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Wyoming's Response to the US and Tribes, Volume VIII, Appendix B, Part 3

Attorney General, State of Wyoming

WYOMING'S RESPONSE TO THE UNITED STATES' AND TRIBES' PROPOSED FINDINGS OF FACT, CONCLUSIONS OF LAW, INTERLOCUTORY DECREE AND SUPPORTING BRIEFS

VOLUME VIII

Appendix B

(Part 3).

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Margaret V. Hampton CLERK

DEPUTY

IN THE DISTRICT COURT OF THE
FIFTH JUDICIAL DISTRICT
STATE OF WYOMING

IN RE: THE GENERAL ADJUDICATION OF ALL RIGHTS TO USE WATER IN THE BIG HORN RIVER SYSTEM AND ALL OTHER SOURCES, STATE OF WYOMING	)	CIVIL NO. 4993

VOLUME 8

APPENDIX B

(PART 3)

This part 3 of Appendix B responds to the Tribes' Proposed Findings of Fact 162 through 265. Each Proposed Finding to which Wyoming responds is reproduced verbatim on a single page with Wyoming's response thereto on the page or pages immediately following.

N.B. Wyoming has not responded to every finding of fact proposed by the Tribes but the lack of a response to a finding should not be construed as an admission of the relevance or accuracy of such finding.

Tribes' Proposed Finding of Fact:

6. Type VII Lands -- Diversion Requirements

162. Mr. Stetson estimated water requirements for the Type VII lands for the United States. Mr. Stetson testified that for Type VII, or idle, lands, within the projects, diversion requirements were determined the same way as for other lands within the projects -- based on historic data. Mr. Stetson testified, subsequently modified by Mr. Dornbusch (U.S. Ex. C-278, Table 18) that diversion requirements for Type VII lands in the projects were as follows:

Project Area	Acres	Annual Diversion Requirements (Acre-Feet Per Acre)	Total Annual Diversion Requirements
Ray	1,769	5.32	9,411
Coolidge	1,161	4.95	5,747
Subagency	200	5.26	1,052
Upper Wind River 'A'	99	12.06	1,194
Upper Wind Dinwoody Bench	393	12.06	4,738
Johnstown	199	6.94	1,312
Lefthand	587	6.9	4,050
LeClair	100	5.48	548
TOTAL	4,498		28,052

(Tr. V. 58, pp. 5258-60, modified by U.S. Ex. C-278, Table 18)

Wyoming's General Response to United States' Proposed Findings of Fact 162 through 164, in part:

Tribes' Proposed Findings of Fact 162 through 164, regarding Type VII lands, are incomplete and erroneous. As a result these Proposed Findings are virtually useless to the Court. The deficiencies, errors and alternative acreage with water requirements are summarized below.

There are seven major deficiencies and errors in the United States' Proposed Findings of Fact with respect to adjudicated lands. These are that:

1. Not all of the claimed lands are currently held in trust by the United States. See Wyoming's Amended Proposed Findings of Fact 28-1 et seq., and support therefor.

2. The climatic data, upon which net irrigation requirement is based, is too general. See Wyoming's Amended Proposed Findings of Fact 23-12, 23-13 and support therefor.

3. Different land types have water requirements commensurate with the current availability and use of water. See Wyoming's Amended proposed Finding of Fact 23-12, 23-12 and support therefor.

4. The historic and estimated conveyance and application efficiencies are too low. See Wyoming's Amended Proposed Findings of Fact 23-12, 23-13 and support therefor

5. Since the United States' evaluation of net irrigation requirements, land types and efficiencies are incorrect, the resulting diversion requirements are unreasonably high. See Wyoming's Amended Proposed Findings of Fact 26-12, 23-13 and support therefor.

6. Furthermore, the net irrigation requirement, a necessary component in quantifying reserved water rights, is not provided in the proposed findings. Compare, Wyoming's Amended Proposed Decree (Appendix 1). cf., Arizona v. California, (Supplemental Decree) 439 U.S. 419, 422 (1979); Wyo. Stat. § 41-3-104; Basin Electric Power v. State Board of Control, 578 P.2d 557 (Wyo. 1978).

7. Nonarable land, therefore nonirrigable land, is incorrectly included in the acreage. See Wyoming's Amended Proposed Finding of Fact 23-7 and support therefor.

In view of these numerous errors and inconsistencies, the State of Wyoming submitted evidence prior to economic analysis regarding acreage and water requirements summarized in the following table. See Wyoming's Amended Proposed Finding of Fact 23-1 et seq., and support therefor.

TYPE VII TRUST LANDS
ACREAGE AND WATER REQUIREMENTS
STATE EVALUATION WITHOUT ECONOMICS

Project or Stream Number	Description	Acres	Diversion Requirement Acre-Feet	Net Irrigation Requirement Acre-Feet
	PROJECT LANDS:			
	WIND RIVER FEDERAL IRRIGATION PROJECT			
	LITTLE WIND UNIT	1,109.1	2,773.4	1,386.7
1	Ray Unit	706.4	1,804.6	902.3
2	Coolidge Unit	146.6	433.6	216.8
3	SubAgency Unit			
	UPPER WIND UNIT	0.0	0.0	0.0
4	Wind River 'A' Canal	311.7	872.8	436.4
5	Dinwoody Bench Area	53.1	150.0	75.1
6	JOHNSTOWN UNIT	267.5	792.0	396.0
7	LEETHAND UNIT			
8	RIDVALE IRRIGATION DISTRICT - TRUST LANDS	0.0	0.0	0.0
9	LECLAIR IRRIGATION DISTRICT - TRUST LANDS	56.4	167.0	83.5
	Total Project Lands	2,648.8	6,993.4	3,496.8
	NON-PROJECT LANDS:			
	WIND RIVER BASIN	0.0	0.0	0.0
10	East Fork Wind River	0.0	0.0	0.0
11	Dinwoody Creek	0.0	0.0	0.0
12	Dry Creek (12 5N-4W)	37.3	100.8	50.4
13	Bull Lake Creek	51.9	131.8	65.9
14	Meadow Creek	73.0	92.0	46.0
15	Dry (Pasup) Creek	92.2	122.2	61.1
16	Crow Creek	0.0	0.0	0.0
17	Willow Creek	0.0	0.0	0.0
18	Sand Draw	178.9	495.8	247.9
19	Wind River - Main Stem			
	Subtotal	433.3	942.6	471.3

TYPE VII
WITHOUT ECONOMICS

Project on Stream Number	Description	Acres	Diversion Requirement Acre-Feet	Net Irrigation Requirement Acre-Feet
	BIG HORN RIVER BASIN			
10	Main Stem - Big Horn River	24.2	71.6	15.8
18	Cottonwood Creek	53.9	82.0	41.0
20	Muddy Creek	103.3	148.4	74.2
21	Five Mile Creek	0.0	0.0	0.0
	Subtotal	181.4	302.0	131.0
	LITTLE WIND RIVER BASIN			
22	North Fork Little Wind River	132.1	110.2	165.1
23	South Fork Little Wind River	0.0	0.0	0.0
24	Main Stem- Little Wind River	214.6	635.2	122.6
25	Sage Creek	600.7	829.0	414.5
26	Crooked Creek	0.0	0.0	0.0
27	Trout Creek	0.0	0.0	0.0
28	Spring Creek	0.0	0.0	0.0
29	Big Horn Draw	0.0	0.0	0.0
17	Hill Creek	0.0	0.0	0.0
	Subtotal	947.4	1,794.4	902.2
	POPO AGIE RIVER BASIN			
11	North Fork Popo Agie River	0.0	0.0	0.0
12	Main Stem - Popo Agie River	0.0	0.0	0.0
	Subtotal	0.0	0.0	0.0
	OWL CREEK BASIN			
14	Main Stem - Owl Creek	0.0	0.0	0.0
13	South Fork Owl Creek and Tributaries	35.0	48.4	24.2
15	Red Creek	0.0	0.0	0.0
16	Red Creek	0.0	0.0	0.0
	Subtotal	35.0	48.4	24.2
	Total: Non-Project Lands	1,597.1	3,007.4	1,548.7
	GRAND TOTAL	4,245.9	10,000.0	5,045.5

The State of Wyoming also submitted evidence regarding acreage and water requirements after economic analysis at 7-1/8% discount rate. The information is summarized in the following table.

TYPE VII TRUST LANDS
ACREAGE AND WATER REQUIREMENTS
STATE EVALUATION WITH ECONOMICS
ANALYSIS AT 7-1/8 PERCENT

Project or Stream Number	Description	Acres	Diversion Requirement Acre-Feet	Net Irrigation Requirement Acre-Feet
	PROJECT LANDS:			
	WIND RIVER FEDERAL IRRIGATION PROJECT			
	LITTLE WIND UNIT			
1	Ray Unit	870.2	2,195.8	1,097.9
2	Coolidge Unit	649.1	1,662.4	831.2
3	SubAgency Unit	0.0	0.0	0.0
	UPPER WIND UNIT			
4	Wind River 'A' Canal	0.0	0.0	0.0
5	Dinwoody Bench Area	199.4	558.6	279.3
6	JOHNSTOWN UNIT	30.0	88.8	44.4
7	LEETHAND UNIT	245.5	726.8	363.4
8	RIDVALE IRRIGATION DISTRICT - TRUST LANDS	0.0	0.0	0.0
9	LECLAIR IRRIGATION DISTRICT - TRUST LANDS	56.4	167.0	83.5
	Total Project Lands	2,050.6	5,399.4	2,699.7
	NON-PROJECT LANDS:			
	WIND RIVER BASIN			
10	East Fork Wind River	0.0	0.0	0.0
11	Dinwoody Creek	0.0	0.0	0.0
12	Dry Creek (32-5N-4W)	37.3	100.8	50.4
13	Bull Lake Creek	51.9	131.8	65.9
14	Meadow Creek	0.0	0.0	0.0
15	Dry (Pavup) Creek	17.2	23.8	11.9
16	Crow Creek	0.0	0.0	0.0
17	Willow Creek	0.0	0.0	0.0
18	Sand Draw	72.0	201.6	100.8
19	Wind River - Main Stem			
	Subtotal	178.4	458.0	229.0

TYPE VII
WITH ECONOMIC ANALYSIS
AT 7-1/8 PERCENT

Project on Stream Number	Description	Acres	Diversion Requirement Acre-Feet	Net Irrigation Requirement Acre-Feet
	BIG HORN RIVER BASIN			
10	Main Stem - Big Horn River	24.2	71.6	15.8
18	Cottonwood Creek	0.0	0.0	0.0
20	Buddy Creek	0.0	0.0	0.0
21	Five Mile Creek	0.0	0.0	0.0
	Subtotal	24.2	71.6	15.8
	LITTLE WIND RIVER BASIN			
22	South Fork Little Wind River	132.1	330.2	165.1
23	South Fork Little Wind River	0.0	0.0	0.0
24	Main Stem - Little Wind River	110.2	326.2	163.1
25	Sage Creek	0.0	0.0	0.0
26	Crooked Creek	0.0	0.0	0.0
27	Trout Creek	0.0	0.0	0.0
28	Spring Creek	0.0	0.0	0.0
29	Big Horn Draw	0.0	0.0	0.0
17	Hill Creek	0.0	0.0	0.0
	Subtotal	242.3	656.4	328.2
	POPO AGIE RIVER BASIN			
11	South Fork Popo Agie River	0.0	0.0	0.0
12	Main Stem - Popo Agie River	0.0	0.0	0.0
	Subtotal	0.0	0.0	0.0
	OWL CREEK BASIN			
14	Main Stem - Owl Creek	0.0	0.0	0.0
11	South Fork Owl Creek and Tributaries	0.0	0.0	0.0
15	Red Creek	0.0	0.0	0.0
16	Red Creek	0.0	0.0	0.0
	Subtotal	0.0	0.0	0.0
	Total: Non-Project Lands	444.9	1,186.0	593.0
	GRAND TOTAL	2,503.5	6,585.4	3,292.7

Tribes' Proposed Finding of Fact:

165. Mr. Sostrum and Mr. Bishop testified for the State on diversion requirements for Type VII lands. They assumed that when Type VII lands were brought back into irrigation, they would fall into the same proportion of full service, partial service and subirrigation as the unadjudicated in-use lands (Tr. V. 148, pp. 13694-97). Then, the same reductions in "net irrigation requirement" were made as with the unadjudicated in-use land -- .3 of net irrigation requirement for Types IV and VI; no water for Type V's; combined with a shortened irrigation season for water short areas.

