Washington Public Power Supply System

P.O. Box 968 3000 George Washington Way Richland, Washington 99352 (509) 372-5000

Docket No. 50-508

G03-82-1107
October 27, 1982

Mr. George W. Knighton, Chief
Licensing Branch No. 3
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington D. C. 20555

Dear Mr. Knighton:

Subject: SUPPLY SYSTEM NUCLEAR PROJECT NO. 3
ENVIRONMENTAL REPORT - OPERATING LICENSE STAGE
RESPONSE TO NRC ACCEPTANCE REVIEW QUESTIONS

Reference: Letter, D. G. Eisenhut to R. L. Ferguson, dated August 20, 1982

A set of questions addressed to the WNP-3 Environmental Report-Operating License Stage (ER-OL) was transmitted as Enclosure 3 to the referenced letter. Please find the Supply System's responses to the subject questions attached.

Included are pages indicating planned amendments to the ER-OL as appropriate to an individual response. Formal submittal of the amendment incorporating formal submittal and distribution of the amendment incorporating these question responses is expected by December 10, 1982.

Enclosed with these responses are copies of ER-OL references and a magnetic tape of meteorology data as requested by several of the questions. Responses to questions 290.01 and 291.13 are incomplete; however, it is expected that a response can be included in the planned amendment.

If you require additional information or clarification, please do not hesitate to contact K. W. Cook, Licensing Project Manager at WNP-3 (206 482-4428 Ext: 5436).

Very truly yours,

G D Bouchey

G. D. Bouchey, Manager
Nuclear Safety & Licensing

Attachments 1. Question Responses
2. 11 report, 1 figure, 1 data tape

cc: WG Albert	NRC	
D Smithpeter	BPA	762
LL Wheeler	NRC	

C001

ATTACHMENT

RESPONSES TO NRC OL ACCEPTANCE REVIEW
QUESTIONS OF AUGUST 20, 1982 (Re: WNP-3 ER-OL)

240.01 Q. Provide a summary of legal restrictions relating to water use imposed by local, state, regional or federal regulations.

A. In the State of Washington nonfederal permitting, licensing, and regulation of electrical generating facilities greater than 250 MWe capacity is consolidated with the Energy Facility Site Evaluation Council (EFSEC). The primary instrument of regulation is the Site Certification Agreement which is signed by the licensee and the Governor. As noted on Page 12.0-1, this agreement is in lieu of any other permits or certificates required by jurisdictions within the state. In developing the WNP-3 Certification Agreement, EFSEC heard testimony regarding water availability and steam flow from the Department of Ecology. Subsequently the Council included the following provisions in Article IV of the agreement:

1. The Supply System is hereby authorized to withdraw water for operation of the project in an amount not exceeding 52,000,000 gallons per day and a 30-day average of 48,500,000 gallons per day, from well water supplies of the Chehalis River within Sections 10 and 15, Township 17, Range 7, West, W.M., subject to applicable terms and conditions stated in this agreement. Instantaneous withdrawal may at no time exceed 80 cfs.

2. Said authorization shall be suspended at any time the river's net instantaneous downstream flow at the point or any of the points of withdrawal falls below the rate of 550 cubic feet per second, exclusive of any tidal influence.

The Council later clarified the latter provision with the following:

Under river flow conditions in excess of 550 cfs, water withdrawal from the Ranney Collector intake wells shall be no greater than the difference between the gauge daily average flow and 550 cfs, and under no circumstances greater than 80 cfs. When the gauge measurement drops below 550 cfs, the Supply System shall cease any withdrawal which would enable power production. However, the Supply System may continue to withdraw minimum flows to maintain a "hot standby" condition, not to exceed 2 cfs.

These restrictions are noted in Section 3.3. The agreement also requires the Supply System to meter withdrawals to provide a continuous record.

240.02 Q. Were rainfall and runoff data obtained at the four watersheds mentioned in the Site section of the ER (p. 2.2-1 and 2.2-2)? If so describe the data and how it was, or can be, used in evaluating the site runoff?

A. As part of the preoperational terrestrial ecology studies (see Subsection 6.1.4.3), monthly total rainfall measurements were made for the four watersheds between March 1978 and December 1980. These measurements actually provide ground-level rainfall comparisons by volume accumulations through a funnel. Instantaneous discharge from each of the four watersheds was estimated twice each month during the same period. Results of these observations are summarized in References 6.1-11 and 6.1-12 (see response to Question 291.03). This data from watersheds outside the zone of construction is not useful for evaluating runoff from the site which was cleared and grubbed in 1977.

240.03 Q. For a more complete and useful hydrologic description, the figures need to reflect all items mentioned in the text. The locations of specific river mile (RM) marks and gaging station mentioned in the description (p. 2.4-1) need to be marked on the figures.

A. See Figure 2.4-2, as amended.

240.04 Q. What is the exact location (please show in appropriate figures) of the place called "near the site" (pp. 2.4.1- and 2.4.2)?

A. In the context of the second, third, and fifth paragraphs of Subsection 2.4.1.1, the expression "near the site" refers to that reach of the Chehalis River from just below the Satsop River (~RM 21) to the plant makeup water well area (~RM 18). The text has been modified for clarification. In the sixth and eighth paragraphs of the same subsection, the meaning is evident from the text.

240.05 Q. For a verification of the estimated yearly flood values ("near the site"), was use made of the approximately 5 years of record now available at the lower Chehalis River gage site to evaluate the drainage area ratios used to make the estimates? If so, please describe the evaluation and if not make such an evaluation.

A. The environmental assessment of plant operation is most concerned with low flows in the Chehalis River in the vicinity of the intake (RM 18) and discharge (RM 20.5). The records obtained at the gage near RM 19 were used to evaluate correlations of low flows recorded upstream with drainage area. The resulting recurrence intervals for low stream flows are shown in Figure 2.4-3. This "verification" showed the earlier estimates to be conservative. For instance, as compared with earlier estimates (i.e., CP stage), the 10-year return, 7-day duration low flow went from 440 to 530 cfs. Verification of the relationship of drainage area to flood flows is not possible since flows greater than 9880 cfs were not recorded below the discharge site.

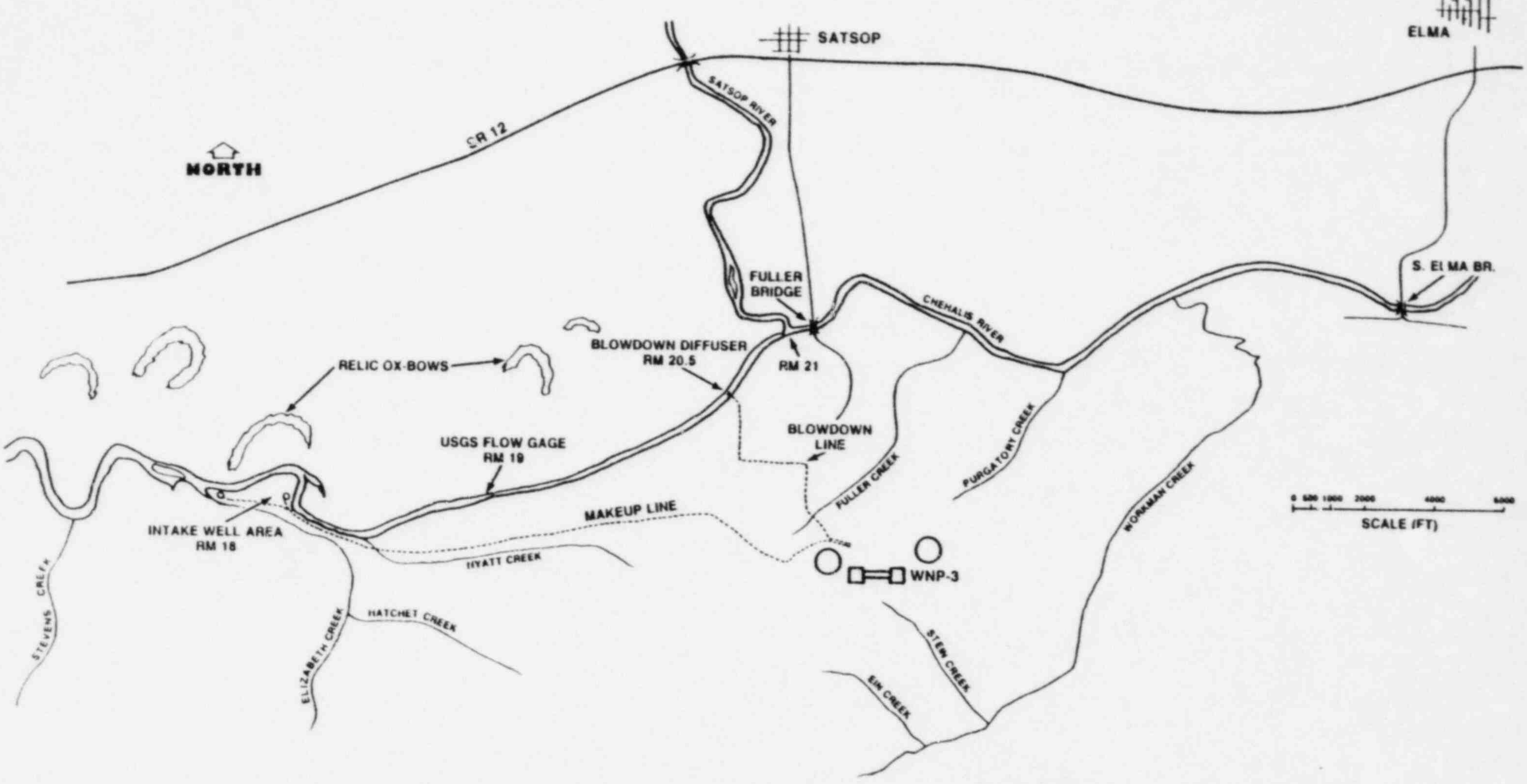
240.06 Q. The map in Figure 2.4-6 is not legible. Provide a more legible copy of this map.

