

**TABLE OF CONTENTS**

EXECUTIVE SUMMARY .....ES-1

1.0 INTRODUCTION ..... 1-1

    1.1 Background..... 1-1

        1.1.1 North and South Hilight Field LBA Tracts ..... 1-5

        1.1.2 West Hilight Field LBA Tract ..... 1-11

        1.1.3 West Jacobs Ranch LBA Tract ..... 1-12

        1.1.4 North and South Porcupine LBA Tracts ..... 1-12

    1.2 Purpose and Need for Action..... 1-16

    1.3 Regulatory Authority and Responsibility ..... 1-18

    1.4 Relationship to BLM Policies, Plans, and Programs ..... 1-19

    1.5 Conformance with Existing Land Use Plans ..... 1-20

    1.6 Consultation and Coordination..... 1-23

2.0 PROPOSED ACTION AND ALTERNATIVES ..... 2-1

    2.1 North Hilight Field LBA Tract..... 2-10

        2.1.1 North Hilight Field LBA Tract Proposed Action ..... 2-10

        2.1.2 North Hilight Field LBA Tract Alternative 1 ..... 2-15

        2.1.3 North Hilight Field LBA Tract Alternative 2 – Preferred  
Alternative ..... 2-16

    2.2 South Hilight Field LBA Tract ..... 2-19

        2.2.1 South Hilight Field LBA Tract Proposed Action ..... 2-19

        2.2.2 South Hilight Field LBA Tract Alternative 1 ..... 2-22

        2.2.3 South Hilight Field LBA Tract Alternative 2 – Preferred  
Alternative ..... 2-23

    2.3 West Hilight Field LBA Tract..... 2-26

        2.3.1 West Hilight Field LBA Tract Proposed Action..... 2-26

        2.3.2 West Hilight Field LBA Tract Alternative 1 ..... 2-29

        2.3.3 West Hilight Field LBA Tract Alternative 2 – Preferred  
Alternative ..... 2-30

        2.3.4 West Hilight Field LBA Tract Alternative 3..... 2-33

    2.4 West Jacobs Ranch LBA Tract ..... 2-37

        2.4.1 West Jacobs Ranch LBA Tract Proposed Action..... 2-37

        2.4.2 West Jacobs Ranch LBA Tract Alternative 1 ..... 2-42

        2.4.3 West Jacobs Ranch LBA Tract Alternative 2 – Preferred  
Alternative ..... 2-43

    2.5 North Porcupine LBA Tract..... 2-47

        2.5.1 North Porcupine LBA Tract Proposed Action..... 2-47

        2.5.2 North Porcupine LBA Tract Alternative 1 ..... 2-53

        2.5.3 North Porcupine LBA Tract Alternative 2 – Preferred  
Alternative ..... 2-53

    2.6 South Porcupine LBA Tract ..... 2-57

        2.6.1 South Porcupine LBA Tract Proposed Action ..... 2-57

        2.6.2 South Porcupine LBA Tract Alternative 1 ..... 2-61

**TABLE OF CONTENTS (Continued)**

2.6.3 South Porcupine LBA Tract Alternative 2 – Preferred  
 Alternative ..... 2-62

2.7 Alternatives Considered but not Analyzed in Detail..... 2-65

2.7.1 Alternative 4: New Mine Start..... 2-65

2.7.2 Alternative 5: Delaying the Sale..... 2-67

2.8 Regulatory Compliance, Mitigation and Monitoring..... 2-69

2.9 Hazardous and Solid Waste ..... 2-69

2.10 Summary of Alternatives and Environmental Consequences .... 2-76

2.10.1 Background..... 2-76

2.10.2 Summary of Alternatives..... 2-77

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL  
 CONSEQUENCES ..... 3-1

3.1 General Setting..... 3-10

3.1.1 Climate and Meteorology ..... 3-10

3.2 Topography and Physiography ..... 3-11

3.2.1 Affected Environment..... 3-11

3.2.2 Environmental Consequences ..... 3-12

3.2.2.1 Proposed Action and Alternatives 2 and 3.... 3-12

3.2.2.2 No Action Alternative ..... 3-15

3.2.3 Regulatory Compliance, Mitigation and Monitoring ..... 3-15

3.2.4 Residual Impacts ..... 3-15

3.3 Geology, Mineral Resources and Paleontology ..... 3-16

3.3.1 General Geology and Coal Resources..... 3-16

3.3.1.1 Affected Environment..... 3-16

3.3.1.2 Environmental Consequences..... 3-19

3.3.1.2.1 Proposed Action and Alternatives  
 2 and 3..... 3-19

3.3.1.2.1.1 North Hilight Field  
 LBA Tract ..... 3-19

3.3.1.2.1.2 South Hilight Field  
 LBA Tract ..... 3-20

3.3.1.2.1.3 West Hilight Field  
 LBA Tract ..... 3-20

3.3.1.2.1.4 West Jacobs Ranch  
 LBA Tract ..... 3-21

3.3.1.2.1.5 North Porcupine  
 LBA Tract ..... 3-21

3.3.1.2.1.6 South Porcupine  
 LBA Tract ..... 3-21

3.3.1.2.2 No Action Alternative ..... 3-22

3.3.1.3 Regulatory Compliance, Mitigation and  
 Monitoring..... 3-22

3.3.1.4 Residual Impacts ..... 3-23

3.3.2 Other Mineral Resources..... 3-23

3.3.2.1 Affected Environment ..... 3-23

**TABLE OF CONTENTS (Continued)**

	3.3.2.1.1	Conventional Oil and Gas .....	3-23
	3.3.2.1.2	Coal Bed Natural Gas (CBNG) .....	3-26
	3.3.2.1.3	Other Minerals.....	3-28
	3.3.2.2	Environmental Consequences.....	3-29
	3.3.2.2.1	Proposed Action and Alternatives 2 and 3.....	3-29
	3.3.2.2.2	No Action Alternative .....	3-30
	3.3.2.3	Regulatory Compliance, Mitigation and Monitoring.....	3-31
	3.3.2.4	Residual Impacts.....	3-32
	3.3.3	Paleontology.....	3-32
	3.3.3.1	Affected Environment.....	3-32
	3.3.3.2	Environmental Consequences.....	3-34
	3.3.3.2.1	Proposed Action and Alternatives 2 and 3.....	3-34
	3.3.3.2.2	No Action Alternative .....	3-34
	3.3.3.3	Regulatory Compliance, Mitigation and Monitoring.....	3-34
	3.3.3.4	Residual Impacts.....	3-35
3.4		Air Quality.....	3-35
	3.4.1	Background .....	3-35
	3.4.1.1	Emission Sources.....	3-36
	3.4.2	Particulate Emissions.....	3-38
	3.4.2.1	Affected Environment for Particulate Emissions .....	3-38
	3.4.2.2	Environmental Consequences Related to Particulate Emissions.....	3-44
	3.4.2.2.1	Proposed Action and Alternatives 2 and 3.....	3-44
	3.4.2.2.1.1	North, South, and West Hilight Field LBA Tracts .....	3-46
	3.4.2.2.1.2	West Jacobs Ranch LBA Tract.....	3-50
	3.4.2.2.1.3	North and South LBA Porcupine Tracts .....	3-54
	3.4.2.2.2	No Action Alternative .....	3-60
	3.4.2.3	Regulatory Compliance, Mitigation, and Monitoring for Particulate Emissions .....	3-60
	3.4.3	Emissions of Nitrogen Oxides (NO <sub>x</sub> ) and Ozone (O <sub>3</sub> ) ....	3-64
	3.4.3.1	Affected Environment for NO <sub>x</sub> and O <sub>3</sub> Emissions .....	3-64
	3.4.3.1.1	Site Specific NO <sub>x</sub> Emissions .....	3-66
	3.4.3.2	Environmental Consequences Related to Short-Term NO <sub>x</sub> Emissions.....	3-67

**TABLE OF CONTENTS (Continued)**

	3.4.3.2.1	Proposed Action and Alternatives 2 and 3.....	3-68
	3.4.3.2.1.1	North, South, and West Hilight Field LBA Tracts .....	3-70
	3.4.3.2.1.2	West Jacobs Ranch LBA Tract.....	3-70
	3.4.3.2.1.3	North and South Porcupine LBA Tracts .....	3-71
	3.4.3.2.2	No Action Alternative .....	3-73
	3.4.3.3	Regulatory Compliance, Mitigation, and Monitoring for NO <sub>x</sub> Emissions.....	3-74
3.4.4		Air Quality Related Values (AQRVs) .....	3-77
	3.4.4.1	Visibility.....	3-77
	3.4.4.1.1	Affected Environment for Visibility .....	3-78
	3.4.4.1.2	Environmental Consequences for Visibility .....	3-78
	3.4.4.1.2.1	Proposed Action and Alternatives 2 and 3 ..	3-78
	3.4.4.1.2.2	No Action Alternative.	3-81
	3.4.4.1.3	Regulatory Compliance, Mitigation, and Monitoring for Visibility Impacts .....	3-82
	3.4.4.2	Acidification of Lakes.....	3-82
	3.4.4.2.1	Affected Environment.....	3-83
	3.4.4.2.2	Environmental Consequences .....	3-84
	3.4.4.2.2.1	Proposed Action and Alternatives 2 and 3 ..	3-84
	3.4.4.2.2.2	No Action Alternative.	3-85
	3.4.4.2.3	Regulatory Compliance, Mitigation, and Monitoring .....	3-85
	3.4.5	Residual Impacts to Air Quality .....	3-85
3.5		Water Resources.....	3-85
	3.5.1	Groundwater.....	3-85
	3.5.1.1	Affected Environment.....	3-85
	3.5.1.1.1	Recent Alluvium .....	3-86
	3.5.1.1.2	Wasatch Formation.....	3-92
	3.5.1.1.3	Wyodak/Wyodak Anderson Coal ..	3-94
	3.5.1.1.4	Subcoal Fort Union Formation .....	3-96
	3.5.1.1.5	Lance Formation-Fox Hills Sandstone .....	3-97
	3.5.1.2	Environmental Consequences.....	3-97
	3.5.1.2.1	Proposed Action and Alternatives 2 and 3.....	3-97