Wyoming's Response:

165. Since the future always requires some degree of speculation, particularly in a complex area such as irrigation development, there is no reason to believe that these lands, if irrigated, will not eventually fall into the same land types or use patterns as currently in-use lands.

Tribes' Proposed Finding of Fact:

166. I find that the diversion requirements suggested by the State for Type VII lands are also insufficient to grow crops on those lands. The diversion requirements testified to by Mr. Stetson more closely reflect what is needed to make these lands productive.

Wyoming's Response:

166. See Wyoming's General Response to Tribes' Proposed Findings of Fact 162 through 164.

Tribes' Proposed Finding of Fact:

167. I find that the annual diversion requirement for the Type VII lands is 47,107 acre-feet, as set forth in Findings 162-64 supra.

Wyoming's Response:

167. See Wyoming's General Response to Tribes' Proposed Findings of Fact '162 through 164.

Tribes' Proposed Finding of Fact:

8. Adjudicated Lands -- Diversion Requirements

174. Mr. Stetson testified for the United States on the diversion requirements to serve adjudicated trust lands. He used the same method for adjudicated project lands as he did for other project lands. His conclusions were as follows:

Project Area	Acres	Annual Diversion Requirements (Acre-Feet Per Acre)	Total Annual Diversion Requirements
Ray Unit	347	5.32	1,846
Coolidge Unit	311	4.95	1,539
Subagency Unit	-0-	--	--
Dinwoody Bench	492	12.06	5,934
Johnstown Unit	-0-	--	--
Lefthand Unit	20	6.9	138
TOTAL	1,170		9,457

(Tr. V. 58, pp. 5230-32.)

Wyoming's General Response to Tribes' Proposed Findings of Fact 174 through 176, in part:

Tribes' Proposed Findings of Fact 174 through 176 regarding adjudicated lands are incomplete and erroneous. As a result, these Proposed Findings are virtually useless to the Court. The deficiencies, errors and alternative acreage with water requirements are summarized below.

There are 10 major deficiencies and errors in the United States' Proposed Findings of Fact with respect to adjudicated lands. These are that:

1. Not all of the claimed lands are currently held in trust by the United States. See Wyoming's Amended Proposed Findings of Fact 28-1 et seq. and support therefor.

2. The climatic data, upon which net irrigation requirement is based, is too general. See Wyoming's Amended Proposed Findings of Fact 18-17, 18-18 and support therefor.

3. Different land types have water requirements commensurate with the current availability and use of water. See Wyoming's Amended Proposed Findings of Fact 24-10, 23-12 and support therefor.

4. The historic and estimated conveyance and application efficiencies are too low. See Wyoming's Amended Proposed Finding of Fact 26-10 and support therefor; see also Wyoming's Response to the Tribes' Proposed Findings of Fact 158, 159 and 160.

5. Since the United States' evaluation of net irrigation requirements, land types and efficiencies is incorrect, the resulting diversion requirements are unreasonably high. See Wyoming's Amended Proposed Findings of Fact 26-10, 26-14 and 26-15 and support therefor.

6. Furthermore, the net irrigation requirement, a necessary component in quantifying reserved water rights, is not provided in the proposed findings. Compare, Wyoming's Amended Proposed Decree (Appendix 1); cf., Arizona v. California, (Supplemental Decree) 439 U.S. 419, 422 (1979); Wyo. Stat. § 41-3-104; Basin Electric Power v. State Board of Control, 578 P.2d 557 (Wyo. 1978).

7. There is no evidence in the Record to show that these lands are practicably irrigable because no arability, engineering, economic, or water availability analyses were performed. See Wyoming's Amended Proposed Finding of Fact 26-14 and support therefor; see also Wyoming's Response to the United States' Proposed Finding of Fact 1.

8. Even if these studies are not required in detail, the acres to which the detail is applied are overestimated. Nonarable land, therefore nonirrigable land, is incorrectly included in the acreage. See Wyoming's Amended Proposed Finding of Fact 26-14 and support therefor.

9. Land which was not irrigated in 1980 is erroneously included in the acreage. See Wyoming's Amended Proposed Finding of Fact 26-14 and support therefor.

10. In addition, the United States' Amended Motion to Take Judicial Notice and United States' Exhibit C-304 Adj. are fraught with errors, inconsistencies and contraditions. See Wyoming's Amended Proposed Finding of Fact 26-1, et seq., and support therefor. See also Wyoming's Response to the United States' Proposed Finding of Fact 1.

In view of these numerous errors and inconsistencies, the State of Wyoming submitted evidence regarding acreage and water requirements which are summarized in the following table. See Wyoming's Amended Proposed Finding of Fact 26-1, et seq., and support therefor.

ADJUDICATED TRUST LANDS
ACREAGE AND WATER REQUIREMENTS
STATE EVALUATION

Project or Stream Number	Description	Acres	Diversion Requirement Acre-Feet	Net Irrigation Requirement Acre-Feet
	PROJECT LANDS			
	WIND RIVER FEDERAL IRRIGATION PROJECT			
	LITTLE WIND UNIT	169.0	594.8	297.4
1	Ray Unit	65.0	230.2	115.1
2	Coolidge Unit	0.0	0.0	0.0
3	SubAgency Unit			
	UPPER WIND UNIT	0.0	0.0	0.0
4	Wind River 'A' Canal	387.0	1,532.6	766.3
5	Dinwoody Bench Area	0.0	0.0	0.0
6	JOHNSTOWN UNIT	0.0	0.0	0.0
7	LEETHAND UNIT			
		0.0	0.0	0.0
8	RIDVALE IRRIGATION DISTRICT - TRUST LANDS	0.0	0.0	0.0
9	LECLAIR IRRIGATION DISTRICT - TRUST LANDS	-------	-------	-------
	Total Project Lands	621.0	2,357.6	1,178.8
	NON-PROJECT LANDS			
	WIND RIVER BASIN	0.0	0.0	0.0
10	East Fork Wind River	0.0	0.0	0.0
11	Dinwoody Creek	0.0	0.0	0.0
12	Dry Creek (12-5N-4W)	0.0	0.0	0.0
13	Bull Lake Creek	161.0	380.6	190.3
14	Meadow Creek	537.0	1,002.4	501.2
15	Dry (Pump) Creek	599.0	799.6	399.8
16	Crow Creek	0.0	0.0	0.0
17	Willow Creek	0.0	0.0	0.0
18	Sand Draw	383.0	1,221.5	610.9
19	Wind River - Main Stem	-------	-------	-------
	Subtotal	1,680.0	3,404.1	1,702.2

ADJUDICATED

Project on Stream Number	Description	Acres	Diversion Requirement Acre-Feet	Net Irrigation Requirement Acre-Feet
	BIG HORN RIVER BASIN			
10	Main Stem - Big Horn River	0.0	0.0	0.0
18	Cottonwood Creek	75.0	47.2	21.6
20	Buddy Creek	672.0	1,170.8	585.4
21	Five Mile Creek	3.0	1.8	0.9
	Subtotal	750.0	1,219.8	609.9
	LITTLE WIND RIVER BASIN:			
22	North Fork Little Wind River	285.0	756.8	378.4
23	South Fork Little Wind River	42.0	49.6	24.8
24	Main Stem- Little Wind River	0.0	0.0	0.0
25	Sage Creek	56.0	51.8	26.1
26	Crooked Creek	0.0	0.0	0.0
27	Trout Creek	0.0	0.0	0.0
28	Spring Creek	0.0	0.0	0.0
29	Big Horn Draw	0.0	0.0	0.0
17	Mill Creek	0.0	0.0	0.0
	Subtotal	383.0	858.3	429.1
	POPO AGIE RIVER BASIN			
11	North Fork Popo Agie River	230.0	730.2	365.1
12	Main Stem - Popo Agie River	26.0	77.6	38.8
	Subtotal	256.0	807.8	403.9
	OWL CREEK BASIN			
14	Main Stem - Owl Creek	153.6	222.8	111.4
13	South Fork Owl Creek and Tributaries	234.0	437.0	218.6
15	Red Creek	184.0	337.4	168.7
16	Red Creek	0.0	0.0	0.0
	Subtotal	571.6	997.2	498.7
	Total: Non-Project Lands	3,640.6	7,287.1	3,644.0
	GRAND TOTAL	4,261.6	9,644.7	4,822.8

Tribes' Proposed Finding of Fact:

177. Mr. Sostrum and Mr. Bishop testified for the State concerning the diversion requirements for adjudicated lands. Diversion requirements were provided not for all lands claimed by the United States but only for those adjudicated lands found by Mr. Sommers to be arable and by Mr. Sostrum to be currently in use. The method used by the State's witnesses to determine diversion requirements for these adjudicated lands was the same as they used for the unadjudicated in-use lands.

Wyoming's Response:

177. See Wyoming's General Response to Tribes' Proposed Findings of Fact 174 through 176.

Tribes' Proposed Finding of Fact:

178. I find that the annual diversion requirement for the 17,411 acres (1,926 off-Reservation) of adjudicated trust land is 97,404 acre-feet (10,406 for off-Reservation acreage), as set forth in Findings 174-76 supra.

Wyoming's Response:

178. See Wyoming's General Response to Tribe's Proposed Findings of Fact 174 through 176.

Tribes' Proposed Finding of Fact:

9. Total Historic Diversion Requirements

179. My findings as to the total annual diversion requirements for all historic tract lands -- unadjudicated in-use, adjudicated and Type VII -- in the projects are summarized as follows:

Project Area	Total Annual Diversion Requirements: All Historic Trust Lands (Acre-Feet)
Little Wind	
Ray	52,657
Coolidge	38,753
Subagency	16,632
Upper Wind	
Wind River A Canal	13,483
Dinwoody Bench	66,231
Johnstown	4,539

Project Area	Total Annual Diversion Requirements: All Historic Trust Lands (Acre-Feet)
Lefthand	14,321
Midvale	3,175
LeClair	7,513

Wyoming's General Response to Tribes' Proposed Findings of Fact 179 through 181:

United States' Proposed Findings of Fact 179 through 181 suffer from the same errors and deficiencies noted in Wyoming's General Responses to Tribes' Proposed Findings 123 through 126, 162 through 164, and 174 through 176.

In view of these numerous errors and deficiencies, the State of Wyoming submitted evidence for adjudicated, unadjudicated in-use and Type VII lands prior to economic analysis regarding acreage and water requirements summarized in the following table. See Wyoming's Amended Proposed Findings of Fact 23-1 et seq., 24-1 et seq., 26-1 et seq. and support therefor.

