Order No: 645
Date: 12-13-82

BEFORE THE STATE OF WASHINGTON

ENERGY FACILITY SITE EVALUATION COUNCIL

In The Matter of the Application of WASHINGTON WATER POWER CO. CRESTON GENERATING STATION A Washington Corporation	)	APPLICATION NO. 80-1 FINDINGS OF FACT, CONCLUSIONS OF LAW ORDER AND RECOMMENDATION

This matter came on regularly for hearing on September 21, 1981, in Lacey, Washington, before Chairman Nicholas D. Lewis and the Energy Facility Site Evaluation Council of the State of Washington. Hearings have been conducted in Ephrata, Waterville, Davenport, Creston and Spokane, Washington. Hearings have been conducted by Nicholas D. Lewis, Chairman, and Patrick Biggs, Administrative Law Judge.

The following parties appeared and were represented as follows:

APPLICANT:

The Washington Water Power Company
by Jerry K. Boyd
Attorney at Law
1400 Washington Trust Financial Center
Spokane, WA 99204
and by
Mr. Guy Gelbron
Attorney at Law
Snell & Wilmer
Valley Bank Center
Phoenix, AZ 85073

PARTIES RESPONDING:

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Olympia, WA 98504

DEPARTMENT OF ECOLOGY
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DEPARTMENT OF GAME
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DEPT. OF SOCIAL & HEALTH SERVICES
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1155 Dexter Horton Building
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DEPARTMENT OF TRANSPORTATION
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Highways-Licenses Building
Olympia, WA 98504

PLANNING & COMM. AFFAIRS AGENCY
By Thomas Bjorgen
Assistant Attorney General
Temple of Justice
Olympia, WA 98504

INTERVENORS:

TOWN OF WILBUR, LINCOLN COUNTY AND LINCOLN COUNTY FIRE PROTECTION DISTRICT NO. 7
By Philip W. Borst
Attorney at Law
P.O. Box 397
Wilbur, WA 99185

REARDAN GRAIN GROWERS, INC. AND CITY OF DAVENPORT
By Kenneth D. Carpenter
Attorney at Law
529 Morgan Street
Davenport, WA 99122

LINCOLN COUNTY AGRICULTURAL COALITION
By Thomas S. Hayward
Attorney at Law
Rainier Bank Tower, Suite 2703
Seattle, WA 98101

TOWNS OF CRESTON, ALMIRA & REARDAN & CRESTON SCHOOL DIST. NO. 73, DAVENPORT SCHOOL DIST. NO. 207 & WILBUR SCHOOL DISTRICT NO. 200
By George R. Nethercutt, Jr.
1010 Paulsen Building
Spokane, WA 99201

DEPARTMENT OF AGRICULTURE
By Kathleen D. Spong
Assistant Attorney General
Temple of Justice
Olympia, WA 98504

COLVILLE CONFEDERATED TRIBES
By Richard A. DuBey
Attorney at Law
Pioneer Building
Seattle, WA 98104

BLUE SKY ADVOCATES
By Rodney M. Reinbold
Attorney at Law
P.O. Box 751
Okanogan, WA 98840
and
Peter J. Eglick
Attorney at Law
500-4th & Pike Bldg.
1424-4th Avenue
Seattle, WA 98101

The following witnesses testified on behalf of the Applicant:

Robert D. Anderson
Keith E. Anderson
Tom R. Arnold
Randall Barcus
Frederick M. Berthrong
Marshall Brammer
David G. Campbell
Samuel Cluts
Earl Davenport
Richard C. Falkenberg
Marion N. Hamill
Robert E. Henriques
Samuel Hui
Jack M. Lee
Robert Kohut
Allen S. Lefohn
Glen W. Lindeman
L. William Lloyd
Walter W. Loo
David L. Mayer
Lloyd Meyers
Kenneth J. Morrison
Glenn Nogle
Gary Normoyle
Donald L. Olson
John J. Paulus
Douglas K. Pottratz
Gregory Prekeges
Timothy A. Rafferty
Harvey "Pete" Rice
Randi Rich
Clyde Rose
Jim Saucerman
Merrill Schultz
Fred A. Shiosaki
Gary Smith
Robert Werner
Allyn Wirkler

The following witnesses testified on behalf of the Washington State Department of Ecology (WDOE):

Jim Bucknell
Richard Burkhalter
Tom Cook
Fred Fenske
Glen Fiedler
M. Edward Garling
Norm Glenn
Tom Harris
Jim Knudson
Roger Ray
Dave Saunders
Eugene Wallace
Linton Wildrick

The following witnesses testified on behalf of the Department of Game:

Dwayne Eldred
Jerry Hickman

The following witness testified on behalf of the Department of Social and Health Services:

T. R. Strong

The following witness testified on behalf of the Department of Transportation:

Daniel Walther

The following witness testified on behalf of the Planning and Community Affairs Agency:

Frederick C. Stouder

The following witnesses testified on behalf of the Towns of Creston, Almira and Reardan, Creston School District No. 73, Davenport School District No. 207 and Wilbur School District No. 200:

Frances Evans
Clarence Foster
William Heinrichs
Brad Jeffries
James L. Lorenz
Thomas Martin
Frederick C. Stouder
J. Tuman

The following witnesses testified on behalf of Lincoln County, City of Davenport, Town of Wilbur and Fire District No. 7:

Philip Borst
John Clifton
Terry Goodman
Tom Haggarty
Ed Hendrickson
Craig Rettkowski

The following witnesses testified at a public hearing in Spokane, Washington on November 16, 1981:

Scott Andrews
Robert Baldazzi
Leo Baldwin
Mark Billups
Robert Bley
Dennis Bracy
Randy Buehler
Glenn Dobbins
Paul Eichin
Marcella Elsten
Glen Evans
W. S. Featherstone
Paul Gilliland
Dave Harris
Don Holden
Bill Jobb
Gordon W. Johnson
Jane Mace
R. L. McKenzie
Judy McMillan
Bill McMillan
Harry McNeely
G. Arne Meekin
Janet Meekin
Karen Michaelson
Norman Mikalson
Capt. Carol Wiggins
Joe Mukai
L. S. Murback
Daniel Murphy
Wayne Murray
Tom O'Neill
Evelyn Oehlschlaeger
Wayne Olson
Charles W. Ort
Dana Pedey
Merle Pickel
William Purvis
Glenn Rader
William E. Rennebohm
Thomas Ritchie
Cecil Robinette
Fred Roe
Robert Roller
J. H. Scroggie
Bob Spanjer
Allen Stratton
Ernest Strebeck
Bob Stuhlmiller
Ted Theodore
Harvey Wallace
Jim Walton
Tom Webb
Herman Wohl

The following witnesses testified at a public hearing in Creston, Washington on November 18, 1981:

John Adams
C. Daryll Bahr
Don Bodeau
Phil Carlson
Everett Cole
Paul Gilliland
Crayton Guhlke
Sharon Guhlke
Patricia Hall
Blake Hall
Dave Harris
Kenneth Hayes
Dennis Herdrick
Hal Johnson
Eddie Johnson
Chris Laney
Joe Lilje
Jim Lindstrum
George Mielke
Courtney Morse
Lowell Murbach
Carl Nelson
Don Oehlwein
Jerry J. Olson
Richard Reed
Jack Ringwood
George Scharff
Robert Seiler
Jerry Sheffels
Robert Sheffels
Trevert Shelley
Mary Sorenson
Carl Sorenson
Eugene Stuckle
Walt Wilbur

The following witnesses testified on behalf of the Energy Facility Site Evaluation Council:

Charles Clark
Robert Diffely
Hank Droege
Fred Fenske
Michael Johns
Marvin Klinger
Mike Landon
Robert Munzinger
Dean Perry
Dennis Port

The following witnesses testified on behalf of the Blue Sky Advocates:

Donald W. George
Edgar L. Michalson
Michael D. Williams
Wayne T. Williams

The following exhibits were admitted into evidence:

NO.	SPONSORING PARTY	DESCRIPTION
1	Washington Water Power (WWP)	Resume of Donald L. Olson
2	WWP	Resume of Glenn F. Nogle
3	WWP	"Northwest Regional Forecast of Power Loads and Resources"
4	WWP	Creston Participation
5	WWP	TWWPCo (Washington Water Power) Loads and Resources
6	WWP	Creston Participants Estimated Loads and Resources
7	WWP	Resume of Randall Barcus
8	WWP	Resume of Lloyd Meyers
9	WWP	Map of NW Region-West Group area
10	WWP	Resume of Merrill Schultz
11	WWP	Loads and Resources West Group Area Only
12	WWP	Resume of Robert E. Henriques
13	WWP	Resume of Gary B. Normoyle
14	WWP	Creston Generating Station (CGS) Materials and Waste Management Program
15	WWP	CGS Materials and Waste Management Plan Implementation
16	WWP	Resume of Robert W. Werner
17	WWP	Resume of Richard C. Falkenberg
18	WWP	Table 3.4.2-1 Route Characteristics: Spokane to Creston Generating Station
19	WWP	Resume of Keith E. Anderson
20	WWP	Letter Dated October 16, 1981 from Mike Donahue

21	WWP	Resume of Frederick M. Berthrong
22	WWP	Resume of A. P. Winkler
23	WWP	Resume of David G. Campbell
24	WWP	Application page 4.1-35
25	WWP	Resume of Marion N. Hamill
26	WWP	Resume of Marshall Brammer
27	WWP	Environmental Evaluation of Centerline Routes
28	WWP	Map of Transmission System by TWWPCo.
29	WWP	Resume of James Saucerman
30	WWP	Seven maps entitled "Creston Generating Station Transmission System Route Locations"
31	WWP	Resume of Samuel Cluts
32	WWP	The WWPC 500 kV Transmission Line
33	WWP	The WWPC 230 kV Transmission Line
34	WWP	Professional Qualifications of Randi C. Rich
35	WWP	Resume of Mr. Lee
36	WWP	Electrical and Biological Effects of Transmission Lines: a Review
37	WWP	Appendix C, Electrical and Biological Effects
38	WWP	Land-use Effects of Southern 230 kV Alternative
39	WWP	Resume of Bob D. Anderson
40	WWP	Resume of Walter Loo
41	WWP	Resume of Samuel Hui
42	WWP	Corrections to Application Figure 4.2.1-1, Table 5.2.1-1, page 4.2-9 and Table 4.2.1-2
43	WWP	Resume of David L. Mayer

44	WWP	Resume of Douglas Pottratz
45	WWP	PSD Application
46	WWP	Resume of John Paulus
47	WWP	Summary - COMPLEX I Modelling of CGS SO_2 Emissions
48	WWP	Revised Tables 5.4.3-8 and 5.4.3-9
49	WWP	Responses to EPA Region X regarding Completeness; Items 6, 7 and 8 for CGS PSD Application
50	WWP/Game	Stipulation between Washington Water Power Company and Washington State Department of Game
51	WWP	Resume of Robert L. Kohut
52	Jointly Sponsored	CGS Socioeconomic Impact Mitigation Agreement and Interlocal Cooperation Agreement
53	WWP	Resume of Fred H. Shiosaki
54	WWP	Resume of Timothy A. Rafferty
55	WWP	Resume of Gary Smith
56	WWP	Revenue/Expenditure Analysis Creston Generating Station
57	WWP	Prepayment Schedule for CGS-Related Local Sales and Use Taxes Showing Apportionment to Cooperating Districts (dollars)
58	WWP	Resume of Clyde B. Rose
59	WWP	Resume of Thomas Arnold
60	WWP	Application for Site Certification Sections 4.5 and 5.5
61	WWP	Non-CGS Figure entitled "Typical Environmental Noise Levels"
62	WWP	Resume of Harvey "Pete" Rice
63	Davenport	City of Davenport Itemized Cost Estimates for Water and Sewer Improvements Related to Population

64	Wilbur	Town of Wilbur Itemized Cost Estimates for Water and Sewer Improvements Related to Population
65	Davenport	Color Coded Map of City of Davenport showing Water and Sewer Improvements
66	Wilbur	Color Coded Map of Town of Wilbur showing Water and Sewer Improvements
67	Creston et al.	Resume of Frederick C. Stouder
68	WDOE	Resume of Norman L. Glenn
69	WDOE	State of Washington Construction Grants Program for Municipal Wastewater Facilities
70	WDOE	Resume of Roger K. Ray
71	WDOE	Regulations Governing Solid Waste Handling and Facilities
72	WDOE	Solid Waste Management Plan for Lincoln County & Municipalities
73	WDOE	Comprehensive Water & Sewer Facilities Plan Washington Drainage Basins 43 & 53
74	WWP/Reardan Grain Growers	Creston Generating Station Agreement Between Washington Water Power Company and Reardan Grain Growers, Inc. Regarding Impacts of Rail Transportation
75	WWP/DOT	Stipulation Between Washington Water Power Company and Washington State Department of Transportation
76	WWP/Schools	CGS Socioeconomic Impact Mitigation Agreement for Schools. (Marked for illustrative purposes only.)
77	Schools	Resume of J. Tuman
78	Schools	Resume of Marshall B. Jeffries
79	Schools	Mitigation of the Population Impact on the Creston School District caused by CGS
80	Schools	Resume of Clarence M. Foster
81	Schools	Resume of James Lorenz

82	WDOE	Corrected page 4 to M. Edward Garling prefiled testimony
83	WDOE	Resume of M. Edward Garling
84	WDOE	State Statutes on Dam Safety
85	WDOE	Recommended Guidelines for Safety Inspection of Dams
86	WDOE	Resume of Dave Saunders
87	WDOE	Resume of Richard A. Burkhalter
88	WDOE	Resume of Fred Fenske
89	WDOE	Air Contaminant Emission Permit
90	WDOE	Resume of Tom E. Harris
91	WDOE	Photographs of the Boardman Facility
92	WDOE	Permit Issued for Nevada Power Company Coal-fired Power Plant
93	WDOE	Permit Issued for Hunter Utah Power and Light Company Coal-fired Power Plant
94	WDOE	Conditional Permit to Commence Construction and Operate the Intermountain Power Project
95	WDOE	Resume of Linton Wildrick
96	WDOE	Resume of Tom Cook
97	WDOE	Resume of Jim Knudson
98	WDOE	State Waste Discharge Permit
99	WDOE	Memorandum from Mr. Burkhalter to Mr. Provost dated November 25, 1981
100	WWP	Rebuttal Testimony of John Paulus
101	WWP	Survey of Over 90 Percent FGD Systems for Coal-Fired Power Plants (Not Admitted)
102	Creston et al.	Creston-Mt. Tolman Impact Assistance Project Subcommittee Needs Assessment Status Report
103	Creston et al.	Town of Creston, Washington General Impact Calculations, July 7, 1981

104	Creston et al.	Town of Reardan, Washington General Impact Calculations, July 7, 1981
105	Creston et al.	Town of Almira, Washington General Impact Calculations, June 30, 1981
106	WWP/DSHS	Stipulation and Agreement between the Department of Social and Health Services and The Washington Water Power Company
107	WDOE	Resume of Glen H. Fiedler
108	WDOE	Resume of James R. Bucknell
109	WDOE	State Water Program, Columbia River In-Stream Resource Protection Program, Program Document, Environmental Impact Statement and Proposed Regulation, June 1980
110	WDOE	State Water Program, Columbia River In-Stream Resource Protection Program, Comments and Responses, June 1980
111	WDOE	Resume of Eugene F. Wallace plus Exhibits EFW-2 thru EFW-32: Photocopies of permits and correspondence regarding water rights. (An itemization of EFW-2 thru EFW-32 is contained in the transcript beginning at page 4932.)
112	WWP/Schools	Stipulation between the Applicant and Creston School District No. 73, Davenport School Dist. No. 207 and Wilbur School District No. 200
113	BPA	Transmission Rate Schedules
114	BPA	Annual Wheeling Charges for 500-MW From Creston to Marshall
115	BPA	Program Estimates Fiscal Year Ending September 1982, Congressional Presentation January 15, 1982 by the Department of Energy and BPA
116	WWP	BPA's Proposed 500 kV Northern Alternative
117	WWP	Selected Information on CGS Transmission System
118	WWP	Large Map with Four Overlays showing land use, zoning and location of centerlines studied by TWWPCo.
119	WWP	Aerial Photographs Nos. 1-10

120	WWP	Handwritten document entitled "Segmentation of BPA Transmission Plant - Fiscal Year 1982, 1981 Transmission Rate Final"
121	WWP	Multi-page, multi-document exhibit; first page - a letter dated 11-19-81 from D. L. Olson to Peter Johnson
122	WWP	Interrogatories and correspondence between BPA and TWWPCo.
123	WWP	Memorandum Covering the Difficulties Encountered in Connection with the Building of TWWPCo's 230 kV Transmission Line from Cabinet Gorge to Spokane
124	WDOE	Air Quality Evaluation of the Creston Generating Station
125	WWP	Supplemental BACT Analysis and Proposed Permit Conditions
126	Blue Sky Advocates (BSA)	Resume of Michael D. Williams
127	BSA	Exposure Program by Foresite Corporation, April 1982
128	BSA	Figure 5.2-1, Annual Stability Wind Rose for Spokane
129	BSA	Comprehensive Analysis of Time-Concentration Relationships and Validation of a Single-Source Dispersion Model (EPA-450/3-75-083, March 1975)
130	BSA	Model Validation and Time-Concentration Analysis of Three Power Plants (EPA-450/3-76-002, December 1975)
131	BSA	Attachment of Example Calculation of Techniques Used to Estimate Dose Above Threshold
132	BSA	Written Statement of Michael Williams Containing Dose with Breakdown and No Breakdown
133	BSA	Resume of Wayne T. Williams
134	BSA	Log of Dose of Sulfur Dioxide (with or without NO_x) times 10-3 Measured in Micrograms per Cubic Meter Hours

135	BSA	Appendix B to Wayne Williams Prefiled Testimony
136	BSA	References for Sections 2 and 4, Wayne Williams Prefiled Testimony
137	BSA	Table 4.3, A "Rule-of-Thumb" Relating Leaf Damage to Yield Reduction
138	BSA	Methods Development for Assessing Air Pollution Control Benefits, Volume III, U.S. Environmental Protection Agency, February 1979
139	BSA	Table V, Effects of Varying Frequency of 3-hour SO_2 Exposures on Yield of Small Grains and Alfalfa
140	BSA	Table VII, Estimated Percent Foliar Injury for Selected Small Grains in the Multiple Exposure Experiment
141	BSA	Table 5, The Area and Production of Rye in Leading States and Totals in United States During 1978
142	BSA	Dose Response Curve for Wheat and Range Grasses
143	BSA	Appendix A - Wheat, Wayne Williams Prefiled Testimony
144	BSA	Table 8-9, Maximum pH Concentration Producing Injury to Vegetation After Direct Contact with Simulated Acidic Precipitation
145	BSA	Figure 5.1-10, Exposure Regime Receptors
146	BSA	Table of Dose Calculations
147	BSA	Figure 41, Muskingum River Plant Cumulative Frequency Distribution for one-hour SO_2 Concentrations
148	BSA	Figure 4-7, Observed and Predicted hourly Sigma Y on the tracer monitoring network, 3 km arc
149	BSA	Figure 4-8, Observed and Predicted hourly Sigma Y on the tracer monitoring network, 7 km arc
150	WWP	Affidavit of Michael T. Mills, PhD dated September 30th, 1982 (not admitted)

151	BSA	Data Base for Wheat/Range Grass Curve
152	BSA	Original Estimate (B) plus recheck (A), Log of Dose of Sulfur Dioxide (Exhibit 134)
153	BSA	Another Dose Response Curve for Wheat and Range Grasses
154	WWP	Blue Sky Advocates Adjustments of CRSTER SO_2 Predictions
155	BSA	Data Base for Dose Response Curve
156	WWP	Crop Loss Assessment - Proceedings of E. C. Stakman Commemorative Symposium - Publication 7-1980, University of Minnesota
157	WWP	Ashenden, T.W., "Growth Reductions in Cocksfoot as a Result of SO_2 Pollution"
158	WWP	Ashenden, T.W. and Mansfield, T.A., "Influence of Wind Speed on the Sensitivity of Ryegrass to SO_2", October 22, 1976
159	WWP	Depression of Yield in Ryegrass Exposed to Sulfur Dioxide, Nature, Vol. 241, January 5, 1973
160	WWP	Bell, J.N.B. and Mudd, C.H., "Sulfur Dioxide Resistance in Plants: A Case Study of Lolium perenne"
161	WWP	Ferenbaugh, Roger W., "Effects of Prolonged Exposure of Oryzopsis hymenoides to SO_2", December 1977
162	WWP	Lawrence, J.A., "Response of Maize and Wheat to Sulfur Dioxide", Plant Disease Reporter, Vol. 63, No. 6, June 1979
163	WWP	Ashenden, T.W., "The Effects of Long-Term Exposures to SO_2 and NO_2 Pollution on the Growth of Dactylis glomerata L. and Poa pratensis L.
164	BSA	Cubic Regression - with data points
165	BSA	Cubic Regression - without log of dose
166	BSA	Cubic Regression - with log of dose
167	BSA	Calculation of Yield Loss on Dad's Farm

168	BSA	Plotting Points, Wayne Williams Prefiled Testimony
169	BSA	Resume of Donald W. George
170	BSA	26 Slides Showing Wheat Plant Development and Growth
171	BSA/WWP	Estimated Per Acre Value of Wheat at Various Levels and Prices Assuming a 50 Bushel Average Yield Per Acre Per Crop Year
172	BSA	Resume of Edgar L. Michalson
173	WWP	Annual Data Report, January-December 1981, CGS Air Monitoring System, September 1982
174	WWP	Letter dated 7-20-82 to D. K. Pottratz from J. J. Paulus re: CRSTER Modeling
175	WWP	Chart of Annual Standards Comparison for SO_2
176	WWP	Figure 26, J.M. Stuart Plant Cumulative Frequency Distribution for One-Hour SO_2 Concentrations At All Stations
177	WWP	1980/1981 Exposure Regimes Based on CRSTER Modeling of the CGS Using TWWPCo On-Site Meteorological Data, September 1982
178	WWP	Hour by Hour Data
179	WWP	Supplemental Assessment Regarding CGS and Crop Yields in Lincoln County
180	WWP	1980/1981 Hourly Predicted Concentrations - Based on CRSTER Modelling of the CGS Using TWWPCo On-Site Meteorological Data, September 1982
181	WWP	Resume of Timothy V. Larson (Exhibit was Withdrawn)
182	WWP	Resume of Kenneth J. Morrison
183	WWP	Resume of Allen S. Lefohn
184	WWP	Lefohn, Allen S. "A Description of the Dosage Concept and a Review of W. Williams Testimony and Report", September 1982

185	WWP	1978 Cumulative Frequency Distributions-EPA Colstrip Research Program - ZAPS Sites
186	WWP	Updated Resume of Robert John Kohut
187	WWP	Partial Bibliography of Robert Kohut
188	BSA	Concentration Chart with Background and NO_2, from July 1980 Predictions for Dad's Farm
189	BSA	Preliminary Results from the EPRI Plume Model Validation Project-Plains Site-Interim Report, Electric Power Research Institute, April 1981
190	BSA	Rigorous Mathematical Analysis for Gaussian Plume - Representation of Trace Field Data - Phillips Petroleum Company
191	BSA	Bioenvironmental Impact of a Coal-Fired Power Plant, Fourth Interim Report, Colstrip, Montana, December 1978, EPA-600/3-79-044, April 1979
192	BSA	Crittenden, P. D. and Read, D.J., "The Effects of Air Pollution on Plant Growth with Special Reference to Sulfur Dioxide", New Phytol., 1978.
193	BSA	Tingey, et al., "Vegetation Injury from the Interaction of Nitrogen Dioxide and Sulfur Dioxide", Phytopathology, December 1971.
194	BSA	Mandl et al. " Effects of Hydrogen Fluoride and Sulfur Dioxide Alone and in Combination on Several Species of Plants", 1975
195	BSA	White et al., "Synergistic Inhibition of Apparent Photosynthesis Rate of Alfalfa by Combinations of Sulfur Dioxide and Nitrogen Dioxide," Environmental Science and Technology, 1974.
196	BSA	Unsworth et al., " Stomatal Responses to Sulfur Dioxide," Nature, October 1972
197	BSA	Bell, et al., "Studies on the Effects of Low Levels of SO_2 on the Growth of Lolium perenne L.", New Phytol., 1979

198	BSA	Biscoe et al., "The Effects of Low Concentrations of Sulfur Dioxide on Stomatal Behavior in Vicia faba", New Phytol, 1973
199	BSA	Ashenden, T.W. and Williams, I.A.D., "Growth Reductions in Lolium Multiflorum Lam. and Phleum Pratense L. as a Result of SO_2 and NO_2 Pollution", Environmental Pollution, 1980.
200	WDOE	Hosker, R.P. and Lindberg, S.E., "Review: Atmospheric Deposition and Plant Assimilation of Gases and Particles", Atmospheric Environment, 1982.
201	WDOE	Hansen, D.A. and Hidy, G.M., "Review of Questions Regarding Rain Acidity Data", Atmospheric Environment, 1982.
202	WDOE	Lewis, W.M. and Grant, M.C., "Acid Precipitation in the Western U.S.", Science, 1980
203	BSA	Bennett et al., "Acute Effects of Combination of SO_2 and NO_2 on Plants", Environmental Pollution, 1975
204	WWP	Chart entitled Yield Reduction Threshold-SO_2
205	BSA/WWP	Foresite Exposure Program, April 1982 Version
206	WWP	Chart entitled Worst Case One-Hour Incident Outlying Receptors
207	BSA/WWP	Foresite Exposure Program, April 1982 Version Theoretical Worst Case Calculations
208	BSA	Dreisinger et al., "Monitoring Atmospheric Sulfur Dioxide and Correlating its Effects on Crops and Forests in the Sudbury Area", Impact of Air Pollution on Vegetation Conference, Toronto, April 1970.

TABLE OF CONTENTS

GLOSSARY

Antagonism	Combined action of more than one pollutant produces effects less than the sum of the effects produced by each pollutant individually.
BACT	Best Available Control Technology
BPA	Bonneville Power Administration
BSA	Blue Sky Advocates
Btu	British Thermal Unit
cfs	Cubic feet per second
CGS	Creston Generating Station
CMTIAP	Creston-Mt. Tolman Impact Assistance Project
CO	Carbon monoxide
Coals A-E	Five types of coal with varying sulfur, ash and energy content representing the range of coals potentially to be selected for the CGS.
CPC	Creston Project Committee
CRIRPP	Columbia River Instream Resources Protection Program
CRSTER	A steady-state Gaussian plume dispersion model to measure air pollutant concentrations at terrain conditions similar to Lincoln County.
dB	Decibels
dbA	Measurement of human response to noise
DEIS	Draft Environmental Impact Statement
FRC	Federal Regional Council
FGD	Flue gas desulfurization
gpm	Gallons per minute
gr/sdcf	Grains per standard dry cubic foot
Inversion breakup fumigation	The rapid mixing downward to the ground of material that has accumulated aloft during a period of atmospheric stability giving rise to the greatest ground-level concentrations.

kV	Kilovolts
kW	Kilowatts
kWh	Kilowatt hours
lb/mmbtu	Pounds per million British thermal units
Ldn	Day-night sound levels (noise measurement)
Lmax	Measurement for noises of short duration
MW	Megawatts
NAAQS	National Ambient Air Quality Standards
NCLAN	National Crop Loss Assessment Network
NO_x	Nitrogen oxides
NO_2	Nitrogen dioxide
NSPS	New Source Performance Standard
O_3	Ozone
PM	Particulate matter
PNUCC	Pacific Northwest Utilities Conference Committee
ppm	Parts per million
PSD	Prevention of Significant Deterioration
REA	Rural Electrification Administration
ROW	Right-of-way
SO_2	Sulfur dioxide
Stomata	Pore-like openings in the leaves of plants
Synergism	Combined action of more than one pollutant produces effects greater than the sum of the effects produced by each pollutant individually.
TSP	Total Suspended Particulates
ug/m^3	Micrograms per cubic meter
VPD	Vehicles per day
WWP	Washington Water Power

OVERVIEW

Washington Water Power, an investor-owned utility, serving parts of Eastern Washington and Northern Idaho, seeks certification to construct up to four units of coal-fired steam electric generation. Full implementation of plans would produce approximately 2,000 MW by 1994.

The plant site is located in Lincoln County, near the town of Creston, sixty miles west of Spokane. The region around the plant site is rural and sparsely populated. Four small towns and the City of Davenport lie within twenty-five miles of the plant site. The economy of Lincoln County is based on agriculture, primarily wheat farming and cattle ranching.

The terrain in the region is gently rolling and relatively flat. Air quality is quite good and there are excellent atmospheric conditions for dispersion of emissions.

The plant will be fueled by high quality, low sulfur western coal to be obtained from coal fields in Wyoming, Montana or Alberta, Canada.

The major east-west Bonneville Power Administration transmission corridor runs five miles north of the plant site.

Local affected communities were involved with planning at a very early stage. A potential site study was published in September of 1979. A thorough and detailed plan for socioeconomic mitigation was developed. Water Power has reached agreement on socioeconomic mitigation with most, if not all, affected municipal subdivisions.

Water Power's approach to licensing has been conceptual in that detailed design and engineering are foreseen as matters to be addressed after a license has been granted. This approach is reasonable in light of recent events in the energy setting of the state of Washington. As a consequence, there is need for further study, review and approval of detailed plans as they are developed. In many areas, actual certification limits and conditions will be developed by the Council as information becomes known.

Major issues addressed in the Application and these Findings are socioeconomic, air quality, transmission line routing, waste management, transportation and noise.

I. INTRODUCTORY FINDINGS

A. Preface

Washington Water Power, a private utility serving Eastern Washington and Northern Idaho, seeks certification to construct as many as four 500 MW coal-fired electric generating plants to be located near Creston, Lincoln County, Washington. The general area surrounding the site is rural, agricultural and sparsely populated. Less than 10,000 people live in all of Lincoln County, though the county occupies 1,619 square miles. Seven small communities lie within 25 miles of the site. The largest is Davenport, the county seat, population 1,551, located 19 miles east of the Town of Creston.

B. History of Proceedings

Proceedings commenced with the potential site study, published September 19, 1979. The application was filed September 29, 1980. Through the course of the proceedings, public hearings have been held in Spokane, Grant, Douglas and Lincoln Counties. Formal intervention was granted first to the Town of Creston by order entered October 27, 1980. Intervention was originally closed to petitions filed after May 22, 1981. Special relief from this date was allowed to seven local intervenors. By order of July 13, 1981, three local school districts became parties granted intervention status. Discovery occurred involving all parties and intervenors. Seven prehearing conferences were held prior to the opening of the hearing and three additional conferences occurred during the hearing. The original contested case hearing commenced with opening statements of the parties on Monday, September 21, 1981. The original contested case involved 40 hearing days. Twenty-one separate parties appeared as agencies or intervenors. Seventy-six witnesses testified. From November 17 to November 20, 1981, three hearing days were held at Davenport, Lincoln County. Public testimony of 89 witnesses was taken in two evening hearing sessions at Creston and Spokane on November 16 and 18, 1981. Six formal stipulations were negotiated and executed between Water Power and other parties speaking to most of the issues raised in the Application. Consistency and compliance with the zoning laws and comprehensive plans were

determined for Lincoln, Douglas, Grant and Spokane counties, as well as the cities of Spokane and Grand Coulee.

