Casper winds do appear to be somewhat lighter than those in the permit area, diffusion calculations obtained from these data will be slightly conservative.

GASEOUS EFFLUENT DISPERSION MODEL

Turner (1970) has presented a model to predict annual average ground-level pollutant concentrations. The model is derived from the Pasquill-Gifford Equation used to predict short-duration concentrations. Meteorological inputs to this model include annual frequency of wind speed and direction by stability conditions. The equation in multistack form is as follows:

$$x = \sum_i \sum_w \sum_p \frac{2.032 Q_i F_{p,w}}{\sigma_{z,x,p} U_{w,p} x_i} \exp \left[-\frac{1}{2} \left(\frac{H}{\sigma_{z,x,p}} \right)^2 \right]$$

where:

x = resulting concentration (g/m^3)

\sum_i = summation over each stack

\sum_w = summation over each wind direction

\sum_p = summation over each Pasquill stability class

Q_i = emission rate of each stack (g/sec)

$F_{p,w}$ = joint frequency of wind direction and Pasquill stability class

$H_{i,u}$ = effective stack height for each stack and average wind speed (m)

$U_{w,p}$ = mean wind speed for each wind direction and stability class (m/sec)

$\sigma_{z,x,p}$ = vertical dispersion coefficient for each distance and stability class

x_i = distance from stack to receptor (m)

The effective stack height (H) was calculated using Briggs' plume equation.*

ANNUAL JOINT WIND DIRECTION, WIND SPEED, AND ATMOSPHERIC STABILITY FREQUENCY TABLES

Tables A-3 through A-9 present relative frequency distributions of wind speeds and wind directions for each of six Pasquill classes and for all classes combined. Data are for Casper, Wyoming, for the years 1967 through 1971 and were obtained from the National Climatic Center. These frequencies were used as input to the diffusion model used to compute annual average ground-level pollutant concentrations.

*G.A. Briggs, 1969, Plume Rise (Oak Ridge, Tenn.: U.S. Atomic Energy Commission).

Table A-1. COMPARISONS OF DAILY MAXIMUM, MINIMUM, AND MEAN TEMPERATURES
 BETWEEN THE MORTON RANCH SITE AND THE NATRONA INTERNATIONAL
 AIRPORT AT CASPER, WYOMING - SEPTEMBER 1974

| Date | Maximum Temperature (°F) | | Minimum Temperature (°F) | | Mean Temperature (°F) | |
|------------------|--------------------------|--------|--------------------------|--------|-----------------------|--------|
| | Site | Casper | Site | Casper | Site | Casper |
| 1 | 58 | 48 | 35 | 41 | 47 | 45 |
| 2 | 51 | 59 | 33 | 35 | 41 | 47 |
| 3 | 70 | 77 | 35 | 33 | 53 | 55 |
| 4 | 79 | 84 | 48 | 39 | 63 | 62 |
| 5 | 71 | 77 | 50 | 50 | 61 | 64 |
| 6 | 78 | 82 | 49 | 43 | 64 | 63 |
| 7 | 82 | 85 | 56 | 47 | 69 | 66 |
| 8 | 82 | 87 | 48 | 46 | 66 | 67 |
| 9 | 85 | 88 | 49 | 47 | 66 | 68 |
| 10 | 86 | 87 | 43 | 45 | 65 | 66 |
| 11 | 41 | 46 | 29 | 33 | 35 | 40 |
| 12 | 40 | 45 | 29 | 32 | 33 | 39 |
| 13 | 57 | 60 | 31 | 30 | 44 | 45 |
| 14 | 67 | 70 | 37 | 35 | 52 | 53 |
| 15 | 73 | 72 | 52 | 34 | 62 | 53 |
| 16 | 71 | 76 | 50 | 44 | 61 | 60 |
| 17 | 75 | 75 | 51 | 40 | 62 | 58 |
| 18 | 76 | 78 | 53 | 44 | 65 | 61 |
| 19 | 59 | 59 | 40 | 42 | 49 | 51 |
| 20 | 50 | 57 | 40 | 39 | 45 | 48 |
| 21 | 60 | 65 | 37 | 32 | 49 | 49 |
| 22 | 70 | 71 | 39 | 34 | 55 | 53 |
| 23 | 78 | 79 | 46 | 36 | 61 | 58 |
| 24 | 66 | 71 | 50 | 40 | 58 | 56 |
| 25 | 82 | 81 | 43 | 42 | 64 | 62 |
| 26 | 82 | 81 | 53 | 47 | 67 | 64 |
| 27 | 51 | 47 | 32 | 31 | 42 | 39 |
| 28 | 60 | 63 | 32 | 34 | 46 | 49 |
| 29 | 53 | 59 | 38 | 35 | 46 | 47 |
| 30 | 65 | 70 | 31 | 30 | 48 | 50 |
| Monthly Means | 67.2 | 69.9 | 41.9 | 38.6 | 54.6 | 54.6 |