**TABLE OF CONTENTS (Continued)**

3.5.1.2.1.1 North, South, and West  
Hilight Field LBA  
Tracts ..... 3-102

3.5.1.2.1.2 West Jacobs Ranch  
LBA Tract..... 3-107

3.5.1.2.1.3 North and South  
Porcupine LBA  
Tracts ..... 3-111

3.5.1.2.2 No Action Alternative ..... 3-116

3.5.1.3 Regulatory Compliance, Mitigation, and  
Monitoring..... 3-116

3.5.2 Surface Water ..... 3-117

3.5.2.1 Affected Environment..... 3-117

3.5.2.2 Environmental Consequences..... 3-128

3.5.2.2.1 Proposed Action and Alternatives  
2 and 3..... 3-128

3.5.2.2.1.1 North, South, and West  
Hilight Field LBA  
Tracts ..... 3-129

3.5.2.2.1.2 West Jacobs Ranch  
LBA Tract..... 3-131

3.5.2.2.1.3 North and South  
Porcupine LBA  
Tracts ..... 3-131

3.5.2.2.2 No Action Alternative ..... 3-132

3.5.2.3 Regulatory Compliance, Mitigation, and  
Monitoring..... 3-132

3.5.3 Water Rights ..... 3-133

3.5.3.1 Affected Environment..... 3-133

3.5.3.2 Environmental Consequences..... 3-137

3.5.3.2.1 Proposed Action and Alternatives  
2 and 3..... 3-137

3.5.3.2.1.1 North Hilight Field  
LBA Tract..... 3-138

3.5.3.2.1.2 South Hilight Field  
LBA Tract..... 3-138

3.5.3.2.1.3 West Hilight Field  
LBA Tract..... 3-139

3.5.3.2.1.4 West Jacobs Ranch  
LBA Tract..... 3-139

3.5.3.2.1.5 North Porcupine  
LBA Tract..... 3-140

3.5.3.2.1.6 South Porcupine  
LBA Tract..... 3-140

3.5.3.2.2 No Action Alternative ..... 3-141

**TABLE OF CONTENTS (Continued)**

	3.5.3.3	Regulatory Compliance, Mitigation and Monitoring.....	3-141
	3.5.4	Residual Impacts.....	3-141
3.6		Alluvial Valley Floors .....	3-142
	3.6.1	Affected Environment .....	3-142
	3.6.1.1	North Hilight Field LBA Tract.....	3-143
	3.6.1.2	South Hilight Field LBA Tract .....	3-144
	3.6.1.3	West Hilight Field LBA Tract.....	3-145
	3.6.1.4	West Jacobs Ranch LBA Tract .....	3-145
	3.6.1.5	North Porcupine LBA Tract.....	3-146
	3.6.1.6	South Porcupine LBA Tract .....	3-146
	3.6.2	Environmental Consequences .....	3-146
	3.6.2.1	Proposed Action and Alternatives 2 and 3..	3-146
	3.6.2.2	No Action Alternative .....	3-149
	3.6.3	Regulatory Compliance, Mitigation and Monitoring...	3-149
	3.6.4	Residual Impacts.....	3-150
3.7		Wetlands.....	3-150
	3.7.1	Affected Environment .....	3-150
	3.7.1.1	North Hilight Field LBA Tract.....	3-153
	3.7.1.2	South Hilight Field LBA Tract .....	3-154
	3.7.1.3	West Hilight Field LBA Tract.....	3-154
	3.6.1.4	West Jacobs Ranch LBA Tract .....	3-155
	3.6.1.5	North Porcupine LBA Tract.....	3-156
	3.6.1.6	South Porcupine LBA Tract .....	3-157
	3.7.2	Environmental Consequences .....	3-157
	3.7.2.1	Proposed Action and Alternatives 2 and 3..	3-157
	3.7.2.2	No Action Alternative .....	3-158
	3.7.3	Regulatory Compliance, Mitigation and Monitoring...	3-158
	3.7.4	Residual Impacts.....	3-159
3.8		Soils.....	3-159
	3.8.1	Affected Environment .....	3-159
	3.8.1.1	North Hilight Field, South Hilight Field and West Hilight Field LBA Tracts .....	3-160
	3.8.1.2	West Jacobs Ranch LBA Tract .....	3-161
	3.8.1.3	North and South Porcupine LBA Tracts .....	3-161
	3.8.2	Environmental Consequences .....	3-162
	3.8.2.1	Proposed Action and Alternatives 2 and 3..	3-162
	3.8.2.1.1	North Hilight Field LBA Tract .....	3-163
	3.8.2.1.2	South Hilight Field LBA Tract .....	3-163
	3.8.2.1.3	West Hilight Field LBA Tract .....	3-164
	3.8.2.1.4	West Jacobs Ranch LBA Tract ...	3-164
	3.8.2.1.5	North Porcupine LBA Tract .....	3-165
	3.8.2.1.6	South Porcupine LBA Tract.....	3-165
	3.8.2.2	No Action Alternative .....	3-166
	3.8.3	Regulatory Compliance, Mitigation and Monitoring...	3-166
	3.8.4	Residual Impacts.....	3-167

**TABLE OF CONTENTS (Continued)**

3.9 Vegetation ..... 3-167

3.9.1 Affected Environment..... 3-167

3.9.2 Environmental Consequences..... 3-169

3.9.2.1 Proposed Action and Alternatives 2 and 3.. 3-169

3.9.2.2 No Action Alternative ..... 3-172

3.9.3 Threatened, Endangered, Proposed, and Candidate  
Plant Species, and BLM and USFS Sensitive Plant  
Species..... 3-172

3.9.4 Regulatory Compliance, Mitigation and Monitoring... 3-172

3.9.5 Residual Impacts.....3-173

3.10 Wildlife..... 3-173

3.10.1 General Setting..... 3-173

3.10.1.1 Affected Environment ..... 3-173

3.10.1.2 Environmental Consequences..... 3-176

3.10.1.2.1 Proposed Action and  
Alternatives 2 and 3..... 3-176

3.10.1.2.2 No Action Alternative ..... 3-177

3.10.2 Big Game..... 3-178

3.10.2.1 Affected Environment ..... 3-178

3.10.2.2 Environmental Consequences..... 3-180

3.10.2.2.1 Proposed Action and  
Alternatives 2 and 3..... 3-180

3.10.2.2.2 No Action Alternative ..... 3-181

3.10.3 Other Mammals..... 3-181

3.10.3.1 Affected Environment ..... 3-181

3.10.3.1.1 North, South, and West Hilight  
Field LBA Tracts ..... 3-189

3.10.3.1.2 West Jacobs Ranch LBA Tract . 3-189

3.10.3.1.3 North and South Porcupine  
LBA Tracts ..... 3-189

3.10.3.2 Environmental Consequences..... 3-190

3.10.3.2.1 Proposed Action and  
Alternatives 2 and 3..... 3-190

3.10.3.2.2 No Action Alternative ..... 3-191

3.10.4 Raptors..... 3-191

3.10.4.1 Affected Environment ..... 3-191

3.10.4.1.1 North, South, and West Hilight  
Field LBA Tracts ..... 3-192

3.10.4.1.2 West Jacobs Ranch LBA Tract . 3-193

3.10.4.1.3 North and South Porcupine  
LBA Tracts ..... 3-193

3.10.4.2 Environmental Consequences..... 3-194

3.10.4.2.1 Proposed Action and  
Alternatives 2 and 3..... 3-194

**TABLE OF CONTENTS (Continued)**

	3.10.4.2.1.1	North, South, and West Hilight Field LBA Tracts.....	3-195
	3.10.4.2.1.2	West Jacobs Ranch LBA Tract .....	3-195
	3.10.4.2.1.3	North and South Porcupine LBA Tracts .....	3-196
	3.10.4.2.2	No Action Alternative .....	3-196
3.10.5		Upland Game Birds.....	3-196
	3.10.5.1	Affected Environment .....	3-196
	3.10.5.1.1	Sage-Grouse Use Associated With the North, South, and West Hilight Field LBA Tracts.....	3-201
	3.10.5.1.2	Sage-Grouse Use Associated With the West Jacobs Ranch LBA Tract .....	3-203
	3.10.5.1.3	Sage-Grouse Use Associated With the North and South Porcupine LBA Tracts .....	3-203
	3.10.5.2	Environmental Consequences.....	3-205
	3.10.5.2.1	Proposed Action and Alternatives 2 and 3.....	3-205
	3.10.5.3	No Action Alternative .....	3-209
3.10.6		Other Birds.....	3-209
	3.10.6.1	Affected Environment .....	3-209
	3.10.6.2	Environmental Consequences.....	3-213
	3.10.6.2.1	Proposed Action and Alternatives 2 and 3.....	3-213
	3.10.6.2.2	No Action Alternative .....	3-215
3.10.7		Amphibians, Reptiles, and Aquatic Species.....	3-215
	3.10.7.1	Affected Environment .....	3-215
	3.10.7.2	Environmental Consequences.....	3-217
	3.10.7.2.1	Proposed Action and Alternatives 2 and 3.....	3-217
	3.10.7.2.2	No Action Alternative .....	3-217
3.10.8		Threatened, Endangered, Proposed, and Candidate Species; BLM Sensitive Species; and USFS Sensitive Species and Management Indicator Species.....	3-217
3.10.9		Regulatory Compliance, Mitigation and Monitoring...	3-217
3.10.10		Residual Impacts.....	3-220
3.11		Land Use and Recreation.....	3-221
	3.11.1	Affected Environment.....	3-221
	3.11.2	Environmental Consequences.....	3-246
	3.11.2.1	Proposed Action and Alternatives 2 and 3..	3-246
	3.11.2.2	No Action Alternative .....	3-248