No party participating in the original proceedings opposed construction of the proposed plant, though a petition for intervention was filed on January 8, 1982, by Blue Sky Advocates seeking further contested case review of most, if not all, major issues in the proceedings. On January 11, 1982, the Council denied the petition for intervention filed by Blue Sky Advocates. Thereafter, Blue Sky Advocates requested reconsideration. On January 25, 1982, the Council reconsidered its denial of the petition for intervention, heard argument on it, and denied the petition for intervention. On March 8, 1982, the Council clarified its record to reflect what actually occurred on January 25, 1982. Blue Sky Advocates appealed the Council's decision to Thurston County Superior Court on February 22, 1982.

The original hearing record was closed on April 5, 1982. Thereafter, the Council considered the Administrative Law Judge's draft recommendation, exceptions and replies filed by parties, and developed its findings of fact, conclusions of law, order, recommendation and draft site certification agreement. On May 24, 1982, the Council forwarded its recommendation and draft site certification agreement to the Governor for his consideration. On June 23, 1982, the Thurston County Superior Court issued a memorandum opinion requiring the Council to reconsider the possible effects of sulfur dioxide (SO_2) and acid rain on crop yields in Lincoln County. On July 7, 1982, the Governor returned the case to the Council for reconsideration of those issues addressed in the Court's order.

On July 12, 1982, the Council reopened the hearing to consider the possible effects of SO_2 and acid rain on crop yields in Lincoln County and granted Blue Sky Advocates intervenor status as to those issues. Three prehearing conferences were held prior to the commencement of the reopened hearings on October 4, 1982, and conferences were held during the reopened hearings. Testimony was taken for ten additional days from October 4 through October 8, 1982, and from October 18 through

October 22, 1982. Four witnesses testified for Blue Sky Advocates and five witnesses testified for the Applicant. Final argument by the parties was heard on October 29, 1982, and proposed findings were submitted. The reopened contested case record was closed on October 29, 1982.

The recommendation forwarded to the Governor on May 24, 1982, Order No. 640, has been amended in these findings as a consequence of the supplemental air quality hearings. The only changes have been to findings relating to the possible effects on crop yields in Lincoln County from emissions of SO_2 and acid rain, principally in Section XII. Portions of these findings not related to this limited supplemental issue have not been changed and remain the same as in the initial Order No. 640.

II. DESCRIPTION OF THE APPLICANT

A. Ownership

The Washington Water Power Company (Water Power) is an investor-owned utility engaged in the generation and distribution of electric power. The Applicant also distributes natural gas, water and steam heat. Water Power was incorporated in 1889 and in 1958 merged with the Spokane Natural Gas Company. The Company is owned directly by approximately 36,000 stockholders. Thirteen hundred people are regularly employed.

B. Service Area

Water Power serves an area of 26,000 square miles in Eastern Washington and Northern Idaho. Spokane is the hub of the service area. Among electrical customers, 200,000 are residential, 25,000 are commercial and 250 are general (primarily involving street and highway lighting).

C. Loads

Due to its base in hydroelectric power, Water Power offers power at a very low cost. In 1979, residential rates were less than one-half the national average. The Company's adjusted average load for 1979 was 849,000 kW.

D. Hydroelectric Ownership

Water Power owns nine hydroelectric plants with capacity of 946,000 kW. The Company has firm long-term contracts for electricity from hydroelectric plants on the Columbia River amounting to 289,000 kW. The Company is a participant in a licensing project for a hydroelectric project at Sullivan Lake in Pend Oreille County. The Sullivan Lake project will provide 16,000 kW if the Company maintains 100% ownership.

E. Thermal Ownership

Water Power's present thermal ownership is limited to 15% of the Centralia project, yielding 199,500 kW. The Washington Irrigation and Development Company, a wholly owned subsidiary, owns 50% of the mine at Centralia and is fully responsible for its operation. Peaking and/or emergency power is supplied by the Othello combustion turbine (32,800 kW) and the Northeast combustion turbine (68,000 kW).

F. Planned Thermal Participation

The Applicant's planned thermal participation includes 15% of Colstrip 3 and 4, equal to 210,000 kW. These plants are scheduled for service commencing in 1984 and 1985, respectively. Water Power owns a 5% interest in WNP No. 3, equal to 62,000 kW. This plant is scheduled to be on line in 1986. Water Power expects to own 25% of the Creston Plant, yielding 500,000 kW. Water Power owns 10% of the Skagit/Hanford Nuclear Project for an anticipated yield of 128,800 kW in 1991. In addition, the Kettle Falls wood-fired plant, currently under construction, will yield 42,000 kW when on-line in 1983. Water Power expects to own 100% of that project.

G. Projected Need

Water Power has determined that additional power generation will be required in its service area in the late 1980s. Conservation has been considered in this judgment. Federal legislation and current levels of exploitation have severely constrained options for further hydroelectric development. Water Power has concluded that a coal-fired plant would make the best use of resource options in the region and best serve the customers within its service area.

III. DESCRIPTION OF THE PROJECT

A. Cost

1. Construction Cost

The proposed cost for construction of the facility is four billion dollars, for four units to be expended through July, 1994.

2. Operating Cost

Annual operating cost with all four units on-line is projected to be in excess of 750 million dollars. Fuel costs alone will exceed 600 million dollars. Additional annual costs, above fuel costs, are primarily for property taxes, insurance, labor and materials.

3. Transportation Cost

Due to the distance between the coal field and the plant site, the cost of rail transportation is estimated to be approximately one-half of the total fuel cost.

4. Financing

Water Power plans to finance its share of the CGS through any and all of the financing methods available to it, including the issuance of common stock, preferred stock, debt securities, and other financing methods such as leasing arrangements or project financing. Participating public utilities will finance their share of the project with the issuance of debt securities or municipal bonds. All REA-affiliated cooperatives will obtain their financing from federal sources.

B. Participation and Subscription

Project participation is currently committed as follows:

Eugene Water and Electric Board	30 Megawatts	1.5%
Pacific Northwest Generating Company	200 Megawatts	10.0%

Puget Sound Power and Light Company	500 Megawatts	25.0%
Seattle City Light	200 Megawatts	10.0%
The Washington Water Power Company	500 Megawatts	25.0%
	1,430 Megawatts	71.5%
Unsubscribed	570 Megawatts	28.5%

C. Conceptual Engineering

1. Presentation

Water Power has presented to the Council an application encompassing only "licensing/environmental" matters. This approach has been denominated "conceptual engineering." (TR Vol. 2, p. 140, Olson)

2. Definition

"Conceptual engineering" describes the minimal level of application detail that is required to bring a project through its permitting phase. (TR Vol. 1, p. 139, Olson)

3. Final Design

Purchases of major equipment and engineering design are planned as post-certification activities. Detailed design is not expected to commence until 1983.

4. Number of Units

The final decision on the number of units to be constructed is also regarded by the Applicant as a post-certification matter. (TR Vol. 2, p. 144, Olson)

D. Scheduling

1. Plant Construction

The construction of the Creston Generating Station involves several phases for each generating unit, including approximately nine months for conceptual or preliminary engineering, approximately fifteen months for detailed engineering, approximately six months for site preparation, and approximately forty-two months for the construction of the unit. Under the present schedule, the construction of CGS Unit 1 would commence in approximately 1984, and be completed in mid-1988. CGS Unit 2 would follow CGS Unit 1 by approximately eighteen months. CGS Unit 3 would follow CGS Unit 2 by approximately thirty-six months. CGS Unit 4 would follow CGS Unit 3 by approximately eighteen months. The precise scheduling which may ultimately occur is subject to a variety of complex factors. The foregoing is Water Power's plan at this stage. (TR Vol. 4, p. 494, Henriques.)

2. Transmission Facilities

Transmission facilities will undergo phase construction as well. Work will begin in mid-1984 on the Marshall Substation and continue on various components of the transmission system with final completion now projected for 1993 in time to receive four units of generation.

3. Work Force

The construction work force should peak at approximately 340 persons in 1984, 2,015 in 1987 and 1,700 in 1992. Regular operational personnel required by July, 1994, with all four units on-line, will be approximately 400.

E. Engineering Design Features-Power Plant

1. Power Generating Units

a. Turbine and Generator

Each unit will have independent power generating and auxiliary systems. Two units each will be located in two separate power

blocks consisting of boiler and turbine-generator buildings. The manufacturer's maximum guaranteed rating (nameplate) will be 570 MW gross generation for each turbine generator.

b. Other Power Block Components

Located within each power block will be each unit's condenser, feedwater, condensate, service water, auxiliary cooling water, ash removal system, lubricating oil and other miscellaneous systems required for power generation.

c. Associated Components

Located outside the power block associated with each individual power generating unit will be atmospheric emissions control equipment and cooling towers. Other systems required for power generation and waste handling will be located adjacent to the power block and shared, to some degree, among the four units.

d. Steam Generation

Associated with each generating unit will be a steam generator where combustion of pulverized coal will generate high pressure, high temperature steam from treated water supplied from the surge pond. Power will then be generated from the steam by the turbine generator. In turn, power will be supplied to the plant substation at its associated switchyard and, from there, put into the transmission system. Exhaust steam from the turbine will be condensed and pumped back into the steam generator. Waste heat will be transferred from the exhaust steam to the heat dissipation system and rejected to the atmosphere by cooling towers. Bottom ash will be removed from under the boiler. Other combustion products, including fly ash, a by-product of burning pulverized coal, will exit the boiler and enter the emissions control system. There, the majority of the fly ash and sulfur dioxide will be removed. The remaining

combustion products will then pass up the stack to the atmosphere.

e. Condensers

The main condenser will reject the waste heat from the steam which goes from the main and boiler feed pump turbines to the circulating water system. The condenser will be a dual-shelf service condenser designed to accept the maximum main turbine heat load and steam exhaust from the boiler feed pump turbines under conditions of highest expected cooling water temperatures. The circulating water temperature rise across the condenser will be approximately 32°F.

f. Deaeration

The steam condensed in the condenser will collect in the condenser hotwell and will be pumped through a series of low pressure feed water heaters to the deaerator storage tank. Two steam-driven boiler feed water pumps will pump water from the deaerator to the steam generator through a series of high pressure feed water heaters. Steam extracted from the turbine at various stages will be used by the feed water heaters to heat the feed water in its return path through the steam generator.

g. Heat Dissipation

Heat dissipation from the condenser and cooling tower system will be the greatest single usage of water in the plant. The function of the heat dissipation system is to absorb waste heat from the plant, primarily from the main condensers, and dissipate this heat to the environment. Waste heat from the plant will be rejected to the atmosphere from round concrete mechanical draft cooling towers. The maximum heat rejection will be 2.9×10^9 BTU/hr. per unit, which will require a circulating water flow of about 176,250 gallons per minute per unit, with a 32°F cooling tower range, or a 32°F condenser

temperature rise. Each unit will require one tower approximately 245 feet in diameter and 70 feet high. Maximum discharge air temperature during the hottest summer periods will be at 98°F. The four towers will be ranged with centers on a northwest-southeast line. Evaporation loss from each tower will vary between a maximum of 5,020 gallons per minute during the hottest summer periods to 2,500 gallons per minute on a 0°F temperature day at a maximum unit load of 622 MW. Average annual evaporation per unit will be approximately 4,325 acre-feet per year at a 75% load factor, or approximately 17,300 acre-feet per year for the four-unit plant at a 75% capacity factor. Present-day cooling towers have a drift loss of 0.005% of the total circulated water flow. Drift loss represents the amount of unevaporated water released to the environment. A four-unit plant drift loss would be approximately 35 gallons per minute.

h. Supplemental Systems

An auxiliary boiler will provide auxiliary steam for plant start-up and heating. It is anticipated that it will operate on an intermittent basis for approximately two years. During start-up of a unit and at low loads, supplementary fuel will be fired in the steam generator. During normal operations, a coal-pulverizer will operate as soon as sufficient primary air temperature is obtained. The use of supplementary fuel and a steam generator for plant start-up will be infrequent, estimated to be about four cold start-ups per year and 10 hot start-ups per year.

i. Output

The net output of CGS will be 2,032 MW. The gross output will be 2,280 MW, including auxiliary requirements. The maximum gross output (valves wide open at five percent overpressure) will be 2,488 MW. Assuming four units, the gross heat rate per unit will be 9,243 BTU/kWh at a guaranteed net unit heat rate

of 10,371 BTU/kWh. The maximum capacity per unit will be 622 MW. The guaranteed capacity per unit will be 570 MW per unit. The net capacity per unit will be 508 MW per unit. The plant design capacity factor is 75%. The unit design life is 35 years.

2. Water Systems

Water for construction of the plant will be obtained from wells located on the site itself. Makeup water will be drawn from a well field site near Franklin D. Roosevelt (FDR) Lake. A water pipeline will run from the well field site up steep slopes to the uplands and then follow rolling terrain to the plant site. (See Section XIV)

3. Transmission Systems

Transmission of generation from the plant will be by 500 kV lattice towers east and west. An interconnection near Spokane will route transmission in a southerly direction by 230 kV lines to the Marshall substation located southwest of Spokane. (See Section XIII)

4. Fuels Handling and Storage

a. Coal Sources

The Applicant has not yet identified a coal source, although a low sulfur, western coal has been specified. (App. Sec. A.6.2.5)

b. Coal Handling

1) Delivery

Coal will be delivered to the plant site by unit trains. The number of trains per day may vary from 3.4 to 5.4 depending on which coal source is selected, assuming operation of four units. Each train will consist of approximately 70-100 gondola-type cars of 100-ton capacity. Coal will be unloaded at a rate of 3,000 to 3,500 tons per hour allowing a unit train to unload in approximately 3-4 hours. A thaw shed will be used in winter to facilitate the unloading of frozen cars.

2) Transfer from Train

Each railroad car will be positioned in a rotary car dumper and physically rotated to dump through the open top of the car. Coal will be discharged from the railroad cars into a hopper which supplies vibratory feeders. Clearance will be provided to allow a mobile ice breaker access for clearing frozen coal. An emergency coal reclaim will be provided at the side of the building to allow coal to be fed into the dumper hopper from the dead coal storage pile by means of mobile equipment.

3) Transfer to Storage

Vibratory feeders will remove coal from the car dumper hopper, discharge it onto a convey belt located in a tunnel and transport it to a transfer house. Conveyor belts will be equipped with a scale for weighing incoming coal. At the transfer house, the coal will flow through a diverter gate to a second belt and be conveyed to another transfer house located between the two covered live coal storage buildings. The second transfer house will contain a feeder bin with diverter gates that will allow coal to be fed to either of the live storage buildings or to the stacker conveyor. The stacker conveyor will deposit coal on the ground via a telescopic spout or lowering well. From this ground level pile of 10,000 tons, mobile equipment will be used to build the 90-day dead coal storage pile. Mobile equipment can reclaim coal from either the 90-day dead storage or the 10,000 ton pile and feed directly into the underground emergency reclaim hopper. From this hopper, vibratory feeders supply coal to a belt located in a tunnel. This conveyor feeds the plant conveyors by-passing the live storage building conveyors.

4) Storage

Two A-frame covered storage buildings will be provided for live coal storage. There will be one building for each pair of units. Under normal operating conditions, coal is placed in storage by a single tripper conveyor on top of each live storage building. Coal is removed from storage by two rotary plows, each feeding a conveyor belt which discharges to conveyors leading to the plant. Each plow and belt combination can supply enough coal to enable firing of two units of both boilers at maximum load. Each building will store enough coal to allow firing at full load for 60 hours.

5) Transfer to Plant

Two conveyors, each capable of supplying coal to two steam generators, will exit the live storage buildings below ground in a tunnel and continue at an angle above ground to transfer houses. The transfer houses will contain magnetic separators, for removing tramp iron, and crushers. The crushers will have provisions for by-passing coal that does not require further size reduction. Leaving the transfer houses, the conveyors will change direction and continue on to the plant. Conveyors for each pair of units will transfer coal to distribution bins located inside the power block. Each conveyor will be capable of supplying coal to units operating at maximum load. Dual conveyor, double belt arrangements will provide redundancy from each live coal storage building to the plant, so that loss of either conveyor will not result in reduced capacity to either unit.

c. Supplementary Fuel System

Number 2 fuel oil or natural gas will be used for the steam generator ignitors during plant start-up for flame stabilization

at low loads. Fuel oil will also be used to fuel emergency diesel generation, the emergency diesel fire pump and mobile equipment. Number 2 fuel oil will be delivered to the site by truck or rail tankers and stored on-site in two 400,000 gallon tanks, which will provide fuel oil requirements for four units. Fuel oil tanks will be located in a diked area, in accordance with the National Fire Protection Association Requirements, required to contain the fuel oil in the event of tank rupture. Oil pumps will be provided in the plant and contain any oil leakage. Natural gas will be delivered to the site through gas pipeline. The gas will be used directly from the pipeline to fire the steam generator ignitors and auxiliary boiler. There will be no natural gas facility onsite.

5. Solid Waste Handling

Each CGS unit will have a wet limestone flue gas desulfurization system (FGD), which will remove a substantial portion of the sulfur dioxide from the boiler combustion gases. Each CGS unit will have a fly ash collection system, which is presently planned to be fabric filtration (baghouse). In addition, bottom ash will be collected at the bottom of the boiler. As discussed in Section XI.B, the FGD waste, fly ash, and bottom ash will be combined, fixated and deposited in a properly managed landfill area.

6. Limestone Handling

The limestone handling system will be designed to unload and handle limestone for the FGD System. Limestone will be dumped into the car dumper building in a manner similar to that for coal. It will be conveyed to the limestone storage silos located in the FGD System reagent storage and preparation plant.

7. Protection Features

a. Dust

Engineering design practices, which will be used at the CGS to minimize emissions of fugitive dust in material storage and

handling systems for coal, limestone, and fly ash, will include: reduction of the number of material transfer points to as few as possible; use of telescopic chutes or lowering wells on outdoor discharge points to minimize open free-fall distances; compaction of inactive coal piles to reduce production of fugitive dust by wind erosion; use of silos for limestone storage; enclosure for live coal storage with baghouse; enclosure of material handling system components; wet dust suppression systems at selected locations; and dry dust collection systems at selected locations. Fugitive dust control levels applied will assure compliance with air quality standards at all points outside of the CGS property boundary.

b. Fire

Sprinkler systems and hose reel stations will provide the required fire protection for the coal handling facilities including the conveyor galleries, tunnels, car dumpers, transfer points, A-frame live storage buildings, crushers and dust collectors.

IV. SITE DESCRIPTION - Physical

A. Legal Description

The legal description of the proposed CGS site is found in the Application, Appendix A, as amended.

B. Earth

1. Geology

a. The plant site is underlain by a thick layer of basalt rock. There is a layer of wind-blown loess, overlying the basalt, which varies in thickness. There are thin sedimentary interbeds between layers of basaltic rock. The interbeds are composed of subarkosic or arkosic materials including substantial quantities of muscovite, varying in grain size from medium sand to silt. The fractured upper and lower portions of the basalt flows are the principal water bearing zones in the area. To the north of the CGS site, the mountainous terrain consists of largely mesozoic and early tertiary granitic rock, which is overlain by pleistocene glacial deposits and recent deposits of alluvium. The glacial deposits are commonly rich in carbonate rock species with high acid buffering capacities.

b. The remainder of the region around the CGS plant is marked by an accumulation of basaltic gravels and boulders with channels which often contain silts of alluvial and aeolian origin.

c. Transmission lines associated with the CGS will be constructed over largely basaltic deposits overlain by basaltic gravels, boulders, and areas overlain by silts of alluvial and aeolian origin.

d. There are no known active faults or other geologic causative factors in the plant site area. The plant site is located within a seismic risk Zone 2 which indicates the area is subject to only moderate damage from earthquakes.

2. Topography

a. The topography of the region near the CGS site is generally flat to gently rolling with the exception of elevated terrain approximately 10 miles north of the site. Elevated terrains include Creston Butte, with an elevation of 914 meters (2,816 feet) above mean sea level; Johnny George Mountain located approximately 20.2 kilometers (12.4 miles) north-northwest of the CGS site with an elevation of 1,247 meters (4,090 feet) above mean sea level; and Jim Mountain located approximately 31.4 kilometers (19.5 miles) due north of the CGS site with an elevation of 934 meters (3,063 feet) above mean sea level. The Columbia River and FDR Lake are located between the CGS site and Johnny George Mountain and Jim Mountain. The land between the CGS site and FDR Lake is generally dissected by deep, steep-sided canyons formed by Welsh Creek and its tributaries.

b. The topography of the plant site consists of nearly flat to generally rolling surface with elevations of uplands averaging approximately 690 meters (2,300 feet) above mean sea level in the southern portion of the site to about 750 meters (2,500 feet) above mean sea level in the northern part of the site. The site has some hills 6 to 20 meters (20 to 70 feet) above the generally flat surface and has small depressions typically filled with silt.

c. The site is divided by a watershed dividing line running generally northwest-southeast through the Creston Butte area. Surface water northeast of the dividing line flows generally northward into FDR Lake, primarily by way of Welsh Creek and its tributaries. Surface water to the southwest of the dividing line flows generally southward, principally through Sinking Creek. The major components of the CGS will be located in the southern drainage area.

d. The makeup water intake system proposed by the Applicant consists of a well field site near FDR Lake which is nearly flat, with land sloping generally north toward the lake. The water pipeline would run generally southward from the well field site up steep slopes to uplands immediately east of Halverson Canyon and then on gently rolling upland surface to the plant site.

e. Three alternative associated transmission facilities have been proposed by the Applicant. In general, the topography for all three alternatives includes rolling hills typical of the CGS site. The 500 kV portion of the alternative transmission systems may cross the Spokane River near the City of Spokane. The topography along the Spokane River in the vicinity of the proposed crossing is steeply sloped.

f. The rail trackage which will be used for transporting coal to the CGS will follow existing lines. One of the alternative rail routes would include the construction of 9 to 10 miles of branch line track from the Burlington Northern main line to an existing branch line from Bluestem to Rocklyn in Lincoln County. This new trackage would cross primarily rolling topography similar to the southern portion of the CGS site.

3. Unique Physical Features

The CGS plant site, well field site and water pipeline route and associated electrical transmission line routes are generally representative of the topography, vegetation and scenic values of the region. With the exception of the riparian vegetation around the potholes on the site, and the lithosolic plant communities, there are no natural or aesthetic features on the CGS plant site or the site of the associated facilities which would be considered unique or of great value.

C. Combustion By-Products

1. Introduction

a. The combustion system of the project will burn coal to convert water to steam to drive turbines producing electricity. There will be four 570 MW (gross) units located in two buildings. Coal from storage silos will be pulverized and fed into boilers. Burning coal results in combustion by-products. These by-products take two main forms: solid waste such as ash and sludge; and airborne emissions such as sulfur dioxide (SO_2), oxides of nitrogen (NO_x) and particulate matter (PM).

b. To protect the environment, it is necessary to ensure that combustion by-products are released into the environment in ways which produce minimal adverse effects. The Council's findings regarding solid wastes are found in Section XI and regarding airborne emissions are in Section XII.

2. Climate-Meteorological Considerations

a. The climate in the project area is generally moderate. Severe weather such as thunderstorms, hailstorms or tornadoes are rare. Average temperatures at the site range from about 24°F in the winter to 68°F in the summer. Annual precipitation averages about 13-14 inches (33-35 centimeters), 70% of which falls between October and March. About one-half of the precipitation occurs as snowfall. (Ex. 45, p. 5-3)

b. Winds in the area are generally from the southwest and south with northeast winds prevailing in September, November, December and January. Winds are highest in the winter and spring, averaging about 10 mph. Summer and fall winds average about 9 mph.

c. The land to the south of the plant site is predominantly rolling farm land. The land to the north of the plant and north of the

Columbia River becomes mountainous. Several of the mountains northeast of the plant site are high enough to "intercept" plant emissions under unfavorable conditions. These mountains are from 12 to 19 miles from the plant site. Johnny George Mountain is 14 miles north of the plant site and has a peak elevation of 4090 feet. It, too, may intercept emissions under unfavorable weather conditions.

d. The Applicant engaged in site-specific air quality monitoring beginning July of 1978. The data collected indicate that SO_2, nitrogen dioxide (NO_2), ozone (O_3) and carbon monoxide (CO) ambient levels are well within both National Ambient Air Quality Standards (NAAQS) as well as Washington State Standards. (Ex. 45, Tables 5.3-10, 5.3-11)

e. Site-specific monitoring for total suspended particulates (TSP) produced annual geometric mean values well within national and state standards. However, the highest 24-hour average figures exceeded state and national standards. These extremely high values seem to be the result of the volcanic eruptions of Mount Saint Helens. (Ex. 45, pp. 5-60 through 5-67) Allowing for the anomaly of Mount Saint Helens' contributions, summer values are still quite high due to agricultural activities and wind erosion of soils. This is typical of northeastern Washington conditions.

3. Existing Air Quality

a. The ambient air quality in the area of the site is excellent and present levels of SO_2, NO_2, CO, O_3 and lead are well below state and national standards. TSP levels which occur in the area of the site are well below national and state standards except for elevated summer 24 hour levels caused by wind erosion or agricultural activities.

4. Measurement of Potential Effects

a. The dispersion of air pollutants is aided by turbulent weather conditions which promote mixing. The Applicant has used computer modelling to produce a summary of stability conditions using data from the site and from Spokane. The computer program used is known as STAR. (Ex. 45, p. 5-22, 2-23) The type of stability most likely to promote a compact plume occurs only 1% of the time in a wind direction likely to carry the plume toward the mountainous areas north of the site.

b. The Applicant also measured the persistence of wind and stability conditions likely to affect the mountains. The analysis used was the PERSIS computer code. Using conservative assumptions, the analysis shows a maximum of 3 hours impact by the plume at Johnny George Mountain, one time per year. Such an impact is within acceptable limits.

c. To measure the impact area for plant stack emissions, the Applicant used two dispersion models. The models used were CRSTER and VALLEY. A circular impact area with a 50 km (31 mile) radius was used. (Ex. 45, pp. 5-39 through 5-41) Modelling was extended up to 100 kilometers (62 miles) in the direction of the Colville and Spokane Indian Reservations to examine the potential for air quality impacts. (Ex. 45, pp. 6-1, 6-2, 6-7, 6-19, 6-22 through 26)

d. In addition to stack emissions, the operation of the plant will result in emissions from the on-site handling of coal, limestone, bottom ash and fly ash/flue gas desulfurization wastes. The Applicant modelled the effects of these activities using an Industrial Source Complex model.

e. Visibility in the project area is normally good, with the exception of those times during summer periods when high particulate levels obscure vision. To determine the extent of plume visibility, the Applicant performed modelling using the PLUVUE model.

f. Computer programs and air quality monitoring performed by Water Power demonstrate that the CGS site possesses good dispersion qualities. Conditions which could result in compact plumes and unusual concentrations of emissions will rarely occur. Such conditions are not expected to persist long enough to result in unacceptable concentrations of emissions, given appropriate Site Certification Agreement conditions.

D. Water Quality

1. Surface Water

a. Generally, the area of the CGS site is characterized as semi-arid with annual precipitation averaging between 13 and 14 inches per year and runoff averaging one inch or less per year. The small intermittent streams on the CGS site flow only during significant rainfall events and during snow thaws and spring runoffs.

b. The makeup water intake will draw from a well field hydraulically connected to FDR Lake. The water makeup pipeline will cross several small intermittent branches of streams flowing into Welsh Creek.

c. The three transmission alternatives will involve the construction and operation of transmission facilities across or near many streams, ponds, and small lakes.

d. All of the electrical transmission alternatives involve the construction and operation of a 500 kV single circuit or double

circuit lines across the Spokane River, approximately five miles northwest of the City of Spokane. The transmission line crossing the Spokane River would be located in or adjacent to an existing transmission line right-of-way.

e. The portion of the site that will be affected by the plant contains 39 small ponds. Most of the ponds dry up during the summer months. Only about 2% of the plant site is occupied by permanent ponds, which shrink to roughly half of their original diameter during the fall of the year.

f. Approximately 7% of the plant site is occupied by ephemeral ponds. The size and number of ponds depend completely on seasonal precipitation. The ponds range in size from pools of a few yards in diameter to ponds covering several acres. For much of the year, the ephemeral ponds dry out completely, although during particularly wet years, larger ponds may persist for several months.

g. The surface water quality of the plant site is similar to that associated with all rural areas in Eastern Washington where substantial agricultural activity occurs. The surface waters on the plant site do not have any peculiar or unique characteristics. These waters are turbid during major rain and snow melt runoff periods.

2. Ground Water

a. The geologic structure of soils at the plant site consists of aeolian, alluvial and glaciofluvial deposits overlying a fractured basalt flow which is over alternating aquifers and dense basalt flows of various thicknesses. There are several wells and springs on the plant site. During construction of the first and second units, the Applicant intends to use waters from wells on-site.

b. Water Power's consultants conducted pump tests at various wells on the plant site to test the ground water movement and rate of recharge and discharge. Results indicate that there is hydrologic connection between the two shallow aquifers and water in all of the aquifers tended to move in the same direction as indicated by surface topography. The aquifers are recharged from surface precipitation. The rate of recharge depends upon the rate of precipitation and the character of the overlying soils in the vicinity.

c. The quality of water in the shallow and deeper aquifers is excellent and has been shown to average approximately 162 milligrams per liter of total dissolved solids with a standard deviation of 26 milligrams per liter. The average pH is 7.75, indicating there is a high acid buffering capacity in the water. Average hardness of the water is approximately 84 milligrams per liter. The principal chemical component of the ground water on the plant site is calcium bicarbonate. Water for the construction of the first two units of the CGS will be drawn from ground water wells approximately 300 to 500 feet deep located on the CGS site.

E. Flora

1. The CGS, the well field serving it, and the makeup water pipeline will be built on semi-arid sagebrush and grassland habitat.

2. Topography of the area is characterized as scabland, and parts of it have been disturbed by grazing and agriculture. There are also undisturbed areas which include blue bunch grass, wheat grass, Idaho fescue, bluegrass, needle grass and sagebrush.

3. Uplands in the area are dominated by Ponderosa pine. Deciduous trees are located near streams and ponds, and include quaking aspen, alder, service berry, dogwood, willow, chokecherry, rose, snowberry

and hawthorne. The ponds frequently contain bullrushes and cattails as well as other grasses, such as sedges and perennial and annual forbs.

4. About 90% of Lincoln County land is devoted to agriculture either for farming or rangeland. Approximately 60% of the total is used for crop production, mostly wheat and barley. In fact, Lincoln County is one of the most productive areas in the world in terms of wheat production. Sheep grass, brome, soft brome and Kentucky bluegrass have largely replaced the perennial native grasses in the rangeland.