Data Source: Natrona International Airport, Casper, Wyoming

Table A-2. COMPARISONS OF DAILY MAXIMUM, MINIMUM, AND MEAN TEMPERATURES BETWEEN THE MORTON RANCH SITE AND THE NATRONA INTERNATIONAL AIRPORT AT CASPER, WYOMING - OCTOBER 1974

| Date | Maximum Temperature (°F) | | Minimum Temperature (°F) | | Mean Temperature (°F) | |
|---------------|--------------------------|--------|--------------------------|--------|-----------------------|--------|
| | Site | Casper | Site | Casper | Site | Casper |
| 1 | 65 | 69 | 39 | 29 | 52 | 49 |
| 2 | 79 | 80 | 35 | 32 | 58 | 56 |
| 3 | 64 | 67 | 48 | 43 | 57 | 55 |
| 4 | 50 | 59 | 39 | 43 | 44 | 51 |
| 5 | 40 | 43 | 29 | 29 | 35 | 36 |
| 6 | 46 | 53 | 29 | 28 | 38 | 41 |
| 7 | 65 | 69 | 34 | 35 | 50 | 52 |
| 8 | 68 | 69 | 50 | 37 | 59 | 53 |
| 9 | 72 | 72 | 44 | 36 | 57 | 54 |
| 10 | 64 | 68 | 43 | 41 | 54 | 55 |
| 11 | 54 | 59 | 36 | 36 | 45 | 48 |
| 12 | 53 | 58 | 34 | 37 | 44 | 48 |
| 13 | 56 | 62 | 35 | 38 | 45 | 50 |
| 14 | 48 | 54 | 27 | 31 | 37 | 43 |
| 15 | 65 | 69 | 35 | 37 | 50 | 53 |
| 16 | 74 | 75 | 46 | 42 | 60 | 59 |
| 17 | 73 | 77 | 51 | 36 | 61 | 57 |
| 18 | 70 | 72 | 46 | 36 | 58 | 54 |
| 19 | 74 | 73 | 52 | 34 | 63 | 54 |
| 20 | 73 | 76 | 44 | 35 | 59 | 56 |
| 21 | 68 | 68 | 37 | 40 | 54 | 54 |
| 22 | 43 | 44 | 30 | 35 | 36 | 40 |
| 23 | 55 | 60 | 31 | 37 | 43 | 49 |
| 24 | 54 | 56 | 39 | 31 | 47 | 44 |
| 25 | 58 | 61 | 30 | 25 | 43 | 43 |
| 26 | 58 | 62 | 38 | 34 | 47 | 48 |
| 27 | 58 | 62 | 41 | 33 | 50 | 48 |
| 28 | 58 | 62 | 37 | 25 | 48 | 44 |
| 29 | 49 | 52 | 34 | 29 | 41 | 41 |
| 30 | 41 | 45 | 34 | 35 | 38 | 40 |
| 31 | 37 | 37 | 31 | 34 | 33 | 36 |
| Monthly Means | 59.1 | 62.3 | 38.0 | 34.6 | 48.6 | 48.7 |

Data Source: Natrona International Airport, Casper, Wyoming.