STATE EVALUATION OF TRUST LANDS
ACREAGE AND WATER REQUIREMENTS
UNADJUDICATED IN-USE, ADJUDICATED
AND TYPE VII WITHOUT ECONOMICS

Project or Stream Number	Description	Acres	Diversion Requirement Acre-Feet	Net Irrigation Requirement Acre-Feet
	PROJECT LANDS			
	WIND RIVER FEDERAL IRRIGATION PROJECT			
	LITTLE WIND UNIT			
1	Ray Unit	4,578.3	13,667.8	6,834.0
2	Coolidge Unit	3,559.4	10,779.0	5,189.7
3	SubAgency Unit	1,672.6	6,444.6	3,222.3
	UPPER WIND UNIT			
4	Wind River 'A' Canal	514.0	1,279.2	639.7
5	Dinwoody Bench Area	3,594.7	13,375.6	6,682.0
6	JOHNSTOWN UNIT	251.1	841.6	420.9
7	LEFTHAND UNIT	685.5	2,173.4	1,086.7
8	RIDVALE IRRIGATION DISTRICT - TRUST LANDS	457.8	1,285.9	641.0
9	LECLAIR IRRIGATION DISTRICT - TRUST LANDS	881.4	2,925.1	1,462.6
	Total Project Lands	16,394.8	52,772.2	26,180.9
	NON-PROJECT LANDS			
	WIND RIVER BASIN			
10	East Fork Wind River	7.0	7.6	3.8
11	Dinwoody Creek	101.0	134.0	67.0
12	Dry Creek (12-5N-4W)	62.0	201.0	100.5
13	Bull Lake Creek	48.3	118.6	59.3
14	Meadow Creek	366.9	835.0	417.5
15	Dry (Pasup) Creek	648.0	1,161.2	580.6
16	Crow Creek	719.2	967.4	483.7
17	Willow Creek	0.0	0.0	0.0
18	Sand Draw	0.0	0.0	0.0
19	Wind River - Main Stem	944.9	2,853.4	1,427.0
	Subtotal	2,899.3	6,278.2	3,139.4

UNADJUDICATED IN-USE, ADJUDICATED AND TYPE VII WITHOUT ECONOMICS

Project or Stream Number	Description	Acres	Diversion Requirement Acre-Feet	Net Irrigation Requirement Acre-Feet
	BIG HORN RIVER BASIN			
10	Main Stem - Big Horn River	24.2	71.6	35.8
18	Cottonwood Creek	263.9	212.2	106.1
20	Buddy Creek	1,347.6	1,901.7	951.0
21	Five Mile Creek	28.0	16.2	8.1
	Subtotal	1,663.7	2,201.7	1,101.0
	LITTLE WIND RIVER BASIN			
22	South Fork Little Wind River	1,658.1	5,005.0	2,502.6
23	South Fork Little Wind River	653.0	1,415.4	707.7
24	Main Stem- Little Wind River	547.4	1,439.6	724.9
25	Sage Creek	979.7	1,173.7	587.1
26	Crooked Creek	45.0	118.4	59.2
27	Trout Creek	194.0	512.6	256.4
28	Spring Creek	73.0	258.4	129.2
29	Big Horn Draw	8.0	4.4	2.2
17	Hill Creek	0.0	0.0	0.0
	Subtotal	4,158.2	9,927.5	4,969.1
	POPO AGIE RIVER BASIN			
11	North Fork Popo Agie River	307.0	969.0	484.5
12	Main Stem - Popo Agie River	45.0	107.2	53.6
	Subtotal	352.0	1,076.2	538.1
	OWL CREEK BASIN			
14	Main Stem - Owl Creek	153.6	222.8	111.4
11	South Fork Owl Creek and Tributaries	297.0	533.8	267.0
15	Red Creek	313.0	509.8	254.9
16	Red Creek	0.0	0.0	0.0
	Subtotal	763.6	1,266.4	633.3
	Total: Non-Project Lands	9,836.8	20,750.0	10,381.1
	GRAND TOTAL	26,231.6	73,522.2	36,762.0

The State of Wyoming also submitted evidence for adjudicated, unadjudicated and Type VII lands after economic analysis at 7-1/8%. The acreage and water requirements are summarized in the following table. See Wyoming's Amended Proposed Findings of Fact 2301, et seq. 24-1 et seq., 26-1 et seq, and support therefor.

UNADJUDICATED IN-USE, ADJUDICATED
AND TYPE VII, WITH ECONOMIC ANALYSIS
AT 7-1/8 PERCENT

Project or Stream Number	Description	Acres	Diversion Requirement Acre-Feet	Net Irrigation Requirement Acre-Feet
	BIG HORN RIVER BASIN			
10	Main Stem - Big Horn River	24.2	71.6	15.8
18	Cottonwood Creek	210.0	130.2	65.1
20	Buddy Creek	1,244.3	1,753.3	876.8
21	Five Mile Creek	28.0	16.2	8.1
	Subtotal	1,506.5	1,971.3	985.8
	LITTLE WIND RIVER BASIN			
22	North Fork Little Wind River	1,658.1	5,005.0	2,502.6
23	South Fork Little Wind River	653.0	1,415.4	707.7
24	Main Stem- Little Wind River	443.0	1,130.6	565.4
25	Sage Creek	379.0	344.7	172.6
26	Crooked Creek	45.0	118.4	59.2
27	Trout Creek	194.0	512.6	256.4
28	Spring Creek	73.0	258.4	129.2
29	Big Horn Draw	8.0	4.4	2.2
17	Hill Creek	0.0	0.0	0.0
	Subtotal	3,453.1	8,789.5	4,395.1
	POPO AGIE RIVER BASIN			
11	North Fork Popo Agie River	307.0	969.0	484.5
12	Main Stem - Popo Agie River	45.0	107.2	53.6
	Subtotal	352.0	1,076.2	538.1
	OWL CREEK BASIN			
14	Main Stem - Owl Creek	153.6	222.8	111.4
11	South Fork Owl Creek and Tributaries	262.0	485.4	242.8
15	Red Creek	313.0	509.8	254.9
16	Red Creek	0.0	0.0	0.0
	Subtotal	728.6	1,218.0	609.1
	Total: Non-Project Lands	8,684.6	18,848.6	9,425.4
	GRAND TOTAL	24,489.2	70,026.8	35,009.2

STATE EVALUATION OF TRUST LANDS
ACREAGE AND WATER REQUIREMENTS
UNADJUDICATED IN-USE, ADJUDICATED
AND TYPE VII WITH ECONOMIC ANALYSIS
AT 7-1/8 PERCENT

Project or Stream Number	Description	Acres	Diversion Requirement Acre-Feet	Net Irrigation Requirement Acre-Feet
	PROJECT LANDS			
	WIND RIVER FEDERAL IRRIGATION PROJECT			
	LITTLE WIND UNIT	4,547.4	13,090.2	6,545.2
1	Ray Unit	3,502.1	10,616.8	5,318.6
2	Courtridge Unit	1,526.0	6,011.0	1,805.5
3	SubAgency Unit			
	UPPER WIND UNIT	514.0	1,279.2	619.7
4	Wind River 'A' Canal	3,482.4	13,061.4	6,524.9
5	Dinwoody Bench Area	230.0	780.4	190.2
6	JOHNSTOWN UNIT	663.5	2,108.2	1,054.1
7	LEETHAND UNIT			
	MIDVALE IRRIGATION DISTRICT - TRUST LANDS	457.8	1,285.9	643.0
8	LECLAIR IRRIGATION DISTRICT - TRUST LANDS	881.4	2,925.1	1,462.6
9				
	Total Project Lands	15,804.6	51,178.2	25,583.8
	NON-PROJECT LANDS			
	WIND RIVER BASIN	7.0	7.6	3.8
10	East Fork Wind River	103.0	134.0	67.0
11	Dinwoody Creek	62.0	201.0	100.5
12	Dry Creek (12-5N-4W)	48.3	118.6	59.3
13	Bull Lake Creek	366.9	835.0	417.5
14	Meadow Creek	575.0	1,069.2	534.6
15	Dry (Pasup) Creek	644.2	869.0	434.5
16	Crow Creek	0.0	0.0	0.0
17	Willow Creek	0.0	0.0	0.0
18	Sand Draw	838.0	2,559.2	1,279.9
19	Wind River - Main Stem			
	Subtotal	2,644.4	5,791.6	2,897.1

Tribes' Proposed Finding of Fact:

10. Type VIII and Arapahoe Ranch Lands

192. Type VIII lands are trust lands within the boundaries of the Federal Irrigation Project which have never previously been developed for irrigation (Tr. V. 63, p. 5582). As noted, Mr. Waples of HKM testified for the United States on the arability of Type VIII lands (see Findings 141-47 supra).

Wyoming's Response:

182. See Wyoming's Responses to Tribes' Proposed Findings of Fact 141 through 147 for a detailed description of the inadequacies of the United States' Type VII and VIII arability study.

Tribes' Proposed Finding of Fact:

183. Arapahoe Ranch area lands are arable trust lands in the Arapahoe Ranch or Owl Creek area which have never been irrigated (U.S. Ex. C-277, p. 1). Mr. Kersich of HKM testified for the United States on the arability of these lands (see Findings 5-15 supra).

Wyoming's Response:

183. See Wyoming's Responses to Tribes' Proposed Findings of Fact 5 through 15. The deficiencies in HKM's arability study of the future project lands are also present in its evaluation of Arapahoe Ranch lands.

Tribes' Proposed Finding of Fact:

11. Type VIII and Arapahoe Ranch Lands -- Engineering

194. Dr. Mesghinna designed irrigation systems to serve the Type VIII and Arapahoe Ranch area lands identified by HKM as being arable (Tr. V. 63, pp. 5589-90). Class 4 lands were excluded (id.). Five percent of the remaining land was excluded to account for roads, farmsteads, and the like (id., p. 5604).

Dr. Mesghinna estimated the cost of bringing the remaining lands into production (U.S. Ex. C-277, p. 4). In most respects, Dr. Mesghinna used the same methods for designing systems and estimating costs for these lands as he used in his analysis of the future lands (Tr. V. 63, pp. 5582, 5590). Two differences were noted. First, since existing canals could serve Type VIII lands, no canal costs were included (id., pp. 5583, 5603-04). Second, since these lands are small tracts, the design used hand-move sprinklers, rather than side rolls as used in the design of the future projects (id., p. 5585). The costs used for these hand-move sprinklers were "on the conservative side" (Tr. V. 64, p. 5641).

Wyoming's Response:

184. Dr. Mesghinna assumed a dollar value on sprinklers and a 10-day irrigation frequency on the very scattered Type VIII areas and from these assumptions estimated the cost of sprinklers. Tr. 5640-5642 (Mesghinna). This differs from his more careful analysis of the proposed five future projects.

There is no evidence in the Record to show the canals, diversion structures, headgates and wasteways are adequately sized to handle additional presently non-irrigated lands now claimed as well as the proposed Type VIII lands. These canals must be designed to carry the additional water with normal management methods and with adequate safety. The United States did not include any costs for reconstruction or for operation and maintenance. The State of Wyoming included an annual operating and maintenance cost of $2.80 per acre for Type VIII lands. Tr. 13560 (Sostrom); Tr. 5583-5584, 5605-5612 (Mesghinna); Wyo. Exh. WRIR FSO-4A (pp. 55-70).

Even though data was available from HKM Associates, it was not used to determine the water holding capacity. Tr. 5683-5685 (Mesghinna). These unreliable methods of not utilizing the water holding capacity to determine water requirements and not evaluating the

capacities of the existing canals at this feasibility study level will certainly strain the budgeted engineering and contingency costs. Additional field work, research, design and inclusion of additional canal structures will be required. The proper estimated costs are on Exhibits HSO-4B and HSO-4C. See Wyoming's Amended Proposed Findings of Fact 20-7, 20-8 and 20-11 and support therefor.

Dr. Mesghinna's exclusion of Class 4 lands provides further support to the State of Wyoming's position that all such lands should be excluded in future project, Type VII and Type VIII areas. See Wyoming's Amended Proposed Findings of Fact 20-2, 20-3 and 20-6 and support therefor.