5. The Colville Indian Reservation is located north of the CGS site and FDR Lake. That area is largely elevated terrain, containing substantial stands of Ponderosa pine and Douglas fir with semi-arid grassland and shrub areas scattered throughout. Here, too, grazing has eliminated many of the native grasses which have been replaced by such grasses as cheat grass and Kentucky bluegrass. Much of the native sagebrush and bitterbrush has been destroyed by fire and replaced by other species.

6. The CGS site contains several plant species of concern which are found in the Washington Natural Heritage Program List. These include mountain-lady slipper (Cypripedium montanum), snow deglacia (Douglasia navalis), the Cascade violet (Viola adjunca variation cascadensis), spinescent flameflowers (Talinum spinescens), piper's daisy (Erigeron piperlanus), yellow sedge (Cavex flaura) thyme-leaved buckwheat (Eriogonum Thymoides), and lomatium biscuit-root (Lomatium favinosum).

7. There are no endangered flora species on the CGS site nor any legally protected species.

F. Fauna

1. Birds

a. A large variety of bird species makes use of the CGS site. One hundred thirty-four different species have been observed there. Many of these birds are migrants to the site, and are found there during the spring, summer and fall. Considerably fewer birds use the site during winter. Birds use different habitat types to greater or lesser degrees. Types of habitat present are riparian (3.9%), wetlands (12.2%), sagebrush (50.2%), Ponderosa pine (5.3%), and cropland (28.4%). Nearly 93% of the birds were observed in Ponderosa pine, wetland and sagebrush habitats. The remainder were found in the riparian and agricultural areas.

b. The major wetland on the CGS site is Sinking Creek Marsh. Waterfowl use this habitat for cover, food and nesting. There are several ponds on the site, most of which are ephemeral and provide no wetland habitat in dry years.

c. Two important species use the sagebrush and grassland habitat. These are the sage grouse and the sharp-tailed grouse, both of which are native game birds. An identified sage grouse strutting ground is located within 10 miles of the site. It is possible that sage grouse nest on the plant site although no strutting grounds or nests were found there, despite a search.

d. One sharp-tailed grouse nest site was found on the CGS site, and dancing grounds are known to occur within 10 miles of the site. It appears that the marshy Sinking Creek area of the site may serve as winter habitat for the sharp-tailed grouse.

e. None of the species of birds found on the site is officially listed as being legally threatened or endangered. However, some do appear to be of concern; mainly the sharp-tailed grouse, the

sage grouse, the western bluebird, the long-billed curlew, the burrowing owl, the black tern, the Brewer's sparrow, the vesper sparrow and the grasshopper sparrow. These species all appear on the Washington Department of Game draft Species of Concern List. (TR Vol. 25, p. 3971) The sage thrashers and Swainson's hawk appear on the Washington State draft Threatened List. (App. Sect. 5.6-11) Additionally, the bald eagle and peregrine falcon may migrate through the area of the CGS project. These two species are federally listed as threatened and endangered species.

2. Mammals

a. The Applicant conducted inventories over a period of a year at the site to identify mammal species. A total of nine small mammal species were identified, including one sagebrush vole (Largurus curtatus). This species is found on the Washington Department of Game's draft Species of Concern List. Other species identified on the site found on that list are the pocket gopher, the montane vole, the white-tailed jack rabbit and Merriam's shrew. (TR Vol. 25, p. 3971)

b. A total of 18 other species of mammals was identified, including mule deer, white-tail deer, coyotes, beavers, raccoon and striped skunk.

3. Amphibians and Reptiles

The Applicant also identified various species of amphibians and reptiles on the site. These include salamanders, toads, frogs and snakes. The blotched tiger salamander and the rocky mountain rubber boa were both observed on the CGS site, and appear on the Washington Department of Game draft Species of Concern List. The striped whipsnake, Great Basin gopher snake and the desert night snake are also listed and may exist on the site. (App. Table 4.6.2-14)

4. Endangered Species

No mammal, reptile or amphibian found on the site is officially listed on a federal or state list of legally protected species, and no endangered species were found on the site.

5. Aquatic Habitat

a. Sinking Creek marsh is the primary aquatic area on the site, and contains no fish species. This is likewise true of the various ponds occurring on the site area. Sinking Creek marsh will not be disturbed by construction and operation of the plant.

b. The Applicant has proposed to withdraw water from FDR Lake using the aquifer next to the lake. There is no evidence that the withdrawal of water through the well field will affect the aquatic biota of FDR Lake.

c. Waters from the site join Welsh Creek and Wilson Creek some distance away. No fish occur in these creeks within five miles of the site, although both do contain fish. Although construction and operation of the plant may increase the volume of water in the Sinking Creek drainage, more information is needed to determine if any effects from the actual increased flows will occur.

6. Associated Facilities

The area occupied by the well field and the water pipeline is similar to that of the plant site, and similar species will be found in that area. This is likewise true of the transmission corridors, with the exception of certain areas near the City of Spokane and the Spokane River, where wintering bald eagles, peregrine falcons, and prairie falcons have been sighted on occasion.

V. SITE DESCRIPTION - Human

A. Population and Demographic Characteristics

1. Regional

The regional impact area includes all areas from which workers are likely to commute--including Spokane and Grand Coulee Dam. The population of the regional area is estimated to be approximately 490,000. Population growth has been approximately 2% per year.

2. Lincoln County

a. Population

The population of Lincoln County is distributed as follows :

LINCOLN COUNTY POPULATION
(1970 and 1980)

	1970	1980	Percentage Change
Lincoln County	9,572	9,597	0.3
Unincorporated	3,932	3,759	-4.4
Incorporated	5,640	5,838	3.5
Almira	376	349	-7.2
Creston	325	318	-2.2
Davenport	1,363	1,551	13.8
Reardan	389	511	31.4
Wilbur	1,074	1,099	2.3

Source: Forecasting and Support Division, Office of Financial Management, September, 1980 and January 2, 1981.

b. Demographics

Between 1970 and 1980, Lincoln County's total population was virtually constant, increasing by less than one half of one percent. The incorporated places in the county, however, increased by 3.5 percent while the unincorporated places suffered a decline, of negative 4.4 percent. The proportion of persons 65 years of age and over was greater in Lincoln County than in Washington State in 1970. The disparity between the counties and the state proportions was even larger by 1980. The current average age of citizens in Lincoln County is 37. (DEIS Sect. 3-125)

3. Grand Coulee Area

The population in the Grand Coulee Dam area has varied very moderately between 1970 and 1980, increasing from approximately 3,700 to approximately 3,800 persons. Nevertheless, the area actually experienced significant growth during the first half of the 1970's as a result of construction work on Grand Coulee Dam's Third Powerhouse. Population declined during the last half of the 1970's as this work was completed. This area has experienced cyclical impacts of major construction projects in the past. The attraction of Grand Coulee Dam also regularly brings an influx of tourists during the summer months. As a consequence of these forces, there exists there a greater capacity to absorb population fluctuations than any of the communities in the western part of Lincoln County. (DEIS Sect.3-126)

B. Economics

1. Regional

The economy of the region is primarily based on agricultural production, including dry land grain farming, livestock grazing and production of deciduous orchard crops. Lumber and wood products manufacturing accounts for a large portion of the manufacturing jobs in the region as does the production of food products. In Spokane County, particularly in the vicinity of Spokane, manufacturing, retail

trade, and service industries provide over half of the total employment. The construction work force in the region is approximately 10,600. The total personal income of the seven county regional impact area was approximately $3.5 billion in 1978. Of that, approximately $2.7 billion were employee wages and salaries.

2. Lincoln County

a. Economic Base

1) The economic base of Lincoln County is dominated by agriculture, which accounts for about 40% of the County's total employment and 58% of its earned income. Another 10-15% of the non-farm employment and income results from such agriculturally-related jobs as grain elevator operation, the sale of farm machinery and implements, and the wholesaling of farm supplies.

2) Lincoln County is a county of small businesses and large farms. Most of the retail trade growth during the last decade has been in the eastern part of the county, while communities in the west, such as Creston and Wilbur, find retail sales concentrated in businesses catering to US Highway 2 travelers. Data reported in the 1977 Census of Retail Trade shows retail sales per capita in Lincoln County to be less than half of those statewide. Other than convenience goods shopping, most large purchases made by Lincoln County residents are made in the Spokane metropolitan area. (DEIS Sect. 3-134)

b. Work Force

1) Lincoln County has a relatively small resident labor force, just under 4,000 persons in 1980. This total represents 41% of the county's population and is under the state's average labor force participation rate of almost 47%. Part of this low participation rate comes from the rural,

farm nature of the population. Another part comes from lack of employment opportunities in rural areas. Most farms in Lincoln County are large and proprietor-owned. Over 60% of the farm employment comes from proprietors whose seasonal labor demands are mostly satisfied by family workers.

2) In the non-farm sector, employment opportunities are dominated by retail trade, wholesale trade and manufacturing. None of these sectors offers strong possibilities for employing secondary wage earners. If alternative employment opportunities were available, it would be probable that the labor force participation rate in Lincoln County would climb closer to the state average.

3) The major source of non-agricultural employment in Lincoln County is retail trade. About a third of these jobs are clustered in eating and drinking places, with remaining jobs being in grocery stores and service stations.

4) Unemployment rates in Lincoln County have been lower than state averages in recent years. Because farm employment, and to a lesser extent, employment related to lumber and wood products, are highly seasonal, Lincoln County has often experienced large seasonal fluctuations in employment.

c. Income

Personal income in Lincoln County in 1978 was $11,343, the highest in Washington State and 25% above the state average. In part, the county's high per capita income reflects the older age of the population and the absence of large families. It also reflects the preponderance of owner-operated enterprises in the county; farm and non-farm proprietors account for 62% of the county's total earned income.

C. Housing

1. Existing Permanent Housing

About 5,500 housing units are found in the Lincoln County and Grand Coulee Dam areas. The majority of this housing is single-family dwelling or mobile homes; less than 4% is multi-family. The Spokane area contrasts markedly having a larger housing stock--almost 110,000 units, of which about 20,600, (19%) are multi-family units. Single family houses are predominant in the Lincoln County communities, but mobile homes and manufactured housing make up a substantial share of the newer housing stock, especially in Creston. In Lincoln County communities, there are few apartments, but Davenport and Creston each have one federally- subsidized apartment project. A similar 20-unit project is planned for Wilbur. Low-income elderly are given first priority for rentals; no waiting lists are currently in effect for subsidized units in Lincoln County. Housing types and prices vary more in the Grand Coulee Dam area than in Lincoln County communities. (DEIS Sect. 3-152)

2. Housing Trends

a. Housing units in Lincoln County increased from 3,827 to 4,319 units from 1970 to 1980. This represents a housing increase of 13% in light of a population increase of less than 1% during the same period. Housing units increased at a slightly faster rate in the unincorporated areas than in the cities and towns. (DEIS Sect. 3-151)

b. In recent years there has been a trend toward new development in the unincorporated areas of northern Lincoln County, particularly along the FDR Lake shore and adjacent areas. Some developments are oriented toward larger permanent homes, but others include mobile homes, recreational vehicle parks and larger acreage platted lots. The Lincoln County Environmental

Health Department has received inquiries from persons interested in developing mobile home parks near the CGS site. However, the cost of providing the required water and sewage treatment systems has discouraged potential applicants. (DEIS Sect. 3-153)

3. Vacancy Rates

a. No county vacancy rates are maintained. Local realtors consider the vacancy rates to be low for all housing types. There has been little new housing development in the Creston-Wilbur-Almira area in recent years. For example, no single family building permits were issued in Wilbur in either 1979 or 1980. Vacancy rates for Spokane in April, 1981 were 2.2% for all housing units and 4.8% for multi-family housing.

b. The Grand Coulee Dam area has considerably more transient housing at present. In mid-1979, about 500 mobile home and travel trailer spaces were located in the Grand Coulee Dam area with a vacancy rate of about 35%. Over 200 motel rooms, of which about 25 have cooking facilities, are also available in the Grand Coulee Dam area. Most offer weekly and/or monthly rates. Vacancy rates fluctuate in response to both tourism and employment levels at the Bureau of Reclamation and other construction projects. In the fall of 1979, motel vacancy rates ranged from between 20-50%.

c. Only limited transient housing is presently available in northern Lincoln County. Davenport and Wilbur each have two small motels. Davenport, Wilbur and Creston have a limited number of transient or semi-permanent mobile home/recreational vehicle spaces. The largest facility is located in Davenport and contains about 30 spaces. (DEIS Sect. 3-152)

d. The general appearances of residential areas vary among the communities. Some, like Davenport and Coulee Dam, have well-maintained residential characters, with paved streets, landscaping, street trees, curbs and sidewalks in most areas. In others, especially Creston and parts of Grand Coulee, these amenities are generally lacking. Past lack of planning and zoning has also resulted in mixtures of uses and confusing street and lot patterns in some areas. (DEIS Sect. 3-152)

D. Transportation and Circulation

1. Roads

a. Highway 2

The principal highway in the vicinity of the site is Highway 2 which runs east and west through Lincoln County, connecting the towns of Reardan, Davenport, Creston, Wilbur, and Almira. Highway 2 is a well-maintained two-lane highway with paved shoulders. Vehicle counts at representative points on roads in Lincoln County are shown in Figure 4.7.4-1 of the Application. Summer vehicle counts along Highway 2 in 1979 ranged from 2400 vehicles per day (VPD) in the vicinity of Creston to 3,850 (VPD) near Wilbur. This road is periodically subject to fog, drifting snow, and black ice. The highest accident rate (per million vehicle miles) along Highway 2 was 3.8 in Davenport, where diagonal parking along the highway contributes to the frequency of accidents. A comparable state-wide average is 2.4 accidents per million vehicle miles. The only capacity problem along the highway is at a section from the Lincoln County line to Graham Road and is caused by the steep grades necessary to descend toward Deep Creek. (App. 4.7-41)

b. Other Highways

Other major roads in Lincoln County are: Highway 28, connecting Davenport, Harrington and Odessa; Highway 21, connecting

Odessa with Wilbur and Highway 2; and Highway 174, connecting Highway 2 in the vicinity of Wilbur with Grand Coulee. The location of these routes and representative vehicle counts are shown in Figure 4.7.4-1 of the Application. There is limited information about the routes and it is difficult to assess the impacts which may occur to them as a consequence of CGS construction.

c. Plant Access

The access to the Creston project will be provided by an existing county road. This road intersects Highway 2 approximately one mile east of Creston. (DEIS Figure 2-2) This road is presently surfaced by gravel. Existing traffic on it is extremely light. (DEIS 3-119)

2. Railroads

a. Lincoln County is served by Burlington Northern Railroad. The main line runs from Spokane west through southern Lincoln County passing Edwall, Bluestem and on to Harrington and Odessa. This line has an average of 13 trains per day. A Burlington Northern branch line runs, roughly paralleling Highway 2, from Reardan to Davenport, Creston, and eventually to Coulee City. The Spokane to Coulee City train operates along this route, primarily to serve agricultural demands. There is one train per day except on Sunday. The train travels west on Monday, Wednesday and Friday, and east on Tuesday, Thursday and Saturday. The schedule varies for holidays and during the harvest season. (App. 4.7-43) There is a spur line running from Eleanor to Davenport. This line is used to haul grain. Burlington Northern has announced its intention to file for abandonment of this line within the next three years. (TR Spokane Public Hearing, p. 100-103, Sheffels)

b. The railroad network in Lincoln County is depicted in Figure 4.7.4-1 and Figure A.6.10-3 of the Application.

3. Airports

Five airports are located in Lincoln County in the communities of Davenport, Wilbur, Almira, Harrington and Odessa. The location of these airports is shown in Figure 4.7.4-1 of the Application. There is no evidence of any significant adverse impacts or demands on these airports as a consequence of CGS construction.

E. Public Services

1. Fire Protection

a. Fire protection in northern Lincoln County communities and the Grand Coulee Dam area is provided by municipal fire departments staffed by volunteers. Some of the municipal fire departments have access to fire district trucks, generally located in the same building. The Rural Fire District has equipment located at Wilbur, Creston and at the Lincoln Mill on FDR Lake.

b. Although some equipment may be outdated, the present equipment and volunteer crews are adequate to meet present demands. A major fire protection deficiency for all communities, with the exception of Davenport and most of the Grand Coulee Dam area, is a lack of an adequate water supply. In Creston, Almira, Wilbur and Reardan, water storage capacity is presently inadequate to provide optimal fire flows.

c. A Class 8 or 9 state fire insurance rating is typical for smaller rural communities. Unincorporated Lincoln County has a Class 10 rating, indicating that it is an unprotected area, due to the distance of local fire departments. (DEIS Sect. 3-171)

2. Police Protection

Police protection in Lincoln County is provided by the Lincoln County Sheriff's Department, municipal police departments and the Washington State Patrol. The Lincoln County jail in Davenport is an outdated

facility with a present capacity of 14 men. Facilities for women and juveniles are inadequate; only temporary holding facilities are available. Most women and juveniles are transferred to Spokane. The jail presently ranks eighth in priority among unfunded jail projects in Washington State. Present law enforcement needs in the county generally relate to traffic violations. Particularly during the summer and on weekends, the volume of pass-through traffic increases, thereby increasing the work load of all law enforcement persons. (DEIS Sect. 3-168)

3. Schools

a. Creston

Creston School District No. 73 encompasses the city of Creston, unincorporated areas of Lincoln County (Seven Bays and other recreational developments) as well as numerous farms throughout the district. School buses serve the outlying areas, while children in town walk to school. The current enrollment in the Creston School is 127 students. The facility has a capacity of 450 students. Although the school has excess capacity, funding is not available to provide the additional equipment, such as books and desks, that will be required to serve additional students. Enrollment in the Creston School District has varied little from year to year. There are few transfers between school districts and the student drop-out rate is minimal. (DEIS Sect. 3-175)

b. Davenport

Davenport School District No. 207 serves Davenport north to Lake Roosevelt, south to Harrington, west approximately eight miles, and east six miles. Bus service is provided for students living outside the city limits while students living in town walk to school. The K-8 facility has a current enrollment of 269 and is considered at capacity. The grades 9-12 facility was at capacity in the 1979-1980 school year with an enrollment of 150

students; the 1980-1981 enrollment was 136 students, just 14 students below capacity. Again, transfers are few and student drop-outs are minimal. (DEIS Sect. 3-175)

c. Wilbur

1) Wilbur School District No. 200 serves an area extending 14 miles south of Wilbur, seven miles west, five miles east and north to the river. All secondary school students from Keller, on the Colville Indian Reservation, are bused to school in Wilbur. The district has six buses. The Wilbur primary and secondary facilities are located on one campus. There are a number of building inadequacies: leaky roofs on two buildings; sidewalks in need of repair; need for replacement of a retaining wall and replacement of the gym floor. Special education classes are offered in Wilbur for children who are retarded or handicapped. Children with minor learning problems also have the opportunity for a special class situation. The school facilities are also the center for adult education evening classes sponsored through the Spokane Falls Community College.

2) In the 1980-1981 school year, there were 168 students enrolled in K-6 in School District No. 200 leaving an excess capacity of 56. There were 75 children enrolled in grades 7 and 8 with an excess capacity of 117. There were 146 students enrolled in grades 9-12 with no excess capacity. (DEIS Sect. 176-7)

d. Non-intervening School Districts

Not intervening in the proceedings were Almira School District No. 17 and Reardan/Edwall District No. 9. For the 1980-1981 school year, School District No. 17 reported an excess capacity of 31 for grades K-6 and 26 for grades 7-12. For School

District No. 9, an excess capacity of 185 students was reported for grades K-6 and excess capacity of 301 students was reported for grades 7-12. Specific needs and mitigation approaches for these schools are not addressed in the hearing record. (DEIS Sect. 175-6; Table 3-57)

e. Tax Base

All Lincoln County school districts are above the state-wide tax base average, about $91,000 per student. General Fund expenditures per pupil are highest for Almira at $2,650 and the lowest for Wilbur at $1,601. The state-wide average expenditure per pupil is $1,804. (DEIS Sect. 3-174-6)

F. Utilities - Infrastructure

1. Public Water

a. Most communities in the area currently have sufficient pumping capacity for the present populations but few have sufficient water storage. (DEIS Sect. 3-159; App. Sect. 4.7.4-1) Reardan and Grand Coulee presently lack sufficient pumping capacity. Almira, Creston, Reardan and Wilbur lack sufficient storage. Inadequate water transmission and distribution systems constitute additional deficiencies in several communities. In Davenport and Wilbur, the transmission lines do not properly balance the well sources and reservoirs and do not adequately supply outlying areas. In other communities, including Wilbur and Almira, some distribution lines are four inches or smaller which is below the minimum recommendation. Fire protection in residential areas requires six-inch loop lines or eight-inch dead-end lines. Creston's water distribution system is currently being upgraded with installation of twelve-inch, eight-inch and six-inch lines.

b. Water quality is a concern of the City of Grand Coulee. Though it draws its water from FDR Lake, its system does not comply

with federal/state requirements for filtration of water from surface sources. (DEIS Sect. 3-159)

2. Waste Water Disposal

a. All of the communities in the area have municipal waste water collection and treatment facilities. Most of these systems have design limitations or operational problems which limit their ability to serve added population. Creston's present system is not adequately serving the current population, due to ground water infiltration problems. Wilbur's sewage lagoons have a design capacity for a population of 2,000 but also have ground water infiltration problems. The Davenport treatment plant has excess capacity, but is not presently meeting water quality discharge standards. Again, infiltration is a problem. Almira's present facility is located in a flood-prone area and does not meet effluent quality standards. Almira has a new lagoon system. Reardan has a three-celled lagoon that overflows during winter.

b. In the Grand Coulee Dam area, the treatment plant serving Coulee Dam/Elmer City is adequate. However, the treatment plant serving Grand Coulee/Electric City is unsatisfactory with respect to effluent discharge conditions. Anticipated federal assistance for a new treatment plant has been delayed.

c. Unincorporated areas utilize septic tank systems. Most of Lincoln County is considered fair-to-poor in septic tank suitability because of soil characteristics and shallow depth of hardpan. (DEIS Sect. 3-163-4; App. Sect. 4.4.7-2)

d. Cutbacks and delays in federal aid for waste water treatment are affecting all local jurisdictions. Local funding capability is becoming increasingly important. (DEIS Sect. 3-165)

3. Solid Waste Disposal

a. Location of an adequate sanitary landfill has been an ongoing problem for the communities of Creston, Wilbur and Almira in recent years. The landfill at Govan, previously used by these communities, was closed in December 1980. Despite substantial efforts to locate a new landfill, no suitable replacement site has been found. Problems of limited topsoil, flood hazard, and possible pollution of ground or surface water have eliminated a number of potential sites. Also, property owners have been generally uninterested in selling land for landfill use. Creston, Wilbur and Almira have considered interim use of either Harrington or Grant County landfills. The ten-acre Harrington landfill also serves the towns of Reardan and Sprague. The town of Harrington has requested a study to determine landfill life if the shared use arrangements continue. Creston, Wilbur and Almira have also considered use of solid waste drop boxes; however, neighboring counties have noted problems with drop boxes. Recycling and incineration have been considered but high costs seem to preclude these alternatives.

b. Davenport has its own solid waste disposal facility--a seventeen acre landfill northwest of town. This landfill may be approaching its capacity limits. The County Environmental Health Office estimates a remaining useful life of 3-5 years.

c. Lincoln County has a number of open garbage dumps. The County's Environmental Health Department has been closing these dumps gradually in accordance with its solid waste management plan.

d. The Grand Coulee Dam area is served by the Grant County Sanitary landfill at Delano, near the city of Grand Coulee. This landfill has approximately 38 acres and a useful remaining life estimated at 20 years. (DEIS Sect. 3-166-7; App. Sect. 4.7.4.3)

4. Communications

a. Telephone Service

Telephone service is provided to northeast Lincoln County including the towns of Reardan, Davenport and Creston by Telephone Utilities of Washington, Inc. The remainder of Lincoln County is served by Pacific Northwest Bell. These services are presently considered adequate and there are no constraints on expanding services to meet future growth.

b. Media

The Wilbur Register (circulation 1,549) and the Davenport Times (circulation 2,200) are the local Lincoln County newspapers. The Spokesman Review, the Spokane Daily Chronicle and the Wenatchee Daily World are also available to the Lincoln County residents. Lincoln County is served by the 10 AM and 10 FM stations and four television stations in the Spokane area.

5. Consumer Energy

The Washington Water Power Company provides electric service to the incorporated areas of Lincoln County, including 1,823 residential and 450 commercial/industrial connections. In addition, Washington Water Power provides 280 natural gas service connections in Davenport and Reardan. Lincoln Electric Cooperative serves primarily the unincorporated areas of Lincoln County, including 1,422 residential, 118 commercial, 291 irrigation and one industrial connection.

G. Human Health

1. Health and social services in Northern Lincoln County are centered in Davenport, the county seat. The 24-bed Lincoln County Memorial Hospital, served by three physicians, has the capability of handling most of the area's present needs. Serious injuries such as those to the back and head, and neurological and heart patients must be referred to Spokane or another large comparable hospital. One dentist is located in Davenport. A medical office building and a 69-bed nursing

home are located near the hospital. Two ambulances and a 12-person volunteer EMT crew serve Davenport.

2. A comprehensive mental health program, Community Health Services, located in Davenport offers most of the social and mental health service programs available in Northern Lincoln County.

3. Other local communities, such as Almira, Creston and Reardan, rely on Davenport-based programs or use Spokane resources. Wilbur is served by Grant County Mental Health.

4. Wilbur has a satellite clinic, a branch of Coulee Community Hospital in Grand Coulee, which is open approximately 30 hours a week and is served by a physician's assistant. A private practice dentist and a semi-retired physician also serve Wilbur.

5. The Grand Coulee Dam area is served by the Coulee Dam Community Health Center consisting of a hospital, nursing home, and comprehensive health clinic. The hospital facility has 28 acute care beds and 20 nursing home beds. Present staff includes one general practitioner, two family practitioners and a surgeon. The average occupancy rate of the hospital is approximately 40 percent.

H. Aesthetics

The project site is generally representative of the topography, vegetation and scenic values of the region known as the Channeled Scablands of Washington. It does not typify the most spectacular scenic elements of the Scablands. The site does contain a marshland area associated with Sinking Creek that is considered uncommon in the region. This area is valuable scenically in terms of its ecological resources. Lincoln County possesses many small lakes, a natural bridge and a meteorite crater in the Odessa area. The most significant scenic resource in the area is generally considered to be FDR Lake and the associated National Recreation Area.

I. Archaeological/Historical

1. Archaeological Resources

a. Based on the record, including surveys conducted by the Applicant's consultants, no archaeological sites within the plant site and the water pipeline area appear to meet the criteria of the National Register of Historic Places. The record further shows that no significant archaeological sites are expected to be encountered on the plant site so long as the construction and location of facilities are conducted as proposed by the Applicant. If significant cultural resources are discovered during project activities, mitigation will involve testing and documentation, or possibly excavation. Significant artifacts will be deposited with the Washington Archaeological Collection Repository. Further archaeological testing should be required for the water pipeline area.

b. The proposed transmission corridors do not appear to have a high probability of traversing an archaeological site. The Applicant will perform on-the-ground surveys when tower locations are established.

2. Historical Resources

The project site is on the historical territories of the Sanpoil and Nespelem Tribes. The area of the site was used by Indians to gather roots until about 1950 when it became an agricultural area. Settlers first arrived in the early 1800's. The area was the site of cattle ranches from 1850 through the 1870's. Uses became predominantly agricultural in the 1880's when most of the local towns were founded. The site survey found at least 10 historical sites that are of interest near the CGS site. No sites were found which were listed in the Historical American Building Survey, National Register of Historic Places or Historical American Engineering Record. Also, no historic features appear to be eligible for the National Register, State Register or the Washington State Inventory. The Applicant will perform an on-the-ground survey as design features are located.

J. Land Use

1. Plant Site

The area of the proposed plant site is currently used for crop land, range land and grazing. The twelve-mile pipeline right-of-way joining the well to the surge pond is also range and forest land. The surrounding area for several miles is primarily crop and range land. Several small rural towns are located within a 25-mile radius of the plant site.

2. Indian Tribes

Both the Colville and Spokane Indian Tribal Lands are within 25 miles of the project site. The tribes rely on the forest and agricultural resources of those lands for economic support.

3. Transmission Corridors

The northern transmission line corridor alternative is presently cleared and crosses primarily dry crop land and range land with some irrigated land and forest land. The southern alternative would cross lands presently used for range land, forest, agriculture, grazing and urban/residential. Two alternatives would use corridor options between the Bell and Marshall substations, which include urban/residential, commercial and industrial land. Any crossing of the Spokane River is subject to the Washington Shoreline Management Act.

4. Railroad

The existing land use under the proposed rail spur is range land. This line will bebuilt from the existing rail right-of-way to the proposed plant site.

K. Noise

1. Plant Site

The general area around CGS is quiet, rural and sparsely populated. Existing noise is caused, in most part, by some combination of nature sounds (wind, rain and animals), distant highway traffic, and farm

equipment. TERA, Water Power's consultant, measured noise at twelve locations from September 13-16, 1980. Brief daytime and nighttime measurements were made at each location on three different days. Estimated day-night sound levels, Ldn, were made based on the measurements. The Ldn values for eleven of the locations ranged from 30 dB to 44 dB, very low levels in a range where no noise impacts are considered to exist. The twelfth location, along Highway 2 had an Ldn of 62dB, a representative value for a road of the type and class of Highway 2. The results of this survey, showing the location of the sites measured, are shown on Figure 3-8 of the DEIS. (DEIS 3-80)

2. Rail Routes

Existing noise levels were not measured along the proposed rail route from Bluestem. Since this area is similar to the plant site, it is considered to have similar existing noise levels. The areas potentially subject to increased noise impacts from unit trains, particularly from Cheney to Medical Lake, were not measured. The evidence in the contested case record raises many questions concerning noise. To develop more information, a noise study may be necessary. (TR Spokane Public Hearing, pg. 31-32, Olson)

L. Light and Glare

As the site is rural in character with a mix of range land and agricultural lands, present sources of light and glare are limited. Three farm houses, occasional train lights, and vehicle headlights on Highway 2 and other local roadways are the major sources. These light sources are common to rural areas. The towns of Creston, Davenport, Wilbur and Reardan have light sources typical of small cities, resulting from residential, store, office, street and car lights. Presently there are no sources of light or glare at the proposed well field site.

VI. NEED FOR POWER

A. Introduction

1. "Energy" is defined as a number of kilowatt hours computed in a given time period. "Kilowatt hour" is an energy term representing 1,000 watts of power used for a period of one hour. "Demand" in the electrical, as opposed to the economic sense, is the rate of energy used, expressed in watts, kilowatts or megawatts, at any given point in time. "Load growth" is the increase in electrical demands served by a utility or utilities.

2. Northwest utilities are joined in a physical sense through interconnected transmission facilities. The planning of these utilities is coordinated through a variety of associations and organizations. The Western Systems Coordinating Council coordinates the planning and operation of generating and transmission facilities. In the area of load forecasting, the Pacific Northwest Utilities Conference Committee (PNUCC) studies load needs and prepares a regional forecast based upon a summation of individual forecasts of participating utilities. It also prepares the econometric forecast.