**TABLE OF CONTENTS (Continued)**

3.11.3 Regulatory Compliance, Mitigation and Monitoring .. 3-248

3.11.4 Residual Impacts..... 3-249

3.12 Cultural Resources..... 3-249

3.12.1 Affected Environment ..... 3-249

3.12.1.1 North, South, and West Hilight Field LBA  
Tracts..... 3-254

3.12.1.2 West Jacobs Ranch LBA Tract ..... 3-255

3.12.1.3 North and South Porcupine LBA Tracts .... 3-256

3.12.2 Environmental Consequences ..... 3-257

3.12.2.1 Proposed Action and Alternatives 2 and 3 . 3-257

3.12.2.2 No Action Alternative ..... 3-257

3.12.3 Native American Consultation ..... 3-258

3.12.4 Regulatory Compliance, Mitigation and Monitoring.. 3-259

3.12.5 Residual Impacts..... 3-259

3.13 Visual Resources..... 3-259

3.13.1 Affected Environment ..... 3-259

3.13.2 Environmental Consequences..... 3-261

3.13.2.1 Proposed Action and Alternatives 2 and 3.. 3-261

3.13.2.2 No Action Alternative ..... 3-262

3.13.3 Regulatory Compliance, Mitigation and Monitoring.. 3-262

3.13.4 Residual Impacts..... 3-262

3.14 Noise..... 3-263

3.14.1 Affected Environment ..... 3-263

3.14.2 Environmental Consequences..... 3-265

3.14.2.1 Proposed Action and Alternatives 2 and 3.. 3-265

3.14.2.2 No Action Alternative ..... 3-267

3.14.3 Regulatory Compliance, Mitigation and Monitoring.. 3-268

3.14.4 Residual Impacts..... 3-268

3.15 Transportation ..... 3-268

3.15.1 Affected Environment ..... 3-268

3.15.2 Environmental Consequences..... 3-275

3.15.2.1 Proposed Action and Alternatives 2 and 3.. 3-275

3.15.2.2 No Action Alternative ..... 3-277

3.15.3 Regulatory Compliance, Mitigation and Monitoring.. 3-277

3.15.4 Residual Impacts..... 3-277

3.15.4.1 Coal Loss During Rail Transport ..... 3-277

3.16 Hazardous and Solid Waste ..... 3-280

3.16.1 Affected Environment ..... 3-280

3.16.2 Environmental Consequences..... 3-280

3.16.2.1 Proposed Action and Alternatives 2 and 3.. 3-280

3.16.2.2 No Action Alternative ..... 3-281

3.16.3 Regulatory Compliance, Mitigation and Monitoring.. 3-281

3.16.4 Residual Impacts..... 3-281

3.17 Socioeconomics ..... 3-281

3.17.1 Local Economy ..... 3-281

3.17.1.1 Affected Environment ..... 3-281

**TABLE OF CONTENTS (Continued)**

3.17.1.2 Environmental Consequences..... 3-285

    3.17.1.2.1 Proposed Action and Alternatives 2 and 3..... 3-285

        3.17.1.2.1.1 North Hilight Field LBA Tract..... 3-285

        3.17.1.2.1.2 South Hilight Field LBA Tract..... 3-287

        3.17.1.2.1.3 West Hilight Field LBA Tract..... 3-287

        3.17.1.2.1.4 West Jacobs Ranch LBA Tract..... 3-287

        3.17.1.2.1.5 North Porcupine LBA Tract..... 3-288

        3.17.1.2.1.6 South Porcupine LBA Tract..... 3-288

    3.17.1.2.2 No Action Alternative ..... 3-288

3.17.2 Population..... 3-289

    3.17.2.1 Affected Environment ..... 3-289

    3.17.2.2 Environmental Consequences..... 3-289

        3.17.2.2.1 Proposed Action and Alternatives 2 and 3..... 3-289

        3.17.2.2.2 No Action Alternative ..... 3-290

3.17.3 Employment..... 3-290

    3.17.3.1 Affected Environment ..... 3-290

    3.17.3.2 Environmental Consequences..... 3-291

        3.17.3.2.1 Proposed Action and Alternatives 2 and 3..... 3-291

            3.17.3.2.1.1 North Hilight Field LBA Tract..... 3-291

            3.17.3.2.1.2 South Hilight Field LBA Tract..... 3-291

            3.17.3.2.1.3 West Hilight Field LBA Tract..... 3-292

            3.17.3.2.1.4 West Jacobs Ranch LBA Tract..... 3-292

            3.17.3.2.1.5 North Porcupine LBA Tract..... 3-292

            3.17.3.2.1.6 South Porcupine LBA Tract..... 3-292

        3.17.3.2.2 No Action Alternative ..... 3-293

3.17.4 Housing..... 3-293

    3.17.4.1 Affected Environment ..... 3-293

    3.17.4.2 Environmental Consequences..... 3-295

        3.17.4.2.1 Proposed Action and Alternatives 2 and 3..... 3-295

        3.17.4.2.2 No Action Alternative ..... 3-295

**TABLE OF CONTENTS (Continued)**

3.17.5 Local Government Facilities and Services..... 3-296  
 3.17.5.1 Affected Environment ..... 3-296  
 3.17.5.2 Environmental Consequences..... 3-298  
     3.17.5.2.1 Proposed Action and  
         Alternatives 2 and 3..... 3-298  
     3.17.5.2.2 No Action Alternative ..... 3-298  
 3.17.6 Social Setting ..... 3-299  
 3.17.6.1 Affected Environment ..... 3-299  
 3.17.6.2 Environmental Consequences..... 3-299  
     3.17.6.2.1 Proposed Action and  
         Alternatives 2 and 3..... 3-299  
     3.17.6.2.2 No Action Alternative ..... 3-299  
 3.17.7 Environmental Justice..... 3-299  
 3.17.7.1 Affected Environment ..... 3-299  
 3.17.7.2 Environmental Consequences..... 3-300  
     3.17.7.2.1 Proposed Action and  
         Alternatives 2 and 3..... 3-300  
     3.17.7.2.2 No Action Alternative ..... 3-301  
 3.17.8 Regulatory Compliance, Mitigation and Monitoring.. 3-301  
 3.17.9 Residual Impacts..... 3-301  
 3.18 Relationship Between Local Short-Term Uses of Man’s  
 Environment and the Maintenance and Enhancement of  
 Long-Term Productivity ..... 3-301  
 3.18.1 Local Area..... 3-301  
     3.18.1.1 Human Health Impact Assessment..... 3-303  
 3.18.2 Greenhouse Gas Emissions ..... 3-304  
 3.19 Irreversible and Irretrievable Commitments of Resources..... 3-308  
 4.0 CUMULATIVE ENVIRONMENTAL CONSEQUENCES ..... 4-1  
 4.1 Past, Present, and Reasonably Foreseeable Development ..... 4-2  
     4.1.1 Coal Development..... 4-4  
         4.1.1.1 Coal Mine Development ..... 4-4  
         4.1.1.2 Coal-Related Development ..... 4-14  
             4.1.1.2.1 Coal Transportation..... 4-14  
             4.1.1.2.2 Electric Power Generation..... 4-16  
             4.1.1.2.3 Transmission Lines..... 4-17  
             4.1.1.2.4 Coal Conversion Technology ..... 4-18  
     4.1.2 Oil and Gas Development ..... 4-19  
         4.1.2.1 Conventional Oil and Gas ..... 4-19  
         4.1.2.2 CBNG Development ..... 4-21  
         4.1.2.3 Oil and Gas Related Development ..... 4-22  
             4.1.2.3.1 Pipelines..... 4-23  
             4.1.2.3.2 Refineries..... 4-24  
     4.1.3 Other Development Activity ..... 4-25  
         4.1.3.1 Other Mining..... 4-25  
         4.1.3.2 Industrial Manufacturing ..... 4-28