A. A more legible copy of Figure 2.4-6 is provided with the original of this submittal.

240.07 Q. For an evaluation of ground water flow in the vicinity of the plant site, maps and cross sections are needed of the geologic formations and acquifer. These should encompass the plant site and nearest (by travel time of ground water) individual and public use of the ground water. Locations of these users should be indicated.

Provide information on the piezometric level, hydraulic gradients, permeabilities, transmissivities, storage coefficients, flow times, and adsorption properties for each of the soil or geologic units in the area of interest.

A. A map of the pre-construction water table and a generalized geologic profile, based on data reported in Appendix 2.5A of the Final Safety Analysis Report (FSAR), are provided in Figure 2.4-13. Estimated permeabilities for each of the formations are indicated on the figure. Three domestic wells nearest the plant are also shown on the figure. Two produce about 10 gpm from the upper terrace and the third produces about 20 gpm from the lower terrance deposit. There are no public water supplies in the zone of groundwater flows potentially impacted by plant operation. Groundwater travel time through the Astoria Formation to the nearest well, about 5,000 feet northward, is about 1900 years with a hydraulic gradient of 0.042 and a porosity of about 0.35 (FSAR Table 2.5-16). Flows entering the overlying Helm Creek Formation would be intercepted by Fuller Creek. Wells on the north side of the river would not intercept flows originating at the plant as the hydraulic gradient there is to the southwest.



AMENDED RE: Q 240.03

WASHINGTON PUBLIC POWER SUPPLY SYSTEM NUCLEAR PROJECT No. 3 OPERATING LICENSE ENVIRONMENTAL REPORT	HYDROLOGIC FEATURES NEAR WNP-3	FIGURE 2.4-2

2.4 HYDROLOGY

2.4.1 Surface Water

The WNP-3 project is located on a ridge 1.4 miles south of the confluence of the Chehalis and Satsop Rivers, and approximately 21 river miles (RM) upstream of the Chehalis River's confluence with Grays Harbor. Nominal plant grade is 390 ft mean sea level (MSL), about 370 ft above the Chehalis River floodplain. Makeup water for the Circulating Water System is supplied from induced infiltration of surface waters and groundwater within the Chehalis River by Ranney collector wells located slightly more than three miles downstream from the Satsop River confluence. Blowdown from the natural-draft cooling tower is discharged to the Chehalis River through a submerged multiport diffuser located 0.5 miles downstream from the confluence (see Section 3.4). The Chehalis River watershed is shown in Figure 2.4-1, and principal hydrologic features of the site vicinity are shown in Figure 2.4-2.

2.4.1.1 Chehalis River Hydrology and Physical Characteristics

The Chehalis River basin is a major river basin draining west-central Washington. The river heads in the Willapa Hills in southwestern Washington, flows generally northeastward to Grand Mound, and enters into Grays Harbor at Aberdeen. The higher portions of the river basin, where the river has an average slope of about 16 feet per mile, are rugged and densely forested. The slope flattens to about 3 feet per mile near the city of Chehalis and then 2 feet per mile near Satsop. The river and its tributaries have a drainage area of about 2,115 sq mi; the total area draining to the site is about 1,765 sq mi, of which approximately 300 sq mi is drainage area of the Satsop River.

A stream gage for the Chehalis River was installed and operated at the site by the United States Geological Survey (USGS) in 1977 using temporary facilities; permanent facilities were constructed in 1981. There are no other long-term gaging station records for the lower reach of the Chehalis River. However, long-term records are available for USGS gaging stations on the Chehalis at Grand Mound (1929-present) (RM 59.9), Porter (1952-1972; 1972-1979)(RM 33.3) and on the Satsop River near Satsop (1929-present)(RM 2.3 upstream from mouth). River flows near the discharge diffuser are estimated by adding the Satsop River flow to the flow in the Chehalis River at Porter or Grand Mound adjusted to the site by drainage area ratio. | 1

The annual mean flow near the diffuser is 6,630 cubic feet per second (cfs); the monthly mean flow ranges from 730 cfs in August to 14,865 cfs in January. The minimum monthly flow, 432 cfs, occurred in August 1951, while the maximum monthly flow, 40,876 cfs, occurred in December 1934. Estimated monthly average flows in the Chehalis River just below the confluence of the Satsop are shown in Table 2.4-1. As indicated in the table, the flow in the river is quite variable and reflects the seasonal rainfall distribution within the basin. Also listed in Table 2.4-1 are the record minimum daily flows for each month. | 1

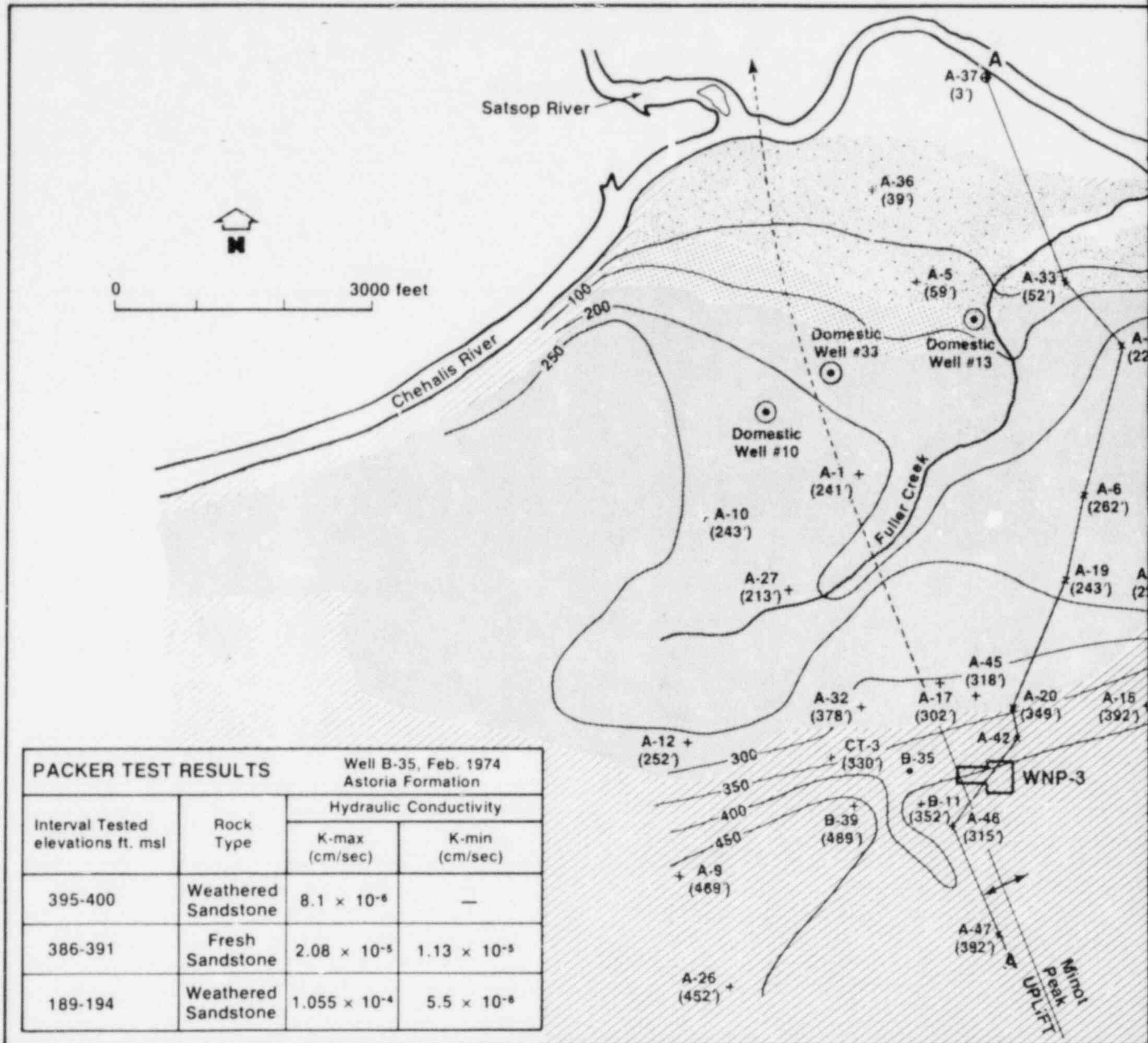
The lowest daily flows in the site vicinity are normally expected in August and September. The one percent non-exceedence flows for these two months are 500 and 460 cfs, respectively. The once-in-10-year, 7-day duration low flow for the Chehalis River downstream of the Satsop confluence is 530 cfs based on recorded flow data for the period 1930-1981 (WNP-3 FSAR Appendix 2.4A). The 7-day low-flow frequency curve is shown on Figure 2.4-3.