3. The Pacific Northwest Electric Power Planning and Conservation Act of 1980 makes significant changes to the ways electricity has previously been coordinated in the region. Power planning will be a consideration of the Northwest Power Planning Council. A system of priorities for new resources is established in the Act, with the highest priority given to cost-effective conservation. The effect of the Act on future electric loads and resources is not known at this time.

B. Forecasts

1. Regional Forecasts

   a. From 1968 through 1978, the West Group of the Northwest Power Pool experienced an average annual compound load growth rate of 4.5 percent. Exhibit No. 11 shows the forecasted peak and energy loads and resources for the West Group

for the period 1981-82 through 1990-91. Demand for energy in the service areas of West Group participants was projected by the PNUCC to grow at a rate of approximately 3.2 percent per year from 1981-82 through 1990-91. Peak loads were forecast to grow at 3.4 percent per year over the same period.

b. Anticipated loads and resources of participants Washington Water Power Company, Pacific Northwest Generating Company, Eugene Water and Electric Board, Puget Sound Power & Light Company and Seattle City Light are included within the West Group forecast and are shown separately in Exhibit No. 6.

c. In addition to the forecast based upon a summation of individual utility forecasts, PNUCC prepared an econometric forecast to test the reasonableness of the aggregated forecast. It predicted that consumption of electricity in the region will grow at a rate ranging from 2.0 to 3.7 percent per year for the period 1981-82 through 1990-91. The mean 10 year average growth predicted by this method was 2.9 percent per year. These estimates are presented in terms of a range at a 90 percent confidence level reflecting uncertainties in economic and demographic factors as well as future levels of electricity prices and the prices and availabilities of competing fuels. (Ex. 3)

2. Washington Water Power Forecasts

a. Since 1969, Water Power has experienced annual average compound energy load growth averaging approximately 5.1 percent per year. Water Power's system sales for 1979 were approximately 6,482,000,000 kWh compared to 3,952,000,000 kWh in 1969. (App. Table 2.2-10)

b. The Applicant annually prepares a long-range energy and peak load forecast. The forecasts from 1981-82 through 2000-2001 are shown in Exhibit No. 5.

c. Previously, Water Power's energy forecasting was accomplished largely by extrapolation of historical trends and adjustment of short-term portions of the forecast up or down based upon anticipated major customer or load growth variations. The difference in actual experience from these projections is shown in Table 2.2-12 of the Application.

d. The Applicant's forecasting efforts are now directed toward attempting to appraise a number of influences on energy use in addition to the factors previously considered. In reaching the results shown in Exhibit No. 5, many newer methods were used to reach the final long-term forecast for the twenty year period. These included a subjective forecast based upon general knowledge and expectations of factors affecting customer and load growth and a separate analysis of each component class of customer use--residential, commercial and industrial--in the light of identified relevant factors. Factors considered were trends of population and customer growth, appliance saturation, changing customer use patterns, appliance efficiencies, insulation standards and conversion from other fuels. The resulting forecast is shown in Exhibit 5.

e. Specific information on expected load growth demand was not presented with the same level of detail for other project participants.

3. Accuracy of Forecasts

a. Increasing costs of oil and natural gas and uncertainties as to the future availability of these fuels have slowed demand competition with electricity. This is true even though Water Power also supplies natural gas and urges its customers to use natural gas. Comparing new residential heat customers to new residential customers over the 1974-79 period shows the former outnumber the latter by approximately 120 percent (34,000 to

28,000). Conversions of existing home heating plants from other sources to electric heat have recently accounted for a substantial portion of electric demand growth in the residential class.

b. Recent changes in the rate structure of Water Power and other utilities, as well as potential future changes under study, are designed to develop rates encouraging more efficient use of energy.

c. Effects of conservation efforts have been substantial. Conservation results primarily from increased efficiencies and by eliminating apparent waste. Both of these factors are self-limiting. Points are reached at which efficiencies cannot be further increased and at which virtually all apparent energy waste is eliminated. Conservation will continue to have effects. Building design, insulation standards and energy system designs, particularly in new construction, will tend to improve energy efficiencies. These factors have generally been recognized in Water Power's growth rate estimates. (TR Vol. 3, pp. 400, 435, Barcus) A recent study by Hittman Associates predicts there is approximately 1000 MW of conservation potential not included in the PNUCC forecast. (TR Vol. 3, p. 274, Nogle) However, the vast majority of this potential appears to exist in utilities other than the participants. (TR Vol. 3, pp. 400, 432, Barcus)

d. Recent forecasts have shown a decided trend toward the reduction of predicted loads. The 1969 West Group forecast of average firm loads for 1978-79 was 16,518 MW. The 1978 forecast for the same period was 15,037 MW. The actual average firm load for the 1978-79 period was 14,716 MW.

e. The 1980 PNUCC forecast predicted an average energy load deficit of 4,086 MW in 1990-91. The 1981 PNUCC forecast predicts a deficit of 1,573 MW for the same period. However, PNUCC included the CGS project as a resource in its 1981 projection. It was not included in the 1980 projection. Washington Public Power Supply System Plants 4 and 5 were included in the 1981 forecast. The long-term fate of these two projects is very much in doubt.

f. The PNUCC forecasts also include several conservative assumptions which may tend to result in predictions of greater deficiencies than will ultimately occur. The forecast load is compared to resources available in a critical water year equivalent to the lowest water conditions which have occurred during a 40 year period. (TR 305) The forecast also assumes that several prospective resources presently under consideration will not be constructed. (TR 336-337) Those resources are described in Exhibit 3, Table 1-5. If all of these resources were constructed and were operational at their assumed operation date, they would add 2,580 MW of capacity to the region.

g. Forecasting is perhaps more of an art than a science. However, forecasts for the West Group of the Northwest Power Pool (PNUCC) are still considered to be the most reliable, by utility managers, for purposes of planning. Applicant's forecasts and those of PNUCC are consistent and are appropriate considering the uncertainties inherent in the forecasting of electrical consumption and the unique characteristics of the Applicant's service area compared to the larger region.

C. Resources

1. Regional Resources

a. Planned new thermal resources for the West Group of the Northwest Power Pool are shown in Exhibit No. 3, Tables 1-2

and 1-3. The resulting surplus or deficiency of total net resources over total area load is also shown. Despite the planned addition of new generating resources, the region is predicted to be energy-deficient in each year in the 10 year period, 1981-82 through 1991-92. (Ex. 3)

b. Additional large thermal resources cannot be constructed in time to meet regional needs. Consequently, the region cannot be assured of meeting its total load under adverse hydroelectric conditions even assuming that the planned new thermal resources currently in the process of licensing or under construction are, in fact, constructed and operated as scheduled.

c. Virtually all of the firm energy capability of the Columbia River is or will be utilized. Depending on reservoir water inventories, additional low-cost peaking power will continue to be obtained from hydro resources, primarily from the addition of generating units at existing hydro projects, and to a smaller extent from development of new hydroelectric projects. Regional plans visualize large thermal generation for baseload energy requirements with peaking capacity supplied by hydro resources. Large thermal power plants are proposed in order to supply growing firm energy requirements.

2. Washington Water Power Resources

a. In 1980, Water Power owned hydroelectric generating facilities with a total net plant capability of 943 MW. It has purchased 283 MW on a long-term contract involving projects on the middle reach of the Columbia River. It owns a 15 percent interest (196 MW) of two coal-fired units at Centralia. It also owns two combustion turbine facilities: one near Othello, Washington (32 MW, oil-fired); and one near Spokane, Washington (68 MW, oil or gas-fired). The Applicant is also a party to several power supply agreements of varying durations and

structures. These arrangements are summarized in Table 2.2-5 of the Application. Water Power also has interests in various planned resources, which are summarized in Application Table 2.2-6. (See Sect. II of these Findings)

b. In the early 1950's, the Applicant purchased firm capacity from hydroelectric projects located on the Columbia River through long-term contracts with various public agencies owning the projects. These arrangements presently account for approximately 289 MW of the Applicant's total firm resources. However, actual hydro output is limited by water conditions, to 40-60% of capacity. (App. 2-19) The source and amounts of long-term contract hydro are shown in Application Table 2.2-4. Some of these long-term contracts contain withdrawal provisions whereby the public agencies, upon giving proper notice under the contracts, can increase their respective withdrawal of plant output, ultimately reducing the Applicant's firm capacity. These contracts are presently scheduled to expire between 1995 and 2018. (See Sect. II of these Findings)

c. During the next 10 years, Water Power projects energy deficiencies ranging from 45 MW to 239 MW. Average deficiencies during the 1987-88 through 1990-91 period average 163 MW. Opportunity to avoid these deficiencies depends upon timely completion of several resources. The margin of net firm resources over total load is non-existent beginning with the 1981-82 year and continuing until 1991-92. At that time, there will be a small margin of net firm resources over total load until 1996-97 and when net deficits continue until the end of the century. (Ex. No. 5) Included in net firm resources are the Applicant's share of Colstrip Units 3 and 4, Washington Public Power Supply System Plant (WNP) No. 3, Skagit Number 1 and Creston Units 1, 2, 3 and 4. The loss or delay of any one of these large generating units could increase the indicated deficit

in firm power resources, impairing the Applicant's ability to carry out its responsibility to provide its customers with an adequate and reliable power supply.

D. Energy Deficiencies

Surpluses and deficiencies of Washington Water Power and the other participants with and without the Project, are shown in Exhibit No. 6. The following is shown, based upon forecasts of demand and resources:

1. Washington Water Power will be deficient with respect to average energy from 1981-82 through 1990-91 and could not meet its firm load in a critical water year during that period.

2. The combined participants will be deficient in energy and peak from 1981-82 each year through 2000-2001 and, even with CGS, could not be assured of meeting their extended firm energy load, in a critical water year.

E. Conclusions

1. Effects of Inaccurate Forecasts

a. Load growth significantly below forecast levels might cause the Applicant to postpone construction of a generating unit. It could defer need for the project's output for a certain period of time. Load growth in excess of forecast levels during the next twenty year period would present substantially more difficult problems to Water Power. The permitting process, as well as physical limitations on construction, would seriously limit or preclude its ability to promptly add additional baseload energy resources or accelerate the completion dates of planned resources.

b. If future electricity demand is overestimated, the worst result could be an overbuilding of capacity. Capital carrying costs, however, could be mitigated by several factors. First, unless

the growth of electricity demand is zero, the period of time in which capacity is excess to need would be limited. Second, during the time in which excess capacity existed, sale of surplus power on a temporary basis to utilities in neighboring regions is possible, although line capacity and demand may be limiting factors.

c. If future electricity demand is underestimated, effects appear to be more severe. Because it is not generally feasible to accelerate additions to capacity, the possibility of shortages would be enhanced. Costs to the regional economy in the form of purchasing out-of-region power, lost production time, spoilage, injuries, damage to capital equipment, and personal inconveniences could be substantial. Longer term costs might include economic suppression and aggravated unemployment.

2. Need for the Project

a. If power surpluses occur, subsequent to site certification at CGS, this would have less adverse impact upon the citizens of the State than allowing a capacity deficiency to occur. CGS is configured as four independent 500 MW increments and thus provides a natural safeguard against the cost of overbuilding. The Applicant will stagger construction of its four units and have discretion to alter its scheduling, subject to EFSEC review, as the timing of need becomes more clearly focused. The public interest requires flexible resource plans to cope with uncertainties as to demand forecasts and the scheduling of new generating resources.

b. In view of its findings as to the costs of electric power insufficiencies in the Pacific Northwest region, and noting the policy of Washington State as declared by its Legislature to provide abundant energy at a reasonable cost, the Council finds that the alternative of denying site certification and precluding the

additional electric power to be made available by the Project would be unreasonable and contrary to the public interest.

3. Alternatives to the Project

a. Purchasing power from other sources is not a viable alternative because it appears there may be no reasonable cost and/or assured firm baseload power available for purchase from any source either within or without the region.

b. All potential available alternative energy sources have been considered, including solar, wind, baseload hydroelectric power, pumped-storage hydroelectric power, combustion turbine generators, cogeneration, conservation and nuclear steam generating plants. Weighing all of the evidence at this time, the Council finds that no alternative is superior to the proposed coal-fired thermal plant.

c. One alternative to the project raised in the public hearings was to complete WPPSS 4 and/or 5 before certifying another thermal generating plant. The jurisdiction of the Council is limited to the review and certification of project proposals. Such a proposal has not as yet been made to the Council.

d. The nearest available economic sources of coal in the quantity required to fuel a coal-fired plant are in the Lethbridge Region of Alberta, Canada; the Powder River Region of Montana and Wyoming; or the Green River-Hams Fork Region of Wyoming.

e. Water Power presented a comparison between the Project and alternatives in Section 3.2 of the Application. Additional comparisons between a coal-fired plant and other alternatives, both economic and environmental, are contained in the record. Considering all of the relevant evidence, the Council finds that the

Project is the preferable alternative and that no other alternative is more likely to provide the citizens of Washington State with abundant, reasonable cost energy during the period under consideration.

4. Conclusion

The demand forecasts presented by the Applicant are credible. Projections of future capacity are reasonable and might be optimistic. Additional electric power to be made available by the Project may be critical to meet the future needs of the Applicant and the Pacific Northwest region. There are no proposed alternatives which are preferable to the project. It is therefore prudent and in the public interest to site certify the Project in order to assure the citizens of the State of Washington an adequate supply of electrical energy at a reasonable cost.

VII. EFFECTS OF CONSTRUCTION

A. Topography, Geology and Soils

1. Plant Site

a. Construction of the CGS will permanently change the topography of approximately 350 acres by grading the construction site to a nearly flat plateau. In addition, site access roads will be constructed to handle large pieces of equipment. No unique topographic features will be affected. The Applicant will not affect the Sinking Creek Marsh (Greenwood Slough).

b. The geology of the site will not be affected. Furthermore, the low seismic activity of the area makes it unlikely that the plant will be affected by seismic events. There are no known fossil or gem occurrences at the site.

c. Soils in the area are limited arable soils suitable for range, woodland or wildlife. The loess on the site is very shallow in many or most areas. Those soils which can be used for revegetation and landscaping will be retained.

d. There will be a temporary increase in soil erosion during clearing and construction operations. The impact from the construction of the CGS will be less than that which would be typical from agricultural activities such as the tillage of the soil for crop production. The Applicant will be required to take appropriate measures to reduce soil erosion to insignificant or acceptable levels. Rainfall runoff from disturbed areas will be collected in holding ponds.

e. Operation of the CGS will produce substantial quantities of bottom ash, fly ash, and flue gas desulfurization solid waste. The Applicant will dispose of those wastes through landfill disposal methods, which will permanently raise the land surface

area of limited portions of the site. A maximum of approximately 1,067 acres will be affected by such landfill activities. This activity will also remove three perennial and 14 ephemeral ponds.

f. Other than the effect upon the soils in connection with the landfill activities described above, no other significant impacts to soil are expected. Some salt deposition will occur as a result of operation of the cooling towers. However, no significant buildup of salt in the soil will occur.

2. Well field

The construction and operation of the well field in connection with the makeup water supply system will have an insignificant effect on the topography, geology and soil of the surrounding area. The construction of the makeup water pipeline will temporarily disturb a strip of land approximately 100 feet wide and approximately 10 miles long or approximately 120 acres. The disturbance of the soil will be temporary until the area has been revegetated. The disturbance may span one wet season during which some moderate erosion may occur in certain areas of pipeline construction. Operation of the makeup water pipeline system will have negligible impact on topography, geology or soils.

3. Transmission Line Construction

The construction of electrical transmission lines will temporarily disturb limited surface areas with slightly increased levels of soil erosion through one wet or growing season. In addition, new access roads and substation facilities will need to be constructed and maintained, which will increase the level of soil erosion slightly. No significant adverse environmental effects on the topography, geology or soil will occur in connection with the construction and operation of the electrical transmission system.

4. Rail Line Construction

Rail transportation for coal to fuel the plant will require either the improvement of a substantial portion of an existing branch rail line of the Burlington Northern Railroad Company or the construction of a new branch line of approximately 10 miles over some 233 acres, with an improvement of a smaller portion of the existing branch line. In either event, there will be a change in the topography including cuts and fills and increased soil erosion for a brief period of time--one growing season. The construction and/or modification of the rail lines will have no significant adverse environmental impact.

B. Habitat and Land Use

1. General Effects

a. Construction of the CGS will cause temporary terrestrial habitat modification of approximately 1,200 acres and a permanent modification of terrestrial habitat of approximately 300 acres. About 450 acres of crop land and approximately 930 acres of range land will be disturbed by construction. The construction of the makeup water pipeline will temporarily disturb 120 acres of grazing land.

b. If natural gas is selected as a supplementary fuel, Water Power proposes to transport it to the site via pipeline. The record includes neither a description of the pipeline nor a discussion of its potential impacts to the physical and human environment. Information on this line will be submitted for review and approval. Construction will be scheduled to avoid interference with agricultural activities along the route.

2. Wildlife Habitat

a. Construction of the plant facilities, including waste disposal areas, will reduce wildlife habitat. Permanent habitat removal will be largely confined to crop land and heavily grazed areas, which have lower wildlife values than other areas. To the

extent possible, much of the construction area will be restored to promote former land uses.

b. Construction and operation of the plant will adversely affect wildlife for a variety of reasons. Habitat will be removed or disturbed by construction. Increased population will result in more hunting. Increased traffic will result in more road kills of animals. Human activity will result in avoidance by some species. It is possible that secondary development will have a larger impact than direct project effects. (TR Vol. 25, p. 3914, Hickman).

c. The habitat of the site area is valuable. Sagebrush communities exist there which are not found extensively in Eastern Washington. (TR Vol. 25, p. 3966, Hickman). The channeled scabland character of the area combined with the riparian vegetation around the potholes and the lithosolic plant communities on the site are important. The Applicant will be required to mitigate lost habitat. An accepted method of mitigation for permanently lost wildlife habitat is by improvement of other underutilized habitat either on or off-site to offset habitat lost. Any habitat improvement affecting agricultural lands should be compatible with that agricultural use.

d. Fifteen to twenty percent of the sagebrush habitat on the CGS site will be removed by plant construction. The sagebrush area is habitat for Brewer's sparrow, the vesper sparrow, the sage thrasher and Swainson's hawks. These last two species are on the Washington State Draft Threatened List.

e. Solid waste disposal areas will ultimately remove approximately 20 acres of habitat containing the spinescent flameflower, Talinum spinescens, which is found on the Washington Natural Heritage Program list, but is not legally protected.

f. Water Power has entered into a stipulation with the Washington State Department of Game. The aim of this stipulation is to preserve wildlife resources. (Ex. 50) It provides for on and off-site pre-construction baseline studies, monitoring of impacts during construction and operation, and a method for selecting mitigation measures. The Applicant will be required to provide the Council with plans for, and the results of, all baseline studies, monitoring methods and results and mitigation measures. All mitigation measures will be first approved by the Council prior to implementation.

3. Crop and Grazing Lands

Construction will result in the removal from production of some crop lands and grazing lands. After construction, those areas that are not used during operations will be revegetated and restored to a land use value equal to or greater than that which existed prior to the construction. The Applicant recognizes the importance of preserving productive agricultural lands and has agreed with the original landowners on the plant site to lease back those areas on the site not required for project operation and construction for the purposes of livestock grazing and crop cultivation.

4. Well Field and Pipeline

Construction and operation of the makeup water well field and makeup water pipeline will have a minimal adverse environmental impact on vegetation and animal life.

C. Construction Practices and Monitoring

1. Construction

The effects of construction at the CGS plant site can be minimized by construction practices and operating conditions. Elsewhere in these Findings, noise, water quality and air quality concerns have been addressed. Additional protections will be provided in the Site Certification Agreement. The Applicant has agreed to:

a. Restore and revegetate disturbed areas wherever possible;

b. Practice horticulture to ensure the restoration of native vegetation and habitat wherever possible;

c. Fence waste disposal areas and waste collection ponds;

d. Instruct construction workers in practices to reduce impacts to wildlife and vegetation;

e. Restore original drainage patterns where possible.

2. Monitoring

a. The Applicant has described a proposed monitoring program on pages A.6.11.8 through A.6.11.11 of the Application. The major elements of this proposed program involve: annual aerial infrared photographic surveys; lichen community studies; bird mating and nesting studies; waterfowl counts; raptor studies; and salamander studies.

b. Monitoring of vegetation on and off the plant site will be intended to identify significant impacts to crops and other vegetation as a result of CGS emissions. This monitoring will be required by the Site Certification Agreement. A more detailed discussion of monitoring of vegetation can be found in Section XII, Air Quality.

c. Monitoring of small mammal species to ensure that populations of species of concern which exist on the plant site do not suffer significant adverse impacts will be undertaken. A monitoring plan will be developed for and approved by the Council.

VIII. SOCIOECONOMIC IMPACTS

A. Impacts on the Quality of Life

1. Construction of the CGS will cause dramatic increases in population in Lincoln County and other areas. Pressures from these increases will bring about both positive and negative changes in a way of life that has gone substantially unchanged for decades.

2. Small communities will lose the cohesion that comes from the shared values of a stable, older, rural population. Social, cultural and civic values will change under the influence of the new population. Demands for social services, public services and housing will dramatically increase. The local economy will undergo transformation.

3. It is well-documented that sudden and massive increases in population can irreversibly degrade small communities if appropriate mitigation does not occur. The Applicant, the parties and the Council recognize that planned mitigation of negative socioeconomic impacts is imperative to assure a reasonable level of well-being for both local citizens and the new, CGS-induced population.

4. Section IX of these Findings discusses mitigation measures for the socioeconomic impacts described in this section.

B. Conceptual Mitigation Planning

1. Water Power proposes to approach the mitigation of negative socioeconomic impacts with a technique denominated "conceptual mitigation planning." Conceptual mitigation planning is defined as the use of population modeling techniques and the exercise of expert judgment to estimate the expected population growth and the timing of growth for each political subdivision. Assessments of needs in each political subdivision for public and private services and capital improvements are based on projected population. This approach permits advanced planning and the employment of mitigation devices, such as tax prepayments for capital improvements and government

services, and active attempts to influence population distribution, prior to actual impacts.

2. The assumptions made for planning purposes will undergo continuous processes of validation and adjustment as actual experience is recorded. (TR Vol. 16, p. 2538, Rafferty)

3. Conceptual mitigation planning is a "state-of-the-art" approach to socioeconomic mitigation. This technique is a reasonable and prudent means for the Applicant to fulfill its responsibilities with respect to the human environment.

C. History and Purpose of the Creston Project Committee (CPC) and the Creston-Mt. Tolman Impact Assistance Project (CMTIAP)

The Socioeconomic Impact Mitigation Plan ("620 Report"), submitted by the Applicant pursuant to former section WAC 463-42-620, and Agreements reached between Water Power and the local political subdivisions reflect substantial assistance from the Creston Project Committee and the Creston-Mt. Tolman Impact Assistance Project. The two groups function to assure public involvement in socioeconomic planning for the CGS. The CMTIAP was formed following a March 17, 1980 announcement by the Federal Regional Council (FRC) of the existence of a demonstration project described in the action agenda of the President's Small Community and Rural Development Policy. The project was implemented as a cooperative venture between FRC, the State of Washington and private industry in anticipation of industrial development in Lincoln County. One of the early results of these programs, as directed to the CGS, was the creation of a local task force referred to as the CPC. The CPC included representatives from the communities in Lincoln County and private industries in the area. The CMTIAP included local officials and citizens as well as professional planners.

The CMTIAP completed its substantive work in mid-January, 1982. The CPC continues to function in anticipation of finalized plans for the project. ("620 Report," Sect. 1.4.)

D. Existing Agreements: Overview

1. The Creston Generating Station Socioeconomic Impact Mitigation Agreement and Interlocal Cooperation Agreement ("Agreement")

a. The Applicant, several of the local political subdivisions and Lincoln County have entered the above-titled Agreement into evidence. (Ex. 52) The Agreement is the result of many months of planning, analysis and negotiation between the parties. (TR. Vol. 17, pp. 2799-2806, Berthrong and Smith) The efforts of the CPC, the CMTIAP and signatories have been considerable. The Agreement provides population estimates and requirements for government services and capital improvements. Monitoring, prepayment and reimbursement schemes are laid out. (See Section IX on Mitigation) Responsibilities of parties to the Agreement are defined.

b. The essence of the Agreement centers around execution and implementation of Interlocal Cooperation Agreements among local political subdivisions. (See RCW 39.34) The importance of the Interlocal Agreements is to establish an equitable distribution of funds among the different communities. The signatories envision, at some later date, the execution of the necessary Agreements.

c. The Council encourages negotiation and agreement among parties and applauds the efforts of the parties to this Agreement. It is reasonable, prudent and appropriate that the Agreement be adopted into the Site Certification Agreement. Adoption of the Agreement is not intended to preclude political subdivisions not parties to this Agreement from seeking mitigation of CGS-related impacts. In addition, the Council does not regard adoption of this Agreement as a resolution of all potential CGS-related socioeconomic impacts.

2. Stipulation Between the Applicant and School Districts Nos. 73, 200 and 207 ("School Agreement")

a. The School Agreement was entered into evidence as Exhibit 112. Parties to this Agreement with the Applicant are Creston School District No. 73, Davenport School District No. 207 and Wilbur School District No. 200. The School Agreement is the result of extensive negotiations between the Applicant and School District representatives, including the Superintendents for each District. The School Agreement outlines anticipated needs of the School Districts due to CGS-related student population increases. In it, the School Districts are given two options from which to choose a payment scheme.

b. It is reasonable, prudent and appropriate that the School Agreement be adopted into the Site Certification Agreement. The adoption of the School Agreement is not intended to preclude School Districts which are not parties to it, from seeking mitigation of negative CGS-related impacts.

E. Employment and Induced Population

1. Direct Employment: Construction

The construction phase of the CGS will occur over a 10 year period scheduled to begin in mid-1984 and to end in mid-1994. The construction work force will include approximately 340 persons in the peak quarter of 1984 and grow to peaks of 2,015 and 1,700 in 1987 and 1992, respectively. The presence of operational personnel beginning in 1985 will result in a total work force of 2,040 during the peak quarter of 1987.

2. Direct Employment: Operations

Commercial operation of CGS Unit 1 is planned for mid-1988, and staffing and training of operational personnel is to begin in 1985. The operations staff is expected to reach a total of 12 in 1985 and will grow to a level of 397 upon completion of all four units in 1994.

3. Secondary Employment

Demand for secondary jobs is estimated to be 346 in the third quarter of 1987 (at peak population) and 244 in 1994 at the beginning of the long-term commercial operation of all four units. These figures are the result of an analysis that employs a multiplier of 1.5 secondary jobs per construction inmigrant and 1.1 secondary jobs per construction traveler. (See Appendix I, Ex. 52) It was assumed that the current ratio of retail trade and service employment to total employment in Lincoln County would improve somewhat over its current, unusually low level (0.23 to 0.24) as the population increases. ("620 Report", Sect. 3.1.3)

4. Total Employment Impact

The total CGS-related population increase is estimated to be approximately 520 in 1984; 3,590 in 1987 (peak 1); 2,250 in 1989; 3,610 in 1992 (peak 2); and 1,220 in 1994.

5. Sources of Construction Labor Force

Water Power has estimated that only 10 percent of the construction labor force will be composed of current local residents. Approximately 30 percent of the construction work force will be daily commuters to the area, most likely from Spokane. The remaining 60 percent of the construction workers are expected to be evenly divided between inmigrant workers (those who move their families into the CGS area) and travelers (those who take up temporary housing in the local area). The DEIS suggests that the 30 percent estimate for daily commuters may be somewhat high, based on the Applicant's optimistic viewpoint of some of the impacts of bus transportation to be provided from Spokane. ("620 Report," Sect. 3.1.4.1; DEIS, Sect. 3-126)

6. Sources of Operations Labor Force

The permanent operations force has been estimated to be 20 percent

local, 5 percent commuters, 5 percent travelers and 70 percent inmigrants. This estimate is based largely on an assessment of available labor skills in the area.

7. Sources of Secondary Employment

The distribution estimated for secondary employment is 20 percent local, 50 percent daily commuter, 5 percent traveler and 25 percent inmigrant. The inmigrant figure includes the spouses and children of inmigrants who would take some of the secondary jobs.

F. Population Distribution

1. The Council finds the projection made by Water Power identified as "Conceptual Mitigation Program-Version 3" is the population distribution for which socioeconomic impacts should be planned and mitigated. ("620 Report," Sect. 3.0)

2. The Council recognizes that this projection is for planning purposes only and that actual distribution may differ greatly from projected distribution. If other communities such as Grand Coulee and Harrington are impacted by CGS-related population growth, it is appropriate that mitigation for such impacts be provided as set forth in Section IX.

3. A responsibly-maintained monitoring program will be a necessary condition of Certification.

G. Economics

1. Private Sector

a. Local private sector economics will undergo transformation under the pressure of population increases. There will be both positive and negative aspects to this transformation.

b. New job opportunities will be created for local citizens. Young persons approaching maturity who would previously have been

forced to leave the area to seek their livelihoods will have some incentives to remain. (TR Vol. 16, p. 2613, Werner)

c. Lincoln County's economy will be diversified by the construction and operation of the CGS.

d. The availability of retail goods and private services is likely to increase as the enlarging population diminishes presently perceived entrepreneurial risks. ("620 Report", Sect. 3.1.3)

e. Citizens with low and fixed incomes may face the burden of higher costs due to increased demands for property, housing and other goods and services.

f. The cost of employing agricultural and other low-salaried workers will increase due to competition for workers between local employers and the CGS.

2. Local Public Finance

a. The majority of revenues accruing to local governments during construction of the CGS will be from sales and use taxes--of which one half cent (less administrative costs) will be returned by the state to the local taxing jurisdictions.

b. The situs of sales and use taxes is determined by the regulations of the Department of Revenue. The Council finds reasonable the Applicant's estimate that 75 percent of the construction-related sales and use taxes generated by the project, and legally available to local jurisdictions, may be allocated to Lincoln County jurisdictions. (TR Vol. 17, p. 2826, Rose)

c. Sources of sales tax for Lincoln County will include purchases made in Lincoln County and purchases made by way of contracts by which vendors will furnish, deliver and erect, at the

site, the goods that are subject to the tax. Further, the purchase of coal outside Washington State may represent a potential long-term source of use tax to the county. (TR Vol. 18, pp. 2914, 2973, Rose; p. 3013, Saucerman)

d. It is reasonable to expect that the CGS will ultimately generate sufficient revenues to offset the negative socioeconomic impacts it will induce. The Council recognizes, however, the possibility of occurrences that may result in a shortfall of revenues.

e. Unregulated accrual of sales and use tax revenues to the local jurisdictions is not likely to result in an equitable distribution for purposes of the impact mitigation. (Ex. 52)

f. Local governments outside Lincoln County are unlikely to share in the tax revenues generated by the CGS. (TR Vol. 18, pp. 2988-2989, Rafferty, Shiosaki)

g. The construction schedule of the CGS will impact the flow of revenues to the signatories to Exhibit 52. It is very likely that the timing of revenue flow will not match the needs of the signatories to rationally plan and effect mitigation programs. (Ex. 52)

h. P.U.D. Privilege Tax revenues will not accrue to local governments in the absence of participation of Public Utility Districts in the CGS.

i. Public utility generation taxes pass only to the state General Fund.

j. The valuation of the CGS for property tax purposes and the depreciation schedule selected will be governed by the Department of Revenue. Several, as yet unknown, factors, including type of ownership and market valuation, will determine the amount of property tax revenues derived from the CGS.

k. Property tax revenues will go to the state for statewide distribution to school districts and redistribution to Lincoln County. Local fire districts are dependent upon property tax revenues.

l. Incorporated jurisdictions in Lincoln County will not receive CGS property tax revenues.

m. Other sources of tax revenues available to the local jurisdictions are motor vehicle excise taxes, liquor excise taxes, travel trailer excise taxes and motor vehicle taxes. The local governments will also receive shares of profit from the Liquor Board.