Tribes' Proposed Finding of Fact:

186. Mr. Sostrum testified for the State that approximately 1,000 acres of Type VIII and Arapahoe Ranch area lands were irrigable from a soils and engineering perspective (Tr. V. 144, p. 13305; State's Ex. FSO-14). Mr. Sostrum's reduction was based primarily on deletion of all lands classified by HKM as Class 6 for either gravity or sprinkler irrigation (Tr. V. 144, pp. 13302-05; State's Exs. FSO-15A through FSO-15E). Dr. Mesghinna testified that including these lands was proper because (1) lands classified by HKM as Class 6 for gravity because of slope or topographic problems could be irrigated by the hand-move sprinklers he designed for these lands, and (2) lands classified as Class 6 for sprinkler because of field size limitations in using side-roll sprinklers could be irrigated using hand-move sprinklers (Tr. V. 64, pp. 5660-61, 5665).

Tribes' Proposed Finding of Fact:

13. Type VIII and Arapahoe Ranch Lands -- Diversion Requirements

192. Dr. Mesghinna also testified as to the water requirements for these Type VIII and Arapahoe Ranch area lands. Again, his methodology, including cropping patterns, and irrigation requirements, was in most respects identical to the methodology used on the future lands (Tr. V. 63, pp. 5582, 5584). The one difference was the use of an estimated, rather than calculated, efficiency, based on a Soil Conservation Service report (id., pp. 5585, 5590).

Wyoming's General Response to Tribes' Proposed Findings of Fact 185,186 and 192 through 195:

These Proposed Findings regarding Type VIII lands are incomplete and erroneous. The overall result is that these proposed findings are virtually useless to the Court.

There are six major deficiencies and errors in the United States' proposed findings with respect to Type VIII lands. These are:

1. Not all of the claimed lands are currently held in trust by the United States. See Wyoming's Amended Proposed Finding of Facts 28-1, et seq., and support therefor.

2. The climatic data upon which net irrigation requirement is based is too general. See Wyoming's Amended Proposed Findings of Fact 18-17 and 18-18 and support therefor.

3. The historic and estimated conveyance and application efficiencies are too low. See Wyoming's Amended Proposed Findings of Fact 18-17 and 18-18 and support therefor.

4. Since the United States' evaluation of the net irrigation requirements, land types and efficiencies is deficient, the resulting diversion requirements are unreasonably high. See Wyoming's Amended Proposed Findings of Fact 18-17 and 18-18 and support therefor.

5. Furthermore, the values for net irrigation, a necessary component in quantifying reserved water rights, requirement are not provided in the proposed findings. Compare, Wyoming's Amended Proposed Decree (Appendix 1); c.f. Arizona v. California, (Supplemental Decree) 439 U.S. 419, 422 (1979); Wyo. Stat. § 41-3-104; Basin Electric Power v. State Board of Control, 578 P.2d 557 (Wyo. 1978).

6. Nonarable land, therefore, nonirrigable land, is included in the acreage. See Wyoming's Amended Proposed Findings of Fact 20-2, 20-3 and 20-6 and support therefor.

In view of these numerous errors and inconsistencies, the State of Wyoming submitted evidence prior to economic analysis regarding acreage and water

requirements summarized in the following table. See Wyoming's Amended Proposed Findings of Fact 24-1, et seq., and support therefor.

State Evaluation of Trust Lands Acreage and Water Requirements - Type VIII and Arapahoe Ranch Area without Economic Analysis

Project or Stream Number	Name	Acres	Diversion Requirement Acre-Feet	Net Irrigation Requirement Acre-Feet
2	Coolidge	200.0	734.0	367.0
6	Johnstown	124.0	464.0	232.0
5	Upper Wind	257.0	874.0	437.0
3	Subagency	257.0	962.0	481.0
1	Ray	0	0	0
40	Arapahoe Ranch	147.0	532.2	266.1
	Totals	985.0	3,566.2	1,783.1

See Wyoming's Amended Proposed Findings of Fact 20-6 and 20-10; Appendices 5 and 11.

The evidence introduced shows the Type VIII lands, after economic analysis, to be infeasible. Therefore, there is no Type VIII practicably irrigable acreage. See Wyoming's Amended Proposed Findings of Fact 20-13 and 20-14 and support therefor.

Tribes' Proposed Finding of Fact:

188. Mr. Dornbusch analyzed the Type VIII and Arapahoe Ranch area lands using the same basic method he used for the future lands (Tr. V. 65, pp. 5719, 5721-22, 5728). Cropping patterns, yields, and gross returns were all the same as for the future lands. (Id.) Production costs were the same as for the future lands, with one exception. Higher operating costs were used for Type VIIIs, because the smaller size of Type VIII tracts may require additional operations like turning machinery (id., p. 5724). Irrigation costs for Type VIIIs were obtained from Stetson Engineers (id., p. 5731). A 4% discount rate was used (U.S. Ex. C-278). A benefit/cost ratio was calculated for each project area, using the same method used for the future projects. Mr. Dornbusch concluded it is economically feasible to irrigate 1,461 acres of Type VIII and Arapahoe Ranch area lands (Tr. V. 65, p. 5760; U.S. Ex. C-278).

Wyoming's Response:

188. Mr. Dornbusch did analyze Type VIII lands using the same basic method he used for the future lands. The State of Wyoming's objections to Mr. Dornbusch's method are detailed in its Findings of Fact, its Response to the United States' Findings of Fact and the Tribes' Findings of Fact with regard to the future projects, and will not be repeated here.

Tribes' Proposed Finding of Fact:

191. For the reasons noted in my findings on the future lands, I find Dr. Mesghinna and Mr. Dornbusch's testimony to be the more persuasive. I find that it is economically feasible to irrigate 1,461 acres of Type VIII and Arapahoe Ranch area lands, as set forth in Finding 185 supra.

Wyoming's Response:

191. For the reasons noted in Wyoming's Response to the Tribes' Proposed Findings of Fact concerning future lands, the Court should find Dr. Jacobs' analysis more persuasive, and find that it is not economically feasible to develop Type VIII lands on the Wind River Indian Reservation.

Tribes' Proposed Finding of Fact:

197. Tribal members testified that many such lands are owned in fee, not because the Indians wanted fee ownership, but because the Bureau of Indian Affairs forced the lands to be taken out of trust and placed in fee. Pius Moss, an enrolled member of the Arapahoe Tribe, testified that in the early 1960's he bought an 80-acre tract of land from his brother-in-law, also an enrolled member of the Arapahoe Tribe. Mr. Moss borrowed this money from the Arapahoe Tribe to make the purchase. When the papers were to be signed, BIA officials in Fort Washakie informed Mr. Moss that to make the purchase he was required to take the land in fee. No reason was given. While he wanted the land to remain in trust, Mr. Moss signed the papers to complete the transaction, taking the land in fee. From that time forward, Mr. Moss, and his daughter, to whom he gave the land, have sought unsuccessfully to have the land returned to trust (Tr. V. 89, pp. 7949-53).

Mr. Moss testified that 13 acres of this tract are currently in irrigation, served from the Subagency Canal, and that there is no state water right associated with the tract (Id., p. 7957; Tribes' Ex. 3, Table 6, Tract 70).

Wyoming's Response:

197. Although the sequence of fee acquisition testified to by Mr. Moss may well be the case for many Indian-owned fee parcels, a substantial number of other tracts were reacquired from non-Indians. There is an incomplete ownership history for lands currently held in fee by Indians since there is no evidence in the Record regarding the chain of title. The Bureau of Indian Affairs (BIA) does not maintain records concerning land held in fee. U.S. Exh. C-317. However, there is evidence in the Record that at least 32 tracts claimed by the Tribes were previously owned by a non-Indian. See Wyo. Exhs. KH-12 and TH-19.

Tribes' Proposed Finding of Fact:

198. Frank Enos, an enrolled member of the Shoshone Tribe and a former member of the Shoshone Business Council, testified that his father purchased trust land from an Indian neighbor in the early 1960's, and was forced by the BIA to take the land in fee to consummate the deal (Tr. V. 90, pp. 7986-87). This tract, adjoining trust land owned by the Enos family, is five miles west of Fort Washakie on the North Fork of the Little Wind River (id.). It is currently irrigated, along with the trust land, through a private ditch. No state water right is associated with the tract (id., p. 7987).

Wyoming's Response:

198. See Wyoming's Response to Tribes' Proposed Finding of Fact 197.

Tribes' Proposed Finding of Fact:

199. Robert N. Harris, Sr., Chairman of the Shoshone Business Council and a member of the Council for about 37 years, expressed the Tribes' concern for the status of fee lands owned by members and their direct descendants. Mr. Harris stated that many of these lands were in fee because Indians were forced to take them in fee. Mr. Harris expressed dismay at the possibility that an Indian farmer who irrigated his farm -- comprised of part trust and part fee land -- might have to let his fee lands dry up if those lands could not be served by a reserved water right (Tr. V. 89, p. 7923).

Wyoming's Response:

199. See Wyoming's Response to Tribes' Proposed Finding of Fact 197.

Tribes' Proposed Finding of Fact:

201. Keith Higginson testified for the Tribes on the current irrigation and irrigability of Indian-owned fee lands. Mr. Higginson, a consulting civil engineer, previously served as Commissioner of the United States Bureau of Reclamation. For 12 years he was Director of the Department of Water Resources and Director of the State Water Agency for the State of Idaho. He also served for eight years as Chief of the Water Rights Branch of the State Engineer's Office for the State of Utah, a position akin to that of State Engineer in Wyoming. He testified for the State of Utah in the original trial in Arizona v. California, and served as special master in an adjudication of water rights for the state court in Idaho (Tr. V. 91, pp. 8044-49). I find that Mr. Higginson is a well-qualified water resources engineer.

Wyoming's Response:

201. Mr. Higginson was admitted as an expert in water resources engineering, although during the last 25 years his work has largely been administrative and he has had little or no experience with actual irrigation system design, analysis of soils, or the determination of irrigation water requirements in Wyoming. Tr. 8050-8052, 8055 (Higginson).

Tribes' Proposed Finding of Fact:

204. Mr. Sostrum testified for the State that 5,061 acres of Indian-owned fee lands were in irrigation (State's Ex. HSO-10 Rev). He excluded from his consideration lands Mr. Higginson testified were in use, which Mr. Sommers testified were nonarable or subirrigated. Mr. Sostrum did not rely on any field work in making this determination as to actual use (Tr. V. 140, p. 12900). Mr. Sostrum relied primarily on interpretations of aerial photographs done under his direction. His analysis of Indian-owned fee lands was subject to the same limitations described in Findings 112-18 supra concerning unadjudicated in-use lands.

Wyoming's Response:

204. The lands excluded from Mr. Sostrom's analysis, due to a nonarable designation by HKM, cannot be irrigable. See U.S. Exh. WRIR C-226 (p. 41) (definition of "irrigable"); Tr. 12434 (Sommers). Mr. Sommers analyzed the HKM land classification soil logs and HKM hydrographic photos, U.S. Exhs. WRIR C-56 through C-136 and C-227-1 through C-227-12, which indicated HKM's classification of land determined to be currently irrigated by Mr. Higginson. Mr. Sommers found that about 180 acres were nonarable Class 6 land and that about 112 acres were subirrigated. These acreages must be subtracted from the United States' claim. Mr. Sommers' evaluation and acreages are posted in Wyo. Exh. WRIR SS-1002. Tr. 12451-12453, 12411 (Sommers).