Floods occur in the region primarily in December and January, but damaging floods may occur as early as the beginning of November and as late as the end of April. The estimated momentary maximum flood flow in the Chehalis
1| River below the Satsop, 97,100 cfs, occurred on December 21, 1933. The annual momentary maximum flows from 1930 to 1979 are listed in Table 2.4-2, and a frequency analysis of flood flow data is presented in Figure 2.4-4.

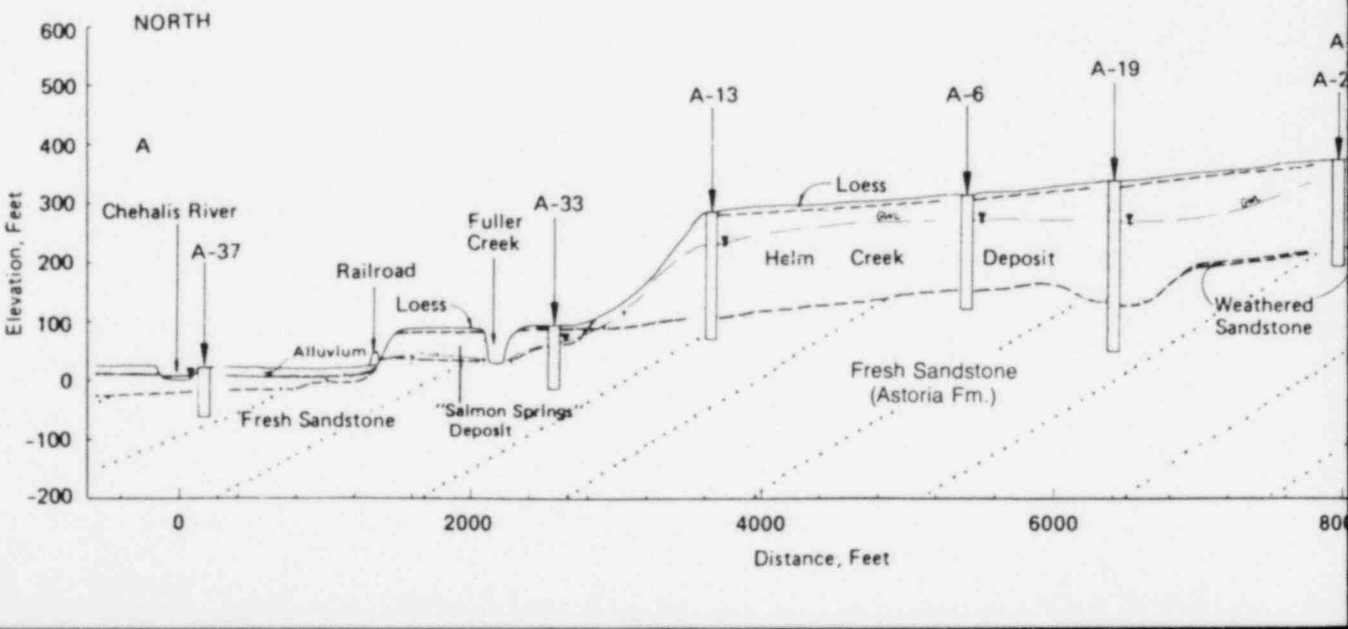
The Chehalis River channel at the site is approximately 250 feet wide and varies in depth from a few feet during low flow to greater than 30 feet during flooding conditions when the entire flood plain is inundated. Channel geometry varies considerably in the site vicinity. Figure 2.4-5 shows river cross-sections in the vicinity of the blowdown diffuser (see Subsection 3.4.4). River bed elevations near the site are variable, ranging from mean sea level just downstream of the Satsop confluence to approximately 19 feet below MSL just upstream of the confluence. The channel gradient or slope from about 10 miles upstream of the site to Grays Harbor (21 miles downstream of the site), is approximately 0.04 percent. The Satsop River exhibits a much steeper slope which ranges from approximately one percent in the vicinity of its confluence with the Chehalis River to nearly 15 percent at its head waters in the Olympic Mountains.

The velocity of the Chehalis River is quite variable. During low-flow conditions (< 200 cfs) upstream of the Satsop confluence, velocities of less than 0.2 fps are experienced. For the reach of river downstream of the Satsop confluence, velocities increase to approximately 0.4 fps during low-flow conditions (~ 400 cfs) due to the Satsop River inflow. During flood conditions (> 30,000 cfs) channel velocities reach 6 to 7 fps.

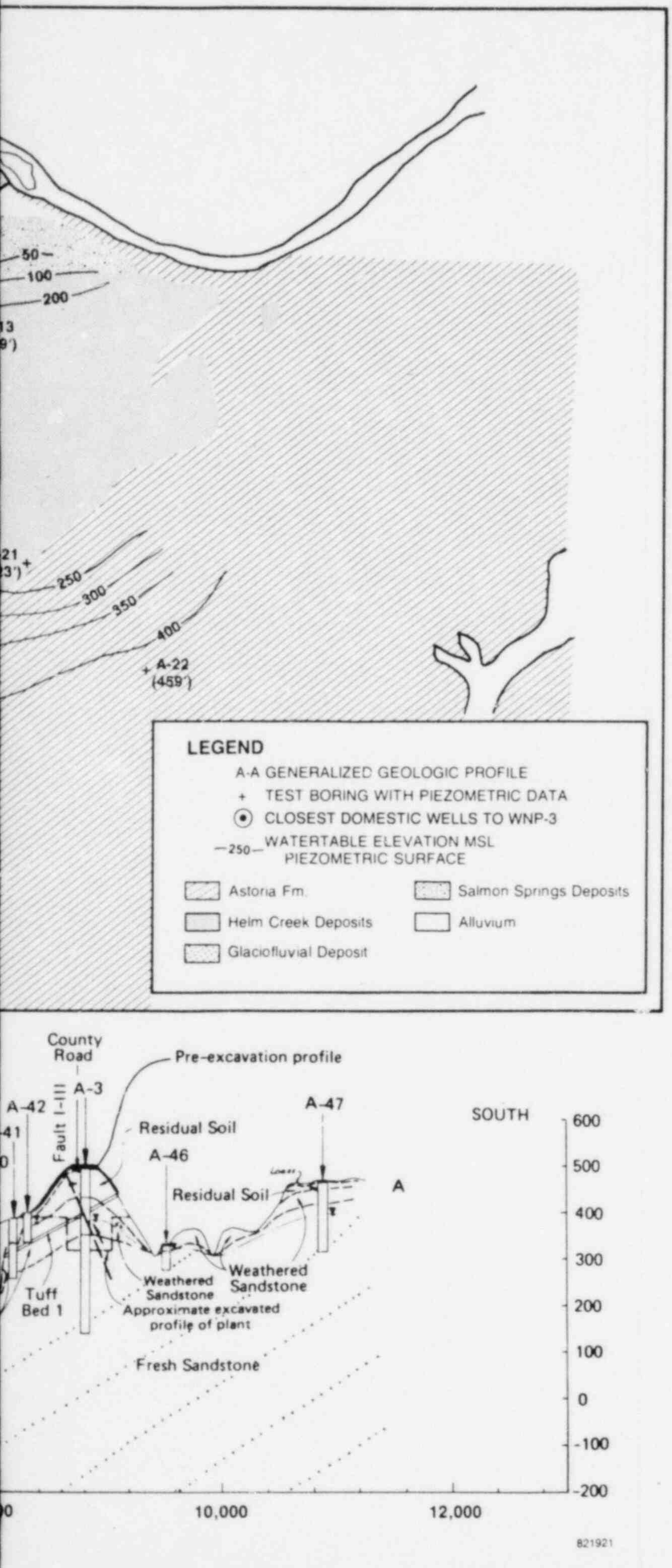
River flow in the site vicinity may also be influenced by tidal action. The degree of tidal effect depends on the river flow and the height of the ocean tide. The influence is most noticeable during spring high tides and low river flows, which in combination reduce and sometimes reverse the current velocity. During periods of high streamflow, the tidal effects on the river stage and flow are considerably less pronounced. Natural bathymetric features also affect river flow and tidal propagation in the river; a riffle area (approximately River Mile 19) reduces the effect of tidal propagation near the site area. In a 1975 field survey, the daily average flow ranged from 1,040 to 1,610 cfs; no reversals were observed during high tides above the riffle area, although current velocity at the riffle was reduced to about 10 percent of its steady flow velocity.(1) In 1977, when the daily average flow was 570 cfs, the velocity at River Mile 20.5 was decreased to 15 percent of the steady flow speed during peak high



PACKER TEST RESULTS		Well B-35, Feb. 1974 Astoria Formation	
Interval Tested elevations ft. msl	Rock Type	Hydraulic Conductivity	
		K-max (cm/sec)	K-min (cm/sec)
395-400	Weathered Sandstone	8.1×10^{-6}	—
386-391	Fresh Sandstone	2.08×10^{-5}	1.13×10^{-5}
189-194	Weathered Sandstone	1.055×10^{-4}	5.5×10^{-6}



RE: Q 240.07



WASHINGTON PUBLIC POWER SUPPLY SYSTEM
WNP-3 ER-OL

PIEZOMETRIC SURFACE AND GEOLOGIC PROFILE OF WNP-3 SITE

FIGURE 2.4-13

290.01 Q. Provide a discussion of the biological significance of the predicted fogging and icing as well as the drift deposition predicted to occur from operation of the cooling towers.