H. Capital Facilities and Government Services

1. Tables A-1 through A-6 of Exhibit 52 represent an estimate of capital facilities and government services that will be required in Lincoln County communities. These tables reflect an assessment of both the existing needs of the affected communities as well as the needs to accommodate the increase in population from the CGS. These figures are conservative, being based on population estimates from "Conceptual Mitigation Program-Version 2" -- a "worst case scenario" which envisions a greater population impact than that of "Conceptual Mitigation Program-Version 3," adopted as reasonable in these Findings. These tables represent active participation of the signatories to Exhibit 52 as well as professional planners from the Creston-Mt. Tolman Impact Assistance Project. The Council finds that the requirements stated in Tables A-1 through A-6 are reasonable estimates for planning purposes. (Ex. 52; "620 Report")

2. Water Power has analyzed the CGS impacts on the Grand Coulee area and regards such potential impacts to be beneficial. (TR Vol. 17, p. 2714, 2721, Rafferty and Smith) Grand Coulee has some entertainment facilities not available in Lincoln County which may attract CGS-related population. (TR Vol. 17, p. 2714, Rafferty; TR Vol. 30, p. 4702, Stouder) It appears that some of the major facilities such as public water and sewage treatment systems in the Grand Coulee area have existing problems which may be exacerbated by population growth. (TR Vol. 30, p. 4707, Stouder; TR Vol. 31, p. 4884 and 4999, Davenport)

I. Schools

1. For intervenor School Districts Nos. 73, 200 and 207, Exhibit 112 encompasses a reasonable estimate of CGS-student population-related impacts.

2. The school districts serving Almira, Reardan, Harrington-Odessa and Grand Coulee have not anticipated unmanageable impacts and have not sought mitigation funds from Water Power.

J. Housing

1. Housing demand in Wilbur, Creston, Almira and Davenport will exceed supply in those communities. (TR Vol. 30, p. 4692, Stouder)

2. Housing costs will likely rise in the face of the increased demand. Low and fixed-income citizens may be adversely affected. (TR Vol. 30, p. 4695-96, Stouder; DEIS, Sect. 3-158)

3. Spokane and Grand Coulee offer existing housing that could meet a portion of the CGS-induced housing demand. (DEIS Sect. 3-151 to 3-156)

4. Without adequate planning, the Town of Creston may have an undesirable amount of temporary housing, and development in rural

Lincoln County may be scattered and unregulated. (TR Vol. 30, pp. 4765, 4790, Stouder)

5. Rural lending institutions are traditionally unwilling and ill-equipped to enter the mortgage financing market. (TR Vol. 30, pp. 4694-4698, Stouder)

6. The Council finds that the private sector housing market may not adequately meet the minimum housing requirements for the CGS-induced population. (For mitigation, see Section IX.C)

K. Noise Impacts

1. Overview

a. Noise impacts resulting from the full realization of Water Power's plans are various, complex, substantial and difficult to manage or regulate.

b. The most serious noise impacts will occur from unit coal trains. The loudest noise will occur with steam cleaning of piping prior to start-up of each generating unit. There will be a noticeable crackling sound from transmission lines in certain atmospheric conditions. Other noise impacts are the general phenomena of noise from construction activity and traffic at the site, and increases in noise levels in the towns from sharply increased populations.

2. Noise Concepts and Terms

a. One does not proceed far into a description of noise before it becomes necessary to use and understand certain basic terms and concepts. Noise is emitted from a source. Impacts of noise are assessed from a fixed receiving point, called a receptor, usually a structure of human habitation - a house, a school, a hospital. Noise decreases as the distance from the noise source increases. Noise may be constant and moving, such as a train,

or intermittent and fixed, such as the blast from the steam cleaning of pipes when generating units are preparing to start. Adverse effects of noise can only be assessed against a given background level that presumably exists before the source sends the noise being examined. This background level is denominated ambient noise level. It may vary, being lower or quieter, in a rural area than, for instance, in the commercial center of a town or city. There are subtle subjective elements which make actual noise irritation a very individual matter. Certain individuals are conditioned to be sensitive to certain sounds such as perhaps the sound of the fence gate opening in the morning when the mail is delivered. Others may be conditioned to be less sensitive to certain sounds, such as the loud sound of rushing water to the person residing beside a river. As a general proposition, if there is no control of the noise source, mitigations must manipulate the area between the source and the receptor. Objects standing between the two tend to reduce noise effect. Thus, buildings in the second and third row of structures from the source experience progressively reduced impacts as the distance from the source increases and the intervening structures progressively disrupt the line of noise. A variety of natural objects and contours, as well as man-made devices, serves to disrupt the line between source and receptor. (TR Vol. 19 and 20, Arnold)

b. The unit of measurement for sound is a decibel or dB. When considering the human response to noise, at a particular dB level, a factor is added, an A-weighting factor, or dbA. The A scale indicates the human response to noise. Leq refers to equivalent energy noise level over a specific period of time. It is used to identify persistent noise such as that which might lead to worker discomfort. (TR Vol. 20, pp. 3114, 3115 Arnold) L_{dn}, the day-night sound level, represents the average noise for a 24-hour period with a 10 dB penalty for nighttime noise

between 10:00 p.m. and 7:00 a.m., recognizing the less active pace of most people during those hours. There is a measure for extreme short duration noises, L_{max}, which is commonly related to generally accepted levels which are assumed to cause disturbance of sleep, possible waking, and consequent upset.

c. The dB noise scale is logarithmic, meaning, for instance, that the apparent loudness of a noise doubles for each 10 dB increase in sound though the dB scale may range from a theoretical 0 level to levels exceeding 100 dB. (TR Vol. 19 and 20, Arnold) Noise levels from steam blowout may range from 95 dbA to 115 dbA within 1,000 feet from the source (TR Vol. 19, p. 3119, Arnold). Most ambient sound levels move in a much narrower range. Background sound levels in the vicinity of the Creston site ranged from 26 dbA to 48 dbA over varying locations and sound durations. (App. Table 4.5.3-1) Sound survey sites along Highway 2 recorded levels in the area of 60 dbA for certain durations. By way of example, normal conversation level for persons six feet apart is considered to be 60 dbA. The sound of a vacuum cleaner in a house is perceived at 70-80 dbA by its operator, depending on the make and model. (TR Vol. 24, p. 3828, Saunders)

3. Noise Regulations

a. The Washington Department of Ecology has published noise regulations in WAC 173-60. The noise from steam blowout will exceed the limits established in that reference and a variance from its provisions will be issued upon review and compliance with conditions which may be imposed by the Department and approved by EFSEC. This regulation presently does not apply to rail carriers. The Department of Ecology enforces the regulation only on a complaint basis. Enforcement of the regulation and action taken under it is not likely to provide significant mitigation for noise impacts which may occur from CGS.

b. The U. S. Environmental Protection Agency has established standards in the nature of guidelines or goals. Current short-term goals seek to reduce environmental noise levels to L_{dn} 65 dbA. (App. Sect. 5.5.-4)

4. Unit Coal Train Impacts

a. There may be a wide range of varying effects from train noise depending upon which of the three coal regions is chosen to fuel the plant. (App. Figure 3.4.1-1, Table 3.4.3-1, DEIS Table 2-10, p. 2-53) From Spokane and west to the site, four more alternatives are being considered, with varying potential noise impacts. (App. Fig. 3.4.2-1, Table 3.4.3-2) This confusing array of possibilities must be considered in light of the limited authority of this Council. Common carrier railroads are specifically excluded from the category of associated facilities in the statute. RCW 80.50.020(6). There is, therefore, no requirement that railroad lines be certified with the energy site. Further, no railroad company stands as a party in this proceeding. Water Power does not deny impacts will occur to those residing near the rail lines. Water Power has taken the position that impacts be mitigated on a case-by-case basis. Water Power has left the task of mitigation to the railroad. (Anderson, TR Vol. 20, pp. 3209, 3210) The Council will consider the requirement of a unit train noise study once Water Power selects a coal source for the CGS.

b. The noise impact of unit coal train passage has been the subject of study by Water Power's consultants. A threshold range of influence was determined to be L_{max} 65 dbA. The study assumed an average of 2.5 trains passing during the day and 1.5 trains passing at night. The actual number of trains for four-unit operation may vary from 3.4 to 5.4 trains a day depending on the coal source selected. Baseline sound levels of 96 dbA for locomotives and 86 dbA for rail cars were assumed to exist 100

feet from the track. The study assumed other factors and the general effect of the assumptions was toward a conservative over-estimation of potential noise effects. Duration of the pass-by was calculated to be approximately two minutes at the assumed speed of 50 mph. During the four train per day schedule, duration of noise in excess of 65 dbA would amount to about eight to ten minutes. These levels assume a receptor 500 feet from the track. Of that duration, approximately six minutes would be spent exposed to L_{max} of 80 dbA or more. As a consequence of this brief daily passage, L_{dn} levels would experience some incremental increase from train noise at a distance of 3,500 feet. Peak pass-by levels, the eight to ten minutes per day, would be 70 dbA at 1,570 feet and 65 dbA at 2,875 feet.

c. The ultimate scheduling of trains is unknown. It is certainly a matter outside the control of this Council. These findings assume the passage of unit trains along the selected routes also during nighttime hours. Sleep interference levels are difficult to establish as a standard because the conditioning and attitudes of the subject play a central role. The sleep interference value of 65 dbA has been well-documented. People exposed to L_{max} levels of 65 dbA suffer interference with sleep when the background ambient level is 55 dbA or less. Though peak pass-by levels of 65 dbA will occur within 2,875 feet of the tracks, sleep interference will not necessarily occur to all residents in that zone. The peak pass-by level assumes a person standing outside. The sleeping person, inside a house, will benefit by some reduction in noise depending upon the type of house construction, room size, and furnishings. If windows are sealed closed, the reduction from outside noise levels may be as much as 25 dbA. If the window is partially open, the reduction may be only 15 dbA. In this fashion, sleep interference in the hot summer months may be reduced by ventilation or a quiet air conditioner.

d. Depending upon the route chosen, as many as 749 farm or residential structures are within areas where some noise effects from unit trains may occur. There is a significant potential for sleep interference to those persons residing in 54-56 farms or residences. Sensitive noise receptors within 1,200 feet of the tracks on the existing Cheney to Burlington Northern Main Line are the following: Eastern Washington University; Antonian School; Medical Lake High School; Silver Lake Recreation Area; and Meadow Lake Recreation Area.

5. Noise Study

The potential exists for substantial unmitigated noise impacts from unit coal trains serving the CGS. A procedure for the Council to require a unit coal train noise study should be a condition of site certification.

6. Coal Source Selection

Noise impacts from unit trains at Cheney and Medical Lake will be substantially reduced if these areas are bypassed. Selection of a coal region other than the Green River-Hams Fork region or routing from Spokane to Creston by Alternates 2 or 3 would have this effect.

7. Transmission Line Noise

Under conditions of high humidity, transmission line noise becomes audible and may be annoying in the absence of background noise to mask it. Levels up to 50 dbA may occur at 100 feet from a transmission line of the type proposed by the Application. The character of the noise is a buzzing sound caused by electrical discharge from dusty insulators. Water Power will identify any receptors within 100 feet of any transmission line placed as a consequence of certification. Noise effects from identified locations will be mitigated by line maintenance, insulators or shields. In the event noise effects cannot be reduced below 50 dbA in this fashion, the line will be located sufficiently distant from the receptor so as to reduce the impact below the 50 dbA threshold level.

8. Steam Blowout

Steam blowout is an operation designed to remove construction debris, rust, scale and other matter which accumulates between the time the pipes are fabricated and their ultimate use in operation. This operation will generate extremely high noise levels. (See Finding VIII.K.2.c) Noise from this activity could reach levels as high as 75 dbA in Creston and 86 dbA at the four residences closest to the plant. These noises will be of short duration, a three-to-six minute period each hour for two to three weeks prior to initial startup of each generating unit. This source will generate noise only during daylight hours. Water Power will notify residents within the Creston area in advance of the scheduled time for the operation. As extreme noise levels from steam blowout could cause hearing loss to workers at the site, care will be taken to ensure that they are protected from adverse effects.

9. Noise from Construction Activity

a. There will be noise generated by construction activities, presently scheduled to occur from 1984 to 1994. This may result in a rise in ambient noise levels for residences close to the site in an amount less than five dbA. No violation of the state noise regulation will occur in this range and effects are minimal.

b. Construction workers may be subject to higher peak noise levels. Protection is provided by compliance with provisions of the applicable occupational and safety regulations. Water Power will comply with such regulations during construction.

L. Light and Glare

1. Development of the CGS will increase light sources in the area during construction and operation. The added light sources will not be typical of a rural area and will alter the existing visual charateristics. Nighttime lighting will be used during construction. This lighting will be viewed by travellers on Highway 2 for a distance

greater than five miles in either direction of the site. The lighting will not create any glare off-site, but will be noticeable and significantly greater than any of the existing light sources.

2. There will also be nighttime lighting during operation. This illumination will most likely be as noticeable as construction lighting. Aircraft warning lights on top of the four emission stacks will be noticeable for great distances at night in any direction. Security lighting at the well field pump houses will also be noticeable at night. These lights will alter the existing night characteristics of the rural area. Water Power will mitigate the impacts by using lamp shades on plant lighting wherever possible, having the effect of directing the light onto the CGS site.

3. Development of the railroad line from Bluestem to Rocklyn will add a specific type of light source in the rural area where it didn't previously exist. Trains making night deliveries of coal will pass approximately nine residences which may be impacted by train lights. The generally increased train activity on existing tracks along the route will create additional light sources during nighttime deliveries of coal. There will, of course, be indirect increases in light sources to the existing rural area as it changes with increased human habitation during construction and operation of the CGS.

M. Archaeological and Historical Resources

Based on present knowledge, no significant impacts to archaeological or historical resources are anticipated.

N. Aesthetics

The development of the CGS will have an adverse aesthetic and visual impact on the Lincoln County area resulting from the introduction of an industrial use into the rural area. The completed plant will be visible for a distance of five miles. Vapor plumes will also be visible. The microwave station on Creston Butte will have visible impacts. Solid waste disposal

sites will create short-term negative aesthetic impacts. Increased rail traffic will alter existing visual characteristics along the tracks. Towers, conductors and rights-of-way will have long-term visual impacts along the transmission corridor system. The appearance of the local communities will be altered by the increased population.

IX. MITIGATION OF SOCIOECONOMIC IMPACTS

A. Population Distribution

Water Power has committed to certain actions to influence the CGS-inmigrant population size and distribution, as outlined in Article 2, Sect. a, Exhibit 52.

1. Local Training Programs

To the extent legally possible, Water Power will recruit workers from among the local population. A reasonable means of encouraging local participation is to provide local training programs. It is anticipated that these programs will require the combined efforts of Water Power and the local trade unions. With respect to operational workers, Water Power has instituted an informational program in the local schools so that interested students may make academic preparation for eligibility for training programs. The Council finds that a policy of local hiring will serve to minimize impacts to the community.

2. Encouragement of Private Development of Permanent Housing and Mobile Home Parks

The record shows that encouragement of private development of housing for CGS-induced population will be undertaken. The record does not establish that these efforts will be totally successful. (See Sect. IX. C.1, below)

3. Bachelor Quarters and Recreational Vehicle Park

Water Power has committed to provide 100-300 bachelor quarters and a 150-space recreational vehicle park in or near the Town of Creston. This is a responsible approach to the need for temporary housing facilities and, if reasonably maintained and dismantled, the facilities will minimize potential blights upon the community in the nature of scattered and unregulated temporary housing. It is an appropriate condition of Site Certification that the planning and construction of

these facilities be timed to accommodate the earliest influx of workers. (Ex. 52)

4. Bus Transportation

Water Power has committed to provide a commuter bus service for workers living in the Spokane and Grand Coulee areas. (Ex. 52) This is a reasonable means to encourage workers to locate or remain in Spokane or Grand Coulee. To the extent the transportation program may encourage inmigration to Grand Coulee, that community may suffer population-induced impacts.

B. Ultimate Responsibilities: Net Financial Burden

1. Water Power will assume responsibility for the "net financial burden" of negative socioeconomic impacts induced by the CGS. (Ex. 52, Art. 8) The assumption of net financial burden is an adequate fulfillment of Water Power's responsibility to mitigate socioeconomic impacts.

2. Any local political subdivision, not party to Exhibit 52 or 112, shall be entitled to payments for net financial burden. (TR Vol. 18, p. 2988, Rafferty) The means by which entitlement must be substantiated is an appropriate provision for the Site Certification Agreement.

C. Housing

1. Water Power has recognized the need for housing for the CGS-induced population. Water Power has proposed construction of bachelor quarters and an RV park. Water Power will also provide planning assistance and will encourage private sector housing development to accommodate needs. (TR Vol. 16, pp. 2649-50, Rafferty)

2. Water Power and the local government participants through a socio-economic mitigation agreement (Exhibit 52) propose to facilitate the development of permanent housing by the private sector through provision of adequate public utilities and facilities. Under the terms of Exhibit 52, Water Power would provide funding to the cities of

Creston, Davenport, Wilbur, Reardan and Almira for capital improvements to sewer and water and street facilities in order to resolve existing or baseline problems and to make these services available for new housing to accommodate the CGS-related population. The program is designed to address the need for services to new housing required by CGS. The agreement further includes mutually agreed upon growth targets for each of the towns.

3. Further action by the Applicant may be necessary to assure that reasonable accommodations are available to the CGS-induced population. A program to develop and implement housing plans is an appropriate condition of Site Certification. (TR Vol. 30, pp. 4699-4700, Stouder)

4. Although the Applicant has provided substantial information on existing housing conditions in the impact area, further studies are necessary. Studies should be required within a time frame to be designated in the Site Certification Agreement.

D. Monitoring

1. A sound monitoring program is crucial to the mitigation of socio-economic impacts. Conceptual Mitigation Planning, the mitigation approach elected by the Applicant, relies for its effectiveness on continuous adjustments to projections with actual experiential data. (TR Vol. 16, p. 2538, Rafferty)

2. Provision for a monitoring program to gather and analyze data and implement programs, subject to Council approval, is an appropriate condition of Site Certification. Data-gathering techniques may include, but are not limited to, those outlined in Article 2 and Appendix 1 of Exhibit 52.

E. Impact Financing

1. Payment of mitigation funds must precede actual impacts to permit planning and implementation of programs. (See Sect. VIII of these Findings)

2. Water Power has committed to prepay mitigation funds. This is a reasonable and prudent mitigation measure. (Ex. 52)

3. Scheduling of advance payments is appropriate.

4. Exhibit 52 anticipates that advance payments will be reimbursed by sales and use taxes generated by the project and accruing to Lincoln County. To the extent that prepayment of sales and use taxes may be accomplished under state law and Department of Revenue regulations, the Council finds this approach to be in the best interests of the public.

5. To the extent prepayment of sales and use taxes is not permitted by law, advance payments will be in the form of grants to the local political subdivisions. For those jurisdictions outside of Lincoln County, or otherwise unable to participate in the agreement relating to the prepayment or distribution of revenue, any mitigation payments that are documented and approved by the Council will be in the form of grants. (See Section IX.B above)

6. The schedule for reimbursement, recoupment or credit for the prepaid taxes was estimated and shown in Exhibit 56. The precise schedule for such reimbursement, recoupment or credit cannot be made; however, such reimbursement, recoupment or credit will occur either at the time the local sales and use taxes or property taxes become due, or when such taxes are paid by the State of Washington to the local taxing districts that are parties to the CGS Socioeconomic Impact Mitigation Agreement and Interlocal Cooperation Agreement as set forth in Exhibit 52.

7. Exhibit 52 anticipates that it may be necessary to advance property tax payments to Lincoln County to mitigate impacts to fire districts. No other provisions involving property taxes, including those for reimbursement, are outlined in the record. The Council finds that advancement of property taxes and reimbursement, carried out in accord with Department of Revenue regulations, is a reasonable way to ensure adequate funding for the Fire Protection Districts. (Ex. 52)

8. Impact mitigation payments made to the School Districts will be in the form of grants. (Ex. 112)

9. The record does not reveal the means by which political subdivisions not parties to Exhibit 52 or 112 can apply for mitigation funds. A process should be set out in the Site Certification Agreement. (Ex. 52)

F. Archaeological and Historical Resources

Water Power has agreed to perform on-the-ground surveys for archaeological and historical resources before transmission towers and other facilities are erected. (App. Sect. 4.9.1-2) Further, all significant artifacts will be deposited with the Washington Archaeological Collection Repository.

G. Aesthetics

Water Power has committed to select as unobtrusive a color scheme as possible for the plant, to suppress visible emissions and dust and to perform landfill and reclamation operations in ways consistent with existing topography and vegetation. Construction specifications should require that contractors preserve natural landscapes and restore work areas to a natural appearance. Though these measures are reasonable, there will be, nevertheless, irreversible negative aesthetic impacts from the construction of the CGS, associated facilities and necessary rail lines.

H. Land Use

1. Water Power will compensate displaced landowners in accord with private agreements. (App. Sect. 5.8.5)

2. Transmission line rights-of-way that displace woodlands will be re-seeded for grazing.

3. If the new railroad branch line is constructed between Bluestem and Rocklyn (Alternatives 3 or 4), Burlington Northern will compensate the property owners for the right of way. Property damages for impacts resulting from severance, noise, glare, and loss of light, view and air will be compensable or mitigated. Cattle passes and fencing are compensable items or mitigating measures. Grade crossings will be provided when and where determined necessary.

4. State-of-the-art equipment will be used on the locomotives and rolling stock (coal cars) to minimize wayside fires and noise. Regardless of which railroad access (alternative 1, 2, 3 or 4) is selected, continuous rail with welded joints will be utilized. The roadbed, ties and rail shall be well maintained to minimize wayside fires and noise.

5. Grade crossings of public roads will be provided with whatever protective devices are warranted by standards promulgated by the Washington Utilities and Transportation Commission (WUTC). The grade crossings and their maintenance shall be the responsibility of the railroad.

6. Water Power will advance payments to Lincoln County for two planning professionals to assist the local political subdivisions in the planning and regulation of CGS-induced primary and secondary growth. (Ex. 52)

7. Water Power and its contractors should perform no construction inconsistent with the Shoreline Management Act or its local enactments.

I. Noise

See Sect. VIII.K, above.

J. Light and Glare

See Sect. VIII.L, above.

X. TRANSPORTATION IMPACTS AND MITIGATION

A. Road and Rail Impacts

1. Overview

a. Substantial impact to the transportation systems of Lincoln and Spokane County will occur from construction and operation of the CGS. Road and rail impacts are interrelated and must be considered in the setting in which they occur. The transportation system in Lincoln County presently serves an agricultural economy. Impacts in population areas of Spokane County will occur at locations already heavily burdened by transportation complexities.

b. Changes in the railroad system in Lincoln County needed to accommodate unit coal trains may impact the ability of farmers to haul grain to markets. Additional rail traffic will complicate and delay traffic movements at points where vehicles and pedestrians normally cross the tracks.

c. The movement of large numbers of construction workers, principally along Highway 2, will impact the present rural nature of uses of the highway. The present traffic is composed of pedestrians, farm equipment and domestic animals, as well as motor vehicles. The patterns of movement of this employment force have been extrapolated and projected. Little is actually known of these patterns though demographic data collection and analysis underlying predictions has been thorough, fair and highly professional.

d. Planning in the area of transportation impacts and mitigation is beyond the scope of conceptual engineering. Judgments must, in large part, be made as the situation develops. For these reasons, a transportation impact study will be conducted as provided in the Site Certification Agreement.

2. Grain Haul Impacts

a. Witnesses at the public hearings expressed repeated concern about their ability to haul grain to market. The apprehension is elusive and diffuse, in the nature of informed suspicion. (See TR Public Hearing-Creston, p. 77, Hayes, and p. 93, Sheffels, as examples) The CGS, a major rail transport incident in the region, is more an occasion for this concern than the cause. Construction of the Bluestem-Rocklyn rail line will, if implemented, probably route unit coal trains away from Davenport. Beyond this single factor, there is little reason to believe CGS construction or presence will affect grain haul service. The Council's authority over these impacts is limited. (RCW 80.50.010(6)) Moreover, farmers' concerns relate to matters not easily regulated. If a problem exists, it is with lines of communication concerning economic planning between the farmers of Lincoln County and Burlington Northern. Farmers fear the railroad would prefer reduced service to its grain haul customers, and that perhaps, even now, Burlington Northern is implementing a policy of eliminating direct farm-to-market service. Burlington Northern has expressed views, though reserved, to the contrary, indicating no intention to change existing service. The economic merits or demerits of farm-to-market rail service are matters to be determined by market forces. If regulation of this relation is to occur, it must be by the Interstate Commerce Commission or possibly, the Washington Utilities and Transportation Commission.

b. For whatever reason, should Burlington Northern choose to abandon the Reardan-Mondavi line, there would result an added burden on the county road system, heightened at harvest season. There is little information in the record about the capacity of roads in the county to absorb grain haul traffic in the event of rail line closure. The DEIS comments that the

effects of such a diversion would be negligible. (DEIS Sect. 2-55) Potential effects on transportation in the event of rail closure should be addressed in the traffic study required by the Site Certification Agreement.

c. Construction of the section of rail line between Bluestem and Rocklyn, if elected by Burlington Northern, may result in short term grain haul problems which are capable of mitigation. There exists the possibility that the Burlington Northern branch line would be closed during construction or during any upgrading of existing branch lines. The Applicant should provide in its agreements with Burlington Northern that construction of this line be scheduled to minimize impacts to agricultural uses of the line during the period of construction.

3. Unit Coal Trains

a. Water Power proposes to obtain coal to fuel CGS from one of three coal regions now being considered. These regions are Lethbridge, in the Province of Alberta; Powder River on the Wyoming-Montana border; and Green River-Hams Fork lying principally in southwestern Wyoming. Three regional rail approaches to Spokane over three different rail carriers are being considered as alternatives, depending on the coal source ultimately selected. (DEIS Fig. 2-15) Round trip distances would be approximately 1,000 miles for the Canadian coal and approximately 2,000 miles for coal from the American coal fields. Four units of production would require an average of 3.4 trains a day for Canadian coal, 4.4 trains for Powder River coal and 5.4 trains per day for Green River-Hams Fork coal. This average is the number of trains passing a given point each day, half of the trains being loaded, and half returning empty. (DEIS Sect. 2-53)

b. Four additional alternatives are being considered for routing of unit trains from the Spokane area to the site. All of these alternatives would use Burlington Northern tracks ; alternatives 1 and 2, the Reardan-Mondavi branch line through Davenport; alternatives 3 and 4, the Burlington Northern main line to Bluestem. The main line alternative approaches require construction of approximately 8 to 12 miles of new track from Bluestem to Rocklyn. Three more alternatives, A, B and C, are proposed to link Bluestem and Rocklyn. (DEIS Fig. 2-17, Table 2-12)

c. The requirement of plant fueling will result in impacts at rail crossings which have not been addressed or defined. As a consequence of Water Power's conceptual approach, conflicts at rail crossings involving unit trains may occur at a variety of potential locations, according to the route selected. Depending on train speed, each unit train may take from two to four minutes to pass at crossings. The delays may have impacts on the operation of emergency vehicles. There is an increased potential for rail-highway accidents. More site-specific information is needed once rail routes are finally identified.

d. Rail line traffic and impacts will depend on which of several alternatives are used. From the view of impacts, the most desirable regional route is the Spokane International Line to Lethbridge, Alberta. This route is less than half the distance of other possible routes, has the lowest existing traffic and provides access to the highest quality coal. The coal characteristics would allow fueling by fewer unit trains. Selection of this source would also avoid rail impacts in the already burdened Cheney-Medical Lake area. There may be a cost disadvantage to its selection. Cost consideration is of prime interest to Water Power. It is also a direct responsibility of this Council. Common carrier rail lines are not associated

facilities within the meaning of RCW 80.50.010(6). Therefore, no certification of rail routes is authorized. However, the best interests of state citizens are served by careful study of impacts and implementation of mitigation for identified impacts wherever possible. In this regard, the task of mitigation would be significantly eased if the Cheney-Medical Lake route was avoided.

e. On the whole, the routes identified are reasonable alternatives to the problem of plant fueling, given the conceptual nature of the approach. No significant adverse environmental impact will occur if mitigation measures identified by the transportation impact study are implemented.

4. Road Impacts

a. At peak employment in 1992, 2,196 workers are projected to be travelling to and from the CGS. As access to the plant will be by way of Highway 2, all workers will utilize the highway for ingress and egress to and from the plant. Preliminary assessments of the magnitude of this labor force in terms of its impacts on Highway 2 capacities have been made. There appears to be no critical concern complicating management of this problem. (DEIS Sect. 3-119 - 3-124, TR Vol. 22, Walther) These matters should be addressed in any transportation study required by the Site Certification Agreement.

b. There is a lack of information concerning potential effects to road systems within the towns affected by population increases. The actual increases and population patterns in each of the towns are not known at this time, being the subject of projections by experts in the Application and the testimony. There is need for assessment of traffic impacts to the towns, particularly Davenport, Creston and Wilbur. Impacts to affected towns should be assessed in the transportation study.

B. Traffic Study and Mitigation

1. At such time as Water Power announces its decision to commence construction of CGS, a transportation study should be implemented as required by the Site Certification Agreement.

2. The study should examine road impacts along Highways 2 and 174 and within the towns of Reardan, Davenport, Creston, Wilbur, Grand Coulee and Harrington. Consideration should be given to all potential vehicle conflicts in which CGS-related traffic may participate. Potential vehicle conflicts with pedestrian movements should be assessed. Routes of school buses and emergency vehicles should be identified with regard to potential conflicts with work-related traffic and coal trains. Agricultural uses of Highway 2 and 174 should be assessed and transportation impacts from CGS considered.

3. Assessment of the transportation consequences of the passage of unit trains through Medical Lake should be a part of the study, if the rail route selected passes there.