Tribes' Proposed Finding of Fact:

205. For each tract, Mr. Higginson reviewed available soils data prepared by the Bureau of Reclamation, the Soil Conservation Service, and the Bureau of Indian Affairs. Based on this data, along with the State water rights of record, visits to each tract, examination of lands in the Midvale Project, and his experience in evaluating land for irrigation potential, Mr. Higginson concluded that 3,943 acres of Indian-owned fee lands -- other than those currently in irrigation -- were practicably irrigable (Tr. V. 91, p. 8071; Tribes' Exs. 8 and 9). All these lands were owned by enrolled members of the Tribes. They were lands, Mr. Higginson testified, which were "of a soil type and texture and the slopes are such and it is within reasonable proximity to a water source that with a usual amount of effort water would be brought to the land and it could grow agricultural crops" (Tr. V. 91, p. 8053). The vast majority of these lands could be served by existing service facilities or by simply extending a ditch or lateral (id., p. 8057). Mr. Higginson testified that in his professional opinion these lands could clearly be irrigated at reasonable cost and that no formal cost/benefit analysis was needed. The State presented no economic or other testimony concerning the reasonableness of irrigating the Indian-owned fee lands.

Wyoming's Response:

205. Mr. Higginson was not tendered to or accepted by the Court as an expert in soils science, agricultural engineering or economics, yet he purported to combine all these fields in making his conclusions with respect to the claimed "potentially irrigable" Indian-owned fee lands. prior to the engineering analysis, there must be a soils analysis to determine the arable land base. Mr. Higginson read through a few reports and decided to do this himself. However, land which he determined to be potentially irrigable in some cases had depths to barrier of only 20 to 40 inches, much less than the 72 inches required by the United States' soils experts and the 84 inches preferred by Wyoming's soils experts and the Bureau of Land Reclamation. Tr. 8223-8225 (Higginson).

While Mr. Higginson testified concerning the arability of these lands, however, there is no evidence whatsoever that Mr. Higginson performed any field work, bored holes, took soil samples, or did any land classification to determine the arability of those lands. Tr. 8052, 8097-8098 (Higginson); Tribes' Exh. 8. While Mr. Higginson has some administrative experience in water resource engineering, he has no hands-on experience in soil science or land classification. Tr. 8051-8052 (Higginson). This lack of experience is evident in his

study methods. Mr. Higginson developed no standards or even guidelines upon which to base his arability study. Tr. 8166-8167 (Higginson). He visited most of the tracts during the winter and made visual observations but did not auger a hole or sample the soil. Tr. 8052, 8097-8098 (Higginson). Mr. Higginson relied on several government soil and land classification reports to determine arability. However, the publications upon which he relied (the Soil Conservation Service Survey of the Riverton Area and the Soil and Range Resources Inventory by the BIA) do not contain specific information upon which arability determinations can be made. Tr. 8063, 8096 (Higginson). Mr. Higginson's engineering experience has primarily been as an administrator for the past 25 years. See Wyoming's Response to Tribes' Proposed Finding of Fact 201.

Wyoming's Proposed Findings of Fact 15-1 et seq. make it clear that a complete engineering analysis and a determination of costs are essential to the quantification of practicably irrigable acres. Mr. Higginson made virtually no attempt to detail the existence of or need for irrigation system facilities. He made no investigation to determine whether existing ditches had sufficient capacity to serve the claimed "potentially irrigable" lands. In fact, six to ten of the tracts Mr. Higginson evaluated had no existing facilities nearby to

convey water. Tr. 8197, 8100 (Higginson). Without designing irrigation systems, it is impossible to proceed to the next steps in a complete engineering analysis, that is, the determination of water requirements and costs.

Mr. Higginson made no attempt to determine the drainage requirements for the lands he classified as "potentially irrigable," nor did he determine whether solving drainage problems was within the economic capability of the lands. Tr. 8152-8237 (Higginson). As a result of Mr. Higginson's incomplete engineering analysis, he was unable to determine the costs of bringing these lands into production and consequently no economic analysis was performed. Tr. 8057-8058, 8095-8096 (Higginson).

Mr. Higginson's "all in one" approach attempts to evade the stipulated definition of "practicably irrigable" (to which the Tribes agreed) in this case, and seeks to trivialize the work of the soil scientists, engineers and economists who testified before the Court. Finally, his "analysis" is of no help to the inquiry whether these lands can successfully sustain long-term irrigation at reasonable cost. The Court should disregard Mr. Higginson's evidence.

Tribes' Proposed Finding of Fact:

206. Craig Sommers testified for the State on the arability of the Indian-owned fee lands identified by Mr. Higginson as being practicably irrigable, but not currently in irrigation. Of the 3,943 irrigable acres identified by Mr. Higginson, Mr. Sommers agreed that 1,618 acres were arable (State's Ex. SS-H). Mr. Sommers relied primarily on two basic factors in excluding from his arable category the remainder of this land. First, all lands the Bureau of Reclamation identified as Class 6 were excluded (Tr. V. 122, pp. 11005, 11009). Mr. Sommers acknowledged that the Bureau classification was for gravity irrigation only. He conceded that he did no work to determine whether Bureau Class 6 gravity lands could be irrigated with sprinklers. He simply assumed, without any apparent study or basis, that sprinklers could only irrigate the same lands as gravity (Tr. V. 107, pp. 11168-69). Even where the SCS classified the land as irrigable, if the Bureau classified it as 6 for gravity, Mr. Sommers eliminated it (id., p. 11170). At least 15 tracts were eliminated based on Bureau gravity classification (Tr. V. 124, p. 11163). Also, Mr. Sommers excluded certain lands based on an alleged lack of sufficient intensity of soils information (id., p. 11168). Mr. Sommers did not do any field work as part of this analysis (id., p. 11163).

Wyoming's Response:

206. Mr. Sommers excluded land when either HKM or the Bureau of Reclamation identified nonarable land within those areas delineated as potentially irrigable by Mr. Higginson. Tr. 11164-11166 (Sommers). The HKM classification was both for gravity and sprinkler irrigation. U.S. Exh. C-43. See Wyoming's Proposed Finding of Fact 21-7. The Soil Conservation Service (SCS) irrigation capability classification of land has little relevance to arability or irrigability as used in the determination of practicably irrigable acreage. The SCS irrigation capability classification is to provide general management information once irrigation has commenced. Tr. 11176 (Sommers). There are no engineering or economic factors considered by the SCS in its classification. Tr. 10749-10751 (Fowkes).

The tracts excluded by Mr. Sommers based on a lack of intensity were identified by Mr. Higginson utilizing only the BIA Soil and Range Inventory. This document was not intended for use in evaluation arability or irrigation potential. See Wyoming's proposed Finding of Fact 15-2; Tr. 11168 (Sommers).

Tribes' Proposed Finding of Fact:

208. Mr. Higginson determined efficiencies for serving these lands. He reviewed existing data concerning efficiencies obtained in existing Reservation irrigation, and current irrigation, practices in the field. He concluded that for gravity irrigation, a 35% overall efficiency is reasonable. For sprinkler irrigation, overall efficiency "could not be expected to increase to more than 40 percent" (Tribes' Ex. 8, p. 13; Tr. V. 91, p. 8076).

Wyoming's Response

208. The following assumptions for calculating the water requirements for irrigated lands within the Tribes' claim should be employed.

1. A net irrigation requirement for Type IV and Type VI (partial service) lands of 30% of full supply; and

2. A net irrigation requirement for Type V (incidental or subirrigated) lands of 0% of full supply; and

3. Water-short areas receive no water after mid-July; and

4. An overall efficiency of 50%.

Those assumptions concerning water requirements apply to irrigated lands owned in fee by Tribal members. There is no reason to have increased efficiencies for future projects such as the Big Horn Flats Extension and still condone waste by quantifying reserved water rights based on past inefficiency. In this age of water scarcity, it is incumbent upon the Court to scrutinize the quantification of all reserved water rights carefully and grant only the minimal amount of water necessary to

fulfill the primary purposes of the Reservation. It would not be in keeping with this careful approach to quantify reserved water rights based on past inefficiency. See Wyoming's Proposed Finding of Fact 24-10 and support therefor.

Tribes' Proposed Finding of Fact:

209. Using these efficiencies, Mr. Higginson concluded that the diverson requirements necessary to grow crops on the Indian-owned fee lands were as follows:

	Upper Area (Above 5900')	Lower Area (Below 5900')
Gravity	4.36	4.75
Sprinkler	3.82	4.15

(Tribes' Ex. 8, pp. 13-14; Tr. V. 91, p. 8076). Mr. Higginson testified that the total diversion requirement for all irrigated and irrigable Indian-owned fee lands is 46,724 acre-feet annually (Tr. V. 91, p. 8076; Tribes' Ex. 9, App. C). Mr. Higginson determined the most logical source of water supply for each tract of irrigated or irrigable Indian-owned fee land (Tribes' Ex. 9, App. C; Tr. V. 91, p. 8078).

Wyoming's Response

209. See Wyoming's Response to Tribes' Proposed Finding of Fact 208 regarding efficiencies. Since there are no explicit engineering analyses and no references to which ditches would serve the lands, it is impossible to determine with accuracy the specific source of water and diversion point or structure for most Indian-owned fee lands. See Tribes' Exh. 8. Without additional information, it is impossible to award and administer a water right for these lands.

Tribes' Proposed Finding of Fact:

210. Mr. Sostrum and Mr. Bishop testified for the State on diversion requirements for the Indian-owned fee lands. They used the same method as they used for estimating diversion requirements for the unadjudicated in-use trust lands (Tr. V. 148, pp. 13698-99).

Wyoming's Response:

210. See Wyoming's Response to Tribes' Proposed Finding of Fact 208.

Tribes' Proposed Finding of Fact:

211. Mr. Higginson also examined state records and determined that of the 14,544 acres of Indian-owned fee land, only 2,106.3 acres were covered by a State-adjudicated right (Tr. V. 91, p. 8071).

Wyomings Response:

211. In fact, 1,704 acres of Indian-owned fee land are the subject of a state-awarded adjudicated water right and an additional 3,625 acres are the subject of a state-awarded valid permit. See Wyo. Exh. WRIR SR-3 Rev.

Tribes' Proposed Finding of Fact:

212. I find that there are 10,374 acres of practicably irrigable Indian-owned fee lands on the Reservation. I further find that in the circumstances of this case, these lands must be protected by the Tribes' reserved water rights, and that the annual diversion requirement to serve these lands is 46,724 acre-feet.

Wyoming's Response:

212. The numerous deficiencies in Mr. Higginson's analysis make it impossible to determine that there are 10,374 acres of practicably irrigable Indian-owned fee land with a diversion requirement of 46,724 acre-feet. See Wyoming's Proposed Findings of Fact 21-1 through 21-7 and 25-1 through 25-7 and support therefor. See also Wyoming's Response to Tribes' Proposed Findings of Fact 197 to 211.

Tribes' Proposed Finding of Fact:

II. LIVESTOCK OPERATION CLAIMS

213. Mr. Richard Harbour, range operations officer at the Wind River Agency, testified on behalf of the United States that there are approximately 25,000 head of cattle owned by the tribes and tribal members on the Wind River Reservation. This number was determined in the annual fall cattle count taken under the supervision of Mr. Harbour (Tr. V. 1, p. 101).

Wyoming's Response:

213. Dr. Robert Carver, testifying on behalf of the State of Wyoming, stated that in 1980, there were approximately 18,560 head of cattle, 2,250 horses and 3,900 game animals on the Wind River Indian Reservation. Dr. Carver's determination of the 1980 livestock population of the Reservation is based upon published Bureau of Indian Affairs (BIA) records. Tr. 11902. While Rich Harbour estimated that there were 25,000 head of cattle, Tr. 101, Mr. Harbour offered no facts and data to support his livestock count and the official records of his employer, the BIA, contradict his testimony.