A. Subsection 5.1.4.1 will be amended to include judgements regarding the biological significance of cooling tower plume effects. We are initiating a reevaluation of the drift deposition pattern. The present estimates are based on ER-CP meteorology and water chemistry. Though the deposition pattern will be altered slightly the magnitudes will be essentially unchanged. An amendment to Subsection 5.1.4.2 will incorporate the reevaluation and discuss biological effects.

290.02 Q. Provide a copy of the following reference related to the BPA transmission network: The Role of the Bonneville Power Administration in the Pacific Northwest Power Supply System, Appendix B, BPA Power Transmission, Bonneville Power Administration, Department of the Interior, July 22, 1977.

A. This report is one volume of a five-volume draft environmental statement on the role of the BPA. Rather than copy the entire 300-page report, we are providing the Table of Contents and the assessment of environmental impacts of power transmission (Chapter VII) with the original of this submittal. Only a portion of what is provided is used as Reference 3.9-2.

291.01 Q. In addition to other requested information provide a summary and brief discussion in table form, by section, of differences between currently projected environmental effects (including those that would degrade, and those that would enhance environmental conditions) and the effects discussed in the environmental report submitted at the construction permit stage.

A. See Table Q291.01

291.02 Q. Provide a summary of the results of the angler use studies for the 16-km section of the Chehalis River between South Elma bridge and the mouth of Smith Canal. Emphasis should be placed on activity observed nearest the site.

A. The 1978-1981 angler use studies are summarized in Figure 5-2 and Table C-3 of the 1981 report of environmental studies at the site. This report is the latest of a series and is provided with the earlier reports requested in Question 291.03.

291.03 Q. Provide copies of the following references: 6.1-9, -10, -11, -12, -20, and -23.

A. The requested references from Section 6.1 are enclosed with the original of this submittal. As noted in the response to the preceding question, also included is a copy of Environmental Monitoring Program, 1981, Washington Public Power Supply System Projects Nos. 3 and 5, Envirosphere Company, Bellevue, Washington, 1982.

291.04 Q. Provide a discussion of the utilization of the Chehalis River by white sturgeon. Identify any critical habitat for this species that might occur in the vicinity of the site. Summarize this species abundance and distribution in the Chehalis River with particular emphasis in the lower river stretches.

A. Subsection 2.2.2.6 (now Subsection 2.2.2.5) has been amended with a discussion based on available information.

291.05 Q. Amend Figure 3.4-6 by providing the elevation of the intakes of each of the circulating water intake pumps located in the Ranny Well intake cassions.

A. Figure 3.4-6 has been amended.

291.06 Q. Figure 3.4-6 shows a service water pump. Figure 3.4-1 shows flow to the RBCCWHx and the service water pump drawing from the circulating water pumps located downstream of the cooling tower. Describe the use of the service water obtained from the service water pumps in the Ranny Collectors.

A. Service water pumps in the intake well caissons supply water to cool the lube oil for makeup water pump motors and pressurize the bearing seals.

291.07 Q. Indicate if Corbicula sp. has been collected from the Chehalis River in the vicinity of the site. If present, provide an estimate of the number of these organisms per square meter for each year data is available. Describe procedures and measures taken or planned that will deny access to critical plant components, or control fouling by these organisms during both construction and operation of the station. Particular emphasis should be placed on evaluating the potential for clams in the system that entered during the construction phase.

A. Corbicula sp. has been found in natural substrate (i.e., core) samples collected in the Chehalis River in the site vicinity. The estimated range of densities for each year of the preoperational sampling program are as follows:

	No. of Values	Density (No./m^2)
1976	2	3
1977	22	16-212
1978	8	27-109
1979	4	27-163
1980	0	0

Although Corbicula sp. are present in the Chehalis River, it is unlikely that the organism could enter the plant. Construction water used for preoperational testing and cleaning of plant components and systems was supplied from a well. Makeup water for plant operation will be supplied from two Ranny well collectors on the south bank of the Chehalis River (see Subsection 3.4.5). Because the intake laterals are approximately 100 ft below the river bed, it is extremely unlikely that Corbicula larvae could pass through the aquifer and into the circulating water system. Because the intake system design precludes entry of Corbicula sp., no special operating procedures are planned.

291.08 Q. Provide additional detail for the supplemental cooling system (Subsection 3.4.3). Indicate its location on a site map. Provide a schematic drawing of the unit. Given an estimate of its usage on an annual basis. Provide the criteria that determine its usage.

A. The supplemental cooling system is a shell and tube heat exchanger with makeup water flow through the tubes. Its location, just west of the WNP-3 cooling tower, is shown on Figure 3.1-3. A schematic drawing of the unit is included on Figure 3.4-1. Usage is required by the thermal effluent limitations of the NPDES Permit (see Appendix A) which are noted in Subsection 5.1.1. These require that when the ambient river temperatures are 20°C or less, the discharge temperature must be 20°C or less and not exceed the river temperature by more than 15°C. Additionally, when the river temperature exceeds 20°C, the discharge temperature can not exceed the river temperature. Based on average conditions, use of the supplemental system will be required during June through September.

291.09 Q. Provide the location on a map of the blowdown diffuser in relation to the Chehalis River, Ranny Collectors and the plant. Also provide an overhead view of the section of river in which the diffuser is located. On this figure differentiate between the blowdown diffuser section and the supply pipeline.

A. See Figure 2.4-2, as amended, for relative locations of the intake and diffuser. Figure 3.4-7 provides a plan view of the river with diffuser.

291.10 Q. Section 3.4.4 describes a 32-foot multiport diffuser. Figure 3.4-4 shows a 34-foot long length of pipe that is presumably the diffuser since section A-A shows a discharger riser. Resolve this difference and indicate on Figure 3.4-4 that portion of the pipeline that is the blowdonw diffuser.

A. The diffuser section was fabricated as a 34-ft pipe with one foot extending beyond the outside, or northernmost, riser and three feet beyond the inside riser. Because the diffuser manifold is the same size (18-inch) as the pipe to which it is coupled, the length is a field installation detail. It was originally planned that the diffuser would be fabricated as a 32-foot section. The important dimension is the 30 feet between the inside and outside risers (45 spaces @ 8" ea.). The diffuser is therefore most appropriately referred to as a 30-ft diffuser. Conforming changes/notations been made to Subsection 3.4.4 and Figure 3.4-4.

291.11 Q. Provide the anticipated frequency of velocities less than 0.3 feet/sec in the Chehalis River (Subsection 5.1.1). Estimate how often and approximate duration this will occur on an annual basis.

A. Velocities less than 0.3 ft/sec are related to the coincidence of low stream flow and high tides. On the average, occurrences will be limited to the months of July through October with the greatest number in August. It is estimated that in August and September there will be about 40 and 30 tides, respectively, resulting in 30-minute durations in which the downstream velocity at the diffuser is less than 0.3 ft/sec. August and September may each have two such occasions of 120-minute duration, the longest anticipated in an average year. July and October occurrences of greater than 30 minutes duration are estimated to be 18 and 10, respectively.

291.12 Q. Reference is made to the total run of the coho and chum salmon (Subsection 5.1.3.1). Provide the estimates of total run for these two species that were used in this analysis. Indicate how these estimates were obtained.

A. An estimate of potential loss of coho and chum salmon due to possible dewatering of Elizabeth Creek was made by the NRC staff and reported on Page 5-30 of the WNP-3 Final Environmental Statement (NUREG-75/053; WNP-3 ER-OL Reference 5.1-3). The total combined Chehalis River run of these two species, on which the calculation was based, was estimated in Table 2.7-42 of the WNP-3 Environmental Report - Construction Permit Stage. In 1973 the total run of coho and chum ranged from 12,180,000 to 26,570,000 per year.

291.13 Q. If available, provide (Subsection 2.2.2.6) on an annual basis some indication of the magnitude of runs past the site for all species and runs of salmon, the steelhead trout, and the white sturgeon.

A. We have requested more recent estimates of fish runs from the Washington State Departments of Fisheries and Game. When the information is available to us we will incorporate it in appropriate amendments to Subsection 2.2.2.

291.14 Q. Section 2.7 discusses only the nearest residence. Locate other nearby noise sensitive areas, e.g., schools, hospitals.

A. The nearest facilities which would be sensitive to noise (e.g., schools, hospitals, nursing homes) are located in Elma more than 3 mi NNW from the plant. These facilities are north of State Route 12, a limited access highway.