4. Consideration should be given to the potential for accidents and the identification of any potentially accident-sensitive areas.

5. The study should consider and comment on the feasibility of certain mitigation measures as well as the justification therefore. The following approaches should be assessed: upgrade of the intersection of Highway 2 with the plant access road to facilitate turning movements and reduce vehicle conflicts; placement of traffic signals and warning signs at appropriate locations; structuring worker shifts or patterns to reduce transportation impacts; use of rail-highway grade separations; placement of pedestrian or farmer overpass and underpass of roads and rail lines; and communication devices between the railroad company and those in particular need of schedule information, such as farmers and emergency vehicle operators. Reference should be made in the course of analysis to generally

accepted criteria for the management of roads, such as the Manual on Uniform Traffic Control Devices and publications, standards and specifications of the American Association of State Highway and Transportation Officials (AASHTO), Washington State Association of Counties, WSDOT and WUTC.

XI. WATER QUALITY IMPACTS AND MANAGEMENT

A. Water Quality Impacts (Excluding Surge Pond)

1. Leachates

   a. Water Power, the Department of Ecology (WDOE) and the Council have recognized that the proposed project may potentially degrade ground water and surface water quality.

   b. The primary sources of potential degradation are leachates from disposed bottom ash, fly ash, FGD (Flue Gas Desulfurization) sludge and the 90-day coal storage pile. Potential contaminants and pollutants cannot be precisely identified until a coal source is selected.

   c. Solid and liquid wastes from the site may fall into the "dangerous wastes" category under WDOE regulations signed in February, 1982, and effective on March 12, 1982. (TR Vol. 27, p. 4325, Knudson)

   d. Based upon the record, detrimental effects upon flora and fauna are not expected. However, there is still the potential that some such effects could occur.

   e. Contamination of local aquifers would degrade the quality of waters used for domestic, stock and irrigation purposes.

2. Surface Water

   a. The project will significantly modify the natural drainage patterns at the site. Because of the construction of various on-site ponds, the total run-off to Sinking Creek will be reduced by about 3% at the beginning of the project. Run-off will then increase, over the 35-year span of the landfill operation, to a maximum of about 15% over current levels. As a consequence of runoff and recharge from the surge pond, Sinking Creek will likely develop a perennial flow. However, increasing the flow

of Sinking Creek will not, in itself, lower the quality of the water.

b. Of the 39 ponds and wetlands in or near the plant area, 18 ponds will not be affected; 14 will be affected and seven may or may not be affected, depending on the exact location of the drainage ditches. The 18 unaffected ponds represent more than 50 percent of the total pond surface area on the site. (TR Vol. 12, p. 1863; App. 5.2.4)

c. Construction of the well site, makeup water pipeline and associated electrical transmission facilities will temporarily increase local turbidity. Due to use of containment structures, no increased turbidity is anticipated for local streams from construction of the plant and landfill. The record does not indicate that significant environmental impacts will result from any changes in turbidity.

d. Some substances contained in the air emissions from the CGS may enter into surface waters at the CGS site and surrounding areas. The principal source of such substances is the deposition of salt from the cooling towers. The anticipated impacts are not environmentally significant.

3. Ground Water

a. There is no evidence of hydraulic continuity between the well field location and the local aquifers. (TR Vol. 12, p. 1906, Loo) No adverse impacts on the pumping of water for local use are anticipated from operation of the well field.

b. There is evidence of variability of aquifer characteristics in the area. The shallow aquifers have hydraulic continuity with Sinking Creek and there is potential for carrying contamination there.

c. Water Power's ground water measurements are preliminary and final conclusions on aquifer characteristics will await further study.

B. Water Quality Mitigations (Excluding Surge Pond)

1. Preliminary Findings

a. It is reasonable and prudent that the proposed project, as a condition of certification, meet all standards of RCW 90.48, which forbids the pollution of any receiving waters in the State.

b. The Applicant does not expect ground water to be degraded by leachates from the ash and sludge disposal areas or the coal storage pile. However, it may be less expensive to line these areas before operation, than to bear the costs of restoring ground waters to baseline quality and lining these areas after operations have begun, if degradation does occur. (TR Vol. 26, p. 4182 and TR Vol. 27, p. 4238, Wildrick)

c. The coal pile will be compacted which will discourage percolation.

d. Water Power proposes not to line either the coal pile, the solid waste storage areas or the run-off drainage ditches. It maintains that leaching from these areas is unlikely to occur and, if present, will be subject to rapid detection and mitigation. The record supports this position from a preliminary standpoint only. Further confirming studies will be required. The Applicant has agreed to perform studies of this nature. The parameters of such studies are appropriate conditions of site certification. If such studies do not confirm Applicant's preliminary position, lining of any or all of the above-referenced areas may be required. (TR Vol. 32, p. 4530, Loo)

e. The timing of the above-referenced studies will be a crucial condition of certification. The record shows that monitoring of a test pile of the chosen coal may be required to gauge leachate probability and character. (TR Vol. 27, p. 4263,Burkhalter) The establishment of necessary data on aquifer recharge rates is likely to take as long as one year. (TR Vol. 26, p. 4177, Wildrick)

2. Commitments to Lining

a. Water Power has committed to lining with impervious liners, the various liquid waste storage ponds where contaminants will be known to occur. These include the waste water evaporation pond, the sanitary waste stabilization pond and the water retention ponds. This is a prudent measure for the protection of water quality.

b. It is a reasonable condition of certification that the runoff ditches leading to the ponds be lined as well.

3. Solid Wastes

a. The Applicant proposes to combine the FGD sludge, fly ash and bottom ash; to treat this combination with a fixating reagent; and to dispose of it by compacting it in a dry landfill. This process is known commercially as the "pozzolanic process" and is offered in lieu of lining. It will lessen the risk of ground water contamination from the areas where these materials are stored. (TR Vol. 4, pp. 542, 543 and 548; Vol. 5, pp. 622-623, Normoyle; Vol. 5, p. 565, Falkenberg; Vol. 27, p. 4350, Burkhalter)

b. Alternative methods of solid waste disposal have been considered including ponding in lined areas, shipment of ash back to the coal mine, and sale of fly ash and bottom ash to available markets.

c. Lining of solid waste areas is unnecessary at this time because the process of fixating fly ash, bottom ash and FGD sludge will provide a relatively impervious barrier to leachates. Shipment of ash back to the mine is not a reasonable alternative for a variety of practical, legal, and monetary considerations. Water Power will actively promote the sale of fly ash and bottom ash to existing markets. (TR Vol. 5, p. 547, Normoyle)

d. Water Power will use portable toilets for sanitary wastes at the construction site until sanitary waste systems are installed.

4. Dam Safety

It is estimated that the site will contain approximately nine impoundments most of which will have the capacity of retaining volumes of 10-acre feet or more of water. It is a reasonable condition of certification that all such structures be designed to safely withstand 100-year frequency flood events. The level of design should be based upon the degree of hazard to life and property that exists in the floodplains below these structures. It is an appropriate condition of site certification that all structures comply with state law, WDOE regulations and safety requirements.

C. Surge Pond

1. The storage of water in the makeup water surge pond will recharge shallow aquifers and is likely to create perennial flow in the Sinking Creek drainage southwest of the surge pond location.

2. Water Power proposes to introduce 700 pounds of copper sulfate yearly into the surge pond to control algae. Copper sulfate will precipitate as copper hydroxide. (TR Vol. 12, pp. 1879-1881, Mayer) The copper hydroxide will not dissipate, but will accumulate at the bottom of the pond. Although other means of controlling algae are available, copper sulfate was chosen for its cost-effectiveness and ease of handling. Trace amounts of copper will leave the surge pond as ground water flow.

3. Water Power has estimated surge pond seepage at a rate of six cubic feet per second (cfs). (TR Vol. 12, p. 1885, Anderson) Depending on how the pond is constructed, the rate could vary considerably. Seepage at 6 cfs represents a loss of 15-20% of the total pumpage from FDR Lake. There is ascertainable economic value assigned to pumpage from FDR Lake. (TR Vol. 12, p. 1883, Normoyle) It is not known how much of the surge pond seepage will emerge as surface flow. (TR Vol. 12, p. 1917, Anderson) If the rate of leachate is high enough, copper may be carried from the surge pond into Sinking Creek via the aquifer. (TR Vol. 26, p. 4214, Burkhalter)

4. Water Power does not propose to line the surge pond to prevent leakage. The decision not to line is based on Water Power's perception that the risk of negative impacts from leakage is too low to justify the costs of lining. The record supports the position that the risk is low. However, if substantial leakage did occur, the release of copper compounds could be environmentally harmful. (TR Vol. 26, p. 4214, Burkhalter)

5. Water Power proposes to monitor groundwater impacts and take mitigating measures, if necessary. It has not yet established a water level monitoring program. A year or more of monitoring will be necessary to determine the quantity and rate of precipitation infiltration to the aquifer. Establishing the recharge rate will improve the predictions of leachate infiltration to the aquifer.

6. Additional information is needed on the precise probability and character of leachates from the surge pond. Further studies, within specific parameters, are appropriate conditions of site certification. Such studies could be incorporated into the testing program the Applicant has proposed. (TR Vol. 12, p. 2017A, Berthrong) Timing of such studies should be planned to substantially precede any potential negative effects of leachate. Should the studies support the Applicant's position that lining is unnecessary, only monitoring of leachate effects will be required as a condition of site certification.

D. Potable Water

Water Power has stipulated with the Washington Department of Social and Health Services (Exhibit 106) that installations supplying potable water to the CGS during construction and operation will conform with standards and regulations of DSHS.

XII. AIR QUALITY

A. Introduction

1. General

a. In Section IV.C. of these Findings, the existing air quality in the Creston area and the methodology used by the Applicant to predict the effects of CGS construction and operation on air quality are described. This section discusses air quality degradation which will result from construction and operation of the CGS and the methods used to mitigate adverse effects.

b. In balancing ecological and energy concerns, these findings: (1) identify the effects of various airborne pollutants upon the environment; (2) consider control technologies which are reasonably available; and (3) determine the levels and methods of control necessary to reduce pollutants to acceptable levels considering the environment, energy and cost.

c. CGS stack emissions will include various pollutants regulated by the Federal Clean Air Act. These include carbon monoxide (CO), nitrogen oxides (NO_x), sulfur dioxide (SO_2), particulate matter (PM), ozone, lead, beryllium, mercury, vinyl chloride, fluorides, sulfuric acid mist, total reduced sulfur, reduced sulfur compounds, and hydrogen sulfide. The record shows that asbestos, vinyl chloride, total reduced sulfur, reduced sulfur compounds and hydrogen sulfide will be emitted in negligible quantities.

d. Of particular concern are SO_2, NO_x and particulates. (DEIS D-47) (Ex. 45, p. 6-54) The three major variables which determine the impacts of these pollutants are concentration, duration, and frequency. A high concentration encountered over a short period of time may result in harm equal to that of lesser concentrations encountered over a longer period of time. (Ex. 45, p. 6-54)

2. Crops

a. Lincoln County is the second largest wheat-producing county in the state. 670,000 acres, some 45% of the land area of the county, are devoted to dryland farming of winter wheat. Of this total acreage, half is devoted to wheat production and half to summer fallow each year. Other dryland crops are spring barley, pasture grasses, hay, spring wheat, grasses and legumes for soil improvement, and various small grains. 50,178 acres are devoted to irrigated crops. The bulk of this irrigated land is in winter wheat. Hay, peas, spring wheat, beans and grass and alfalfa seed are other irrigated crops. There are 125 acres of orchard production in the county.

b. Summer fallow in alternate years is a practice adopted to allow the soil to collect additional moisture for the next year of wheat production. Winter wheat is seeded early in September and harvested the following August. Wheat plants are dormant, or nearly so, during the months of December, January, February and March. Though the crowns, roots and leaves of the plants are alive, there is little metabolic activity taking place at those times.

c. The average dryland wheat yield in Lincoln County was 50.7 bushels per acre in 1980, with a range of about 25-60 bushels per acre per crop year on individual farms. The average price per bushel in 1981-1982 was $4. (TR Vol. 45, p. 7161, Michalson; Ex. 171)

d. Major wheat diseases in Lincoln County are stripe rust, foot rot, dwarf bunt, take-all, yellow dwarf virus and snow mold. Bunt infections are controlled by seed treatment and the use of resistant varieties. The major insect problems arise from infestation by wireworms and aphids. Infestations are treated with insecticides. Winter injury occurs due to low winter

temperatures or frost damage at critical growth stages. Infection by disease organisms can result in clogging the water-conducting vessels of the plant stem, reducing water supply to the leaf, resulting in an effect closely resembling the consequences of drought.

e. At the onset of conditions which produce moisture stress, the wheat plant reacts in a manner which has the effect of reducing moisture loss. Its primary method of moisture conservation is to close the stomata, tiny pores in the leaf surface through which moisture vapor normally is transpired. Transpiration in turn activates a flow of moisture and nutrients from the roots to the leaves. Normally, a significant reduction in water use efficiency can result in yield loss under dryland farming conditions such as exist in Lincoln County. (TR Vol. 44, p. 7053, George)

f. The growth stage of winter wheat is an important factor in its relative sensitivity to air pollutants. Wheat tends to be resistant to SO_2 pollution up to the two-leaf stage of development and becomes most susceptible shortly thereafter, at about the three-leaf stage. This phase of special susceptibility generally occurs in October. The plant is again particularly susceptible in the boot stage which may occur from mid-February to early July, most commonly beginning in June. Some studies suggest that grasses in general are more susceptible to SO_2 damage in the winter months when growth is slow. The most resistant period to SO_2 pollution for winter wheat is, therefore, from harvest in August to October.

3. CRSTER Modelling

a. The Applicant utilized computer modelling to predict concentrations of SO_2 from the plant emissions. For Lincoln County and other agricultural areas, which are in level to

rolling terrain south of the Spokane River and FDR Lake, principal reliance was placed upon the CRSTER atmospheric dispersion model. CRSTER is a steady-state Gaussian plume dispersion model developed by EPA. It was designed to predict maximum and maximum second-highest pollutant concentrations for both short-term (one-hour, three-hour, 24-hour) and long-term (annual) time periods due to emissions from isolated point sources. CRSTER is EPA's preferred technique for assessing power plant air quality effects, for terrain similar to the CGS site.

b. The computer was programmed for maximum SO_2 emissions, assuming four units operating for 24 hours each day, firing the highest sulfur coal, coal D, with a sulfur content of .843 pounds per million Btu (lb/mmbtu), and without chemical alteration or loss of the emission pollutants between point source and receptors. Meteorological inputs included hour-by-hour surface data and mixing heights from Spokane International Airport (1973-77) and data from the Applicant's on-site monitoring program (1980 and 1981).

c. Concentration levels were predicted each hour for a period of 366 days at 720 ground-level receptor sites from one kilometer to 100 kilometers from the plant site. Concentrations were predicted in a radial grid 360° around the plant site.

d. The resulting hourly concentrations for each receptor site provided the foundation for the Applicant's air quality analysis. From this basis, CRSTER demonstrated low concentration regimes. The maximum annual average concentration of SO_2 from plant emissions at any receptor is projected to be .001 parts per million (ppm), far below any threshold of effect suggested by the literature of SO_2 effects on plants. Concentrations were predicted to be below detectable levels, close to zero, in over 98% of the hourly predictions made by CRSTER.

e. Based upon the CRSTER results, the maximum and maximum second-highest SO_2 impacts from CGS emissions at any receptor, in level to rolling terrain, over the seven year period modelled were predicted to be:

	Maximum SO_2	Maximum Second-Highest SO_2
Annual	*2.9 ug/m^3 (0.001 ppm)	----------
24-hour	62.8 ug/m^3 (0.024 ppm)	48.5 ug/m^3 (0.019 ppm)
8-hour	162.5 ug/m^3 (0.062 ppm)	131.9 ug/m^3 (0.050 ppm)
3-hour	259.1 ug/m^3 (0.099 ppm)	231.3 ug/m^3 (0.088 ppm)
1-hour	404.1 ug/m^3 (0.154 ppm)	364.6 ug/m^3 (0.139 ppm)

(* ug/m^3 = micrograms per cubic meter)

Comparable figures for earlier CRSTER runs, using Spokane Airport meteorological inputs, are set out in Table 6.2-1 of the Applicant's PSD Application.

f. CRSTER did not model NO_2 emissions, though a basis for a calculation was provided. Corresponding maximum NO_x concentrations can be determined by multiplying predicted SO_2 concentrations in ug/m^3 by 2.77 and ppm values by 3.86. The Applicant used the conservative assumption that 100% of NO_x would be emitted as NO_2. It is more likely that 70% of the NO_x emissions will be in the form of NO_2 after reaction of NO_x with oxides in the environment. Based on the 70% assumption, maximum and maximum second-highest concentrations for NO_2 are the following:

	Maximum NO_2	Maximum Second-Highest NO_2
Annual	5.6 ug/m^3 (.003 ppm)	----------
24-hour	121.8 ug/m^3 (.065 ppm)	94 ug/m^3 (.051 ppm)
8-hour	315.3 ug/m^3 (.167 ppm)	255.9 ug/m^3 (.135 ppm)
3-hour	502.7 ug/m^3 (.267 ppm)	448.7 ug/m^3 (.238 ppm)
1-hour	784 ug/m^3 (.416 ppm)	707.3 ug/m^3 (.375 ppm)

g. Using an assumed emission rate of 4,560 pounds per hour of SO_2 for all four units, the computer was programmed for each hour of the CRSTER Model runs. Adjustments to concentrations as a consequence of a different emission rate can be made by the direct mathematical relation of the emission rate studied to the base of 4,560 pounds per hour of SO_2.

h. The Applicant has proposed an emission limit of 4,560 pounds per hour on a 24-hour rolling average. Water Power has, however, requested a one-hour per unit maximum SO_2 limitation of 2,764 pounds of SO_2. The draft Site Certification Agreement approved by the Council on May 24, 1982, limited sulfur dioxide emissions to 1,250 pounds per hour per unit on a 24-hour rolling average basis and 2,500 pounds per hour per unit on a one-hour average basis not to be exceeded more than once during any calendar month. Even at the 2,500 pounds per hour figure, there remains some potential for four units to emit up to 10,000 pounds per hour of SO_2 for one or more hours, provided the 24-hour rolling average for the units is not exceeded. Under the Applicant's proposal of 2,764 pounds per hour, four units might emit 11,056 pounds per hour in some hours, 242% more than the 4,560 pounds per hour programmed into each hour of emissions predicted by CRSTER. To consider the concentrations resulting from such a hypothetical instance, one need only multiply the CRSTER-predicted concentrations by a factor of 2.4. In this way, CRSTER can be used to consider maximum potential exposure regimes which might occur within proposed permit conditions. For instance, the predicted maximum one-hour incident of SO_2 fumigation may be presumed to change from 404.1 ug/m^3 (0.154 ppm) to 969.84 ug/m^3 (0.36 ppm). Although it is theoretically possible that the 4,560 pounds per hour SO_2 limitation could be doubled in a single hour under the original draft Site Certification Agreement (TR Vol. 48, p. 7657, Paulus), such an event would be extremely unlikely. (TR Vol. 48, pp. 7649, 7656, Paulus)

i. The reliability of CRSTER, particularly for its applications in this hearing has been questioned by Blue Sky Advocates. Dr. Michael Williams described many aspects of CRSTER's design which caused it to deviate from the future reality it was attempting to predict. There was considerable dispute over the conclusions of several studies done by EPA designed to check CRSTER predictions against real events, to, in short, validate its products. Dr. Michael Williams concluded that CRSTER probably underestimated most of the predicted CGS concentrations by a factor of five. He referred to the validation studies to support his criticisms. The studies showed a reasonable level of accuracy for highest and second-highest hourly SO_2 concentrations. Dr. Michael Williams granted CRSTER was reliable for these high concentrations within a plus or minus range of 10 to 40% accuracy. He utilized charts comparing predicted with measured and measured minus background concentrations to support his proposed 500% increase in SO_2 predictions at lower concentrations. The effective cross-examination of this testimony and the studies themselves (Ex. 129, 130, 176) emphasized the admittedly subjective element in Dr. Michael Williams's choice of the factor of five as a multiplier.

j. The testing of this evidence did not, however, establish that EPA's attempts to validate CRSTER for lower concentrations had succeeded. Mr. Paulus admits that the validation studies neither validate nor invalidate those CRSTER-predicted concentrations below the highest and second-highest hourly SO_2 concentrations. Stated another way, EPA attempted to validate CRSTER's use for such purposes on three occasions and could not do it. In each validation study, CRSTER was, however, shown to consistently underpredict lower concentrations, those below maximum highest and second-highest. Under these circumstances, it is not possible to make any meaningful description of CRSTER in terms of confidence intervals or

statistical accuracy for predictions of these lower concentrations and the frequency of their occurrence.

k. EPA developed CRSTER to identify short-term high levels of concentration, maximum and maximum second-highest concentrations for different time intervals. This goal of CRSTER is reasonable. The literature concerning effects on plants causes more concern for high concentration incidents than long-term chronic concentrations. Concern for short-term high concentrations is central to the testimony of the Applicant's experts, Dr. Kohut and Dr. Lefohn.

l. CRSTER assumes the recurrence of meteorological events that have occurred in the past. It is highly unlikely, for instance, that SO_2 fumigation incidents predicted to occur at a particular time and place will actually occur at that time and place.

m. CRSTER did not model inversion breakup fumigation. This phenomenon may occur when an emission plume flows into a stable atmosphere and is transported downwind as a compact flat ribbon. As the air warms, mixing develops from the ground level up to the plume and the plume can be rapidly mixed to the ground. This can result in high, short-term (30-45 minute duration) concentrations within a relatively narrow band beneath the original stable plume. By a series of complex methods and calculations, the Applicant predicted a maximum one-hour concentration 16 kilometers from the plant site of .164 to .177 ppm SO_2. Another method of calculation predicted a somewhat lower concentration. Inversion breakup fumigation, leading to high concentrations at various distances from the source, will occur infrequently. It is unlikely that this event could cause high concentrations to fall in the same place more than once.

n. The Applicant has utilized CRSTER results as an essential element of its air quality analysis. The concentration regimes reported have been compared with the literature on plant response to SO_2. Various threshold levels of "injury", "damage", or "adverse effect on yield" have been extrapolated from the studies. CRSTER concentrations have been compared to threshold concentrations leading to the Applicant's conclusion that there will be no demonstrable adverse effects on vegetation from CGS emissions. CRSTER is an important, if not essential, part of this analysis. The potential for wide variations between predicted and measured concentrations exists, particularly for those concentrations below those predicted as highest and second-highest maximums.

B. Potential Impacts of CGS Emissions

1. Potential Impacts - General

a. Construction and operation of the CGS will result in increased fugitive dust and carbon monoxide (CO) levels. These are emissions which do not come from the plant itself, but from construction, traffic, material storage and handling, and train delivery of coal. Sources and levels of these particulate emissions are listed in Exhibit 45, Table 3.2-13. This listing describes the sources and levels which may be expected to occur.

b. Both the stacks from the combustion process and the cooling towers will have visible plumes under certain conditions. The visibility of the cooling tower plume is expected to be greater due to the high moisture content of the emissions. In predicted worst-case conditions, occurring approximately 0.4% of the time, cooling tower plumes extending for 7 to 8 miles are expected. This will probably occur during days of high relative humidity which are generally associated with overcast or rainy conditions. (Exhibit 45, pp. 6-44, 6-45) Extended visible plumes

from the combustion stacks will occur less frequently and will be substantially smaller in size.

c. Combustion stack emissions will usually be invisible due to particulate control devices. However, NO_x stack emissions could convert to NO_2 under certain circumstances resulting in a reddish-brown plume discoloration. (Exhibit 45, pp 6-45) Modelling results indicate that on very infrequent occasions a reduction in visibility from 5-10% could occur when the plume would be visible as a reddish-brown discoloration to an observer looking through the plume. (Exhibit 45, pp. 6-47, 6-52) Plumes will have no significant visibility impact upon existing Prevention of Significant Deterioration (PSD) Class I areas nor on integral vistas associated with National Parks. (Exhibit 45, pp. 6-42, 6-52).

d. The plant in operation will not cause any significant misting, fogging or icing. Such extremely low levels as might occur under certain conditions will rarely extend beyond plant site boundaries. (DEIS, Section 3-10, 3-11)

e. Construction and operation will also involve refuse disposal and waste burning. In performing these activities, the Applicant will be required to comply with all local, state and federal regulations and guidelines, as required in the Site Certification Agreement.

f. Operation of vehicles and fuel burning equipment will result in exhaust emissions and possible emissions from hauled materials blowing away. The most reasonable methods for controlling these emissions are: ensuring that all vehicles and fuel-burning equipment are kept in proper mechanical order; and requiring vehicles hauling materials to be covered where those materials are likely to be blown away when hauled. These requirements should be stated in the Site Certification Agreement.

g. Fugitive dust will occur during site preparation and construction. Traffic, clearing, grading and excavation will result in increased fugitive dust levels. The most reasonable methods for controlling these emissions are watering, paving, controlling the speed of vehicles and chemical treatment. Conditions necessary to mitigate these emissions should be contained in the Site Certification Agreement.

h. The presence of salts and dissolved minerals in the cooling tower emissions is another concern. Some salt build-up can be expected in the area surrounding the plant as the land is irrigated and the water evaporates. Because salt drift from the cooling towers will be concentrated within one mile of the towers, the vast majority of salt will be deposited within the boundaries of the plant site. These depositions will increase the dissolved salt load in site rainwater runoff. If runoff is properly controlled, no significant adverse environmental impact is likely to occur.

i. Under certain rare meteorological conditions, such as inversion breakup fumigation, concentrations of SO_2 and NO_x may give rise to a perceptible odor of sulfur. These conditions will be rare and normally the odor will not be perceptible off the plant site. (DEIS 3-22, TR Vol. 28, p. 4487) Therefore, odor will not present a significant adverse environmental impact.

j. Operation of the CGS will release radionuclides in very small amounts. This results from the fact that coal contains trace amounts of radioactive isotopes of uranium, thorium, radon, radium, lead, polonium and bismuth. These releases are at levels below any threat to health. The vast majority of these trace amounts will be removed by the particulate controls to be used at the plant. With the exception of Radon-222, which is a gas, these materials will be collected in the fly or bottom ash.

The Applicant has entered into an agreement with the Washington State Department of Social and Health Sevices dated December 10, 1981, which deals with monitoring these materials. The conditions of that agreement are reasonable and provide adequate and appropriate protection for the public and the environment. The conditions of the agreement are appropriate for incorporation into the Site Certification Agreement regarding the CGS.

k. Sulfuric acid mist is a by-product of the combustion and flue gas desulfurization (FGD) processes. Any such emissions are not expected to be carried beyond the plant boundary or to occur in harmful concentration.

2. Potential Effects of SO_2 on Crops

a. Lengthy portions of the air quality hearing record are devoted to expert testimony and scientific studies concerning the effects of SO_2 on plants. Drs. Kohut, Wayne Williams and Lefohn, as well as Professor George, have researched the literature on this subject. These experts have approached the subject from differing perspectives and have reached varying conclusions. It is a challenging task to take from this complex and confusing body of information, knowledge which can be applied to the issues raised by this Application.

b. There is no question that sulfur dioxide in sufficiently high concentrations is harmful to plants. Plants exposed to very high concentrations of SO_2 will die. Properly-controlled SO_2 emissions from the CGS will be far below identified acute toxic levels, however, and the real issues raised by this Application lead to assessment of sublethal concentrations of SO_2. Several questions become immediately pertinent. How much SO_2 is too much? How long an exposure is too long? How many exposures are too many? The first question relates to concentration, the second to duration and the third to frequency.

c. Assessment of these questions is complicated by the fact that there is no scientific information specific to Lincoln County or the cultivars grown there. Experts have had to resort to analysis of data produced in other circumstances, much of it widely varying, and make largely subjective extrapolations to the Lincoln County situation.

d. The spectrum of plant responses to SO_2 is wide. Responses may include:

1) no effect;
2) increased growth or yield;
3) visible injury with or without growth or yield reductions;
4) growth or yield reductions with no apparent visible injury; and
5) plant death.

e. The specific response of a plant to SO_2 will be affected by other variables. Some examples are:

1) the species or variety of the plant studied;
2) climate and meteorological conditions;
3) the growth rate and stage of development of the plant;
4) moisture availability;
5) heat;
6) light;
7) the presence of other air pollutants;
8) soil conditions;
9) agricultural practices; and
10) pre-existing stress (disease, infestation, drought, freezing).

f. Scientists studying plant responses to SO_2 have attempted to develop dose-response curves. This effort is continuing at this time. This work aims to develop predictions of crop losses based on a mathematical relationship between pollutant dose

and yield reduction. Dose is a function of concentration over time. If such a relationship could be established, it would allow predictions of yield reduction, given the concentration, duration and frequency of exposure to SO_2. The Environmental Protection Agency has concluded that a valid dose-response curve is beyond the state-of-the-art at this time.

g. Dr. Wayne Williams appeared as a witness for Blue Sky Advocates. Dr. Wayne Williams asserted he could predict yield loss as a consequence of CGS emissions. Moreover, Dr. Wayne Williams suggested yield losses might approach 20%, being certainly at least 3%, at selected locations downwind from the CGS. His testimony on dose-response curves is not considered credible and is of no assistance to this Council. It is fatally flawed for the following reasons:

1) He essentially assumed that SO_2 and NO_x were equally toxic when they are not. This assertion was supported by a distorted analysis of the confusing and contradictory subject of SO_2 plus NO_2 synergism. From these studies, he concluded that synergism meant one could double the toxicity of the most toxic participant in the synergistic reaction ($SO_2 + NO_2 = SO_2 \times 2$).

2) After combining SO_2 and NO_2 and assuming all was SO_2, he identified an inflated estimate of the number of fumigation incidents exceeding concentrations of .01 ppm SO_2 for one hour.

3) He then totalled the number of $SO_2 + NO_2$ hours. In this fashion, he effectively ignored the factors of exposure frequency and potential for plants to recover during lengthy ensuing periods of high air quality. Dr. Wayne Williams essentially stated plants accumulate SO_2 and do not recover from its effects.

4) He derived concentration and duration numbers for placement on his curves from various studies. Examination of those studies revealed, in many instances, that the authors would not endorse Dr. Wayne Williams's characterization of the products of their research, i.e., the numbers were taken out of the context in which they were developed.

5) He did not use all data points available for the development of his curves and his selections implied a bias toward over-prediction of yield reduction.

6) He used data relating to foliar damage, yield loss, and total biomass decrease as if they described the same response, again totally disregarding the prospect of recovery.

7) He made mathematical errors on essential equations and produced equations which could not reproduce his conclusions.