**TABLE OF CONTENTS (Continued)**

	4.1.3.3	Wind Power.....	4-28
	4.1.3.4	Solar Power.....	4-29
	4.1.3.5	Reservoirs.....	4-30
	4.1.3.6	Other Non-Energy Development.....	4-30
4.2		Cumulative Environmental Consequences .....	4-33
	4.2.1	Topography and Physiography .....	4-35
	4.2.2	Geology, Mineral Resources, and Paleontology .....	4-36
	4.2.2.1	Coal.....	4-36
	4.2.2.2	Oil and Gas .....	4-37
	4.2.2.3	Other Mineral Resources .....	4-37
	4.2.2.4	Paleontology.....	4-37
	4.2.3	Air Quality.....	4-38
	4.2.4	Water Resources.....	4-48
	4.2.4.1	Groundwater.....	4-49
	4.2.4.2	Surface Water.....	4-59
	4.2.5	Channel Stability.....	4-64
	4.2.6	Alluvial Valley Floors .....	4-65
	4.2.7	Soils.....	4-66
	4.2.8	Vegetation, Wetlands and Riparian Areas .....	4-67
	4.2.8.1	Vegetation.....	4-67
	4.2.8.2	Special Status Plant Species .....	4-68
	4.2.8.3	Noxious and Invasive Weed Species .....	4-68
	4.2.8.4	Wetland and Riparian Species .....	4-70
	4.2.9	Wildlife and Fisheries .....	4-70
	4.2.9.1	Game Species.....	4-71
	4.2.9.2	Non-game Species.....	4-74
	4.2.9.3	Fisheries.....	4-75
	4.2.9.4	Special Status Species .....	4-78
	4.2.10	Land Use and Recreation.....	4-81
	4.2.10.1	Grazing and Agriculture.....	4-82
	4.2.10.2	Urban Use .....	4-84
	4.2.10.3	Recreation .....	4-84
	4.2.11	Cultural Resources and Native American Concerns...	4-86
	4.2.11.1	Prehistoric Sites.....	4-86
	4.2.11.2	Historic Sites .....	4-88
	4.2.11.3	Native American Traditional Cultural Places.....	4-88
	4.2.11.4	Site Protection .....	4-88
	4.2.12	Transportation and Utilities.....	4-88
	4.2.13	Socioeconomics.....	4-91
	4.2.13.1	Employment and the Economic Base .....	4-92
	4.2.13.2	Labor Market Conditions .....	4-94
	4.2.13.3	Personal Income .....	4-95
	4.2.13.4	Population and Demographics .....	4-95
	4.2.13.5	Housing.....	4-98
	4.2.13.6	Public Education .....	4-101

**TABLE OF CONTENTS (Continued)**

4.2.13.7 Facilities and Services ..... 4-102  
 4.2.13.8 Fiscal Conditions..... 4-104  
 4.2.13.9 Social Setting..... 4-106  
 4.2.14 Coal Mining and Coal-Fired Power Plant Related  
 Emissions and By-Products..... 4-108  
 4.2.14.1 Global Climate Change and Greenhouse  
 Gas Emissions..... 4-109  
 4.2.14.2 Mercury, Coal Combustion Residues, and  
 Other By-Products..... 4-123  
 5.0 CONSULTATION AND COORDINATION..... 5-1  
 6.0 REFERENCES CITED ..... 6-1  
 7.0 GLOSSARY ..... 7-1  
 8.0 INDEX..... 8-1

**LIST OF TABLES**

Table ES-1. Summary Comparison of Coal Production, Surface  
 Disturbance, Mine Life, and Revenues for North Hilight  
 Field LBA Tract and Black Thunder Mine – Shroyer Road  
 is Not Moved and the Underlying Coal is Not Recovered .....ES-15  
 Table ES-2. Summary Comparison of Coal Production, Surface  
 Disturbance, Mine Life, and Revenues for North Hilight  
 Field LBA Tract and Black Thunder Mine – Shroyer Road  
 is Moved and the Underlying Coal is Recovered .....ES-16  
 Table ES-3. Summary Comparison of Coal Production, Surface  
 Disturbance, Mine Life, and Revenues for South Hilight  
 Field LBA Tract and Black Thunder Mine – Reno Road is  
 Not Moved and Underlying Coal is Not Recovered .....ES-17  
 Table ES-4. Summary Comparison of Coal Production, Surface  
 Disturbance, Mine Life, and Revenues for South Hilight  
 Field LBA Tract and Black Thunder Mine – Reno Road is  
 Moved and the Underlying Coal is Recovered .....ES-18  
 Table ES-5. Summary Comparison of Coal Production, Surface  
 Disturbance, Mine Life, and Revenues for West Hilight  
 Field LBA Tract and Black Thunder Mine – State Highway  
 450 and Hilight Road are Not Moved and the Underlying  
 Coal is Not Recovered .....ES-19  
 Table ES-6. Summary Comparison of Coal Production, Surface  
 Disturbance, Mine Life, and Revenues for West Hilight  
 Field LBA Tract and Black Thunder Mine – State Highway  
 450 and Hilight Road are Moved and the Underlying  
 Coal is Recovered .....ES-20

**TABLE OF CONTENTS (Continued)**

**LIST OF TABLES (Continued)**

Table ES-7. Summary Comparison of Coal Production, Surface Disturbance, Mine Life, and Revenues for West Jacobs Ranch LBA Tract and Jacobs Ranch Mine – State Highway 450 and Hilight Road are Not Moved and the Underlying Coal is Not Recovered .....ES-21

Table ES-8. Summary Comparison of Coal Production, Surface Disturbance, Mine Life, and Revenues for West Jacobs Ranch LBA Tract and Jacobs Ranch Mine – State Highway 450 and Hilight Road are Moved and the Underlying Coal is Recovered .....ES-22

Table ES-9. Summary Comparison of Coal Production, Surface Disturbance, Mine Life, and Revenues for North Porcupine LBA Tract and North Antelope Rochelle Mine – Mackey Road is Not Moved and the Underlying Coal is Not Recovered .....ES-23

Table ES-10. Summary Comparison of Coal Production, Surface Disturbance, Mine Life, and Revenues for North Porcupine LBA Tract and North Antelope Rochelle Mine – Mackey Road is Moved and the Underlying Coal is Recovered .....ES-24

Table ES-11. Summary Comparison of Coal Production, Surface Disturbance, Mine Life, and Revenues for South Porcupine LBA Tract and North Antelope Rochelle Mine – 2.25-Mile Section of Antelope Road is Not Moved and the Underlying Coal is Not Recovered .....ES-25

Table ES-12. Summary Comparison of Coal Production, Surface Disturbance, Mine Life, and Revenues for South Porcupine LBA Tract and North Antelope Rochelle Mine – 2.25-Mile Section of Antelope Road is Moved and the Underlying Coal is Recovered .....ES-26

Table ES-13. Projected Maximum Potential Near-field Impacts .....ES-58

Table ES-14. Modeled Change in Visibility Impacts at Class I and Sensitive Class II Areas .....ES-59

Table ES-15. Recent and Projected PRB Population .....ES-60

  

Table 1-1. Leases Issued and Exchanges Completed Since Decertification, Powder River Basin, Wyoming ..... 1-6

Table 1-2. Pending LBAs, Powder River Basin, Wyoming ..... 1-8

  

Table 2-1. Regulatory Compliance, Mitigation and Monitoring Measures for Surface Coal Mining Operations Required by SMCRA and State Law for all Alternatives..... 2-70

Table 2-2. Summary Comparison of Coal Production, Surface Disturbance, Mine Life, and Revenues for North Hilight Field LBA Tract and Black Thunder Mine – Shroyer Road is Not Moved and the Underlying Coal is Not Recovered ..... 2-78

**TABLE OF CONTENTS (Continued)**

**LIST OF TABLES (Continued)**

Table 2-3. Summary Comparison of Coal Production, Surface Disturbance, Mine Life, and Revenues for North Hilight Field LBA Tract and Black Thunder Mine – Shroyer Road is Moved and Underlying Coal is Recovered ..... 2-79

Table 2-4. Summary Comparison of Coal Production, Surface Disturbance, Mine Life, and Revenues for South Hilight Field LBA Tract and Black Thunder Mine – Reno Road is Not Moved and the Underlying Coal is Not Recovered..... 2-80

Table 2-5. Summary Comparison of Coal Production, Surface Disturbance, Mine Life, and Revenues for South Hilight Field LBA Tract and Black Thunder Mine – Reno Road is Moved and the Underlying Coal is Recovered ..... 2-81

Table 2-6. Summary Comparison of Coal Production, Surface Disturbance, Mine Life, and Revenues for West Hilight Field LBA Tract and Black Thunder Mine – State Highway 450 and Hilight Road are Not Moved and the Underlying Coal is Not Recovered ..... 2-82

Table 2-7. Summary Comparison of Coal Production, Surface Disturbance, Mine Life, and Revenues for West Hilight Field LBA Tract and Black Thunder Mine – State Highway 450 and Hilight Road are Moved and the Underlying Coal is Recovered ..... 2-83

Table 2-8. Summary Comparison of Coal Production, Surface Disturbance, Mine Life, and Revenues for West Jacobs Ranch LBA Tract and Jacobs Ranch Mine – State Highway 450 and Hilight Road are Not Moved and the Underlying Coal is Not Recovered ..... 2-84

Table 2-9. Summary Comparison of Coal Production, Surface Disturbance, Mine Life, and Revenues for West Jacobs Ranch LBA Tract and Jacobs Ranch Mine – State Highway 450 and Hilight Road are Moved and the Underlying Coal is Recovered ..... 2-85