291.15 Q. Is any air quality permit or approval needed for any aspect of the project?

A. As explained in Section 12.0, the Site Certification Agreement (SCA) issued by the Energy Facility Site Evaluation Council (EFSEC) in October 1976 is in lieu of other permits required by the state or lower jurisdictions. EFSEC approval was sought and obtained on several occasions during the construction phase to allow open burning of slash from land clearing activities. Similar approval was obtained for an onsite incinerator for disposal of combustible construction debris. As issued, the SCA set limitations on emissions of nitrous oxides, sulfur dioxide, and ash from the emergency diesel generators. In April 1982 an amendment to the SCA deleted the emissions limitations and imposed a 0.5 percent limitation on sulfur content of the fuel. No other approvals related to air quality are required.

291.16 Q. Have any evironmental impact appraisals been performed by or for any other agency?

A. Impact appraisals have been performed by or for other agencies for specific project features:

a) To support a modification of the NPDES Permit in 1979, the Supply System assembled a body of information related to the thermal and chemical effects of the anticipated blowdown discharge. Much of this information has been cited in Sections 5.1, 5.3, and 6.1.

b) In establishing NPDES Permit conditions EFSEC reviewed the Supply System submittal and those of others and prepared findings in October 1979 which are essentially an impact appraisal of this project feature.

c) Grays Harbor County had a consultant prepare an environmental impact statement in July 1980 as part of a procedural step under the State Environmental Policy Act (SEPA). The action under review was the county's proposed improvements of Key Road and Minkler Road which provide access to the site from the west. The EIS addressed the proposed road improvements.

d) In March 1981 the Supply System prepared a supplemental environmental assessment for Grays Harbor County on the replacement of the Chehalis River-Keys Road Bridge which was part of the above-noted road improvements. This assessment was required of the county by the U.S. Coast Guard which had approval authority on the bridge work.

291.17 Q. Provide References 2.4-1, -3, and -5.

A. Copies of the requested references are enclosed with the original of this submittal.

291.18 Q. At the time of the site visit make Reference 2.4-6 available for examination.

A. The requested reference will be available.

TABLE Q291.01

SUMMARY OF PROJECTED ENVIRONMENTAL EFFECTS OF WNP-3 OPERATION (ER-CP vs. ER-OL)

	ER-CP	ER-OL
Physical Parameters of Heat Dissipation System	P. 5.1-4a - 5.1-6 and 5.1-9 - 5.1-11 - 12.6 cfs max blowdown with 4.8×10^7 Btu/hr from two units - 53 cfs consumptive use (two units)	P. 3.3-1 and 3.4-1 - 6.3 cfs max blowdown with 3.6×10^7 Btu/hr (without supplemental cooling) from one unit. - 30 cfs consumptive use (one unit).
Biological Effects of Heat Dissipation System		
Intake Structure Effects	P. 5.1-7 - 5.1-8 - Ranney wells eliminate potential fish impingement and entrainment problems. - River water level fluctuations from induced filtration of surface water expected to be undetectable from natural fluctuations. - Little effect on spawning and rearing habitat anticipated.	P. 5.1-2 No change.
Effects of Thermal Effluents Periphyton and Phytoplankton	P. 5.1-12 - 5.1-15 - Population dominated by diatoms. - Rapid dilution of discharge ensures no acute or chronic effect on diatom community.	P. 5.1-3 - 5.1-5 No change.
Benthic Macroinvertebrate and Zooplankton	- Thermal increments associated with discharge inconsequential compared to upper temperature limits for majority of organisms known to inhabit the river.	- Sessile organisms in area encompassed by 0.6°C (0.012 acres) isotherm may be affected. The ecological consequences of such a change are judged to be negligible.
Fish	- Salmonid species most sensitive to thermal discharge. - Limited salmonid spawning near discharge, thus effect on embryogenesis and early develop ment are not significant.	No change.

TABLE Q291.01 (contd.)

	ER-CP	ER-OL
Fish (contd.)	- No adverse effect on juvenile salmonids, due to high river flow and low thermal increments when this life stage is present in the Chehalis River. - Adults can avoid high temperature areas which extend over only a small portion of the total river width. Adults move along the shorelines away from the center stream discharge. - Resident populations can tolerate temperatures above 26.9°C (80°F).	
Cold Shock	- Maximum area of river which have temperatures raised by 0.5°F is 800 ft². Adverse impact on fish population unlikely.	- No change for fish. Potential impact to sessile benthic organisms in a small area.
Effects on Water Quality and Aquatic Habitat	P. 5.1-16 - No decrease in dissolved oxygen levels - Little or no addition of nutrients - Little siltation from discharge due to low volume. - No significant impact on habitat; discharge mixing area is very small.	P. 5.1-5 - 5.1-6 - No change.
Effects of Liquid Chemical and Biocidal Discharges	P. 5.4-1 - 5.1-12 - EPA criteria allows discharge of free residual chlorine (FRC) 2 hours/day, dilution, the FRC at 10 ft from diffuser is 0.02 mg/l with no effect on aquatic biota.	P. 5.3-1 - 5.3-9 - EPA criteria allows discharge of total residual chlorine (TRC) 0.002 mg/l. Assume TRC discharge at detection level (i.e. 0.05 mg/l) then TRC reduced to 0.002 mg/l level in 22 minutes: exposes 0.5 acres of river to greater concentrations. A small but insignificant portion of benthic habitat may be affected.
	- Maximum sulfate under "worse case condition" = 27 mg/l in river - no measurable effectto aquatic system expected.	- Maximum concentration = 60 mg/l at edge of mixing zone. Conclusion still the same as at ER-CP stage.

TABLE Q291.01 (contd.)

	ER-CP	ER-OL
Effects of Liquid Chemical and Biocidal Discharges (contd.)	- Increased of sodium river concentration from 6-20 mg/l depending upon river flows: no determintal effect on aquatic biota expected.	- No change.
	- Increase total dissolved solids at edge of mixing zone from 70 to 160 mg/l. Effect of increase not expected to be significant.	- No change.
	- Copper not addressed specifically.	- Ambient copper range from 2.0-8.0 ppb. Concentration at edge of mixing zone ranges from 3.9-13.3 ppb. Benthic organisms in 0.1 acre area may be affected.
	- Nickel not addressed specifically.	- Ambient nickel ranges from 1.0-14.0 ppb. Concentration at edge of mixing zone ranges from 2.7-20.0 ppb. No measurable effect on aquatic organisms expected.
Atmospheric Effects	P. 5.1-1 - 5.1-4a	P. 5.1-6 - 5.1-8
Plume and Fog Formation	- No significant tower-induced ground fogging or icing incidents. Frequencies are considered too small to effect flora or fauna.	- No change.
	- Elevated plumes 3 km about 2300 hr/yr.	- Elevated plumes 3 km about 700 hr/yr.
Drift Deposition	- Peak salt deposition 18.2 lb/acre/year at 1000' ENE from site. - Bulk of drift to fall on site property, thus no damage to crops. - No significant damage to flora or fauna due to cooling tower operation.	- Drift decreased significantly due to only one unit operation.

TABLE Q291.01 (condt.)

	ER-CP	ER-OL
Radiological Effect of Operation Routine Operation	P. 5.2-1 - 5.3-10, C-35 - C-38 - Adult thyroid dose = 2.6 mrem/yr/unit - Adult population dose to thyroid = 3.6 man-rem/yr/unit	P. 5.2-1 - 5.2-4 - Adult thyroid dose = 1.0 mrem/yr - Adult population dose to thyroid = 4.7 man-rem/yr
Plant Accidents	P. 7.1-1 - 7.1-47 - Classes 1-8, max exposure at site boundary = 0.03 rems whole body (large LOCA); max population dose = 6 man-rem (object drop on core)	P. 7.1-1 - 7.1-18 - Classes 1-8, max exposure at site boundary (EAB) = 0.57 rems whole body (waste gas decay tank rupture); max population dose = 83 man-rem (waste gas decay tank rupture). - Class 9 (more severe than design basis) not evaluated at CP.
Other Effects of Operation		
Sanitary Waste Discharges	P. 5.5-1 - No effect from small discharge meeting State of Washington treatment standards.	P. 5.4-1 - No effect from discharge of treated waste to drainfield or to river.
Operation and Maintenance of Transmission Lines	P. 5.6-1 - No effect to humans or natural resources from operation of substation-to-plant lines.	P. 5.5-1 - No change.
Noise	P. 5.7-1 - No disturbance to residences or public facilities.	P. 2.7-1 - No change.

Re: Q 291.04

Steelhead comprised the fourth and third most frequently captured salmonid species in 1979-1980 and 1978, respectively. The highest densities of 0+ steelhead trout occurred in Satsop River catches beginning in August for 1976, 1977 and 1978. Extremely low river levels prevented Satsop River sampling in 1979. Young-of-the-year (age 0+) steelhead trout from other sampling areas generally increased in mean fork length from 32 mm in May to 77 mm in October 1979. Mean condition factors for these fish ranged from 0.85 in May to 1.20 in September 1979. Similar lengths and condition factors were recorded in 1980.

Most of the juvenile steelhead encountered were of the 0 + age class. This age class is common in the study area from June to October with peak abundance occurring in June and July. A smaller number of yearlings and older steelhead have been captured in the study area, most often from March through May. The 1+ and 2+ age class trout use areas in both the Satsop and Chehalis Rivers above the discharge area.