8) After adjusting his curve in response to criticism, he was unable to verify the statistical accuracy of his process due to lack of knowledge about statistical validation processes.

h. Dr. Wayne Williams was a patient and cooperative witness. He is obviously sensitive to the environment and his motives are not criticized by these findings. However, given the atmosphere of doubt, anxiety and strained trust which has come to exist between the Applicant and Lincoln County farmers, Dr. Wayne Williams's participation in this process must be viewed as unfortunate. The record of this proceeding establishes that energy facility licensing is a poor sea for shake-down cruises of unrefined scientific theories.

i. Work continues by qualified experts leading to the development of dose-response curves. If such curves could be developed within some estimated confidence parameter, they would no doubt assist a body such as this Council. The National Crop Loss Assessment Network (NCLAN) is attempting to develop dose-response curves with a strong economic impact component. NCLAN is looking to results from this work to be produced in 1985. Wheat is one of the crops NCLAN is studying.

j. The subject of potential interaction of pollutants has been examined. The effects resulting from pollutant interaction may be:

1) antagonistic, or less than the sum of the effects produced by each pollutant individually;

2) additive, or equal to the sum of the effects produced by each pollutant individually; or

3) synergistic, or greater than the sum of the effects produced by each pollutant individually.

k. Blue Sky Advocates has urged the proposition that concentrations of SO_2 and NO_2, when combined, act synergistically to produce detrimental plant responses at concentration levels below those at which either pollutant would produce such a response, acting individually.

l. The Applicant, by Dr. Kohut, suggested, in testimony before the Council, that it should consider the combined effect of SO_2 and NO_2 to be only additive, no more than the sum of the individual effects of each. Dr. Kohut goes further and states that concentrations of NO_2 produced by CGS would not cause a detrimental response. He therefore suggests any contribution of NO_2 to toxicity can be ignored.

m. The positions of both parties are drawn from the scientific literature. The research involved on the subject of synergistic reactions of SO_2 and NO_2 has been extremely fragmentary and has produced inconsistent results. The scientific references on this subject are summarized below:

1) Ashenden, 1979, Exhibit 163--0.11 ppm of SO_2 and NO_2 were applied, separately and in combination, to cocksfoot and meadow grass for 103.5 continuous hours per week for 20 weeks. Some effects were synergistic.

2) White et. al., 1974, Exhibit 195--.25 ppm of SO_2 and NO_2 were applied to alfalfa in one and two hour fumigations and a greater depression of photosynthesis occurred than if either were applied individually. The same result occurred at levels of .15 ppm. However, the degree of synergism decreased as concentrations increased.

3) Tingey et. al., 1971, Exhibit 193--Various plants, including oats, were exposed for four hours to combinations of SO_2 and NO_2 ranging from .05 ppm to .25 ppm. The resultant plant injury was synergistic but decreased as concentration increased.

4) Ashenden and Williams, 1980, Exhibit 199--Ryegrass and timothy grass were exposed to .06 to .08 ppm SO_2 and NO_2 for 103 hours per week. Synergistic effects were noted. The authors noted that grasses appear more susceptible to aerial pollutants during winter months.

5) Bennett et. al., 1975, Exhibit 203--Several plant species were exposed to concentrations ranging from .125 ppm to 1 ppm of SO_2 and NO_2. Species other than radish, including oats, showed only a slight tendency for synergistic effects.

n. There is a tendency for synergistic effects of SO_2 and NO_2 to be found at lower concentrations below the threshold for effects from either pollutant acting independently. In this fashion, the concept of synergism tends to complicate conclusions that short-term breaches of injury thresholds by CGS emissions are rendered unimportant by the infrequency of such incidents. Dr. Kohut's assumption of only additive effects occurring between SO_2 and NO_2 may be too conservative. There is a possibility that synergism of SO_2 and NO_2 may aggravate the potentially toxic relation of these pollutants to plants in Lincoln County.

o. Reference has been made to threshold levels of SO_2. The concept of threshold has been a complex and confusing element in this proceeding. The Applicant asserts that there will be no demonstrable adverse effects to crops in Lincoln County from CGS emissions. This conclusion has been reached with reference to a threshold of harm. A threshold in this proceeding has come to mean a concentration of SO_2 for some duration below which there are no identifiable adverse effects. Stated another way, a threshold may be that concentration of SO_2 for some duration above which some identifiable consequence occurs which can be characterized as adverse. This process becomes complex in a variety of ways. What is adverse? Blue Sky Advocates asserts it is adverse for a plant to open its stomata when the environmental setting alone would not elicit that response. The Applicant has inclined its thresholds more toward concentrations which can be said to have a demonstrated yield effect . In this fashion, the record is replete with references to "the threshold level of plant response to SO_2," "the threshold for injury to the plant," "the threshold of yield effect," and "the visible injury threshold." A threshold level is some stated concentration of SO_2 for some duration. The durations vary widely, from one hour concentrations to seasonal

concentration regimes. As a consequence, it is difficult to compare threshold levels for "yield," to take an example, from one duration to another, or from one plant species to another.

p. The concept of a threshold yield effect, especially for wheat, is highly controversial. Where visible leaf injury may produce a direct yield loss capable of reasonable estimation for a crop like tobacco, visible leaf injury to wheat cannot be reasonably related to reduction in yield. Heggested and Heck (1971, Exhibit 179) reviewed the literature and determined that SO_2 concentrations of .05 to 1.0 ppm SO_2 for eight hours were necessary to produce injury to sensitive plant species.

There is an additional element of subjective judgement involved in determining which plants are sensitive or resistant. Wheat would seem to be moderately resistant, recognizing that environmental factors, differences in cultivars and growth stages might modify this classification.

q. The eight-hour maximum SO_2 concentration predicted by CRSTER of .062 ppm SO_2 is greater than the .05 ppm SO_2 lower end of the Heggested and Heck (1971) threshold for injury to sensitive plants. Dr. Kohut and Dr. Lefohn both endorsed the concept of .1 ppm SO_2 as a one hour threshold for yield effect to wheat. This threshold would be exceeded by CRSTER's predicted one-hour maximum concentration and is closely approached by the three-hour maximum highest concentration .099 ppm. When Dr. Lefohn was presented with a hypothetical worst case of four hours of concentrations at or above .1 ppm SO_2, he stated he would expect no yield effect. Further, he would expect no injury or any adverse effect. He clarified his description of .1 ppm SO_2 as a one-hour yield effect threshold for wheat by stating he really intended that threshold to be a point at which the scientist "might be concerned," or would

"take a closer look." He emphasized the high air quality of the days and weeks which would precede and follow the four-hour hypothetical fumigation. In effect, Dr. Lefohn comes very close to saying only acute toxic concentrations would produce concern where, as here, long periods of barely measurable concentrations of SO_2 will give plants an opportunity to recover. This post-threshold analysis contradicts, rather than clarifies, his earlier testimony on the yield threshold for wheat. The analysis further disregards the potential for subtle effects in which growth and yield reductions occur without evident foliar injury. These effects are microscopic and molecular and are not readily identifiable. They include metabolic and physiological changes which may subsequently produce alterations in growth and yield. (Appendix C, Exhibit 179)

r. The primary route of uptake of air pollutants into a plant is through openings in the leaves called stomata. The leaf stomata open or close as necessary to receive materials from the atmosphere for respiration and photosynthesis, or to prevent the entrance or exit of materials such as moisture. When the stomata are open, greater entry of materials from the atmosphere is possible. Thus, the action of stomata in the presence of SO_2 can have a direct effect on the SO_2 dose received by the plant.

s. Following uptake of SO_2 through the leaf stomata, contact of SO_2 within the leaf with wet cellular membranes, and subsequent liquid phase reactions result in the formation of sulfite (SO_3) and sulfate (SO_4) ions and/or compounds. Sulfite is an extremely toxic metabolic intermediate in the conversion of SO_2 to sulfate. Sulfate is incorporated by the plant into sulfur-containing amino acids and proteins. Plants thus have the ability to absorb, detoxify, and metabolically incorporate atmospheric sulfur.

t. While the capacity of a leaf to oxidize sulfite to sulfate will determine whether sulfite will reach toxic levels, as the level of sulfate increases over time beyond the ability of the leaf to metabolically incorporate it, toxic levels of sulfate can eventually be attained resulting in increased leaf senescence. Younger leaves have a generally higher photosynthetic rate and can more readily incorporate sulfate. The rate and stage of growth, as well as the concentration and duration of exposure, are, therefore, important factors in a plant's response to SO_2.

u. Such complex processes underlie the threshold level of adverse effect proposed by Blue Sky Advocates. Blue Sky asserts that the lowest concentration of SO_2 at which plants have been found to exhibit stomatal response is .01 ppm for one hour. (Unsworth, Exhibit 196, beans and maize, 1972) From this study is proposed the theory that stomatal response to SO_2, coming at the wrong time, could reduce yield. Plants open or close their stomata in response to a variety of environmental factors. Research has indicated that plants will open stomata in response to SO_2 at levels at least as low as .05 ppm and perhaps as low as .01 ppm. (Unsworth, Exhibit 196, p. 1; Biscoe, Exhibit 198) This effect of SO_2 is increased in plants which are water-stressed. (Exhibit 196, p. 2) Dr. Kohut has granted the potential exists for situations in which stomatal opening in response to SO_2 can increase evapotranspiration in a plant which is moisture-stressed. (TR Vol. 49, p. 7964, Kohut) However, Dr. Kohut asserts that such opening would not occur where the relative humidity is below 40%. (TR Vol. 50, p. 8014, Kohut) He does not believe that relative humidity will commonly exceed 40% in the Creston area. (TR Vol. 49, p. 7965, Kohut) Table 4.1-1 of Exhibit 179, based upon 22 years of Spokane data, shows that the only times relative humidity would be below 40% are the 4:00 p.m. readings for June, July, August and September and the 10:00 a.m. reading for July.

Bearing in mind that these figures are averages; that the highest SO_2 background levels of .008 ppm SO_2 approach the .01 ppm level of response; and that the accuracy of CRSTER modelling at these low levels is questionable, one cannot say with certainty that stomatal opening will not be caused by CGS SO_2 emissions. This is true even if the highest concentrations tend to occur in the summer months. (TR Vol. 49, p. 7941, Paulus) Stomatal response is subtle at best and its contribution to the ultimate injury or yield loss of a water-stressed plant would be, for all practical purposes, impossible to identify.

v. The additional information presented within the record is extensive and detailed on the subject of possible impacts of sulfur dioxide and acid rain on crop yields in Lincoln County. The Council has considered the additional information in respect to its Order No. 640 of May 24, 1982. Considering the preponderance of evidence in the record, the record shows that it is unlikely that crop yields in Lincoln County will be adversely affected by sulfur dioxide emissions from the Creston Generating Station within the limits established by this Order.

3. Acid Rain

a. General

1) Acid rain is a phenomenon which has received a great deal of attention recently. Acid rain refers to complex chemical reactions wherein atmospheric emissions of sulfur and nitrogen oxides are converted into acids and are deposited by rain or snow. Such materials can also be deposited in dry form and converted to acids by rain, fog, dew, or applied water. The acids most commonly involved are sulfuric acid (H_2SO_4) and nitric acid (HNO_3).

2) The acidity of a material is given a numerical value known as pH. The pH scale ranges from 0 to 14. pH 1 is

very acidic (battery acid), 7 is neutral and 13 is very alkaline (lye). pH is logarithmic in nature, so that pH 3 is 10 times as acidic as pH 4 and 100 times as acidic as pH 5.

3) Acid rain may be harmful in two main ways: by direct effect on plants, animals and structures; and by promoting the release of potentially harmful metals from soils and sediments (for example, aluminum).

4) Acid rain presents significant potential harm to the environment. Fish, for example, are known to be sensitive to acid accumulations. Lakes with pH values below 4.6 may become void of fish over time, due to the effects on reproduction. Lakes in the Adirondack Mountains of the United States are known to have become considerably more acidic since the 1930s. (App. Sect. 5.6-36) This acidity is attributed to depositions of sulfur and nitrogen oxides from industrial processes and other human activities.

5) Aquatic organisms other than fish may be injured by acid rain. Algae, plankton and other organisms are affected in extreme cases and changes in feeding patterns or relationships may occur.

6) Acidification may also have an adverse effect upon terrestrial plants. (App. Sect. 5.6-30) For example, long-term acidification may decrease the productivity of forest soils. (App. Sect. 5.6-30. DEIS Sect. 3-27) The magnitude of effects to the forest is largely unknown at this time. High levels of acidification are known to affect plant growth. (Ex. 45, Table 607-1) However, the long-term effects of lower concentrations are not as well understood. (DEIS, p. 3-29)

7) Acid rain was frequently mentioned at public hearings as a feared result of the operation of the CGS. This phenomenon is a particular and understandable concern of the farmers in the area whose livelihood is directly and inextricably connected to the fertility and characteristics of the soil. The optimum pH of soils for wheat growing is between 6.4 and 7.5 pH. (Creston hearing, Nov. 18, 1981, p. 35) Typical Creston area soils have a pH of 6.8. (Exhibit 179, p. 6.2-1) Any threat to the continued existence of these optimum conditions is naturally viewed with alarm.

b. Present and Predicted pH Levels

1) Normal rain in Lincoln County was measured in 1981 and the annual average pH was 5.18, with the pH of rainfall events extending from 4.35 to 6.36. (Exhibit 179)

2) The Applicant has modelled the predicted levels of both wet and dry acid deposition in Lincoln County. In its modelling, the Applicant assumed that NO_x and nitrates had a negligible effect on precipitation pH. Although Blue Sky Advocates would assign substantial significance to NO_x as a constituent of acid deposition, assignment of a zero or low value seems most appropriate, at least within the boundaries of Lincoln County. (Exhibit 179, pp. 3-17, 3-18)

3) The Applicant's modelling resulted in a predicted lowest event basis pH of 3.9. This event is predicted to occur within five kilometers of the CGS. Except for a narrow area north of the CGS, annual pH values, at a distance greater than 10 kilometers, are expected to be above 5.1. (Exhibit 179, p. 4-3) To the north, annual pH values could be reduced to approximately 5.0 within 5 kilometers and

to 5.1 at 25 kilometers. (Exhibit 179, p. 5-1) Most event basis pH values less than 4.3 are expected to occur within five kilometers of the CGS. None would occur beyond 20 kilometers. (Exhibit 179, p. 5-1)

c. Effects of Acid Deposition

1) A factor in measuring the effect of acid rain is the buffering capacity of the waters involved. It appears that the largest body of water in the area, FDR Lake, has a substantial buffering capacity which should not be significantly adversely affected by CGS operation. (App. Sect. 5.6-36)

2) The Council's analysis of this phenomenon is complicated by the fact that some of the nitrogen and sulfur compounds contained in acid rain have a beneficial nutrient effect on plants. In fact, sulfur and nitrogen in substantial quantities are added to cultivated soils through the application of fertilizers. (TR Vol. 46, pp. 7377-7381, Morrison) This makes indirect depositions of these compounds through acid rain that much more difficult to quantify.

3) The effects of increased acid in rainfall can also be substantially mitigated by the buffering capacity of the receiving soils. The soils in the region of the CGS in Lincoln County are known to have a high buffering capacity. All parties agree that detrimental acidification of soils in Lincoln County as a consequence of CGS emissions, will not occur. (TR Vol. 42, p. 6615, Wayne Williams; Exhibit 179, p. 6.5-1) Soils will be tested as provided in the Site Certification Agreement.

4) The question of pollutants accumulating in snowfall and then later being concentrated by snow melt was brought to the Council's attention by Donald George (TR Vol. 44, pp. 7055-7056, George). Mr. George later admitted that SO_2 would not be released by snow melt in that form. (TR Vol. 44, p. 7109, George) Mr. Paulus testified that any effect of snow melt on pH would be negligible. (TR Vol. 46, p. 7328, Paulus) Mr. Paulus also testified that snowfall accumulates very low levels of SO_2 and any decrease in melt water pH would be quite small. (TR Vol. 49, pp. 7910-7912, Paulus) SO_2 accumulation in snow would not result in a substantial decrease in snow melt pH.

5) The most controversial aspect of acid rain, on the record before the Council, is the predicted effect on plants caused by rainfall with a lowered pH actually striking the plants. It appears that plants close to emission sources may accumulate acid-producing materials on leaf surfaces which may lower the pH values (make more acidic) of rainfall passing through the leaf canopy. (Exhibit 179, p. C-14) Plant leaves further removed from emission sources seem to have the ability to buffer rainfall. (Exhibit 179, p. C-14) In laboratory conditions, plants have sustained injury from exposure to acidic solutions. (Exhibits 179, pp. C-17, C-18) Acid rain may play a part in host-parasite interactions. (Exhibit 179, p. C-19) Yet, the witness most critical of acid rain, Dr. Wayne Williams, stopped short of predicting actual yield loss from rainfall with a pH of 3.9. (TR Vol. 42, pp. 6614-6615, Wayne Williams)

6) Based on the record, the Council finds that acid rain at the pH levels predicted should have no effect on wheat,

barley or alfalfa production. (Exhibit 179, pp. 7.1-9; 7.2-3; and 7.3-8) The effects of acid rain on the forest species occurring in Lincoln County have not been researched. Extrapolation from studies of other species indicates that no effects should be anticipated. (Exhibit 179, p. 9.3-3) There has been no study on the effects of acid rain on rangeland vegetation. Research on crop plants suggests that range grasses may be resistant to acid deposition. However, this assumption cannot be confirmed without further research. (Exhibit 179, p. 8.2-1) Drs. Kohut and Lefohn testified that no study had documented adverse effects of acid rain on terrestrial vegetation.

7) The findings and conclusions of the Council regarding the pH of precipitation, are not based, in any way, upon any of the prepared testimony which was submitted on behalf of Dr. Larson and later withdrawn. The findings and conclusions of the Council are strictly based upon the testimony presented by the Applicant and Blue Sky Advocates through their witnesses and evidence in the contested case record.

8) The effects of acid rain on crops are not completely understood. Based upon what is now known, the Council would not expect CGS operation, as controlled by provisions which should be included in the Site Certification Agreement, to have significant adverse effects. Monitoring to confirm predicted pH levels and to study possible effects is appropriate.

9) The Council can say with assurance that the effects of any acidification of precipitation which may occur as a consequence of CGS operation, will be nowhere near the magnitude of the effects in areas (such as the Ohio

Valley) where there are many coal-fired plants, burning high sulfur coal, located close to one another, utilizing minimal SO_2 controls. (TR Vol. 14, p. 2255, Paulus)

C. Control Technology

1. Sulfur Dioxide (SO_2)

a. There are presently 16 flue gas desulfurization (FGD) systems (at eight coal-fired plants) with greater than 90 percent sulfur removal efficiencies operational in the United States. (TR Vol.28, p. 4397, Paulus) For 13 of these systems, the total emissions exceed those which would occur if the CGS were to operate at 86.5 percent efficiency with coal D because higher sulfur coal is being burned in the other plants.

b. Greater removal efficiencies remove more materials which results in more solid waste disposal. On the whole, this is an environmental benefit. As discussed elsewhere in these Findings, the Council is confident that solid waste disposal conducted as required will not have a significant adverse environmental impact. It is preferable to have these materials deposited in one discrete location where both potential adverse impacts and controls are well understood than to have them released into the atmosphere and deposited by the winds and rain in ways and with effects predicted by computer models and published scientific research.

c. The Prevention of Significant Deterioration (PSD) increment for the Creston area serves as a limitation of future industrial expansion. With four units operating at maximum guaranteed rating, the models used predict substantial use of the PSD increment at one location on Johnny George Mountain. Although the record does not reveal any planned activity in the area which would be threatened by using all but 0.1 ug/m^3 (micrograms per cubic meter) of the available 24-hour incre-

ment in the area (VALLEY model) or 32.4 ug/m^3 of the available increment (COMPLEX 1 model), the PSD limitation creates an exhaustible and perhaps irretrievable resource. Allowing emissions beyond those necessary to provide a commensurate benefit to the state in project development and energy production may place an unnecessary limit on future development in the area; however, the Council finds the risk of limiting future progress to be small.

d. In its PSD application, Water Power initially proposed the installation of an SO_2 control system capable of removing 86.5% of the SO_2 from stack gases without regard to coal ultimately selected. After CRSTER and the ensuing air quality analysis supported the assertion that that there would be no demonstrable adverse affects on vegetation at an emission rate of 4,560 pounds per hour, the Applicant modified its proposal. Water Power now proposes to purchase and install SO_2 control equipment capable of scrubbing at an efficiency level which will introduce no more SO_2 into the atmosphere than 4,560 pounds per hour on a 24 hour rolling average.

e. If coal D is selected as fuel, the consequent percent control would be 86.5%, under the Applicant's proposal. If, however, some other coal is selected, the maximum percent efficiencies required to emit no more than 4,560 pounds per hour on a 24 hour rolling average would be: coal A, 73%; coal B, 77%; coal C, 79%; and coal E, 83%. In this setting, the selection of coal A or B, for instance, may allow the Applicant to purchase an FGD System with a capacity of 75-80% control. Further, the equipment may be operated most of the time at 70% control, as a consequence of shutdowns or reduced loads.

f. The Applicant has committed to purchase and operate a control system capable of 86.5% control of coal D. However, it would

cost less to scrub a lower sulfur coal to an 86.5% removal efficiency than it would cost for the same efficiency with coal D. In this fashion, the dynamics of coal selection may lead to a reduction in scrubbing costs below those figures submitted to the Council. Savings would result as a consequence of reduced capital expenses for sizing of the FGD system and reduced operating costs for operation at lower scrubbing efficiencies. The Applicant requests cost savings and variable operating rate flexibility based upon the proposition that there would be no demonstrated effect to crops from emissions at 4,560 pounds per hour, the conclusion of its air quality analysis. Why, inquires the Applicant, should it be required to release less SO_2 to the environment than 4,560 pounds per hour when there will be no demonstrated benefit?

g. Best Available Control Technology (BACT) is determined on a case-by-case basis taking into account energy, environmental and economic impacts and other costs, (WAC 463-39-030). A scrubbing efficiency of 90% is achievable for any of the coals proposed as potential fuels for the plant. A BACT determination has been requested for all four units of the CGS, though the final unit will not be producing energy until 1995 by the present schedule. Sulfur control technology is developing, particularly toward reducing costs of scrubbing at high levels of percentage removal.

h. This time setting is the principal reason for the proposal of WDOE that the BACT determination for units 3 and 4 be reserved to a future time when more is known about plant responses to SO_2, potential for crop losses from SO_2, and advances in SO_2 control technology. Presumably the procedure for such a review might involve an entirely new air quality application for units 3 and 4. The consequent delays and uncertainties could significantly complicate planning and engineering design for those units.

i. The record establishes that any adverse effect on crop yields from CGS emissions would be practically impossible to demonstrate in the field setting of climatological stress, plant disease and infestation. As a consequence, there is no scenario for mitigation of crop losses other than one peopled by lawyers and experts arguing contradictory theories about a matter which cannot be resolved to a known. No meaningful mitigation can be expected where crop losses cannot be proved, if they, in fact, occur.

j. The Applicant wishes the most predictable regulation of all four units at the lowest cost within the BACT formula. Blue Sky Advocates opposes the project, but if the CGS is certified, advocates high levels of sulfur control designed to eliminate any possibility of crop loss or damage.

k. The Applicant's assertion of no demonstrable adverse effect at 4,560 pounds per hour SO_2 emission is persuasive. However, the analysis supporting the assertion relies on assumptions and techniques which are uncertain. Though one cannot equate Water Power's analysis to a flashlight shone in a darkened room, neither is the room so well lighted that all its corners, cracks and contours can be readily seen. Future circumstances may cause economic loss to farmers, which cannot be readily mitigated.

l. In determining the appropriate method to control SO_2 emissions, the Applicant and the Council have considered various technologies. These technologies included pre-combustion fuel desulfurization, wet and dry limestone flue gas desulfurization (FGD), lime FGD, alkaline fly ash FGD, wet soda FGD, and magnesium oxide FGD. Based upon the record, the wet limestone flue gas desulfurization method:

1) has been proven in large-scale applications;
2) is capable of efficiencies greater than 90%;
3) could use locally available limestone; and
4) is, compared to other reasonable technologies, the least expensive. (TR Vol. 13, p. 2061, Paulus)

At the present time, wet limestone flue gas desulfurization is the preferred technology for CGS SO_2 control. However, the Applicant should be allowed the latitude to select a different technology in the future, if such technology offers equivalent or better SO_2 removal.

m. BACT for all four units cannot be established at the limits proposed by the Applicant. If all four units are to be permitted by the Air Quality Permit, higher controls must be required. BACT for all four units is the following:

1) Flue gas desulfurization technology capable of removing 86.5% SO_2 for coal D for units 1 and 2 and 90% SO_2 for coal D for units 3 and 4.

2) SO_2 emissions limits for units 1 and 2 would be:
   a) 0.22 lb/mmbtu on a 30-day rolling average;
   b) 1,250 pounds per hour per unit on a 24-hour rolling average;[1]
   c) 2,500 pounds per hour per unit; maximum one hour emission not to be exceeded more than once in thirty days.[1]

[1]Emissions limits are based upon maximum unit operation of valves wide open 5% over-pressure capacity and SO_2 control equivalent to 86.5% sulfur scrubbing of coal D.

3) SO_2 emissions limits for units 3 and 4 would be:

a) 0.16 lb/mmbtu on a 30-day rolling average;

b) 925 pounds per hour per unit on a 24-hour rolling average;[2]

c) 1,850 pounds per hour per unit; maximum one hour emission not to be exceeded more than once in thirty days.[2]

4) The SO_2 emissions limit for plant-wide operation would be 4,000 pounds per hour for all four units on a 24-hour rolling average basis, not to be exceeded more than once in 30 days.[3]

n. Emissions controlled within these limits will reduce total SO_2 emissions to the atmosphere by as much as one-third over the Applicant's proposal, in a given year. Fluctuating operating rates of sulfur removal equipment within the limits will provide needed operational flexibility. Economic burdens on the Applicant are reasonable, considering the plant construction schedule and the setting of the plant in a prime agricultural area. The Applicant will be assured of certain SO_2 control constraints for all four units which will assist in engineering design and management of costs.

[2]Emissions limits are based upon maximum unit operation of valves wide open 5% over-pressure capacity and SO_2 control equivalent to 90% sulfur scrubbing of coal D.

[3]The plant-wide emissions limit is based upon four units operating at guaranteed nameplate rating.

o. Within the present state of scientific understanding of SO_2 effects on crops, emissions limited by these controls will eliminate any realistic possibility of adverse effects to crops in Lincoln County as a consequence of emissions from the CGS.

p. These limitations were established with the expectation that Water Power will, prior to construction, submit to the Council for approval, detailed design information identifying the specific control equipment to be used and the guarantees and warranties which will be required from manufacturers. (TR Vol. 28, pp. 4443, 4444, Henriques)

2. Nitrogen Oxides (NO_X)

NO_X emissions are controlled by boiler design and operational characteristics. NO_X emissions can easily be limited to less than 0.5 lb/mmbtu for subbituminous coals and 0.6 lb/mmbtu for bituminous coals by the use of the boiler design proposed and proper operational controls. The conceptual boiler design proposed by the Applicant constitutes "best available control technology" (BACT) if operated properly. The Applicant will be required to submit for approval, all operational criteria prior to commencing operation. The Council should specify operational criteria in the Site Certification Agreement. Design specifications and guarantee requirements will be subject to Council approval as provided in the Agreement.

3. Cooling Tower Impacts

The four proposed, 12-cell circular mechanical draft cooling towers are reasonable and appropriate to mitigate the occurrence of visible plumes. The towers will also reduce off-site salt deposition levels to less than 2000 kilograms per square kilometer/month, as provided by the Site Certification Agreement.

4. Particulate Emissions

a. In Table 4.2 of the supplemental BACT submittal to EPA, the Applicant's Prevention of Significant Deterioration document, Water Power lists various sources of fugitive particulate emissions and proposed types and levels of controls. These controls are generally reasonable and appropriate with the exception of certain sources and controls which should be treated in the Site Certification Agreement.

b. Stack particulate emissions can be limited to the New Source Performance Standard (NSPS) of less than 0.03 lb/mmbtu, per unit, by the use of a baghouse, containing fabric filters. This constitutes best available control technology. The Council further finds that similar results could be expected from the use of electrostatic precipitators and would consider approval of such devices if detailed designs were first submitted to the Council. Approval of design specifications and guarantee requirements will be required before control facility construction and operation may commence. The particulate matter emission removal efficiency will be at least 99% for each unit, as established by performance tests.

5. Stack Height

The emissions stacks themselves are a method of mitigation. The design and height of the stacks encourage mixing and dispersion of emissions and minimize the possibility of icing or fogging. The proposed 555-foot stack height is consistent with good engineering practice.

6. Opacity

Particulate matter opacity levels will not exceed state or federal standards. Specific limitations should be established in the Site Certification Agreement.

7. Carbon Monoxide and Volatile Organic Compounds

Optimum combustion efficiency minimizes the production of carbon monoxide and volatile organic compounds. Boiler design and operation are the controlling factors. Optimizing combustion constitutes best available control technology for these emissions. Design specifications and guarantee requirements should be reviewed by the Council prior to construction to ensure these emissions are minimized, in accordance with the Site Certification Agreement.

8. Monitoring

The record establishes that if CGS emissions adversely affected crop yields by as much as five percent, that effect would be very difficult, if not impossible, to isolate in view of the many other variables that can affect crop yield. (TR Vol. 47, p. 7506, Morrison; TR Vol. 45, p. 7204, George). If pollutant damage did occur, it might very well escape attention. The Council must therefore place its primary reliance upon appropriate controls to avoid the possibility of such damage in the first instance. Still, an appropriate monitoring program has a place and a value to test predictions upon which emission control requirements have been based, measure concentrations and identify, to the extent possible, effects. Air and vegetation monitoring should be required by the Site Certification Agreement and developed prior to the operation of the first CGS unit.

3. If constructed, this line will have sufficient capacity to carry the entire production from four units of generation, 2032 MW. Connection with the upgraded line would physically connect the entire output of the CGS with the Northwest Power Grid. Though the 500 kV upgrade is planned whether any units of CGS are built or not, much of the ultimate load on the line is eventually seen to originate at the CGS. The Council cannot order BPA, an agency not a party to this proceeding, to build the line. At this point, 500 kV upgrade is an expectancy backed by qualified assurances of BPA executives.

4. The capacity from the double circuit 500 kV line is relied upon by Water Power for transmission of the balance of participants' shares of CGS generation, ultimately 75 percent of 2,032 MW. Two of Water Power's transmission proposals rely upon 500 kV construction being completed by BPA. The remaining proposal, the southern 500 kV, is presented as an alternative in the event BPA does not upgrade to 500 kV service on its northern corridor. These Findings assume the necessary upgrade will occur. If this assumption is proved by subsequent events to be in error, use of an identified alternative transmission route must be approved.