Table 2-10. Summary Comparison of Coal Production, Surface Disturbance, Mine Life, and Revenues for North Porcupine LBA Tract and North Antelope Rochelle Mine – Mackey Road is Not Moved and the Underlying Coal is Not Recovered ..... 2-86

Table 2-11. Summary Comparison of Coal Production, Surface Disturbance, Mine Life, and Revenues for North Porcupine LBA Tract and North Antelope Rochelle Mine – Mackey Road is Moved and the Underlying Coal is Recovered ..... 2-87

**TABLE OF CONTENTS (Continued)**

**LIST OF TABLES (Continued)**

Table 2-12.	Summary Comparison of Coal Production, Surface Disturbance, Mine Life, and Revenues for South Porcupine LBA Tract and North Antelope Rochelle Mine – 2.25-Mile Section of Antelope Road is Not Moved and the Underlying Coal is Not Recovered .....	2-88
Table 2-13.	Summary Comparison of Coal Production, Surface Disturbance, Mine Life, and Revenues for South Porcupine LBA Tract and North Antelope Rochelle Mine – 2.25-Mile Section of Antelope Road is Moved and the Underlying Coal is Recovered .....	2-89
Table 2-14.	Summary Comparison of Magnitude and Duration of Direct and Indirect Impacts for Alternative 1 (No Action), the Proposed Action, Alternative 2, and Alternative 3 for the North Hilight Field, South Hilight Field, West Hilight Field, West Jacobs Ranch, North Porcupine, and South Porcupine LBA Tracts ....	2-91
Table 2-15.	Summary Comparison of Magnitude and Duration of Cumulative Impacts .....	2-98
Table 3-1.	Comparison of Existing and Proposed Black Thunder Mine Disturbance Area and Mining Operations for the North Hilight Field LBA Tract .....	3-4
Table 3-2.	Comparison of Existing and Proposed Black Thunder Mine Disturbance Area and Mining Operations for the South Hilight Field LBA Tract .....	3-4
Table 3-3.	Comparison of Existing and Proposed Black Thunder Mine Disturbance Area and Mining Operations for the West Hilight Field LBA Tract .....	3-5
Table 3-4.	Comparison of Existing and Proposed Jacobs Ranch Mine Disturbance Area and Mining Operations for the West Jacobs Ranch LBA Tract .....	3-5
Table 3-5.	Comparison of Existing and Proposed North Antelope Rochelle Mine Disturbance Area and Mining Operations for the North Porcupine LBA Tract .....	3-6
Table 3-6.	Comparison of Existing and Proposed North Antelope Rochelle Mine Disturbance Area and Mining Operations for the South Porcupine LBA Tract .....	3-6
Table 3-7.	Average Overburden, Interburden, and Coal Thicknesses and Approximate Postmining Surface Elevation Changes of the Six LBA Tracts .....	3-14
Table 3-8.	Assumed Background Air Pollutant Concentrations, Applicable AAQS, and PSD Increment Values .....	3-37
Table 3-9.	2001 Through 2008 Annual 4 <sup>th</sup> Max, 8-Hour Average Ozone Values.....	3-66
Table 3-10.	Annual Ambient NO <sub>2</sub> Concentration Data .....	3-76

**TABLE OF CONTENTS (Continued)**

**LIST OF TABLES (Continued)**

Table 3-11. 2002 Through 2008 Annual Mean NO<sub>2</sub> Concentration Data... 3-77

Table 3-12. Approximate Distances and Directions from the General Wright Analysis Area to Mandatory Federal PSD Class I, Tribal Federal PSD Class I, and Federal PSD Class II Areas..... 3-79

Table 3-13. Existing Acid Neutralizing Capacity in Sensitive Lakes..... 3-84

Table 3-14. Vegetation Types Identified and Mapped Within the Combined Vegetation Analysis Areas..... 3-168

Table 3-15. Distribution of Surface Ownership Within Each LBA Tract Configured Under Alternative 2, BLM's Preferred Alternative..... 3-221

Table 3-16. North Hilight Field LBA Tract Federal Oil and Gas Lessees of Record..... 3-235

Table 3-17. South Hilight Field LBA Tract Federal Oil and Gas Lessees of Record..... 3-236

Table 3-18. West Hilight Field LBA Tract Federal Oil and Gas Lessees of Record..... 3-237

Table 3-19. West Jacobs Ranch LBA Tract Federal Oil and Gas Lessees of Record..... 3-238

Table 3-20. North Porcupine LBA Tract Federal Oil and Gas Lessees of Record..... 3-239

Table 3-21. South Porcupine LBA Tract Federal Oil and Gas Lessees of Record..... 3-241

Table 3-22. Noise Impacts Associated with Mine Blasting on the Wright Area LBA Tracts ..... 3-266

Table 3-23. Projected Socioeconomic Impacts from Leasing the Wright Area LBA Tracts Under the Proposed Action and Alternatives 2 and 3 ..... 3-286

Table 3-24. Estimated Annual Equivalent CO<sub>2</sub> Emissions at the Black Thunder, Jacobs Ranch, and North Antelope Rochelle Mines ..... 3-307

  

Table 4-1. Status and Ownership of Wyoming PRB Coal Mines for 2003, the PRB Coal Review Baseline Year, and for 2007 ..... 4-6

Table 4-2. Baseline Year and Projected Wyoming PRB Coal Mine Development, Lower Coal Production Scenario ..... 4-10

Table 4-3. Baseline Year and Projected Wyoming PRB Coal Mine Development, Upper Coal Production Scenario ..... 4-11

Table 4-4. Baseline Year and Projected Wyoming PRB Coal-Related Development Scenario ..... 4-14

Table 4-5. Past, Present, and Projected Wyoming PRB Coal Mine and Coal-Related Development Scenario..... 4-20

Table 4-6. Baseline Year and Projected Wyoming PRB Conventional Oil and Gas Development Scenario ..... 4-21

**TABLE OF CONTENTS (Continued)**

**LIST OF TABLES (Continued)**

Table 4-7. Baseline Year and Projected CBNG Development Scenario for the Wyoming PRB..... 4-22

Table 4-8. Wyoming PRB Conventional Oil and Gas, CBNG, and Related Development Disturbance and Water Production..... 4-23

Table 4-9. U.S. Nuclear Resources Commission Applications for In-Situ Recovery Uranium Projects in the Wyoming PRB Study Area ..... 4-27

Table 4-10. Baseline Year and Projected Wyoming PRB Total Development Scenario – Task 3 Study Area ..... 4-33

Table 4-11. Projected Maximum Potential Near-field Impacts ..... 4-41

Table 4-12. Maximum Predicted PSD Class I and Sensitive Class II Area Impacts..... 4-44

Table 4-13. Modeled Change in Visibility Impacts at Class I and Sensitive Class II Areas ..... 4-45

Table 4-14. Predicted Total Cumulative Change in Acid Neutralizing Capacity of Sensitive Lakes ..... 4-47

Table 4-15. Recoverable Groundwater in the Fort Union/Wasatch Aquifer System..... 4-50

Table 4-16. Water Use as of 2002 in the Powder/Tongue River Basins..... 4-59

Table 4-17. Surface Water Availability in the Powder/Tongue River Basins..... 4-60

Table 4-18. Water Use as of 2002 in the Northeast Wyoming River Basins..... 4-60

Table 4-19. Surface Water Availability in the Northeast Wyoming River Basins..... 4-61

Table 4-20. Summary of Proposed Limits for SAR and EC ..... 4-63

Table 4-21. Impact of CBNG Production Water on Perennial Streams..... 4-65

Table 4-22. Potential Cumulative Disturbance to Pronghorn Ranges from Development Activities—Lower and Upper Coal Production Scenarios..... 4-72

Table 4-23. Potential Cumulative Disturbance to White-tailed Deer Ranges from Development Activities—Lower and Upper Coal Production Scenarios..... 4-72

Table 4-24. Potential Cumulative Disturbance to Mule Deer Ranges from Development Activities—Lower and Upper Coal Production Scenarios ..... 4-73

Table 4-25. Potential Cumulative Disturbance to Elk Ranges from Development Activities – Lower and Upper Coal Production Scenarios..... 4-73

Table 4-26. Potential Cumulative Impacts to Greater Sage-grouse Leaks from Coal Mine Development – Upper and Lower Coal Production Scenarios..... 4-81