Faced with a contradiction between Mr. Harbour's unsubstantiated opinion and the official published data of the BIA which supports Dr. Carver's opinion, the Court should adopt the latter since it is more reasonable than a mere opinion concerning an objective fact. Cf. Wyo. R. Evid. 803 (8).

Tribes' Proposed Finding of Fact:

215. James Merchant, an economist with David M. Dornbusch and Company, studied the cost of livestock operations, found that it would be an economically viable industry and developed a model livestock operation for the Wind River Reservation through which he was able to forecast 50% expansion possibilities for Reservation livestock operations over the present level (Tr. V. 4, p. 373).

Wyoming's Response:

215. Mr. Merchant does not claim to be an agricultural economist nor an agricultural expert by background, training or education. His resume reflects no special background in livestock whatsoever. U.S. Exh. C-30; Tr. 181-185, 230 (Merchant).

Tribes' Proposed Finding of Fact:

216. Dr. Robert Carver, qualified by the State as an expert in livestock operation, management and economics (Tr. V. 130, p. 11893), reviewed present livestock operations on the Wind River Reservation, critiqued Mr. Merchant's studies (id., pp. 11898-99), and concluded that the Reservation could sustain a 25% increase in livestock operations rather than a 50% increase (id., pp. 11905-06).

Wyoming's Response:

216. Dr. Carver is widely recognized as an expert in the area of livestock. He was reared on a wheat and cattle ranch in central Montana and has spent his entire professional career studying and working in agriculture in the northern plains and intermountain region. His experience includes reviewing and evaluating the growth potential for livestock operations on the Fort Belknap and Fort Peck Indian Reservations in northeastern Montana. Tr. 11886-11894; Wyo. Exh. LC-1.

Tribes' Proposed Finding of Fact:

218. Mr. Merchant testified that in 1980 1,820 acre-feet of water were required for livestock on the Reservation (U.S. Ex. C-17). This consumption amount was determined by a formula, which takes into account average daily consumption plus an amount for evaporation.

Mr. Merchant relied on a United States Department of Agriculture publication and a Wyoming State Engineer's publication in determining the average consumption amount. He determined the number of stock ponds, and the average area of each, through consultations with the BIA range operations officer. He relied on findings by HKM Associates for the annual stockpond evaporation rate (Tr. V. 3, p. 271; V. 4, pp. 387-90).

Wyoming's Response:

218. Dr. Carver pointed out that based upon the Merck Veterinary Manual that daily consumption of water by cattle varies by season from 2.5 to 12 gallons per day, not the 15 gallons per head per day testified to by Mr. Merchant. Tr. 11956, 12121 (Carver). Mr. Merchant also bases his 1980 water requirements on a herd size of 25,000 head, while BIA records indicate that there were only 18,560 head of cattle on the Reservation in 1980. Tr. 11907 (Carver). Mr. Merchant also reports from the HKM study that the average size of stockponds is 2 acres. He then assumes that they remain full of water throughout the year and suffer a 2.5 feet/acre evaporation loss. Tr. 387-388 (Merchant). Dr. Carver points out that these ponds undergo evaporation and seepage loss, the average size on a 12-month basis is somewhat less than 2 surface acres. Tr. 12121-12122. As a result, Mr. Merchant overestimated consumptive use requirements for current livestock operations.

Tribes' Proposed Finding of Fact:

220. Mr. Merchant concluded that the future water requirement for livestock on the Reservation is 2,730 acre-feet of water per year (Tr. V. 4, pp. 658-60; U.S. Ex. C-17).

Wyoming's Response:

220. Mr. Merchant's future water requirements on the Reservation are too high because his consumption and evaporation figures are inappropriate. See Wyoming's Response to Tribes' Proposed Finding of Fact 218.

Tribes' Proposed Finding of Fact:

222. I find that presently there are approximately 25,000 head of cattle, consuming about 1,320 acre-feet of water per year on the Wind River Reservation.

Wyoming's Response:

222. The Court should find that Dr. Carver's estimates of current water requirements of 750 acre-fee per year are more appropriate based on the evidence cited in Wyoming's Response to Tribes' Finding of Fact 218.

Tribes' Proposed Finding of Fact:

223. I find that in light of the record as a whole and the tendency of the Tribes to expand their livestock industry when possible, that the 50% expansion and increased water usage testified to by Mr. Merchant is reasonable. Indeed the difference between the State's testimony and that of the United States is minimal in terms of water needs. I therefore find that the Tribes are entitled to 2,730 acre-feet of water per year for cattle watering, with an 1868 priority. Based upon the testimony of Mr. Harbour concerning the present cattle population distribution on the Reservation by drainage (see Finding 214 supra), I further find that of the 2,730 acre-feet per year, 870 acre-feet will come from the Wind River; 870, from the Little Wind River; 930, from Owl Creek; and 60 from the Popo Agie River.

Wyoming's Response:

223. Rather than adopting Mr. Merchant's analysis, the Court should adopt Dr. Carver's analysis based upon the fact that he is widely recognized as an expert in the area of livestock. He was reared on a wheat and cattle ranch in central Montana, and has spent his entire professional career studying and working in agriculture in the northern plains and intermountain region. His experience includes reviewing and evaluating growth potential of livestock operations on the Fort Belknap and Fort Peck Indian Reservations in northeastern Montana. Tr. 11886-11894; Wyo. Exh. LC-1.

In contrast, James Merchant was offered by the United States and accepted by the Court as an economist. Mr. Merchant does not claim to be an agricultural economist nor an agricultural expert by his background, training or education. His resume reflects no special background in livestock whatsoever. U.S. Exh. C-30; Tr. 181-185, 230 (Merchant).

Tribes' Proposed Finding of Fact:

III. MINERAL DEVELOPMENT AND ASSOCIATED INDUSTRIAL CLAIMS

A. General Findings

224. James P. Merchant was qualified and testified for the United States as an economist (Tr. V. 2, p. 230), concerning the present and future mineral development on the Wind River Indian Reservation and the associated water requirement (Tr. V. 5, p. 486). Mr. Merchant studied the available information concerning mineral resources on the Reservation, investigated the characteristics of mining and processing industries associated with minerals, identified and evaluated trends in mining and processing industries, and determined the water requirements necessary for Reservation mineral development (Id., p. 487). He ultimately gave his opinion that it will be economic to develop more fully the following minerals on the Wind River Reservation: oil, natural gas, coal, uranium, phosphate rock and gypsum (Id., pp. 493-94; U.S. Exs. C-28, C-29 and C-33-B).

Wyoming's Response:

224. Mr. Merchant holds a bachelors degree in economics, but his graduate degrees are in business administration and law. Tr. 185 (Merchant). An undergraduate degree in economics hardly qualifies one as an expert in natural resource economics. Even if Mr. Merchant were a qualified natural resource economist, however, he would not be qualified to establish the existence of mineral deposits on the Wind River Indian Reservation. As Mr. Merrill pointed out:

> you have a witness who is going to tell you what mineral deposits there are out there, he is going to tell you where they are, how he located them, how they can be brought out, what is going to be done with them, how big a plant can be, all of these sorts of things that are all beyond the field of general economics.

Tr. 549 (Merrill).

The Special Master responded by saying:

> The economist on the stand may continue to testify to those things as expertise gives him a right to, but I would doubt if it would go to telling us what that coal field contains unless he had some first hand knowledge . . . Mr Merrill, I think you made a good point.

Tr. 550 (Special Master).

The United States never did establish the extent of mineral deposits on the Reservation except through the testimony of an economist. Furthermore, the water

requirements testified to by Mr. Merchant are hardly in a form that is meaningful to the Court. To the contrary, Mr. Merchant testified only to peak water use for various proposed developments. Tr. 597 (Sleater). As the Special Master noted with regard to the U.S. Exh. WRIR C-29:

> You see, the Exhibit raises in my mind a fear that you are going to seek to have me believe that there is going to be a need simultaneously for all the water listed in the last column and nothing is really further from what the truth is or what you portend.

Tr. 598 (Special Master).

The Special Master went on to ask:

> Can the witness help us with what the ordinary routine, expected normal requirements might be over the next 10, 15, 20, 30 years in total usage? Then the Exhibit would have more value to me.

Tr. 599 (Special Master).

This query went unheeded; there is no response to this request anywhere in the Record.

Tribes' Proposed Finding of Fact:

226. Gary Watts, the State's expert economist (Tr. V. 127, p. 11551), reviewed the United States and the Tribes' Statement of Claims and Mr. Merchant's testimony. He testified that in his opinion there are some mineral deposits on the Reservation, but the existence of these deposits does not necessarily mean that it is economically feasible to develop them now or in the future. (Id., pp. 11555-56.) Mr. Watts admitted that he has not conducted any independent feasibility study regarding future development of these or any other minerals on the Reservation, or any analyses of the water requirements to which Mr. Merchant and Mr. Page testified (id., p. 11590). Furthermore, Mr. Watts did not present any evidence supporting his claim that there are substitutes available that will render these minerals useless or obsolete (id., pp. 11563-70).

Wyoming's Response:

226. Mr. Watts is a natural resource economist who has had substantial experience studying the economic feasibility of coal development in Wyoming, the location of coal gasification facilities, underground coal mining and the potential economic impact of coal-fired plants. Mr. Watts was qualified as an expert natural resource economist by the Master without objection by the United States and Tribes. Tr. 11551 (Special Master). Mr. Watts did testify that he did not conduct in-depth studies of mineral development on the Wind River Indian Reservation, Tr. 11590; he did testify, however, that "using those facts in making a judgment gives you some indication of what the potential feasibility is." Tr. 11590. Mr. Merchant made it quite clear that his opinions concerning the feasibility of mineral development on the Wind River Indian Reservation were based on his own experience and knowledge, rather than upon a study of costs and returns. Tr. 717. Under the circumstances, the Court must find that Mr. Watts is much more qualified to render professional opinions concerning feasibility than Mr. Merchant.

Tribes' Proposed Finding of Fact:

229. Both Mr. Merchant and Mr. Page testified that 6,580 acre-feet of water per year presently are required for secondary recovery operations at these three sites (Tr. V. 5, pp. 513-14; V. 7, p. 914). The 1,030 acre-feet of this total that is not obtained from groundwater is diverted from the Wind River to serve Steamboat Butte (Id.).

Wyoming's Response:

228. Mr. Watts testified that only 94 acre-feet annually are actually being taken out of the Wind River through nearby groundwater wells. The remaining water used for recovery in the Steamboat Butte Field is water produced as a part of the on-site oil recovery process. Tr. 11573. Mr. Watts testified that of the total 6,500 acre-feet of water presently required for secondary operations, 3,994 acre-feet come from groundwater wells while the remainder is produced as a part of the secondary recovery process itself. Tr. 11571, 11575 (Watts).

Tribes' Proposed Finding of Fact:

229. Although there may be too little information on the full future oil production picture on the Reservation, the Tribes have asked a 20% contingency reserve of water in order to cover such unforeseeable circumstances. Furthermore, on cross-examination, Mr. Merchant stated that the prospect of substantially higher oil prices in future years may increase the amount of recoverable reserves because (1) higher prices would allow recovery of oil that was not profitable to recover before, and (2) higher prices will elicit more exploration for oil reserves (Tr. V. 6, p. 615). Greater recoverable reserves will increase the likelihood of increased development.

Wyoming's Response:

229. The Tribes did not claim water for secondary recovery for future uses on the Wind River Indian Reservation, and both Mr. Merchant and Mr. Watts testified that there was no evidence that such a need would arise. Tr. 515 (Merchant); Tr. 11571 (Watts). The Tribes accept this testimony by stating there "may be too little information on full future oil and gas production on the Reservation," Tribes' Finding of Fact 229, yet somehow conclude that "greater recoverable reserves will increase the likelihood of increased development." This conclusion has no factual basis in the Record other than Mr. Merchant's pure speculation.