No seasonal peak in 1+ age class and older trout could be detected; nor were any spawning fish sampled. Washington Department of Game statistics indicate that the winter steelhead run in the Chehalis is larger than the summer run.

No distributional preferences have been observed for juvenile steelhead in the study area. Yearling and older trout have shown some preference for fast water areas with gravel substrate, as in sections of the holding area.

White Sturgeon (*Acipenser transmontanus*, Richardson)

White sturgeon is another species of commercial and sport value to the Grays Harbor region. Although some can be found in the ocean and ascend rivers to spawn, the species is not truly anadromous. White sturgeon utilize upper Grays Harbor and the lower Chehalis River during the entire year with the greatest abundance occurring from late September through early April when high river flows and low salinities prevail.[26] The greatest numbers in the river are found below Montesano (~RM 14);[27] a survey revealed that the reach below Montesano was the section most often fished by sturgeon fishermen.[28] Although not substantiated by field studies, adults may spawn in the Chehalis River during spring and early summer as gravid fish are occasionally noted in catches.[26] No sturgeon have been sampled in five years of preoperational studies and no critical habitat has been identified in the vicinity of the site.

Commercial white sturgeon landings in Grays Harbor between 1952 and 1975 have ranged from 8,200 (1952) to 81,300 lbs. (1962) and averaged 28,300 lbs.[28] Nearly 80 percent of the poundage is taken in September through November.[26]

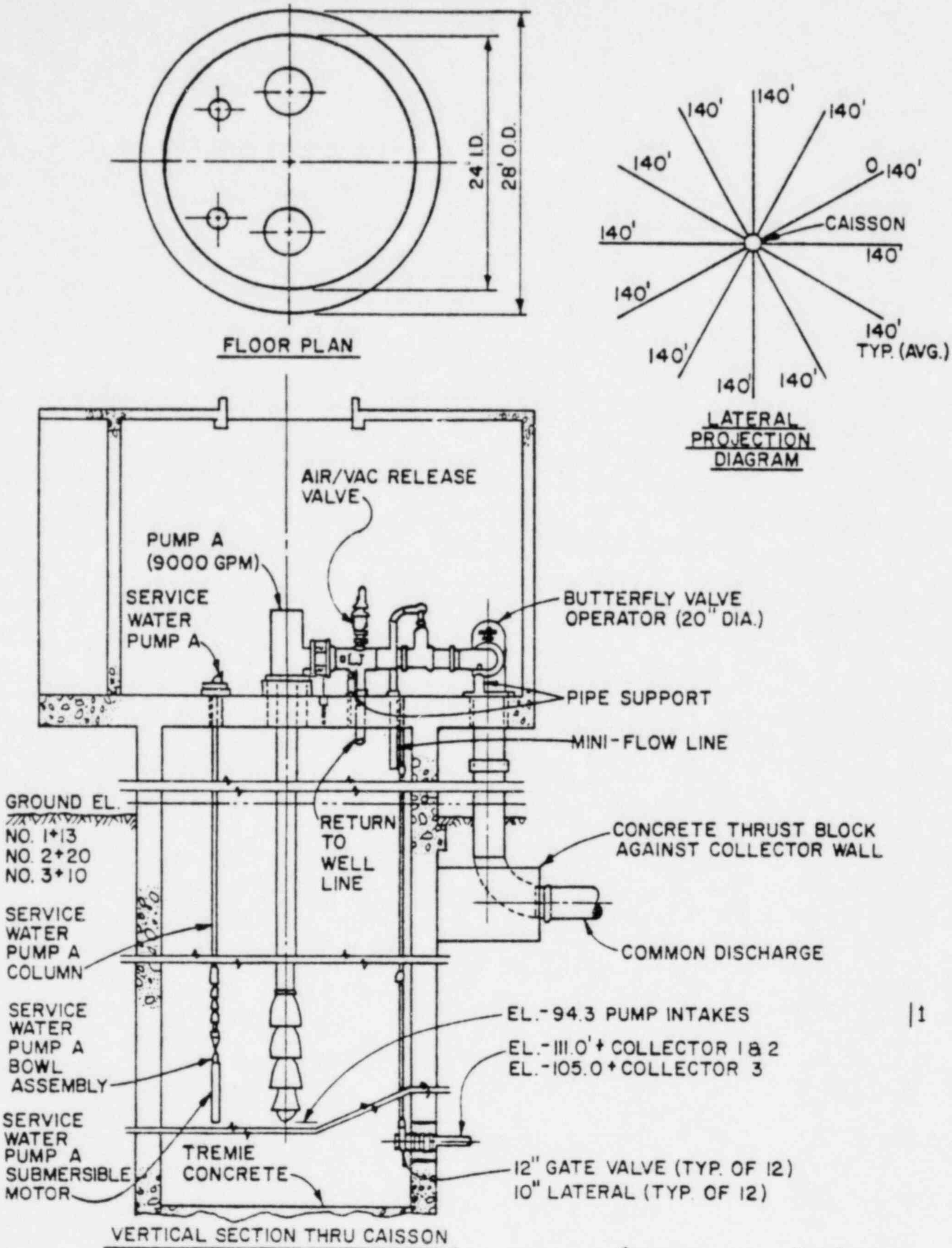
Re: Q 291.04

References for Section 2.2 (contd.)

26. Deschamps, G., S. G. Wright, and R. E. Watson, Fish Migration and Distribution in the Lower Chehalis River, Wash. Dept. of Fisheries Tech. Rept. No. 7, Olympia, Washington, 1971.

27. Personal Communication, J. E. Mudge, Supply System, with D. Stone, Wash. Dept. of Fisheries, September 9, 1982. 1

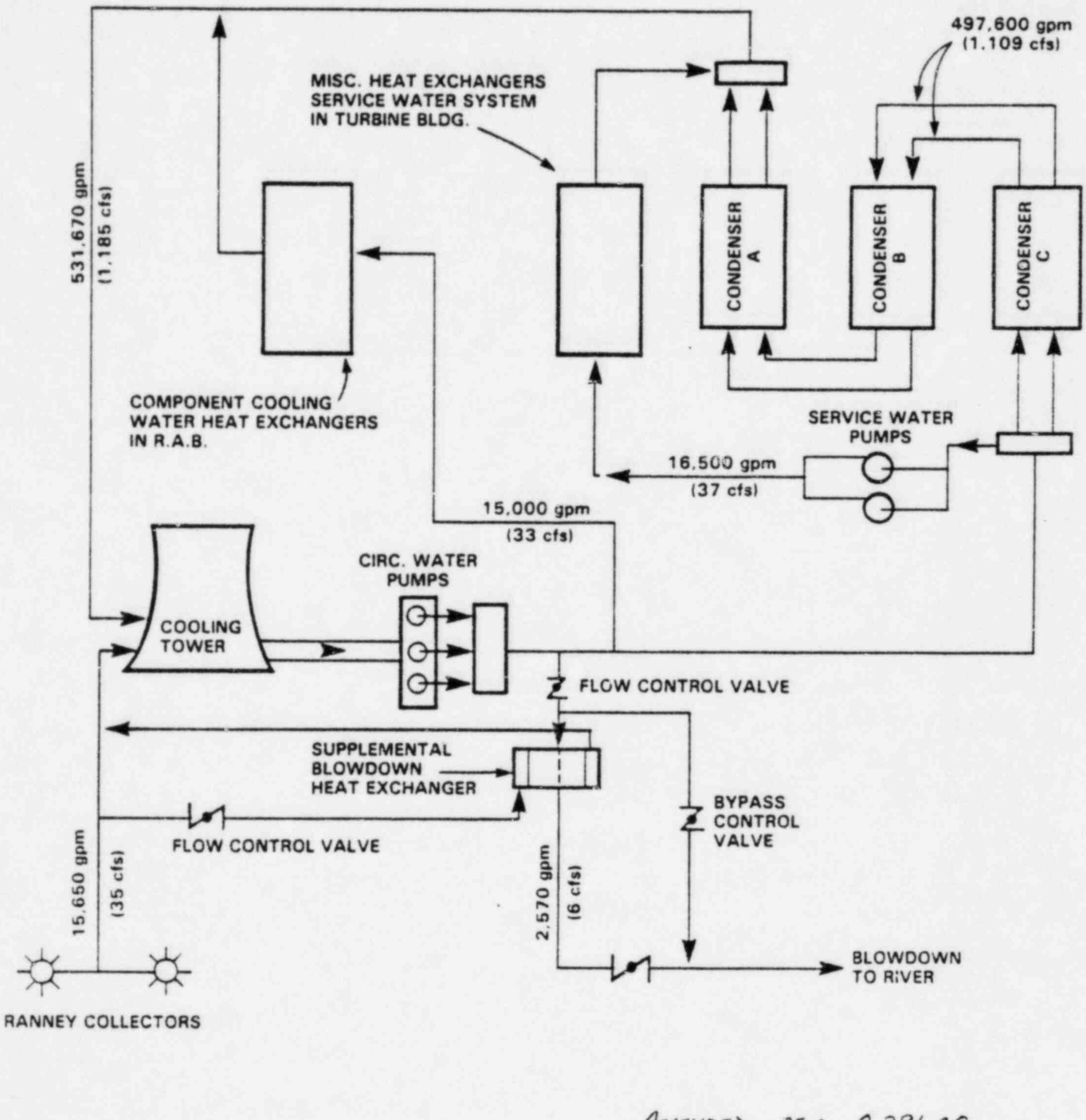
28. Zook, W. J., "Notes on the Sport Fishery for White Sturgeon (Acipenser Transmontanus) on the Chehalis River," In: Wash. Dept. of Fisheries Progress Rept. No. 8, p. 24-31, Olympia, Washington, 1976.