Table 4-27. Land Use by Surface Ownership..... 4-82

**TABLE OF CONTENTS (Continued)****LIST OF TABLES (Continued)**

Table 4-28.	AUMs and Acres of Cropland Estimated Unavailable on Lands Disturbed and Not Yet Reclaimed as a Result of Development Activities .....	4-83
Table 4-29.	Square Miles of Projected Cumulative Disturbance and Number of Potentially Affected Cultural Resource Sites in the PRB Coal Review Task 3 Study Area – Lower and Upper Coal Production Scenarios.....	4-87
Table 4-30.	PRB Rail Lines Coal Hauling Capacity and Projected Use.....	4-91
Table 4-31.	Recent and Projected PRB Population.....	4-96
Table 4-32.	Rental Housing Vacancy Rates, 2004 4Q and 2006 4Q.....	4-98
Table 4-33.	Total Housing Stock in 2000 and 2005.....	4-98
Table 4-34.	Monthly Housing Rents in 2006 in the PRB Study Area and Percent Change from 2004 .....	4-99
Table 4-35.	Summary of Mineral Development Tax Revenues Associated with Energy Resource Production Under the Lower Coal Production Scenario .....	4-105
Table 4-36.	Summary of Mineral Development Tax Revenues Associated with Energy Resource Production Under the Upper Coal Production Scenario .....	4-106
Table 4-37.	Estimated Annual Equivalent CO <sub>2</sub> Emissions from Coal Production at Mines With Pending LBAs.....	4-119
Table 4-38.	Projected Percent of CO <sub>2</sub> Emissions by Source.....	4-120
Table 4-39.	Projected Percent of CO <sub>2</sub> Emissions by Source Under a Reduced CO <sub>2</sub> Emissions Scenario.....	4-121
Table 4-40.	2004 Percent Contribution to Worldwide Anthropogenic Mercury Emissions.....	4-125
Table 5-1.	List of Contributors and Reviewers .....	5-4
Table 5-2.	List of Preparers .....	5-7
Table 5-3.	BLM Distribution List for the Wright Area Draft EIS .....	5-9

**LIST OF FIGURES**

Figure ES-1.	General Location Map with Federal Coal Leases and LBA Tracts.....	ES-2
Figure ES-2.	North Hilight Field LBA Tract Alternatives.....	ES-3
Figure ES-3.	South Hilight Field LBA Tract Alternatives .....	ES-4
Figure ES-4.	West Hilight Field LBA Tract Alternatives.....	ES-5
Figure ES-5.	West Jacobs Ranch LBA Tract Alternatives .....	ES-7
Figure ES-6.	North Porcupine LBA Tract Alternatives .....	ES-8
Figure ES-7.	South Porcupine LBA Tract Alternatives.....	ES-9
Figure ES-8.	Maximum Modeled PM <sub>10</sub> and NO <sub>x</sub> Concentrations at the Black Thunder Mine Ambient Air Boundary for the Year 2017.....	ES-32

**TABLE OF CONTENTS (Continued)**

**LIST OF FIGURES (Continued)**

Figure ES-9. Maximum Modeled PM<sub>10</sub> Concentrations at the Jacobs Ranch Mine Ambient Air Boundary for the Years 2013 and 2015 .....ES-33

Figure ES-10. Maximum Modeled PM<sub>0</sub> and NO<sub>x</sub> Concentrations at the North Antelope Rochelle Mine Ambient Air Boundary for the Year 2015.....ES-34

Figure ES-11. Residences, School Bus Stops, Public Roads, and Other Publicly Accessible Facilities Within 3 Miles of the North Hilight Field LBA Tract Under Alternative 2.....ES-37

Figure ES-12. Residences, School Bus Stops, Public Roads, and Other Publicly Accessible Facilities Within 3 Miles of the South Hilight Field LBA Tract Under Alternative 2.....ES-38

Figure ES-13. Residences, School Bus Stops, Public Roads, and Other Publicly Accessible Facilities Within 3 Miles of the West Hilight Field LBA Tract Under Alternative 2.....ES-39

Figure ES-14. Residences, School Bus Stops, Public Roads, and Other Publicly Accessible Facilities Within 3 Miles of the West Jacobs Ranch LBA Tract Under Alternative 2.....ES-40

Figure ES-15. Residences, School Bus Stops, Public Roads, and Other Publicly Accessible Facilities Within 3 Miles of the North Porcupine LBA Tract Under Alternative 2 .....ES-41

Figure ES-16. Residences, School Bus Stops, Public Roads, and Other Publicly Accessible Facilities Within 3 Miles of the South Porcupine LBA Tract Under Alternative 2 .....ES-42

Figure ES-17. Extrapolated Extent of Life of Mine Cumulative Drawdown Within the Wyodak Coal Aquifer With the Addition of Wright Area Coal LBA Tracts.....ES-43

  

Figure 1-1. General Location Map with Federal Coal Leases and LBA Tracts..... 1-2

Figure 1-2. Black Thunder Mine’s Federal Coal Leases and North Hilight Field, South Hilight Field, and West Hilight Field LBA Tracts as Applied for ..... 1-9

Figure 1-3. Jacobs Ranch Mine’s Federal Coal Leases and West Jacobs Ranch LBA Tract as Applied for ..... 1-13

Figure 1-4. North Antelope Rochelle Mine’s Federal Coal Leases and North Porcupine and South Porcupine LBA Tracts as Applied for..... 1-15

  

Figure 2-1. North Hilight Field LBA Tract Alternatives ..... 2-2

Figure 2-2. South Hilight Field LBA Tract Alternatives..... 2-3

Figure 2-3. West Hilight Field LBA Tract Alternatives..... 2-4

Figure 2-4. West Jacobs Ranch LBA Tract Alternatives..... 2-5

Figure 2-5. North Porcupine LBA Tract Alternatives..... 2-6

**TABLE OF CONTENTS (Continued)**

**LIST OF APPENDICES (Continued)**

Figure 2-6. South Porcupine LBA Tract Alternatives ..... 2-7

Figure 3-1. General Wright Analysis Area ..... 3-3

Figure 3-2. Stratigraphic Relationship and Hydrologic Characteristics of Upper Cretaceous, Lower Tertiary, and Recent Geologic Units, PRB, Wyoming..... 3-17

Figure 3-3. Wind Rose, Air Quality and Meteorological Stations at the Black Thunder Mine..... 3-40

Figure 3-4. Wind Rose, Air Quality and Meteorological Stations at the Jacobs Ranch Mine ..... 3-41

Figure 3-5. Wind Rose, Air Quality and Meteorological Stations at the North Antelope Rochelle Mine..... 3-42

Figure 3-6. Annual Coal Production and Overburden Removal vs. Ambient Particulates for the General Wright Analysis Area ..... 3-43

Figure 3-7. Maximum Modeled PM<sub>10</sub> and NO<sub>x</sub> Concentrations at the Black Thunder Mine Ambient Air Boundary for the Year 2015 ..... 3-48

Figure 3-8. Maximum Modeled PM<sub>10</sub> and NO<sub>x</sub> Concentrations at the Black Thunder Mine Ambient Air Boundary for the Year 2017 ..... 3-49

Figure 3-9. Residences, School Bus Stops, Public Roads, and Other Publicly Accessible Facilities Within 3 Miles of the North Hilight Field LBA Tract Under Alternative 2 ..... 3-51

Figure 3-10. Residences, School Bus Stops, Public Roads, and Other Publicly Accessible Facilities Within 3 Miles of the South Hilight Field LBA Tract Under Alternative 2 ..... 3-52

Figure 3-11. Residences, School Bus Stops, Public Roads, and Other Publicly Accessible Facilities Within 3 Miles of the West Hilight Field LBA Tract Under Alternative 2 ..... 3-53

Figure 3-12. Maximum Modeled PM<sub>10</sub> Concentrations at the Jacobs Ranch Mine Ambient Air Boundary for the Years 2013 and 2015..... 3-55

Figure 3-13. Residences, School Bus Stops, Public Roads, and Other Publicly Accessible Facilities Within 3 Miles of the West Jacobs Ranch LBA Tract Under Alternative 2..... 3-56

Figure 3-14. Maximum Modeled PM<sub>10</sub> and NO<sub>x</sub> Concentrations at the North Antelope Rochelle Mine Ambient Air Boundary for the Year 2012..... 3-58

Figure 3-15. Maximum Modeled PM<sub>10</sub> and NO<sub>x</sub> Concentrations at the North Antelope Rochelle Mine Ambient Air Boundary for the Year 2015..... 3-59

**TABLE OF CONTENTS (Continued)**

**LIST OF FIGURES (Continued)**

Figure 3-16. Residences, School Bus Stops, Public Roads, and Other Publicly Accessible Facilities Within 3 Miles of the North Porcupine LBA Tract Under Alternative 2 ..... 3-61

Figure 3-17. Residences, School Bus Stops, Public Roads, and Other Publicly Accessible Facilities Within 3 Miles of the South Porcupine LBA Tract Under Alternative 2 ..... 3-62

Figure 3-18. Maximum Modeled PM<sub>10</sub> and NO<sub>x</sub> Concentrations at the Jacobs Ranch Mine Ambient Air Boundary for the Years 2006 and 2013..... 3-72

Figure 3-19. Visibility in the Badlands and Bridger Wilderness Area..... 3-80

Figure 3-20. Locations of Currently Active Groundwater Monitoring and Water Supply Wells at the Black Thunder Mine ..... 3-87

Figure 3-21. Locations of Currently Active Groundwater Monitoring and Water Supply Wells at the Jacobs Ranch Mine ..... 3-88

Figure 3-22. Locations of Currently Active Groundwater Monitoring and Water Supply Wells at the North Antelope Rochelle Mine ..... 3-89

Figure 3-23. Black Thunder Mine Life of Mine Drawdown, Resulting from Currently Approved Mining with the Addition of the North, South, and West Hilight Field LBA Tracts ..... 3-105

Figure 3-24. Jacobs Ranch Mine Life of Mine Drawdown, Resulting from Currently Approved Mining with the Addition of the West Jacobs Ranch LBA Tract ..... 3-109

Figure 3-25. North Antelope Rochelle Mine Life of Mine Drawdown, Resulting from Currently Approved Mining with the Addition of the North and South Porcupine LBA Tracts ..... 3-114