5. At the present time, there is no 500 kV service on the BPA corridor or in the Spokane vicinity. The first will approach Spokane in approximately 1984 when a line of this size is connected to the Bell Substation from the east, carrying power from the Colstrip stations in Montana. The introduction of this service will accommodate, if not require, adjustments and upgrades to the transmission network in the Spokane area and along the northern corridor. This requirement, or opportunity, to upgrade 500 kV service is a matter which is incidental, if not independent and collateral, to the requirement to integrate CGS generation to the existing transmission system. This improvement is similar, in terms of its impact on this proceeding, to the Applicant's evidence regarding support to the Lind-Harrington

area and various 1990 reliability requirements for general transmission systems in Eastern Washington and Greater Spokane. This licensing proceeding, though providing an occasion for considering contingent and planned aspects of the total transmission setting, is principally concerned with simple connection with the existing energy distribution network. Stated another way, system engineering requirements of a wide region into the distant future become a remote concern once output from the plant is physically connected to existing transmission networks. See RCW 80.50.020(6)

6. The presence of transmission facilities within five miles of the plant is a compelling reality, a reality no doubt perceived and relied upon by the Applicant in siting the plant. The fact that this corridor is owned and operated by an agency of the federal government charged with managing a major portion of the Northwest Power Grid - the "one utility" concept - adds further weight to this circumstance. Without regard to issues of cost and reliability, physical connection with BPA's proposed 500 kV system in the northern corridor will integrate CGS output into the Northwest Power Grid and allow transmission of energy to all plant subscribers.

7. BPA is an agency of the federal government, organized pursuant to federal law. It is required to accept and transmit energy provided to it, where capacity exists, on a nondiscriminatory basis according to published rate schedules. As a government agency, BPA does not seek profit nor is it allowed to acquire and accumulate profit. The rates charged by it for transmitting energy (wheeling) are, by design, directly caused, related to, and determined by the costs and expenses incurred by BPA in providing transmission service. (TR Vol. 37, pp. 5493-5506)

C. Proposed Facilities

1. Well field

The well field near FDR Lake will require electric energy. Providing this energy will require the construction of 12 miles of 115 kV transmission line and a distribution substation at the well field. The energy will be supplied by the Lincoln Electric Cooperative.

2. Water Power has proposed three alternative transmission systems to integrate CGS output into the existing transmission network. Various proposals have some elements in common. BPA has described an alternative to one of the proposals. The three alternatives proposed by the Applicant are referred to as the Northern Double Circuit 500 kV Alternative (Northern Alternative); the Southern Single Circuit 500 kV Alternative (Southern Alternative); and the Southern Double Circuit 230 kV Alternative, preferred by Water Power (Preferred Alternative).

a. Northern 500 kV

The Northern Alternative includes a double circuit 500 kV line running from the CGS to the Douglas Switchyard, near Grand Coulee; and a double circuit 500 kV line running from the CGS to the Bell Substation with one of the 500 kV circuits looped into and out of the future Marshall Substation. One 230 kV line would be looped into the CGS for station service. 500/230 kV transformers would be located at the Bell Substation and Marshall. Two of the 230 kV transmission lines on the existing BPA right-of-way would remain connected to the Bell Substation with one of the 230 kV circuits being connected to the Marshall Substation, by interconnection at the existing substation at Westside.

b. Southern 500 kV

The Southern Alternative includes a single circuit 500 kV line from the CGS to the Douglas Switchyard utilizing a route which lies generally southerly of the existing BPA right-of-way.

Three of the 230 kV lines on the existing BPA right-of-way would be connected to the transformer at Douglas. A 500 kV transmission line would connect the CGS to the future Marshall Substation. A 500 kV line would run from Marshall to the BPA right-of-way on the North-South connector. A 500/230 kV transformer at Marshall is proposed by this alternative. Marshall would also be connected by 230 kV line to the westside substation which would, in turn, be connected to existing 230 kV lines on the BPA right-of-way. Three 230 kV circuits on the BPA corridor would be connected with the proposed CGS.

c. Southern Preferred 230 kV

The Preferred Alternative provides for construction of double 500 kV circuits utilizing the existing Bonneville Power Administration's right-of-way in Lincoln County from the Creston Generating Station west to the Douglas Switchyard. Double 500 kV circuits would also extend eastward from the CGS to the BPA Bell Substation north of Spokane utilizing the existing BPA right-of-way. A unique feature of this plan is a double circuit 230 kV transmission line from the CGS to the future Marshall Substation south of Spokane. The line would be constructed, owned and operated by the Applicant. 500/230 transformation facilities would be constructed at CGS, in this proposal. No new construction would occur in the sensitive north-south corridor between Marshall and the BPA right-of-way. Also, no looping of one of BPA's 230 kV lines into the CGS to provide station service would be required.

d. Comparison of Routing

The common routing features of the various alternatives can be described as follows:

1) Both the Northern and Southern 500 kV Alternatives involve the construction of transmission facilities between the BPA right-of-way (ROW) and the Marshall Sub-

station for a distance of approximately 16 miles. This is the North-South Connector.

2) Both the Southern 500 kV and Preferred Alternative involve construction along new ROW to be owned by the Applicant south of the CGS connecting CGS with the Marshall Substation, a distance of approximately 60 miles.

3) Both the Northern and Preferred Alternatives involve construction of double circuit 500 kV lines on the existing BPA ROW from the Douglas Switchyard to CGS and from CGS to the Bell Substation for a distance of approximately 83 miles.

4) All of the alternatives contemplate a connection between the CGS and the BPA ROW near the plant for a distance of approximately five miles.

5) The Southern 500 kV alternative has one routing feature which it does not share with any of the other alternatives. In this plan, a route runs from CGS west to the Douglas Switchyard on a line south of the BPA ROW for a distance of approximately 36 miles, with another six miles along the BPA ROW to Douglas.

3. North-South Connector

The North-South Connector, a route of approximately 16 miles, is complicated by the relatively intense development of land uses along it, when compared to uses in the northern and southern corridors. The Spokane International Airport is in close proximity to the right-of-way as is Riverside State Park. There is more intensive residential development, a highway crossing and view impacts to the Indian Canyon Park Area. Fairchild Air Force Base is in the same general vicinity. Although construction of transmission facilities in this area

will be difficult, no witness has suggested that such construction could not be accomplished. Impacts in the North-South Connector will be reduced to an acceptable level if the line selected for traverse is a 230 kV line. The lower height of tower structures with this line provides greater flexibility in routing and consequently facilitates passage of the flight paths of Spokane International Airport. Impacts on air traffic will be reduced to acceptable levels. Aesthetic impacts of single pole 230 kV lines will be minimal when compared to comparable impacts of 500 kV lattice towers. Low voltage transmission lines presently exist along routes in the North-South connector corridor.

4. Interconnection with BPA Northern Corridor

The five-mile segment from the CGS north to the BPA ROW is largely scabland containing sagebrush and grass. Disruption due to construction and operation of transmission lines will be minimal.

5. Existing Uses

a. The portion of the Southern 500 kV Alternative Route extending from CGS to the Douglas Switchyard passes many marshes, ponds and wetlands, although the centerline would avoid the most sensitive areas. Eleven miles of agricultural lands would be crossed by this line. No transmission facilities exist along this route at the present time.

b. The route southeast from CGS to the Marshall Substation is predominately composed of scabland and agricultural land. A significant number of lakes, ponds and creeks are located near the route. Waterfowl use of these areas is frequent. Approximately 100 homes are located within one mile of the centerline. Most of the homes sit on the eastern portion of the route. No transmission facilities presently exist along this route. Detailed environmental studies of this route have not been completed. Right-of-way has not been obtained and the line may yet vary from the proposed corridor.

c. The BPA Northern Corridor from the Douglas Switchyard to the Bell Substation is presently occupied by transmission facilities. (See XIII B.1.)

6. Tower Construction

a. The Southern Alternative single circuit 500 kV line would be constructed on free-standing, four-legged galvanized steel towers. The base of the towers would be approximately 35 feet by 35 feet and the towers would be from 100 to 150 feet tall.

b. The double circuit 500 kV transmission line in the Northern Alternative will be free-standing, four legged, galvanized steel towers with a base of approximately 35 feet by 35 feet and from 175 to 200 feet tall.

c. The 230 kV Preferred Alternative would involve single pole towers with a base of approximately four feet by four feet and a height of 90 to 125 feet. The northern BPA portion of this alternative would involve 500 kV double circuit towers.

d. Towers for all alternatives would be spaced about 1,200 feet apart, or 4.4 to the mile. In the northern route, existing 115 kV wood pole lines would be replaced by 500 kV double circuit towers. Since the wood poles are more closely spaced, this will result in fewer poles on the ROW and is considered an improvement by farmers over the existing wood structures. (TR Vol. 9, Cluts, Public Hearing, Creston)

D. Impacts of the Preferred Alternative

1. General

a. Since the Preferred 230 kV Southern Alternative also involves the construction of 500 kV double circuit lines on the Northern BPA ROW, it has the combined impacts of construction on both routes. The Northern BPA ROW already exists and contains

several lines of transmission facilities. Transmission on this ROW alone, with connection to Marshall by 230 kV service, would result in the least impacts of any of the alternatives.

b. The Preferred 230 kV Alternative would be constructed along a route where no transmission facilities exist. No right-of-way for such a line presently exists. The Applicant was contacting landowners to receive their input on the proposed southern corridor as this hearing proceeded. Though opposition exists to this line, opponents grant that Water Power has been sensitive to the desires of area residents in the actual placement of the centerline. As a consequence, it is not yet known whether such a line, if physically placed, will wander outside the corridor designated in the Application.

c. As would be the case with the intrusion of any major transmission facility in a previously uncommitted area, the environmental impacts may be significant. The line will pass through approximately seven miles of forest lands. Several miles are near wetland areas. Nine miles of cultivated agricultural land would be crossed. The construction of the line and consequent road access may complicate the abilities of landowners to use their lands as presently used and as intended for future use. (TR Public Hearing, Creston).

2. Agricultural Concerns

a. Siting of a southern line has been opposed in these proceedings by the Lincoln County Agricultural Coalition. This group opposes the placement of any transmission line over agricultural lands previously uncommitted to transmission and asserts: environmental impacts along the northern corridor are more or less fixed; there exists ample capacity on the upgraded corridor; sound policy requires full utilization of existing corridors; and there is, therefore, no need for the southern line. (TR Public Hearings, Spokane and Creston)

b. The Coalition asserts the following effects will occur to the management of their lands: the presence of the structures will complicate the cultivation of lands, impeding their machines and equipment; the access required for construction and upkeep of the lines results in the uncontrolled entry of the public with consequent degradation of private ownership rights; and, there will be a marked detrimental aesthetic effect particularly where the line passes within sight of residences. Once the lines are in, it will be impossible to prevent future expansion of facilities in the right-of-way, it has been asserted. This group is concerned about possible avoidance responses by domestic animals and reduction in property values. (See generally transcript of public hearings, Spokane and Creston).

c. Though the record supports some of the concerns, others are not supported. For instance, there is no convincing evidence that domestic animals avoid transmission rights-of-way in any significant regard. The evidence of potential health effects fairly strongly supports the conclusion that any such effects are minimal and elusive. On the other hand, the long-term health effects of at least 500 kV and larger lines are not fully known and investigations are on-going. Asserted interference with radio and television is not established by the record except when in close proximity to the line and then only in conditions conducive to corona. Corona conditions and shock to humans and animals do occur but require infrequent and transient atmospheric conditions. In any case, electric shock is not likely to cause harm or injury, short-term or long-term, particularly with 230 kV lines. (TR Vol. 9, 10, Cluts, Lee and others).

d. The presence of transmission lines has a marked detrimental effect on aesthetics and quality of life to those living and working under them. This effect has been articulately and persuasively presented by farmers testifying in these proceedings. (Public Hearings, Spokane and Creston).

e. Though processes exist for the compensation of landowners for the intrusion represented by these lines, it is apparent farmers do not view such payments as being capable of totally replacing what they perceive to be lost. Such monies will provide no effective compensation to those individuals residing on, and working, land they do not own. It is apparent that farming and residence in Lincoln County do not uniformly follow ownership. Some farmers are both landowners and tenants. It is also apparent that there exists land in Lincoln County which is difficult to value in a simple market sense, having been the residence for several generations of a single family. (Public Hearings, Spokane and Creston).

f. Farmers testifying in these proceedings demonstrate a feeling of identity with the land and the fragile renewable resources it fosters. They are concerned that agricultural pursuits and styles may be threatened by larger social, economic and political concerns.

g. The concerns of these farmers cannot be determinative to a body charged with responsibility to a large region and all of the diverse interests within it. However, the attitudes of those who must live with transmission facilities provide a background for consideration of the transmission requests of the Applicant. Such facilities should not be placed casually or insensitively, without regard to issues of compelling need.

3. Energy Policy Issues

a. Farmers have asserted that they, as individuals, may suffer from the conflict between transmission policies of Water Power and BPA. There is some credit to this view. (TR Public Hearing, Creston, Morse p. 25, Guhlke p. 41).

b. Washington Water Power insists on a policy of ownership of the lines serving its service area. The Bonneville Power Administration asserts a policy disallowing Water Power ownership of any portion of its facilities on the northern corridor. These are matters of stated policy. There is a history of strained relations between Water Power and BPA. (Ex. 123) An upgraded northern corridor has the capacity for transmission of the total output of CGS energy. The Council is cognizant that both BPA and Water Power ultimately represent individuals - transmission customers of the Northwest Grid, in the case of BPA; and ratepayers of its service area, in the case of Water Power. BPA and Water Power assert that the aforementioned policies protect the larger interests of the individuals they ultimately serve.

c. Though bearing a progressively remote relation to these proceedings, the Applicant asserts that the policy of transmission ownership, translated through values of cost and reliable electric service, requires construction of the southern 230 kV line, the Preferred Alternative. These values depart from the point at issue as consideration proceeds to an assessment of distant system needs and plans bearing no direct relation to certification. Examples are long-term service needs in the Harrington area, and transmission facilities needed to serve loads for times in the distant future.

4. Environmental Criteria

The Applicant has set forth eight criteria from "Environmental Criteria for Electric Transmission Systems" (USDI/USDA, 1970) in its Application at Appendix D.3.3, Evaluation of Alternative Transmission Corridors, page 5-19. The criteria are as follows:

a. Rights-of-way should be selected to preserve the natural landscape and minimize conflict with present and planned uses of the land on which they are to be located.

b. Where possible, retirement or upgrading of existing lower voltage transmission circuits should be required to allow construction of higher voltage, higher capacity circuits on the existing right-of-way.

c. Properly sited established rights-of-way should be used where warranted for the location of additions to existing transmission facilities.

d. The joint use of electric transmission facilities by two or more utilities should be encouraged, when feasible, to reduce the total number of transmission lines constructed.

e. Rights-of-way should avoid heavily timbered areas, steep slopes, proximity to main highways, shelter belts and scenic areas.

f. Long views of transmission lines parallel to existing or proposed highways should generally be avoided. Alternative routes away from highways should be considered. Where ridges or timber areas are adjacent to highways or other areas of public view, overhead lines should be placed beyond the ridges or timber areas.

g. Open expanses of water and marshland, particularly those used as flight lanes by migratory waterfowl and as heavily used corridors by other birds, should be avoided. Areas of wildlife concentrations such as nesting and rearing areas, should be avoided.

h. A route should be selected that will maximize the use of natural screens to remove transmission facilities from view.

Every Site Certification Agreement this Council has issued has required compliance with "Environmental Criteria for Electric Transmission Systems." (See Site Certification Agreement for Washington Public Power Supply System (WPPSS) Units 3 and 5 at p. 11; Site Certification Agreement for WPPSS Units 1 and 4 at p. 9; Site Certification Agreement for WPPSS Unit 2 at p. 7; Site Certification Agreement for Puget Sound Power and Light Company Units 1 and 2 at p. 13).

5. Cost and Reliability

a. Each of the proposed alternatives is reliable in terms of prudent utility management and the criteria established by the Western Systems Coordinating Council. (Klinger TR 5529). Given this acceptable level of reliability, discussions of which reliable system is the most reliable have little significance in these proceedings.

b. There remain considerations of cost. The Applicant has presented a thorough, articulate and persuasive case for cost savings to its ratepayers. Water Power strongly opposes the loss of control over costs which would result were it required to utilize BPA facilities to wheel power sixty miles to its service area. In attempting to assess what the actual cost of wheeling will be, estimates have varied widely. The Applicant asserts that this cost will be a minimum of $139,400,000 over the life of the project. This evidence is persuasive if for no other reason than because Bonneville's rate system is very complex, cumbersome, subject to economic factors over a wide regional area, and presently in the midst of radical alteration. Bonneville asserts that its estimate of the comparable wheeling charges including losses, ranges from $32,000,000 to $124,000,000 (TR Vol. 37, p. 5519). BPA can give no assurance of how the rate may vary or what the final figure may be.

c. Though the concept is subject to change, BPA does presently have two rate approaches in existence. They are the IR-1 rate and the FPT-2 rate. The FPT-2 rate is distance-based (TR Vol. 25, p. 5511). The IR-1 rate is a "postage stamp rate," which does not vary with distance. Applying the FPT-2 rate to CGS transmission to Spokane results in a cost of $2.61 per kilowatt year. The equivalent IR-1 rate would be $5.78 per kilowatt year (TR Vol. 25, p. 5513). Should the IR-1 rate become the only rate available in the future, the Applicant would pay a cost per mile of transmission greater than the system average. In view of the 60-mile transmission for the life of the CGS, application of the IR-1 rate would create a disproportionate cost disadvantage to the Applicant.

d. BPA does not pay property taxes or sales and use taxes, whereas Water Power pays such taxes. The payment of such taxes benefits the state and local governments. (TR Vol. 37, p. 5624, Klinger)

E. BPA "Capacity Sharing" Proposal

BPA is willing to allow Water Power an arrangement whereby Water Power would pay 7/8 of the capital cost allocated to the construction of one 500 kV circuit in the northern corridor as well as station service and start-up. (TR Vol. 37, p. 5666, Klinger; p. 5607, Porter; and p. 5531) This would be a one-time payment roughly in the same amount as Water Power would pay if it owned property rights in the northern corridor. If it owned the line, Water Power could send energy east and west, more flexibly enter a variety of electric transmission arrangements, collect revenues for transmission of other companies' power, treat and control challenges to reliability along the route, and enjoy other direct and indirect incidents of ownership. Though paying an ownership amount under BPA's proposal, Water Power would suffer the following additional disadvantages over ownership. It would have to pay BPA a "firming up capacity charge" in the event of an outage on the line, while BPA could use that circuit as a

back-up for its service without paying such a charge. The Applicant could transmit only energy from CGS and only to the Spokane area. In addition, Water Power would be charged for operation and maintenance. (TR Vol. 37, p. 5532)

F. Northern 500/230 kV Transmission Alternative

1. Route Described

Cost and reliability of all of the alternatives for connection of the CGS have been considered. In addition to the alternatives proposed by the Applicant, these values would be served by a line with the following design and routing: a double circuit 500 kV line from Coulee to Bell, transformation from 500 kV to 230 kV in the vicinity of Indian Prairie and a 230 kV line in the North-South Connector to Marshall. This plan would be reliable. It would connect the 500 kV system from Colstrip to Coulee. It would provide two 500/230 kV transformers in the Spokane area. It would wheel all CGS power in a highly reliable fashion to project participants and to Water Power's service area. The plan would be consistent with the policy of maximum utilization of existing transmission corridors prior to embracing new transmission route construction, a policy which this Council endorses.

2. Connection at Indian Prairie

This Northern 500/230 kV Transmission Alternative will require construction of a 500/230 kV transformer at the juncture of the Northern Corridor and the North-South Connector in the vicinity of Indian Prairie. This substation facility would likely be constructed within the transmission corridor identified in the Application. Further, it is in an area which was reviewed by the Applicant in the course of its transmission centerline investigations. (TR Vol. 39, p. 5814) Existing there is a low density of structures (Ex. 117, p. 8) Construction of the substation would require approximately 33 acres of land. (TR Vol. 38, p. 5726) Environmental effects would be minimal, particularly when compared to 500 kV construction in the North-South Connector.

3. Ownership

The record reveals no legal impediment to providing ownership to Water Power of a line in the BPA right-of-way. BPA and the Applicant share a ROW in Montana, for example. The best interests of the people of the State of Washington and the policy of Chapter 80.50 RCW would be served by the Applicant having an interest in the nature of ownership in one 500 kV circuit from CGS to a juncture in the corridor where energy from that line could be conveniently transformed to 230 kV and routed to the Marshall Substation.

4. Advantages

A transmission line in the Northern Corridor would require the least new ROW. It would have the least environmental impacts. It would provide reliability and the lowest electrical losses.

G. Conclusion

1. The construction and operation of transmission facilities in the Northern Corridor are approved and will be certified if Water Power and BPA reach agreement on the following general conditions or their equivalent:

   a. The Applicant has the use of one 500 kV circuit in both directions from CGS to a 500/230 kV transformer in the area of the juncture of the BPA right-of-way and the North-South Connector;

   b. Each 500 kV circuit on the Northern Corridor is considered a backup to the other and no charge is made by the Applicant or BPA for backup power in the event of one circuit outage;

   c. Operation and maintenance costs for both circuits are shared equitably by BPA and the Applicant;

   d. The Applicant pays a reasonable charge for the use of the BPA ROW;

e. The Applicant and BPA share wheeling revenues derived from wheeling energy other than that used to service the Applicant's loads;

f. Only 230 kV transmission facilities are constructed in the North-South Connector;

g. Station service is provided to CGS by BPA;

h. Total costs of the arrangement are equivalent to the cost of the Applicant's Preferred 230 kV Alternative.

2. Recognizing that this Council cannot compel BPA to enter into the relationship described above, the Council can and does require the Applicant to use its best good faith efforts to secure this arrangement or a similar acceptable arrangement for transmitting power on the described route, and to report to the Council monthly on the status of the negotiations.

3. In the event an acceptable arrangement cannot be reached between the Applicant and BPA within six months from the time the Site Certification Agreement is executed and signed, use of an identified alternative transmission route must be approved. Such approval must involve a thorough and detailed environmental analysis of an established corridor and identified centerline.

4. Construction of transmission facilities from the BPA ROW to CGS for station service and backup should be approved as proposed.

5. Construction of transmission facilities to the CGS site for construction purposes and to the well field site should be approved as proposed.

XIV. WATER RIGHTS

A. Proposed Water Use

1. Waters for construction purposes for the first and second units will be obtained from wells located on the site itself. The use will average 50 gallons per minute (gpm) with a peak use of 200 gpm during the construction period. (TR Vol. 8, p. 1156, Hamill) The source of these waters will be the same as two wells presently used by Mr. Merwin Houger, for potable, stock, and irrigation water. These two wells presently draw up to 1060 gpm. (TR Vol. 8, p. 1157, Hamill) Water Power will either use the existing wells on-site or drill new wells to supply construction water for the first and second units. In either case, total water usage will not exceed what is presently permitted.

2. Except for water allocated for domestic and stock water supply, all irrigation withdrawal is now limited to the irrigation season, or April 1 to September 30.

3. Construction water requirements would require year-round use from the wells.

4. Water Power has proposed acquiring water for operation of the CGS project from the Columbia River at FDR Lake. The application proposes installing a well field and withdrawing waters from an aquifer which is in direct hydraulic continuity with FDR Lake.

5. In the operation of the plant, the Applicant proposes to pump a maximum of 62 cfs. The total annual requirement is 32,000 acre-feet.

B. Existing Federal Water Rights

The Federal Bureau of Reclamation has a Columbia River water permit for 13,450 cfs mainly for irrigation purposes with a priority date of May 10, 1938 (Exhibit 111). The Bureau also has a 1938 Columbia River water right to a maximum of 75,000 cfs for power generation purposes (Exhibit 111). The Bureau has a storage water certificate for storage of 6,400,000 acre

feet of water behind Grand Coulee Dam for irrigation and hydroelectric power. (Exhibit 111). The Bureau also has various other interests in waters behind Grand Coulee Dam. (Exhibit 111)

C. Availability of Water

1. The proposed use of water by CGS is a consumptive and beneficial use of water. The proposed withdrawal of water for operation of the CGS project by the Applicant will not have a physically measurable effect on the use of Columbia River waters by others downstream or on instream flows. (TR Vol. 32, p. 4942)

2. There are sufficient ground waters physically available for the proposed project.

D. Columbia River Water Management

The Department of Ecology has adopted certain minimum flow and management requirements for the pertinent reach of the Columbia River, by the adoption of Chapter 173-563 WAC. This is known as the Columbia River Instream Resources Protection Program (CRIRPP) which became effective on June 24, 1980. These regulations were adopted after numerous meetings and communications with various groups using the Columbia River.

E. Public Interest

1. The public will greatly benefit from the generation of electrical energy by the CGS. Further, an assured supply of water is essential to the construction and operation of the CGS.

2. The use of water from FDR Lake will result in the generation of approximately 2,000 times the power that would be generated by the same water at Grand Coulee Dam and approximately 650 times as much as would be generated by the same amount of water at all of the other hydroelectric projects on the Columbia River below Grand Coulee Dam, assuming that all of the water used in the CGS was

available for use to generate electrical energy at all of the hydro-electric plants on the Columbia River from Grand Coulee downstream. (App. Sect. 5.3.2).

3. Based on the above, in addition to the full record, the Council finds that there are overriding considerations of public interest, for which reason the Council should grant an exemption to the Applicant from the regulatory provisions of CRIRPP as set out in Chapter 173-563 WAC.

F. Request of Bureau of Reclamation

1. The Bureau of Reclamation has applied to the Washington Department of Ecology for a change in purpose of use of the waters in active storage in the reservoir behind Grand Coulee Dam. (TR Vol. 36, p. 5405). If granted by the Department of Ecology, it is contemplated that at least a portion of the water would be used by the CGS.

CONCLUSIONS OF LAW

Having considered the whole record in this proceeding, and the foregoing Findings of Fact, the Council makes the following Conclusions of Law:

1. The Council has jurisdiction over the subject matter of Application No. 80-1 and the parties to this proceeding.

2. The Application for Site Certification is in compliance with the Council's guidelines for such applications contained in Chapter 463-42 WAC.

3. The Council has satisfied the statutory requirements contained in Chapter 80.50 RCW and in Chapter 43.21(C) RCW (SEPA) by evaluating the application; commissioning independent consultant review; conducting zoning and land use consistency and compliance hearings; conducting evidentiary hearings into compliance of the Application with the Council's guidelines as set forth in Chapter 463-42 WAC; conducting required and optional public hearings; developing and issuing a draft and final Environmental Impact Statement; and developing from the evidence, exhibits and other materials presented to the Council, Findings of Fact, Conclusions of Law and Order, constituting the required recommendation of the Council to the Governor of the State of Washington.

4. The proposed Creston Generating Station and associated facilities are consistent with and in compliance with Lincoln County, Douglas County, Spokane County, Grant County, City of Grand Coulee and City of Spokane land use plans and zoning ordinances, and are required for the public convenience and necessity.

5. To legally withdraw ground waters appropriated for irrigation use, under the existing Houger water right, it will be necessary for the Applicant to obtain from WDOE a temporary change in purpose of use to industrial/construction supply for the period of April 1 to September 30 (irrigation season).

6. The Council has authority, under the provisions of RCW 80.50.110 and .120, to authorize ground water withdrawal for construction supply during the non-irrigation season (October 1 through March 31, annually).

7. In the event the Applicant does not elect to use existing wells on the site as the source of water for construction purposes, the Council has authority pursuant to RCW 80.50.110 and 120, to authorize ground water withdrawal for the construction of units one and two from a new well or wells. In this circumstance, the Applicant should be authorized to withdraw an average of 50 gallons per minute (gpm) not to exceed 200 gpm for these purposes.

8. The Applicant should be authorized to withdraw, not to exceed 62 cubic feet per second (cfs) or 32,000 acre-feet per year, water from its proposed well field near FDR Lake for use at the Creston Generating Station. These waters will be exempt from the provisions of Chapter 173-563 WAC. This authorization would not preclude the Applicant from obtaining a superior priority right from the Bureau of Reclamation or others.

9. The Application for Site Certification constitutes a "Notice of Construction" for purposes of Chapter 463-39 WAC. The Project, if constructed and operated according to the conditions of this document and the Site Certification Agreement, will be in accord with Chapter 70.94 RCW (Washington Clean Air Act) and the applicable rules and regulations adopted pursuant to that Chapter.

10. The Creston Generating Station, if constructed and operated according to the conditions of this document and the Site Certification Agreement, will be consistent with Chapter 80.50 RCW.

11. The Creston Generating Station, if constructed and operated according to the conditions of this document and the Site Certification Agreement, will not result in discharges requiring a National Pollutant Discharge Elimination System Permit.

12. The Governor of the State of Washington will act within the purpose of the statutes contained in Chapter 80.50 RCW by approving certification of the proposed site, provided that such certification is conditioned upon the application of each and every limitation stated in this Order and the Site Certification Agreement.

13. The Council is authorized to and should submit the following recommendation and order to the Governor of the State of Washington. Certification should be contingent upon execution by the Governor and the Applicant of the Site Certification Agreement for the Creston Generating Station.

XIII. TRANSMISSION SYSTEMS

A. Introduction

1. CGS will require transmission for up to 2,032 MW of electric output. Water Power has proposed various methods for provision of power within its service area and integration of the balance of the power into the Northwest Power Grid for the use of other participants in the project.

2. The service needs of other participants lie to the west of Creston. The only subscriber with a service area to the east is Washington Water Power. However, since transmission devices are many and varied, involving exchanges, sales and a variety of modes of transmission, it is too simplistic to say that 75 percent of the power will flow only west and 25 percent will flow only east.

3. The Council has an obligation to view an application in its totality. An essential element of any thermal power plant is the provision of sufficient associated transmission facilities to connect that plant to the Northwest Power Grid. RCW 80.50.020(6)

B. Transmission Setting and Need for Integration

1. The site of the plant is located approximately five miles from the major Bonneville Power Administration (BPA) east-west corridor. On this corridor presently exist one steel double circuit 230 kV line, one steel single circuit 230 kV line and two wood pole 115 kV lines. The present BPA system is not adequate to integrate CGS output.

2. BPA has indicated its intention to upgrade this corridor to add a double circuit 500 kV line running the length of the route from the Douglas Switchyard near Grand Coulee to the Bell Substation near Spokane. Authorization for monies for this upgrade has been submitted in the budgetary request of BPA for Fiscal Year 1983. Energization of the upgraded line is scheduled to occur by July of 1987. (Exhibit 115).

RECOMMENDATION AND ORDER

Having considered the entire record in this proceeding, including the above Findings of Fact and Conclusions of Law, the Council hereby reports to the Governor of the State of Washington that the Application for Site Certification for the Creston Generating Station is in compliance with the applicable law and regulations, and recommends to the Governor that he approve the Application for Site Certification and certify the site for construction and operation of the Project contingent upon execution by the Governor and the Applicant of the Site Certification Agreement for the Creston Generating Station.

IT IS FURTHER ORDERED That the foregoing report and recommendation, together with the foregoing Findings of Fact and Conclusions of Law, shall be, and the same are hereby, forwarded forthwith to the Governor of the State of Washington for his consideration and action.

DATED at Olympia, Washington, and effective this 17th day of December, 1982.

WASHINGTON STATE ENERGY FACILITY
SITE EVALUATION COUNCIL

By Nicholas D. Lewis
Nicholas D. Lewis
Chairman