Table A-3. ANNUAL RELATIVE FREQUENCY DISTRIBUTION, CAPSER, WYOMING, 1967-1971 (A Stability)

| Direction | Wind Speed (knots) | | | | | | Total |
|-----------|--------------------|----------|-------|-------|-------|-------|----------|
| | 0-3 | 4-6 | 7-10 | 11-16 | 17-21 | 21 | |
| N | 0.000069 | 0.000137 | - - - | - - - | - - - | - - - | 0.000206 |
| NNE | 0.000240 | 0.000274 | - - - | - - - | - - - | - - - | 0.000514 |
| NE | 0.000103 | 0.000206 | - - - | - - - | - - - | - - - | 0.000308 |
| ENE | 0.000240 | 0.000069 | - - - | - - - | - - - | - - - | 0.000308 |
| E | 0.000171 | 0.000137 | - - - | - - - | - - - | - - - | 0.000308 |
| ESE | 0.000103 | 0.000206 | - - - | - - - | - - - | - - - | 0.000308 |
| SE | 0.000069 | 0.000137 | - - - | - - - | - - - | - - - | 0.000206 |
| SSE | 0.000411 | 0.000617 | - - - | - - - | - - - | - - - | 0.001028 |
| S | 0.000137 | 0.000069 | - - - | - - - | - - - | - - - | 0.000206 |
| SSW | 0.000206 | 0.000206 | - - - | - - - | - - - | - - - | 0.000411 |
| SW | 0.000240 | 0.000069 | - - - | - - - | - - - | - - - | 0.000308 |
| WSW | 0.000240 | 0.000274 | - - - | - - - | - - - | - - - | 0.000514 |
| W | 0.000377 | 0.000548 | - - - | - - - | - - - | - - - | 0.000925 |
| WNW | 0.000171 | 0.000343 | - - - | - - - | - - - | - - - | 0.000514 |
| NW | 0.000206 | 0.000000 | - - - | - - - | - - - | - - - | 0.000206 |
| NNW | 0.000103 | 0.000206 | - - - | - - - | - - - | - - - | 0.000308 |
| TOTAL | 0.003083 | 0.003494 | - - - | - - - | - - - | - - - | |

Relative Frequency of Occurrence of A Stability = 0.006576

Relative Frequency of Calms Distributed Above With A Stability = 0.002192

Table A-4. ANNUAL RELATIVE FREQUENCY DISTRIBUTION, CAPSER, WYOMING, 1967-1971 (B Stability)

| Direction | Wind Speed (knots) | | | | | | Total |
|-----------|--------------------|----------|----------|-------|-------|-------|----------|
| | 0-3 | 4-6 | 7-10 | 11-16 | 17-21 | 21 | |
| N | 0.000554 | 0.000959 | 0.000685 | - - - | - - - | - - - | 0.002198 |
| NNE | 0.000507 | 0.001233 | 0.000617 | - - - | - - - | - - - | 0.002356 |
| NE | 0.000374 | 0.000685 | 0.000685 | - - - | - - - | - - - | 0.001744 |
| ENE | 0.000421 | 0.000411 | 0.000411 | - - - | - - - | - - - | 0.001243 |
| E | 0.000960 | 0.001233 | 0.000617 | - - - | - - - | - - - | 0.002810 |
| ESE | 0.000424 | 0.001165 | 0.000206 | - - - | - - - | - - - | 0.001794 |
| SE | 0.000665 | 0.001302 | 0.000548 | - - - | - - - | - - - | 0.002515 |
| SSE | 0.000651 | 0.001165 | 0.00274 | - - - | - - - | - - - | 0.002089 |
| S | 0.000977 | 0.002124 | 0.000548 | - - - | - - - | - - - | 0.003649 |
| SSW | 0.000410 | 0.001028 | 0.000685 | - - - | - - - | - - - | 0.002122 |
| SW | 0.000618 | 0.001576 | 0.000822 | - - - | - - - | - - - | 0.003015 |
| WSW | 0.000445 | 0.001370 | 0.001096 | - - - | - - - | - - - | 0.002911 |
| W | 0.001126 | 0.001370 | 0.001781 | - - - | - - - | - - - | 0.004277 |
| WNW | 0.000402 | 0.000959 | 0.000685 | - - - | - - - | - - - | 0.002046 |
| NW | 0.000208 | 0.000548 | 0.000754 | - - - | - - - | - - - | 0.001510 |
| NNW | 0.000644 | 0.001096 | 0.000822 | - - - | - - - | - - - | 0.002562 |
| TOTAL | 0.009385 | 0.018222 | 0.011234 | - - - | - - - | - - - | |