Figure 3-26. Surface Drainage in the General Wright Analysis Area..... 3-119

Figure 3-27. Surface Water Features Within and Adjacent to the North Hilight Field LBA Tract Alternatives ..... 3-120

Figure 3-28. Surface Water Features Within and Adjacent to the South Hilight Field LBA Tract Alternatives ..... 3-121

Figure 3-29. Surface Water Features Within and Adjacent to the West Hilight Field LBA Tract Alternatives ..... 3-123

Figure 3-30. Surface Water Features Within and Adjacent to the West Jacobs Ranch LBA Tract Alternatives ..... 3-124

Figure 3-31. Surface Water Features Within and Adjacent to the North and South Porcupine LBA Tract Alternatives ..... 3-125

Figure 3-32. Raptor Nest Sites, Sage-Grouse Leks, and Prairie Dog Colonies Within and Adjacent to the North Hilight Field LBA Tract .... 3-183

Figure 3-33. Raptor Nest Sites, Sage-Grouse Leks, and Prairie Dog Colonies Within and Adjacent to the South Hilight Field LBA Tract.... 3-184

Figure 3-34. Raptor Nest Sites, Sage-Grouse Leks, and Prairie Dog Colonies Within and Adjacent to the West Hilight Field LBA Tract..... 3-185

Figure 3-35. Raptor Nest Sites, Sage-Grouse Leks, and Prairie Dog Colonies Within and Adjacent to the West Jacobs Ranch LBA Tract... 3-186

**TABLE OF CONTENTS (Continued)**

**LIST OF APPENDICES (Continued)**

Figure 3-36. Raptor Nest Sites, Sage-Grouse Leks, and Prairie Dog Colonies Within and Adjacent to the North Porcupine LBA Tract..... 3-187

Figure 3-37. Raptor Nest Sites, Sage-Grouse Leks, and Prairie Dog Colonies Within and Adjacent to the South Porcupine LBA Tract ..... 3-188

Figure 3-38. Average Male Sage-grouse Lek Attendance Within the Northeast Wyoming Local Working Group Area..... 3-206

Figure 3.39.- Average Male Sage-grouse Lek Attendance Statewide and Within the Northeast Wyoming Local Sage-grouse Working Group Area and the Thunder Basin National Grasslands..... 3-206

Figure 3-40. Surface Ownership Within the North Hilight Field LBA Tract Alternatives ..... 3-222

Figure 3-41. Surface Ownership Within the South Hilight Field LBA Tract Alternatives ..... 3-223

Figure 3-42. Surface Ownership Within the West Hilight Field LBA Tract Alternatives ..... 3-224

Figure 3-43. Surface Ownership Within the West Jacobs Ranch LBA Tract Alternatives ..... 3-225

Figure 3-44. Surface Ownership Within the North Porcupine LBA Tract Alternatives ..... 3-226

Figure 3-45. Surface Ownership Within the South Porcupine LBA Tract Alternatives ..... 3-227

Figure 3-46. Oil and Gas Wells and Oil and Gas Ownership Within the North Hilight Field LBA Tract Alternatives ..... 3-229

Figure 3-47. Oil and Gas Wells and Oil and Gas Ownership Within the South Hilight Field LBA Tract Alternatives ..... 3-230

Figure 3-48. Oil and Gas Wells and Oil and Gas Ownership Within the West Hilight Field LBA Tract Alternatives..... 3-231

Figure 3-49. Oil and Gas Wells and Oil and Gas Ownership Within the West Jacobs Ranch LBA Tract Alternatives ..... 3-232

Figure 3-50. Oil and Gas Wells and Oil and Gas Ownership Within the North Porcupine LBA Tract Alternatives..... 3-233

Figure 3-51. Oil and Gas Wells and Oil and Gas Ownership Within the South Porcupine LBA Tract Alternatives ..... 3-234

Figure 3-52. Relationship Between A-Scale Decibel Readings and Sounds of Daily Life ..... 3-264

Figure 3-53. Transportation Facilities Within and Adjacent to the North, South, and West Hilight Field LBA Tracts ..... 3-269

Figure 3-54. Transportation Facilities Within and Adjacent to the West Jacobs Ranch LBA Tract ..... 3-270

Figure 3-55. Transportation Facilities Within and Adjacent to the North and South Porcupine LBA Tracts ..... 3-271

Figure 3-56. Pipelines Within and Adjacent to the North, South, and West Hilight Field LBA Tracts ..... 3-272

**TABLE OF CONTENTS (Continued)**

**LIST OF FIGURES (Continued)**

Figure 3-57. Pipelines Within and Adjacent to the West Jacobs Ranch  
LBA Tract ..... 3-273

Figure 3-58. Pipelines Within and Adjacent to the North and South  
Porcupine LBA Tracts ..... 3-274

Figure 3-59. Estimated Wyoming and Federal Revenues from 2007 Coal  
Production in Campbell County ..... 3-284

Figure 4-1. Wyoming Study Area for PRB Coal Review Studies Evaluating  
Current and Projected Levels of Development ..... 4-3

Figure 4-2. Tons of Federal Coal Leased Versus Tons of Coal Mined Since  
1990 ..... 4-5

Figure 4-3. Projected Total Coal Production from Campbell and Converse  
Counties Under the Lower and Upper Production Scenarios .... 4-9

Figure 4-4. Wyoming Task 3 Study Area for PRB Coal Review Studies  
Evaluating Projected Environmental Consequences ..... 4-34

Figure 4-5. Extrapolated Extent of Cumulative Drawdown Within the  
Wyodak Coal Aquifer in the Wright Area Subregion..... 4-54

Figure 4-6. Projected Campbell County Population and Employment to  
2020 ..... 4-97

Figure 4-7. Projected Housing Demand in the PRB Study Area Under  
the Lower Coal Production Scenario ..... 4-100

Figure 4-8. Project School Enrollment Trends to 2020 Under the Lower  
Production Scenario ..... 4-102

**LIST OF APPENDICES**

Appendix A. Federal and State Permitting Requirements and Agencies

Appendix B. Unsuitability Criteria for the North Hilight Field, South Hilight  
Field, West Hilight Field, West Jacobs Ranch, North Porcupine,  
and South Porcupine LBA Study Areas

Appendix C. Coal Lease-By-Application Flow Chart

Appendix D. Bureau of Land Management Special Coal Lease Stipulations,  
U.S. Forest Service Special Stipulations, and Form 3400-12  
Coal Lease

Appendix E. Conventional Oil and Gas and Coal Bed Natural Gas Wells  
Capable of Production Located Within the BLM Study Areas for  
the North Hilight Field LBA Tract, South Hilight Field LBA Tract,  
West Hilight Field LBA Tract, West Jacobs Ranch LBA Tract,  
North Porcupine LBA Tract and South Porcupine LBA Tract

**TABLE OF CONTENTS (Continued)**

**LIST OF APPENDICES (Continued)**

- Appendix F. Supplemental Air Quality Information
- Appendix G. Biological Assessment for the Wright Area Coal Lease Applications EIS for the North Hilight Field LBA Tract, South Hilight Field LBA Tract, West Hilight Field LBA Tract, West Jacobs Ranch LBA Tract, North Porcupine LBA Tract and South Porcupine LBA Tract
- Appendix H. BLM Sensitive Species and USFS Region 2 Sensitive Species and Management Indicator Species Evaluations for the Wright Area Coal Lease Applications EIS

## *Abbreviations and Acronyms*

---

### *Abbreviations and Acronyms Used in this Report*

---

AAQS	Ambient Air Quality Standards
Ac	acre(s)
ACC	Antelope Coal Company
ac-ft	acre-foot, acre-feet
ac-ft/yr	acre-foot per year, acre-feet per year
AIRS	Aerometric Information and Retrieval System
ALC	Ark Land Company
AML	Abandoned Mine Land
ANC	acidification neutralization capacity
ANFO	ammonium nitrate fuel oil
APD	Application for Permit to Drill
APLIC	Avian Power Line Interaction Committee
AQD	Air Quality Division
AQRV	air quality related values
ARCO	Atlantic Richfield Company
ARS	Air Resource Specialists, Inc.
ASCM	alternative sediment control measure
AUM	animal unit month
AVF	alluvial valley floor
A&C	Allen and Crouch Petroleum Engineers, Inc.
BACM	best available control measure
BACT	best available control technology
bcf	billion cubic feet
bcy	bank cubic yards
BLM	Bureau of Land Management
BMP	Best Management Practice
BNSF	Burlington Northern Santa Fe
BNSF-UP, BNSF&UP	Burlington Northern Santa Fe and Union Pacific
BN-UP, BN&UP	Burlington Northern-Union Pacific
BOE	barrels of oil equivalent
B.P.	before present
BTU	BTU Western Resources, Inc.
Btu	British thermal units
Btu/lb	British thermal units per pound
CAA	Clean Air Act
CAAA	Clean Air Act Amendment
CAGR	compounded annual growth rate
CANAC	CANAC Railway Service, Inc.
CANDO	Converse Area New Development Organization
CBNG	coal bed natural gas
CCBC	Campbell County Board of Commissioners
CCC	Caballo Coal Company
CCEDC	Campbell County Economic Development Corporation
CCP	coal combustion product
CCSD	Campbell County School District
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
cfs	cubic feet per second
CHIA	Cumulative Hydrologic Impact Assessment
CH <sub>4</sub>	methane