Tribes' Proposed Finding of Fact:

231. I find that 6,580 acre-feet per year of water presently are required for secondary recovery operations at Steamboat Butte, Winkleman Dome and Lander oil fields on the Wind River Reservation. This water is collected from water produced from the oil wells in conjunction with secondary recovery operations, water drawn from the Madison formation and other deep groundwater sources, and, at the Steamboat Butte field, some 1,030 acre-feet from the Wind River.

Wyoming's Response:

231. Mr. Watts' testimony clearly indicates that of the 6,500 acre-feet of water currently required for secondary recovery operations, only 94 acre-feet per year is diverted through the Wind River alluvium via ground water wells. Tr. 11572 (Watts).

Tribes' Proposed Finding of Fact:

232. I find that there is a substantial likelihood that there will be additional future oil development on the Reservation, particularly in view of the prospect of substantially higher oil prices in future years and the commensurate increase in recoverable reserves. There must therefore be reserved to the Tribes for this future increment an amount of water equal to the present requirement but increased by the 20% contingency factor, totaling not less than 7,900 acre-feet per year, sufficient to develop these oil resources and probably to come from groundwater sources.

Wyoming's Response:

232. This Finding is totally unsupported by evidence in the Record, and is directly contradicted by the testimony of both expert witnesses, Mr. Merchant, Tr. 515, and Mr. Watts, Tr. 11571.

Tribes' Proposed Finding of Fact:

235. Mr. Merchant testified that the natural gas sweetening and dehydrating plant presently requires 6 acre-feet of water per year, and the sulphuric acid plant requires 95 acre-feet per year (Tr. V. 5, pp. 517, 519). This water is presently derived from groundwater sources in the Wind River formation (id., p. 520; U.S. Ex. C-31-A, Table 4). Mr. Watts did not contradict these figures. (Tr. V. 127, p. 11591.)

Wyoming's Response:

235. Mr. Watts testified that the sulfuric acid plant does not use any sulfur nor natural gas from the Reservation in producing sulfuric acid. Tr. 11577-11578. Furthermore, the Court was presented with no evidence that the natural gas sweetening plant makes use of mineral resources held in trust by the United States for the Tribes.

Tribes' Proposed Finding of Fact:

236. Mr. Merchant also concluded that it would be economically feasible to develop an anhydrous ammonia plant on the Reservation, possibly near Riverton, based upon his consideration of long-term trends and the probable market area for production of nitrogen fertilizers. He also found that the natural gas production on the Reservation exceeds the requirements of such a plant (Tr. V. 5, pp. 520-22, 529). The plant envisioned by Mr. Merchant would produce 1,000 tons per day and would require 4,250 acre-feet of water per year (id., p. 519).

Wyoming's Response:

236. The Court should not be misled into believing that Mr. Merchant conducted feasibility analyses for mineral development on the Reservation. In his own words, Mr. Merchant testified "I did not develop detailed cost [sic] returns for these mineral enterprises." Tr. 709. The scope of his analysis was further defined through the following exchange:

> Q. So, based on that general phenomenon for these resources, rather than any empirical analysis, it's your opinion that it would be commercially feasible to recover these resources sometime in the next 40 years?
>
> A. I think that statement was empirical.
>
> Q. Do you mean you have some empirical analysis to support what you are saying?
>
> A. I've been looking at energy issues for several years, and I think based on my experience in doing that that I can make that statement based on my own personal knowledge.

Tr. 717 (Merchant) (emphasis added).

Tribes' Proposed Finding of Fact:

237. Mr. Watts testified that the development of an anhydrous ammonia plant was a very speculative prospect, but he did not conduct any feasibility study and he would not say that such a plant would never be built (Tr. V. 127, pp. 11578-80).

Mr. Merchant stated that natural gas prices probably will substantially increase after prices are deregulated pursuant to existing law. The increase in prices could well cause increased production, in much the same way as for oil. (Tr. V. 6, pp. 613-16.)

Wyoming's Response:

237. Mr. Watts' testimony obviously contradicts that of Mr. Merchant; and although neither witness did in-depth studies of feasibility, Mr. Watts' credentials are clearly superior to Mr. Merchant's with respect to the potential for mineral development on the Reservation.

Tribes' Proposed Finding of Fact:

238. I find that presently there are several natural gas fields under production on the Wind River Reservation, specifically those identified on U.S. Ex. C-23. There is a natural gas sweetening and dehydrating plant located east of Riverton, and a sulphuric acid plant southwest of Riverton. The processing plant requires 6 acre-feet per year for processing natural gas, and the sulphuric acid plant requires 95 acre-feet per year for its operations. The source of this water is groundwater from the Wind River formation.

Wyoming's Response:

238. See Wyoming's Response to Tribes' Proposed Finding of Fact 235.

Tribes' Proposed Finding of Fact:

239. I further find that it is technically and economically feasible that an anhydrous ammonia plant be located on the Reservation in the next 40 years and that plant would require 4,250 acre-feet per year of water to be obtained either from groundwater or the Wind River, probably near Riverton.

Wyoming's Response:

239. Based upon the testimony of both witnesses, there is no evidence in the Record supporting the technical or economic feasibility of an anhydrous ammonia plant to be located on the Reservation within the next 40 years. See Wyoming's Response to United States' Findings of Fact 236 and 237.

Tribes' Proposed Finding of Fact:

D. Coal

240. Mr. Merchant identified coal deposits on the Reservation, described the deposits that in his opinion are suitable for development, and outlined the water requirements and water sources for development of these deposits. Based on a United States Bureau of Mines report and a United States Geological Survey report, among other things, Mr. Merchant concluded that there are coal deposits (1) in the Alkali Butte field in the southeast corner of the Reservation, (2) in the Muddy Creek area in the northern part of the Reservation, (3) near the surface in the Hudson area, and (4) deep deposits between two locations as indicated on U.S. Ex. C-24. There have been small mining operations in the Hudson area. (Tr. V. 5, pp. 550-52.) Mr. Merchant concluded that the coal deposits at the Alkali Butte and Muddy Creek locations are suitable for development (id., pp. 547-48).

Wyoming's Response:

240. Although Mr. Merchant did reach the conclusions outlined in this finding, he should not have been allowed to do so. As the Special Master pointed out,

> the economist on the stand may continue to testify to those things as expertise gives him a right to, but I would doubt if it would go to telling us what that coal field contains unless he had some first hand knowledge . . . Mr. Merrill, I think you made a good point.

Tr. 550 (Special Master). There is no evidence in the Record that Mr. Merchant has first-hand knowledge of <u>any</u> mineral deposits on the Reservation.

Tribes' Proposed Finding of Fact:

241. Mr. Merchant testified that the coal reserves at Alkali Butte are suitable for development through underground (or in situ) coal gasification.

Wyoming's Response:

241. As pointed out in Wyoming's Response to Tribes' Finding of Fact 548, Mr. Merchant is hardly qualified to testify as to the suitability of developing coal reserves through in situ coal gasification. Not only does such a development involve considerations far outside of the field of economics, Mr. Merchant did not even consider the economic costs of his proposal. Tr. 718 (Merchant).

Tribes' Proposed Finding of Fact:

242. Mr. Watts, while admitting that he is not an expert on coal gasification, had certain reservations about the possible development of *in situ* gasification.

Wyoming's Response:

242. Mr. Watts, at least, was realistic about the limitations of his expertise as a natural resource economist. Tr. 11583. He did, however, point out certain potential problems that might be incurred in developing the Tribes' coal resources in that way. Tr. 11583, 11587. Mr. Watts' accurate assessment of his own limitations should not lead the Court to believe that the Tribes or the United States have met their burden of proof in establishing the feasibility of *in situ* coal gasification on the Reservation.

Tribes' Proposed Finding of Fact:

243. Mr. Merchant concluded that the in situ gasification process at Alkali Butte would require 2,800 acre-feet per year of water (Tr. V. 5, p. 554). Mr. Page stated that its source would likely be from groundwater in the Wind River, Lance or Mesa Verde formations (Tr. V. 7, pp. 915-16).

Wyoming's Response:

243. Mr. Watts contradicts Mr. Merchant's testimony by stating that the moisture content of the coal in the particular field under consideration would not require additional water to burn coal in situ, even if it were economically and technically feasible. Tr. 11586.

Tribes' Proposed Finding of Fact:

244. The other location suitable for coal development, as determined by the government's expert, is Muddy Creek. There the coal is shallower than at Alkali Butte, and is suitable for mining. The coal is sufficient, Mr. Merchant testified, to support a 150-megawatt power plant that could be added to interstate transmission lines. (Tr. V. 5, pp. 553-54.) Twenty-five acre-feet per year of water would be required at Muddy Creek for dust control and surface reclamation, and 2,490 acre-feet per year would be required for the power plant all to be obtained from shallow groundwater. (Id., p. 554; V. 7, pp. 815-16; U.S. Ex. C-31-A.)

Wyoming's Response:

244. Mr. Merchant's testimony is refuted by Mr. Watts, who testified that the 150 megawatt power plant proposed by Mr. Merchant would exhaust the known coal reserves at the Muddy Creek Field in 13 to 14 years and thus would not be economically feasible. Tr. 11581, 11582 (Watts).

Tribes' Proposed Finding of Fact:

245. The water use for the in situ gasification and power plant would be totally consumptive (Tr. V. 5, p. 560).

Wyoming's Response:

245. As Mr. Watts testified, the water need for in situ gasification would be nonexistent. Tr. 11586.

Tribes' Proposed Finding of Fact:

247. Mr. Merchant stated that the United States Geological Survey has identified many reserves on the Reservation that are not identified on U.S. Ex. C-24, and that these may become feasible to exploit in the future. Furthermore, as with oil and gas, the price of coal is likely to increase in the future, thereby increasing the amount of recoverable coal reserves on the Reservation. (Tr. V. 6, p. 615.)

Wyoming's Response:

247. Mr. Merchant made it quite clear upon cross-examination that his conclusions concerning future oil, natural gas and coal development were based upon his personal opinion, as opposed to any assessment of economic feasibility. Tr. 717. Although Mr. Merchant is entitled to his opinion, Mr. Watts clearly indicated he disagreed with Mr. Merchant. Tr. 11581. Mr. Watts also is far more experienced in studies dealing with the economic potential for coal development in Wyoming than is Mr. Merchant. See Wyoming's Amended Proposed Finding of Fact 40-2.

Tribes' Proposed Finding of Fact:

248. I find that the coal deposits in the Muddy Creek area and the Alkali Butte area, as identified on U.S. Ex. C-24, are suitable for development, that at Alkali Butte there are sufficient reserves, with a sufficient overburden, for in situ coal gasification and that the process would require 2,800 acre-feet of water per year, probably from groundwater.

Wyoming's Response:

248. For the reasons cited in Wyoming's Response to United States' Proposed Findings of Fact 548 through 554, there is no evidence in the Record for the Court to conclude that in situ coal development on the Reservation is economically or technically feasible.

Tribes' Proposed Finding of Fact:

249. I find that at Muddy Creek, there are shallower coal deposits that are suitable for mining and sufficient to supply a 150-megawatt power plant, that 25 acre-feet per year of water would be required for dust control and surface reclamation in connection with mining, and that the proposed power plant would require 2,490 acre-feet of water per year, all probably from groundwater.

Wyoming's Response:

249. Mr. Watts' testimony concerning the potential economic life and infeasibility of the proposed power plant was not refuted by the Tribes and stands unchallenged. See Tribes' Proposed Finding of Fact 246.