Relative Frequency of Occurrence of B Stability = 0.038841

Relative Frequency of Calms Distributed Above With B Stability = 0.002603

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Table A-5. ANNUAL RELATIVE FREQUENCY DISTRIBUTION, CAPSER, WYOMING, 1967-1971 (C Stability)

| Direction | Wind Speed (knots) | | | | | | Total |
|-----------|--------------------|----------|----------|----------|----------|----------|----------|
| | 0-3 | 4-6 | 7-10 | 11-16 | 17-21 | 21 | |
| N | 0.000186 | 0.000959 | 0.002535 | 0.000274 | 0.000000 | 0.000000 | 0.003954 |
| NNE | 0.000133 | 0.001370 | 0.001850 | 0.000137 | 0.000069 | 0.000000 | 0.003558 |
| NE | 0.000115 | 0.000959 | 0.001576 | 0.000137 | 0.000000 | 0.000000 | 0.002786 |
| ENE | 0.000118 | 0.001028 | 0.001713 | 0.000137 | 0.000000 | 0.000000 | 0.002995 |
| E | 0.000366 | 0.001781 | 0.002329 | 0.000343 | 0.000000 | 0.000000 | 0.004819 |
| ESE | 0.000186 | 0.000959 | 0.001918 | 0.000343 | 0.000000 | 0.000000 | 0.003406 |
| SE | 0.000127 | 0.001233 | 0.001233 | 0.000137 | 0.000000 | 0.000000 | 0.002730 |
| SSE | 0.000037 | 0.000822 | 0.000822 | 0.000000 | 0.000000 | 0.000000 | 0.001681 |
| S | 0.000282 | 0.001507 | 0.001233 | 0.000343 | 0.000137 | 0.000000 | 0.003502 |
| SSW | 0.000186 | 0.000959 | 0.001987 | 0.000959 | 0.000069 | 0.000000 | 0.004159 |
| SW | 0.000186 | 0.000959 | 0.003699 | 0.002055 | 0.000343 | 0.000069 | 0.007310 |
| WSW | 0.000292 | 0.001713 | 0.006439 | 0.001713 | 0.000343 | 0.000137 | 0.010635 |
| W | 0.000179 | 0.002398 | 0.004727 | 0.001918 | 0.000411 | 0.000069 | 0.009701 |
| WNW | 0.000273 | 0.001302 | 0.002261 | 0.000343 | 0.000206 | 0.000000 | 0.004383 |
| NW | 0.000320 | 0.000754 | 0.001644 | 0.000411 | 0.000000 | 0.000000 | 0.003129 |
| NNW | 0.000028 | 0.000617 | 0.001576 | 0.000685 | 0.000000 | 0.000000 | 0.002905 |
| TOTAL | 0.003014 | 0.019318 | 0.037539 | 0.009933 | 0.001576 | 0.000274 | |

Relative Frequency of Occurrence of C Stability = 0.071654

Relative Frequency of Calms Distributed Above With C Stability = 0.000959

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Table A-6. ANNUAL RELATIVE FREQUENCY DISTRIBUTION, CAPSER, WYOMING, 1967-1971 (D Stability)

| Direction | Wind Speed (knots) | | | | | | Total |
|-----------|--------------------|----------|----------|-----------|----------|----------|----------|
| | 0-3 | 4-6 | 7-10 | 11-16 | 17-21 | 21 | |
| N | 0.000792 | 0.005412 | 0.011440 | 0.011097 | 0.002809 | 0.001028 | 0.032577 |
| NNE | 0.001053 | 0.005823 | 0.014249 | 0.014865 | 0.003768 | 0.001028 | 0.040785 |
| NE | 0.000854 | 0.004453 | 0.010207 | 0.010275 | 0.001713 | 0.000274 | 0.027775 |
| ENE | 0.000741 | 0.003220 | 0.008768 | 0.006508 | 0.000617 | 0.000000 | 0.019854 |
| E | 0.000598 | 0.004110 | 0.009248 | 0.010001 | 0.002261 | 0.000137 | 0.026355 |
| ESE | 0.000592 | 0.003220 | 0.004932 | 0.005480 | 0.000822 | 0.000069 | 0.015115 |
| SE | 0.000548 | 0.001918 | 0.003014 | 0.0001987 | 0.000411 | 0.000000 | 0.007878 |
| SSE | 0.000268 | 0.001302 | 0.001370 | 0.000548 | 0.000137 | 0.000000 | 0.003625 |
| S | 0.000548 | 0.001918 | 0.002124 | 0.003699 | 0.001781 | 0.000411 | 0.010482 |
| SSW | 0.000336 | 0.001233 | 0.006302 | 0.030826 | 0.26716 | 0.014797 | 0.080210 |
| SW | 0.000411 | 0.002055 | 0.014180 | 0.065420 | 0.050075 | 0.022469 | 0.154610 |
| WSW | 0.000530 | 0.003357 | 0.021304 | 0.051993 | 0.022126 | 0.009727 | 0.109038 |
| W | 0.000679 | 0.003357 | 0.017468 | 0.019318 | 0.009248 | 0.005206 | 0.055276 |
| WNW | 0.000816 | 0.002398 | 0.005412 | 0.009453 | 0.004042 | 0.001165 | 0.023285 |
| NW | 0.000430 | 0.001439 | 0.005206 | 0.005891 | 0.002398 | 0.000411 | 0.015774 |
| NNW | 0.001009 | 0.004521 | 0.005001 | 0.004042 | 0.001028 | 0.000343 | 0.015943 |
| TOTAL | 0.010207 | 0.049733 | 0.140224 | 0.251404 | 0.129949 | 0.057063 | |