*Abbreviations and Acronyms Used in this Report*

---

CMC	Cordero Mining Company
CO	carbon monoxide
CO <sub>2</sub>	carbon dioxide
CO <sub>2</sub> e	CO <sub>2</sub> equivalents
COE	U.S. Army Corps of Engineers
CP	Canadian Pacific Railway Ltd.
CREG	Consensus Revenue Estimating Group
CRI	Caballo Rojo, Inc.
CSI	Community Strategies Institute
CWA	Clean Water Act
cy	cubic yards
dBA	A-weighted decibels
DEIS	Draft Environmental Impact Statement
DM&E	Dakota, Minnesota & Eastern Railroad Corporation
DOE	Department of Energy
DNRC	Department of Natural Resources and Conservation
DOI	Department of the Interior
dv	deciview, a measure of view impairment
EA	Environmental Assessment
EC	elemental carbon particles (re: air quality)
EIA	Energy Information Administration
EIS	Environmental Impact Statement
ENCOAL	Encoal Corporation
EO	Executive Order
EOR	enhanced oil recovery
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
EQC	Environmental Quality Council
ESA	Endangered Species Act
EUR	estimated ultimate recovery
EVG	Erathem-Vanir Geological, PLLC
F	Fahrenheit
FAA	Federal Aviation Administration
FCLAA	Federal Coal Leasing Act Amendments of 1976
FCW	Foundation Coal West, Inc.
FDM	Fugitive Dust Model
FEA	Final Environmental Assessment
FEIS	Final Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
FGD	Flue Gas Desulfurization
FLM	Federal Land Management
FLPMA	Federal Land Policy Management Act of 1976
FR	Federal Register
FRA	Federal Railroad Administration
ft	feet, foot
ft/day	feet per day
ft/mile	feet per mile
ft <sup>3</sup>	cubic feet
FY	fiscal year
FYPC	Fossil Yield Potential Classification
g	gram

## *Abbreviations and Acronyms*

---

### *Abbreviations and Acronyms Used in this Report*

---

GAO	General Accounting Office
GAGMO	Gillette Area Ground Water Monitoring Organization
GDP	Gross Domestic Product
GHG	greenhouse gas
GIS	Geographic Information Systems
gpm	gallons per minute
GSP	Gross State Product
HAP	Hazardous Air Pollutant
HFC	hydrofluorocarbon
HIP	Health Impact Assessment
hp	horsepower
hr	hour
HUC	Hydrologic Unit Code
IBLA	Interior Board of Land Appeals
IMPROVE	Interagency Monitoring of Protected Visual Environments
IR	Intermountain Resources
JRCC	Jacobs Ranch Coal Company
JRM	Jacobs Ranch Mine
J&S	Thunderbird - Jones & Stokes
km	kilometers
kV	kilovolts
LAC	limits of acceptable change (re: air quality)
LBA	lease by application
lbs/mmBtu	pounds per million British thermal units
LFC	liquids from coal
LNCM	Lands Necessary to Conduct Mining
LOP	life of project
LRMP	Land and Resource Management Plan
LW	Lower Wyodak coal seam
MACT	Maximum Achievable Control Technology
MBHFI	migratory birds of high federal interest
MBTA	Migratory Bird Treaty Act
µeq/L	microequivalents per liter
µg/m <sup>3</sup>	micrograms per cubic meter
µmhos/cm	micromhos per centimeter
mcf	thousand cubic feet
MDEQ	Montana Department of Environmental Quality
MDEQ/AWM	Montana Department of Environmental Quality/Air and Waste Management Bureau
MEI	maximally exposed individual
mg/L	milligrams per liter
MLA	Mineral Leasing Act of 1920
MLE	most likely exposure
mm	million
mmbcy	million bank cubic yards
mmbo	million barrels of oil
mmcf	million cubic feet
mmcfpd	million cubic feet of gas per day
mmgpy	million gallons per year
mmt	million tons
mmtpy	million tons per year

*Abbreviations and Acronyms Used in this Report*

mph	miles per hour
MSA	Metropolitan Statistical Area
MSDS	material safety data sheet
MW	megawatts
NAAQS	National Ambient Air Quality Standards
NADP	National Atmospheric Deposition Program
NAPG	North American Power Group
NARM	North Antelope Rochelle Mine
NCTA	National Coal Transportation Association
NEAP	Natural Events Action Plan
NEPA	National Environmental Policy Act of 1969
NERC	North American Electric Reliability Corporation
NIOSH	National Institute of Occupational Safety and Health
NO	nitrogen oxide
NOA	notice of availability
NOAA	National Oceanic and Atmospheric Administration
NOI	notice of intent
N <sub>2</sub> O	nitrous oxide
NO <sub>2</sub>	nitrogen dioxide
NO <sub>x</sub>	nitrogen oxides
NPDES	National Pollution Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSPS	National Source Performance Standards
NWI	National Wetlands Inventory
NWLSWG	Northeast Wyoming Local Sage-Grouse Working Group
O <sub>3</sub>	ozone (photochemical oxidants)
OC	organic carbon particles
OHWM	ordinary high water mark
ORV	off road vehicle
OSHA	Occupational Safety and Health Administration
OSM	Office of Surface Mining Reclamation & Enforcement
OWUS	other waters of the U.S.
PEC	Peabody Energy Corporation
PECs	passive enclosure control systems
PFYC	Probable Fossil Yield Classification
P.M.	Prime Meridian
P&M	Pittsburg and Midway Coal Mining Company
PM <sub>2.5</sub>	particulates finer than 2.5 microns in effective diameter
PM <sub>10</sub>	particulates finer than 10 microns in effective diameter
PMT	postmining topography
POD	Plan of Development
ppm	parts per million
PRB	Powder River Basin
PRBRC	Powder River Basin Resource Council
PRC	Powder River Coal, LLC
PRCC	Powder River Coal Company
PRRCT	Powder River Regional Coal Team
PSD	Prevention of Significant Deterioration
R2P2	Resource Recovery and Protection Plan

## *Abbreviations and Acronyms*

---

### *Abbreviations and Acronyms Used in this Report*

---

RAG	RAG Coal West, Inc.
RH	relative humidity
RMEF	Rocky Mountain Elk Foundation
RMP	Resource Management Plan
ROD	Record of Decision
ROW	right-of-way
RTEA	Rio Tinto Energy America
RV	recreational vehicle
SAR	sodium absorption ratio
SARA	Superfund Amendment & Reauthorization Act of 1986
scf/ton	standard cubic feet per ton
SCSD	Sheridan County School District
SEIS	Supplemental Environmental Impact Statement
SEO	State Engineer's Office
SGAC	South Gillette Area Coal
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SMCRA	Surface Mining Control and Reclamation Act of 1977
SO <sub>2</sub>	sulfur dioxide
SPL	Sound Pressure Level
SPRB	South Powder River Basin
STB	Surface Transportation Board
T&E	Threatened and Endangered
TBCC	Thunder Basin Coal Company, LLC
TBNG	Thunder Basin National Grassland
TCO	temporary cessation of operations
TDS	total dissolved solids
TJS	Thunderbird, Jones & Stokes
TPY	tons per year
TSP	total suspended particulates
TSS	total suspended solids
UPRR	Union Pacific Rail Road
U.S.	United States
USC, U.S.C.	United States Code
USDA	U.S. Department of Agriculture
USDA-FS	U.S. Department of Agriculture - Forest Service
USDI	U.S. Department of the Interior
USDOE	U.S. Department of Energy
USGS	U.S. Geological Survey
USFS	U.S. Department of Agriculture - Forest Service
USFWS	U.S. Fish and Wildlife Service
UW	University of Wyoming
VMT	vehicle miles traveled
VOCs	volatile organic compounds
VRM	visual resource management
WA	Wilderness Area
WAC	Wright Area Coal
WAAQS	Wyoming Ambient Air Quality Standards
WAQSR	Wyoming Air Quality Standards and Regulations
WARMS	Wyoming Air Resources Monitoring System
WCDA	Wyoming Community Development Authority

***Abbreviations and Acronyms Used in this Report***

---

WCIC	Wyoming Coal Information Committee
WDEQ	Wyoming Department of Environmental Quality
WDEQ/AQD	Wyoming Department of Environmental Quality/Air Quality Division
WDEQ/ISD	Wyoming Department of Environmental Quality/Industrial Siting Division
WDEQ/LQD	Wyoming Department of Environmental Quality/Land Quality Division
WEQC	Wyoming Environmental Quality Council
WFA	Western Fuels Association
WGFD	Wyoming Game and Fish Department
WMA	Wyoming Mining Association
WOC	Wyoming Outdoor Council
WOGCC	Wyoming Oil and Gas Conservation Commission
WoUS	Waters of the U.S.
WRCC	Western Regional Climate Center
WRRRI	Water Resources Research Institute
WSBLC	Wyoming State Board of Land Commissioners
WSFC	Wyoming School Facilities Commission
WSGS	Wyoming State Geological Survey
WSO-RMG	Wyoming State Office Reservoir Management Group (BLM)
WYDOT	Wyoming Department of Transportation
WYPDES	Wyoming Pollution Discharge Elimination System
WYNDD	Wyoming Natural Diversity Database
WWC	WWC Engineering