|1

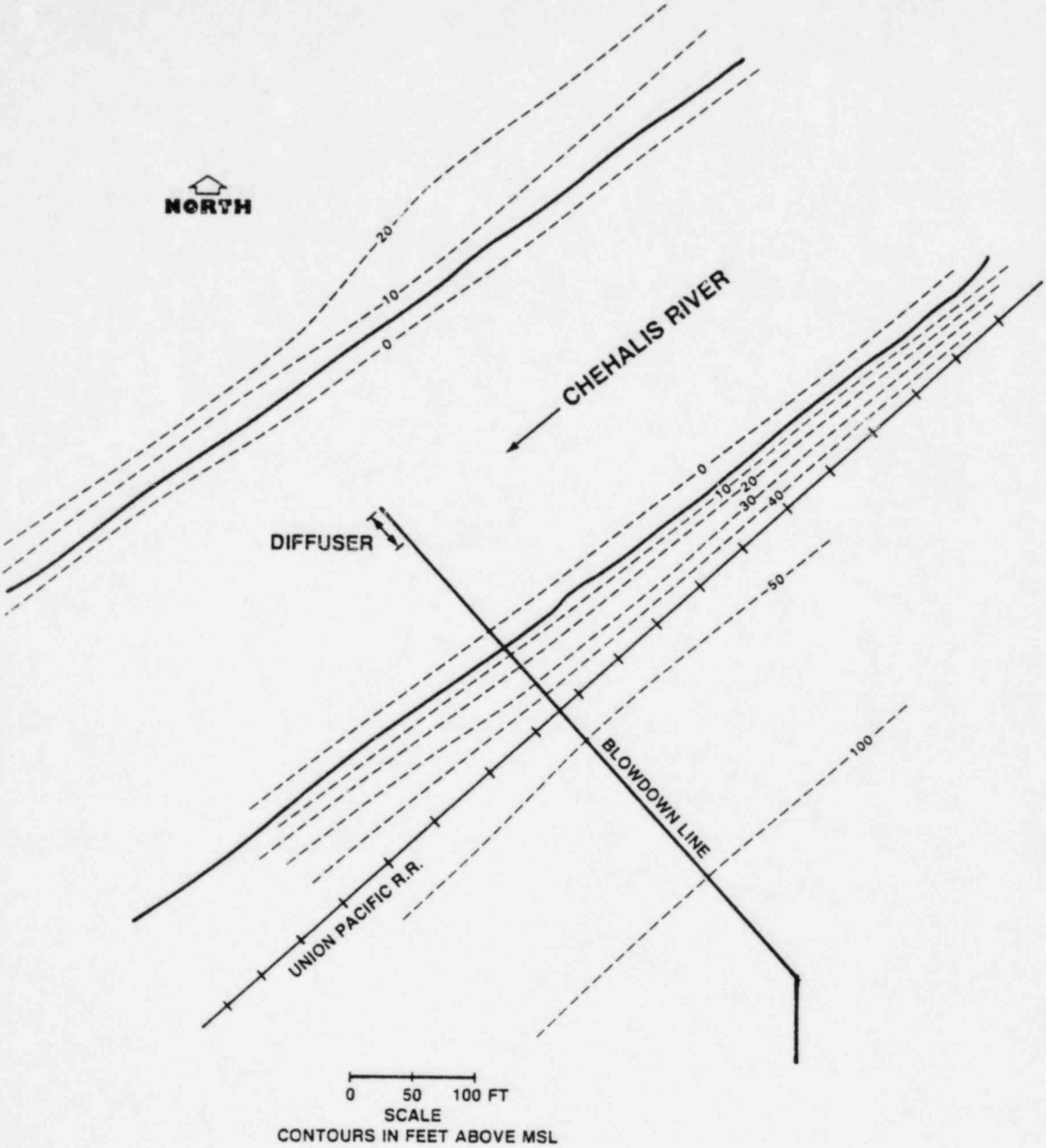
AMENDED RE: Q 291.05

WASHINGTON PUBLIC POWER SUPPLY SYSTEM NUCLEAR PROJECT No. 3 OPERATING LICENSE ENVIRONMENTAL REPORT	RANNEY GROUNDWATER COLLECTOR	FIGURE 3.4-6



AMENDED RE: Q 291.08

WASHINGTON PUBLIC POWER SUPPLY SYSTEM NUCLEAR PROJECT No. 3 OPERATING LICENSE ENVIRONMENTAL REPORT	SCHEMATIC DIAGRAM OF CIRCULATING COOLING WATER SYSTEM	FIGURE 3.4-1



AMENDMENT RE: Q 291.09

WASHINGTON PUBLIC POWER SUPPLY SYSTEM NUCLEAR PROJECT No. 3 OPERATING LICENSE ENVIRONMENTAL REPORT	PLAN VIEW OF DISCHARGE DIFFUSER	FIGURE 3.4-7

Re: Q 291.10

The water droplets separate from the air flow within the drift eliminator and collect and fall back to the fill surface. The drift eliminator system is guaranteed to limit the drift loss to 0.003 percent of the design flow. Table 3.4-2 lists the design parameters of the cooling tower. Figure 3.4-3 presents the tower performance under design conditions.

The concentration of dissolved solids within the circulating water system is controlled by continuous blowdown (at an annual average rate of 3.7×10^6 gpd) from the cooling tower basin. Blowdown flow will be determined by daily analyses of the circulating water chemistry; the flow will be adjusted by a remotely operated butterfly valve. A continuous makeup supply is provided to the system from the Ranney collectors for the loss due to evaporation, blowdown and cooling tower drift.

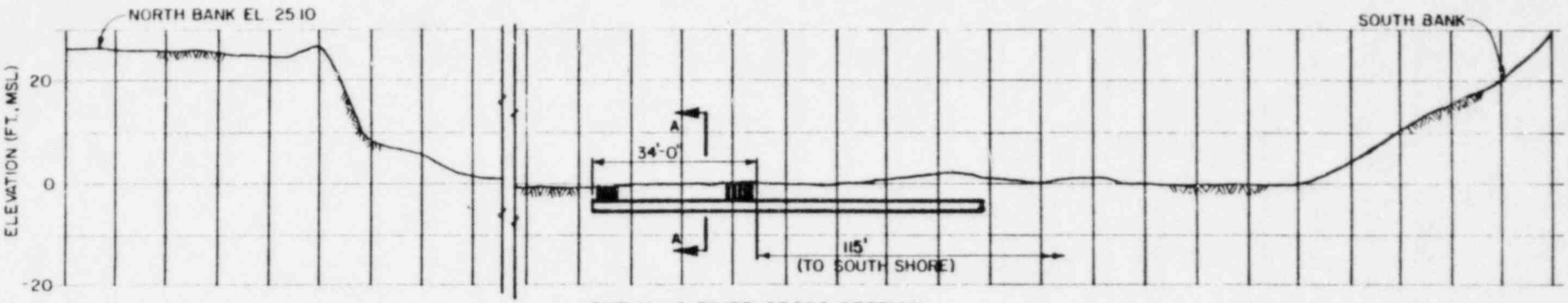
3.4.3 Supplemental Cooling System

Supplemental cooling of the blowdown water is provided by a countercurrent heat exchanger and associated control and monitoring equipment (see Figure 3.4-1). The heat exchanger uses plant makeup water as the cooling medium and is sized for a 3°F approach to the makeup (well water) temperature. The supplemental cooling system is constructed primarily of Type 304 stainless steel tubing with a total exposure of approximately 26,000 sq ft.

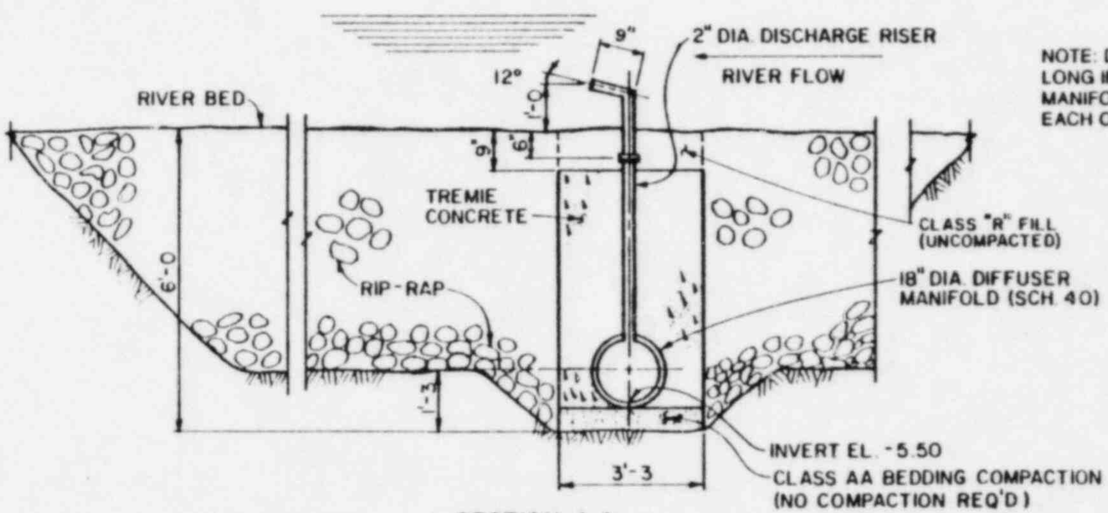
The thermal monitoring system for the circulating water system blowdown consists of temperature sensors for the river, makeup well water, and blowdown; and there are also flow sensors for the makeup and blowdown. The temperature control of the discharge (to Chehalis River) will be controlled by using a variable bypass around the heat exchanger. Discharge temperature will be controlled within the limits of the NPDES Permit (see Appendix A). The heat exchanger can be completely bypassed if the blowdown temperature falls within the acceptable limits.