Relative Frequency of Occurrence of D Stability = 0.638581

Relative Frequency of Calms Distributed Above With D Stability = 0.005001

D4-29

Table A-7. ANNUAL RELATIVE FREQUENCY DISTRIBUTION, CAPSER, WYOMING, 1967-1971 (E Stability)

| Direction | Wind Speed (knots) | | | | | | Total |
|-----------|--------------------|----------|----------|-------|-------|-------|----------|
| | 0-3 | 4-6 | 7-10 | 11-16 | 17-21 | 21 | |
| N | - - - | 0.004179 | 0.003425 | - - - | - - - | - - - | 0.007604 |
| NNE | - - - | 0.003357 | 0.003014 | - - - | - - - | - - - | 0.006371 |
| NE | - - - | 0.002877 | 0.002809 | - - - | - - - | - - - | 0.005686 |
| ENE | - - - | 0.001918 | 0.002877 | - - - | - - - | - - - | 0.004795 |
| E | - - - | 0.002603 | 0.004042 | - - - | - - - | - - - | 0.006645 |
| ESE | - - - | 0.001576 | 0.003083 | - - - | - - - | - - - | 0.004658 |
| SE | - - - | 0.001507 | 0.001165 | - - - | - - - | - - - | 0.002672 |
| SSE | - - - | 0.001028 | 0.000480 | - - - | - - - | - - - | 0.001507 |
| S | - - - | 0.001370 | 0.000548 | - - - | - - - | - - - | 0.001918 |
| SSW | - - - | 0.001165 | 0.004042 | - - - | - - - | - - - | 0.005206 |
| SW | - - - | 0.002466 | 0.010892 | - - - | - - - | - - - | 0.013358 |
| WSW | - - - | 0.004932 | 0.028223 | - - - | - - - | - - - | 0.033155 |
| W | - - - | 0.007467 | 0.019044 | - - - | - - - | - - - | 0.026510 |
| WNW | - - - | 0.003631 | 0.004042 | - - - | - - - | - - - | 0.007672 |
| NW | - - - | 0.003288 | 0.002466 | - - - | - - - | - - - | 0.005754 |
| NNW | - - - | 0.003288 | 0.002603 | - - - | - - - | - - - | 0.005891 |
| TOTAL | - - - | 0.046650 | 0.092752 | - - - | - - - | - - - | |

Relative Frequency of Occurrence of E Stability = 0.139403

Relative Frequency of Calms Distributed Above With E Stability = 0.000000

D4-30

Table A-8. ANNUAL RELATIVE FREQUENCY DISTRIBUTION, CAPSER, WYOMING, 1967-1971 (F Stability)