Tribes' Proposed Finding of Fact:

E. Gypsum

250. Mr. Merchant evaluated gypsum development possibilities on the Wind River Reservation by reviewing available information, including USGS and U.S. Bureau of Mines reports, on gypsum deposits. He looked at the location, size, grade of gypsum, the characteristics of the gypsum industry, and future industry trends. (Tr. V. 6, pp. 585-86.) On the basis of that information, Mr. Merchant determined that the Reservation contains massive deposits of high grade gypsum that could be surface mined (id., pp. 586, 590, 699). By analyzing data on the productivity and sales of wallboard, he concluded that in the future there will be an ample market for wallboard, which is produced using gypsum (id., p. 589). Therefore he concluded that it is feasible to mine the gypsum and use it in a wallboard manufacturing plant. Mr. Merchant estimated that the manufacturing plant would produce about 410,000,000 square feet of one-half inch wallboard per year. The plant probably would be located near Riverton because of its proximity to rail service and the population needed for labor purposes. (Id., pp. 587-88; U.S. Ex. C-27.)

Wyoming's Response:

250. Mr. Watts testified that based upon his investigations, including conversations with the Wyoming State Geologist, it was not economically feasible at the present time to develop the gypsum deposits on the Reservation. Tr. 11553, 11554, 11558, 11559. In direct contradiction to Mr. Merchant, Mr. Watts testified that the gypsum deposits on the Reservation are located in steeply dipping beds, meaning that underground mining techniques would be required to exploit the mineral deposits. Tr. 11558, 11559.

Tribes' Proposed Finding of Fact:

251. Mr. Watts stated that in his opinion it is not economically feasible to develop gypsum on the Reservation (Tr. V. 127, pp. 11558), but he did not present any documentation or state any sources for these doubts.

Wyoming's Response:

251. Mr. Watts specifically stated the scope of his studies and the sources of his information on transcript pages 11552-11555.

Tribes' Proposed Finding of Fact:

252. Mr. Merchant stated that surface reclamation in connection with mining gypsum on the Reservation would require 10 acre-feet of water per year and that the wallboard manufacturing plant would require 300 acre-feet per year. (Tr. V. 6, pp. 587-88; U.S. Ex. C-31-A, Table 4.) Mr. Watts did not review or contradict these water claims. The source of water would either be surface, probably from the Wind River near Riverton, or groundwater (Tr. V. 6, pp. 587-88).

Wyoming's Response:

252. Mr. Watts contradicted Mr. Merchant's testimony concerning gypsum mining on the Reservation and its associated water requirements by stating quite clearly that, in his professional opinion, it is highly unlikely that these resources will be developed in the foreseeable future. Tr. 11561. Thus, it would be meaningful to postulate water requirements.

Tribes' Proposed Finding of Fact:

253. The gypsum deposits are located in the aesthetics area defined by the government's expert, and the Tribes ultimately will have to choose between preserving this area and developing the gypsum (Tr. V. 6, p. 592).

Wyoming's Response:

253. This Finding is just another example of inconsistencies in the United States' and Tribes' claims for water for mineral development.

Tribes' Proposed Finding of Fact:

254. I find that there are massive gypsum deposits on the Wind River Reservation. It is technically and economically feasible to mine these deposits and to locate a wallboard manufacturing plant on the Reservation. Gypsum mining would require 10 acre-feet per year of surface water, and the wallboard manufacturing plant would require 300 acre-feet per year from groundwater or from the Wind River near Riverton.

Wyoming's Response:

254. Based on Wyoming's Response to Tribes' Findings of Fact 261, 262 and 263, the Court should conclude that there is no evidence concerning the economic feasibility of mining gypsum deposits on the Wind River Indian Reservation; and if there were, there is no evidence concerning what normal annual water requirements might be.

Tribes' Proposed Finding of Fact:

F. Uranium

255. Mr. Merchant testified that there are indications of uranium deposits in the Aycross formation in the northwest corner of the Reservation, with a quality of one-tenth of one percent uranium content. He concluded that, although the basic field work has not been done to positively locate these deposits, the increasing interest in uranium makes it likely that such work will be done in the future. (Tr. V. 5, pp. 567-68; U.S. Ex. C-25.)

Wyoming's Response:

255. This Proposed Finding and Mr. Merchant's testimony make it clear that there is no conclusive evidence that uranium deposits even exist on the Wind River Indian Reservation. Without evidence that uranium deposits exist, there is absolutely no basis in the Record for awarding a water right for their development.

Tribes' Proposed Finding of Fact:

256. To determine future development possibilities for uranium, Mr. Merchant analyzed the characteristics of other uranium mines in Wyoming, particularly the grade of uranium and the size of the mines, and reviewed uranium industry trends. (Tr. V. 6, pp. 707-08.) On the basis of those studies, he concluded that development of uranium deposits would be economically feasible. If deposits are found, they would be mined by underground mining, then the ore would be beneficiated or refined into yellowcake and shipped off the Reservation for further processing (Tr. V. 5, p. 568).

Wyoming's Response:

256. The statement, "if the deposits are found, they would be mined by underground mining," is so speculative as to hardly deserve comment.

Tribes' Proposed Finding of Fact:

257. Mr. Merchant determined that uranium mining activities would require 15 acre-feet per year of water for dust control and incidental uses. He further concluded that processing uranium into yellowcake would require 475 acre-feet per year. (Tr. V. 5, pp. 568-69, 571; U.S. Ex. C-31-A, Table 4.) The sources would likely be both groundwater and diversions from Crow Creek (Tr. V. 6, pp. 568-69).

Wyoming's Response:

257. Mr. Merchant's speculation that if any uranium deposits are found, they would be mined by underground mining, is dwarfed by his guess that 15 acre-feet of water per year for dust control might be required. This testimony again hardly meets the burden of proof that water for uranium development will be required in the future on the Wind River Indian Reservation.

Tribes' Proposed Finding of Fact:

258. The State did not offer any evidence on uranium development on the Reservation.

Wyoming's Response:

258. The State of Wyoming did not offer any evidence on uranium development on the Reservation because there is no evidence that uranium even exists on the Reservation. Tr. 567-568 (Merchant).

Tribes' Proposed Finding of Fact:

259. I find that there are indications of uranium deposits on the Reservation. The uranium, if it exists, is likely to be mined through underground mining and processed into yellowcake on the Reservation. Mining would consume 15 acre-feet per year of water for dust control and incidental uses, and processing would require 475 acre-feet of water per year, to be taken from groundwater and surface water in Crow Creek.

Wyoming's Response:

259. This Finding is the final cap on a pyramid of pure speculation that has no factual support in the Record and should be rejected by the Court.

Tribes' Proposed Finding of Fact:

G. Phosphate Rock

260. Mr. Merchant also analyzed the possibility of future development of phosphate rock on the Reservation. He determined, by reviewing available information, that there are extensive phosphate deposits. By analyzing the characteristics of the phosphate industry, trends in the production of phosphoric acid, and technological suitability of grades of phosphate rock for processing, the government's expert concluded that there is increasing demand for phosphates in the United States and that the phosphate rock on the Reservation could be mined and shipped to a plant in the Riverton area for beneficiation and use in a wet acid processing plant. Mr. Merchant testified that, although the phosphate rock is of a fairly low grade, it is capable of beneficiation. (Tr. V. 5, pp. 573-74; V. 6, pp. 619-20; U.S. Ex. C-26.)

Wyoming's Response:

260. The Court should again be reminded that Mr. Merchant testified concerning his own personal knowledge, Tr. 717 (Merchant), and that his testimony was refuted by Mr. Watts, who testified that it was unlikely that phosphate rock deposits on the Reservation would be developed in the foreseeable future. Tr. 11561 (Watts).

Tribes' Proposed Finding of Fact:

261. Mr. Watts stated that in his opinion it is not economically feasible to develop phosphate rock. He claimed that, as with coal and gypsum, the resource is in steeply dipping beds, and must be mined by the more expensive underground mining method (Tr. V. 127, pp. 11558-59), while there is a great deal of phosphate rock throughout the country that can be mined by cheaper strip mining techniques. Furthermore, he claimed that substitutes obviating the need for phosphate rock may be developed in the future (id., p. 11564). However, Mr. Watts did not audit Mr. Merchant's figures or present any specific evidence to support his conclusion.

Wyoming's Response:

261. Mr. Watts' background and experience as a natural resources economist, and the sources upon which he relied to form his opinions are specified in the transcript at pages 11544 through 11556 (Watts).

Tribes' Proposed Finding of Fact:

262. Mr. Merchant concluded that phosphate rock mining would require 5 acre-feet per year of water, which could be drawn locally from on-site wells near the mine (Tr. V. 5, pp. 574-75). Beneficiation would consume 425 acre-feet of water per year, and production of phosphoric acid would consume 400 acre-feet of water per year to be from groundwater or the Wind River in the Riverton area (Tr. V. 5, pp. 574-75; V. 7, p. 318). Mr. Watts did not review the government expert's conclusions on water requirements and sources.

Wyoming's Response:

262. Mr. Watt's did not review the government experts' conclusion on water requirements and sources because he testified that it would not be economically feasible to develop phosphate rock deposits on the Reservation in the foreseeable future. Tr. 11561 (Watts).

Tribes' Proposed Finding of Fact:

263. The area of potential phosphate rock development includes part of the aesthetics area claimed by the United States, so that, again, the Tribes would ultimately have to choose between the two (Tr. V. 5, pp. 577-78).

Wyoming's Response:

263. See Wyoming's Response to Tribes' Proposed Finding of Fact 253.

Tribes' Proposed Finding of Fact:

264. I find that there are low grade phosphate rock deposits on the Wind River Reservation, including but not limited to those identified on U.S. Ex. C-26. It is economically feasible to develop these minerals in the future by mining, beneficiation, and use in a wet acid processing plant. Mining will require 5 acre-feet per year of water from groundwater. Beneficiation will consume 425 acre-feet of water per year, and wet acid processing 400 acre-feet per year of water, to be taken from groundwater or the Wind River near Riverton.

Wyoming's Response:

264. Based upon Wyoming's Response to Tribes' Findings of Fact 261, 262 and 263, the Court should conclude that there is not sufficient evidence concerning the economic feasibility of phosphate rock development on the Wind River Indian Reservation.

Tribes' Proposed Finding of Fact:

265. In sum, I find that the Tribes are entitled to a reserved water right with an 1868 priority for mineral development as follows:

Mineral	Water Requirement (A/F)	Source
Oil	5,550 (Present)	Groundwater
	1,030 (Present)	Wind River (near Steamboat Butte)
	7,900 (Future)	Probably groundwater
Natural Gas	101 (Present)	Groundwater
	4,250 (Future)	Groundwater or Wind River (near River
Coal	5,315 (Future)	Probably groundwater
Gypsum	310 (Future)	Groundwater or Wind River (near River
Uranium	490 (Future)	Groundwater and Crow Creek
Phosphate Rock	5 (Future)	Groundwater
	325 (Future)	Groundwater or Wind River (near River

Wyoming's Response:

265. As pointed out in Wyoming's Response to Tribes' Finding of Fact 224, these water requirements represent peak annual requirements that would only occur if the highly speculative future developments were to all occur simultaneously. Tr. 597, 598, 599. The Court should reject these requirements for the following reasons:

1. Both the United States and Wyoming agreed that mineral resources on the Reservation constitute a non-renewable resource, which if developed, would be exhausted in a finite period of time. Tr. 486-487 (Merchant): Tr. 11587-11588 (Watts).

2. The United States presented no evidence to the Court concerning what average annual water requirements of these combined developments would be, and over what time frame water for them would be required. Tr. 599 (Special Master).

3. Mr. Watts testified that the various proposals for mineral development put forth by the United States were, for the most part, highly speculative. Tr. 11557-11589 (Watts).