| Direction | Wind Speed (knots) | | | | | | Total |
|-----------|--------------------|----------|------|-------|-------|-----|----------|
| | 0-3 | 4-6 | 7-10 | 11-16 | 17-21 | 21 | |
| N | 0.003723 | 0.006919 | --- | --- | --- | --- | 0.010642 |
| NNE | 0.001668 | 0.005617 | --- | --- | --- | --- | 0.007286 |
| NE | 0.001431 | 0.003562 | --- | --- | --- | --- | 0.004994 |
| ENE | 0.001104 | 0.003562 | --- | --- | --- | --- | 0.004666 |
| E | 0.001608 | 0.003631 | --- | --- | --- | --- | 0.005239 |
| ESE | 0.001124 | 0.001987 | --- | --- | --- | --- | 0.003111 |
| SE | 0.000635 | 0.001576 | --- | --- | --- | --- | 0.002210 |
| SSE | 0.000583 | 0.000891 | --- | --- | --- | --- | 0.001473 |
| S | 0.001221 | 0.001644 | --- | --- | --- | --- | 0.002865 |
| SSW | 0.001124 | 0.001987 | --- | --- | --- | --- | 0.003111 |
| SW | 0.001448 | 0.002809 | --- | --- | --- | --- | 0.004257 |
| WSW | 0.002996 | 0.007809 | --- | --- | --- | --- | 0.010806 |
| W | 0.005746 | 0.012673 | --- | --- | --- | --- | 0.018419 |
| WNW | 0.002607 | 0.006234 | --- | --- | --- | --- | 0.008841 |
| NW | 0.002023 | 0.005754 | --- | --- | --- | --- | 0.007777 |
| NNW | 0.002606 | 0.006645 | --- | --- | --- | --- | 0.009250 |
| TOTAL | 0.031648 | 0.073298 | --- | --- | --- | --- | |

Relative Frequency of Occurrence of F Stability = 0.104946

Relative Frequency of Calms Distributed Above With F Stability = 0.017126

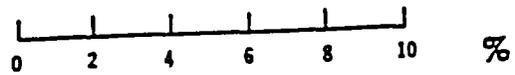
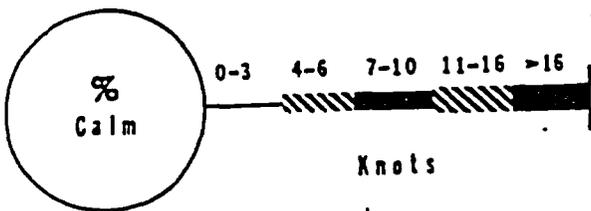
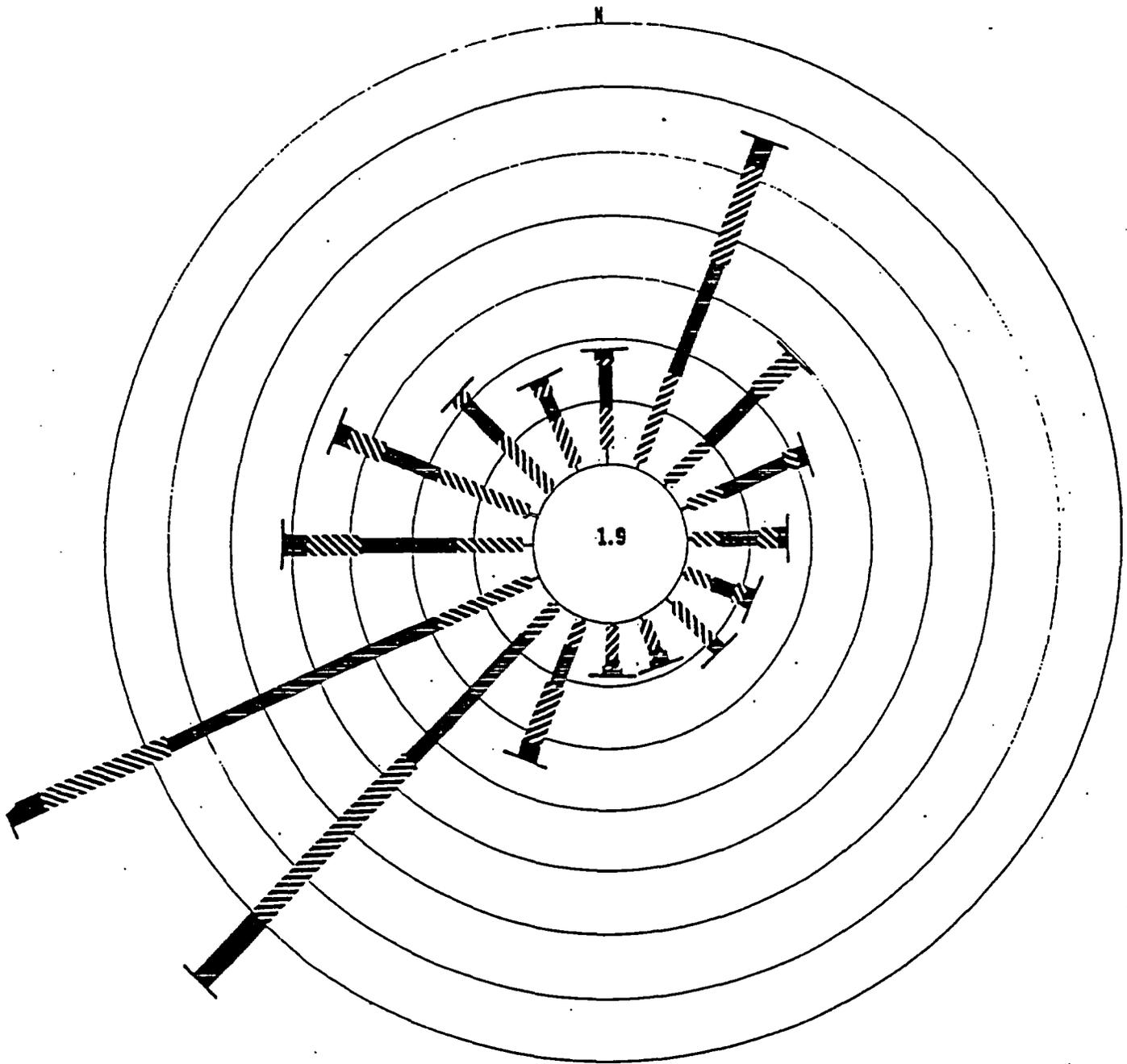
Table A-9. ANNUAL RELATIVE FREQUENCY DISTRIBUTION STATION, CAPSER, WYOMING, 1967-1971 (Average)

| Direction | Wind Speed (knots) | | | | | | Total |
|-----------|--------------------|----------|----------|----------|----------|----------|----------|
| | 0-3 | 4-6 | 7-10 | 11-16 | 17-21 | 21 | |
| N | 0.005290 | 0.018564 | 0.018085 | 0.011371 | 0.002809 | 0.001028 | 0.057146 |
| NNE | 0.003657 | 0.017674 | 0.019729 | 0.015002 | 0.003836 | 0.001028 | 0.060925 |
| NE | 0.003008 | 0.012741 | 0.015276 | 0.010412 | 0.001713 | 0.000274 | 0.043425 |
| ENE | 0.002638 | 0.010207 | 0.013769 | 0.006645 | 0.000617 | 0.000000 | 0.033875 |
| E | 0.003860 | 0.013495 | 0.016235 | 0.010344 | 0.002261 | 0.000137 | 0.046332 |
| ESE | 0.002510 | 0.009111 | 0.010138 | 0.005823 | 0.000822 | 0.000069 | 0.028473 |
| SE | 0.002190 | 0.007672 | 0.005960 | 0.002124 | 0.000411 | 0.000000 | 0.018357 |
| SSE | 0.001823 | 0.005823 | 0.002946 | 0.000548 | 0.000137 | 0.000000 | 0.011276 |
| S | 0.003296 | 0.008631 | 0.004453 | 0.004042 | 0.001918 | 0.000411 | 0.022730 |
| SSW | 0.002216 | 0.006576 | 0.013015 | 0.031785 | 0.026784 | 0.014797 | 0.095174 |
| SW | 0.002988 | 0.009933 | 0.029593 | 0.067475 | 0.050418 | 0.022537 | 0.182944 |
| WSW | 0.004476 | 0.019455 | 0.057063 | 0.053706 | 0.022469 | 0.009864 | 0.167032 |
| W | 0.007816 | 0.027812 | 0.043020 | 0.021236 | 0.009659 | 0.005275 | 0.114817 |
| WNW | 0.004172 | 0.014865 | 0.012399 | 0.009796 | 0.004247 | 0.001165 | 0.046644 |
| NW | 0.003126 | 0.011782 | 0.010070 | 0.006302 | 0.002398 | 0.000411 | 0.034089 |
| NNW | 0.004271 | 0.016372 | 0.010001 | 0.004727 | 0.001028 | 0.000343 | 0.036741 |
| TOTAL | 0.057337 | 0.210713 | 0.281751 | 0.261337 | 0.131525 | 0.057337 | |

Total Relative Frequency of Observations = 1.000000

Total Relative Frequency of Calms Distributed Above = 0.027881

FIGURE A-1



WIND ROSE FOR CASPER, WYOMING - SEPTEMBER AND OCTOBER 1974