3.4.4 Blowdown Diffuser

After passing through the supplemental cooling system, the blowdown water will be conveyed through a piping system consisting of approximately 6,900 ft of 21-inch reinforced concrete pipe, 1,200 ft of 20-inch carbon steel/fiberglas pipe; and 275 ft of 18-inch carbon steel pipe. The pipe runs to the Chehalis River at River Mile 20.5 (below the confluence with the Satsop River). The pipeline will extend north and under the river bed approximately 150 feet from the south bank of the river and includes a 30-foot long multiport diffuser (see Figures 3.4-4 and 3.4-7). The 30-foot diffuser is a 18-inch diameter pipe perforated with 46 discharge ports which are 2 inches in diameter and spaced at 8-inch intervals. The diffuser is located so that the projecting ports are one foot above the river bottom and direct the discharge downstream at a 12 degree angle above the horizontal. This orientation will minimize bottom scouring. Average discharge jet velocity will be about 6.25 fps. The discharge rate and temperature are tabulated by month on Table 3.4-1. 1



CHEHALIS RIVER CROSS-SECTION



SECTION A-A

NOTE: DIFFUSER INSTALLATION MODULE IS 34 FT LONG INCLUDING 30-FT DIFFUSER SECTION AND MANIFOLD EXTENSIONS OF 1 FT AND 3 FT AT EACH OF THE ENDS. 1

AMENDED RE: Q 291.10

WASHINGTON PUBLIC POWER SUPPLY SYSTEM NUCLEAR PROJECT No. 3 OPERATING LICENSE ENVIRONMENTAL REPORT	SCHEMATIC CROSS-SECTIONS OF DIFFUSER	FIGURE 3.4-4

320.01 Q. Provide the following:

A production cost analysis which shows the difference in system production costs associated with the availability vs. unavailability of the proposed nuclear addition. Note, the resulting cost differential should be limited solely to the variable or incremental costs associated with generating electricity from the proposed nuclear addition and the sources of replacement energy. If, in your analysis, other factors influence the cost differential, explain in detail.

a) The analysis should provide results on an annual basis covering the period from initial operation of the first unit through five full years of operation of the last unit.

b) Where more than one utility shares ownership in the proposed nuclear addition or where the proposed facility is centrally dispatched as part of an interconnected pool, the results of the analysis may be aggregated for all participating systems.

c) The analysis should assume electrical energy requirements grow at (1) the system's latest official forecasted growth rate, and (2) zero growth from the latest actual annual energy requirement.

d) All underlying assumptions should be explicitly identified and explained.

e) For each year (and for each growth rate scenario) the following results should be clearly stated: (1) system production costs with the proposed nuclear addition available as scheduled; (2) system production costs without the proposed nuclear addition available; (3) the capacity factor assumed for the nuclear addition; (4) the average fuel cost and variable O and M for the nuclear addition and the sources of replacement energy (by fuel type) - both expressed in mills per kWh; and (5) the proportion of replacement energy assumed to be provided by coal, oil, gas etc. (The base year for all costs should be identified)

A. If WNP-3 were not available for operation as scheduled, replacement power would be obtained from either other Pacific Northwest utilities or surrounding regions. The cost would depend on unknown circumstances such as the weather and the availability of surplus generating capacity in adjacent regions. During years of favorable weather, adequate electricity could be obtained from Pacific Northwest hydroelectric facilities at essentially zero incremental system costs (resulting in higher costs to California utilities which would have purchased the surplus Pacific Northwest Power). During years of unfavorable weather, the electricity probably would have to be purchased from oil-fired power plants in California. On the average, the unit cost probably would be a meld of the costs for several sources (California oil-fired plants, Pacific Northwest hydro, British Columbia hydro, Wyoming coal, etc.) and probably would average about the same as for WNP-3. However, this cost would be in addition to the costs for repaying the capital investment for WNP-3. Consequently, the incremental cost for the replacement power for the plant is assumed to be the capital repayment costs for WNP-3.

On this basis and assuming that the plant is completed at the current forecast cost, the average incremental electricity cost if WNP-3 were not available would be as shown in Table Q320.01. The average fuel and variable operation and maintenance costs for the sources of replacement energy and the types of fuel used by those sources cannot be estimated because the sources are not known.

The above analysis was based on the assumption that the demand for electricity will continue to increase as currently forecast at an average annual rate of about 1.6 percent. If, in contrast, the demand were not to increase over the actual demand in 1982, the currently available resources (including imports) would be sufficient for the total demand. As a result, completion and operation of WNP-3 would then be related to plans to alter hydro system operation or opportunities to export the power.

320.02 Q. Provide 30-yr levelized fuel and O and M costs (fixed and variable). Provide escalation, discount rates and all other variables assumed in calculating these costs.

A. The 30-yr levelized fuel and O and M costs for WNP-3 are estimated to be 35 and 21 mills/kwhr, respectively. These costs were obtained by assuming an 8 percent annual escalation for costs and a 9 percent discount rate. Electricity production was assumed to continue uniformly at a 70 percent capacity factor throughout the thirty years following completion of the initial plant startup period.

TABLE Q320.01

INCREMENTAL REPLACEMENT POWER COSTS FOR WNP-3[a]

Fiscal Year	Incremental System Production Costs With WNP-3		Incremental System Production Costs Without WNP-3 ($ x 10^6)		Capacity Factor
	Total ($ x 10^6)	Fuel and Variable O&M (mills/kWh)	Total	Incremental Increase	
1987	240	19	417	177	60
1988	435	20	738	303	63
1989	434	19	736	302	68
1990	451	21	752	301	70
1991	468	24	767	299	70
1992	485	27	782	297	70

(a) Includes only Supply System WNP-3 production and replacement power costs based on 70% capacity factor.

450.01 Q. Provide more evidence, or refer to a source that gives evidence, to support the assumptions regarding evacuation (Section 7.1.9.6). The present discussion is too incomplete to serve as a basis for choosing evacuation parameters for an independent evaluation of accident consequences.

A. A discussion of the two evacuation scenarios which were used in a reevaluation of severe accident consequences is provided in Subsection 7.1.9.6, as amended. Results of the reevaluation will be incorporated in the initial amendment.

450.02 Q. Provide evidence that ". . .the actual risks associated with WNP-3 would be less than the calculated values. . ." (Section 7.1.9.8). There is no basis for evaluating this statement; there should be a discussion of how the engineered safety features of WNP-3 are an improvement, with respect to safety (or provide for at least the same level of safety), over the older PWR design that was the base design in the RSS.

A. The WNP-3 engineered safety features (ESF) are those safety-related systems and components designed to directly localize, control and mitigate the consequences of a design basis accident by: (1) protecting the fuel cladding; (2) ensuring the containment integrity; and (3) limiting fission product releases to the environment within the guidelines of 10 CFR Part 100. To meet these safety goals, WNP-3 utilizes the following ESF Systems:

a) Containment Vessel
b) Secondary Containment
c) Containment Heat Removal Systems
d) Containment Isolation System
e) Combustible Gas Control in Containment
f) Emergency Core Cooling System
g) Control Room Habitability Systems
h) Fission Product Control System
i) Auxiliary Feedwater System
j) ESF Ventilation System
k) Chemical Additive Subsystem

A detailed design description of each WNP-3 ESF system is provided in Chapter 6 of the WNP-3 FSAR.

Additionally, WNP-3 has incorporated, or plans to incorporate, certain other design or programmatic features which tend to lower the probability of challenges to these ESF systems and would mitigate the consequences of an event more severe than a design basis accident. Examples of these features include:

- o Control Room Design Review will be performed (Human factors analysis included);
- o Upgraded operator qualifications (in accordance with ANSI/ANS 3.1-1981);
- o High reliability Auxiliary Feedwater System (reliability analysis in FSAR Section 10.9.7A);
- o Regulatory Guide 1.97, Rev. 2 now being implemented;
- o Core Protection Calculators;
- o Reactor Vessel Level Monitoring System;
- o Post-Accident Sampling System.

7.1.9.5 Land Use and Economic Data

Land use and economic data are based on regional averages. Economic information includes decontamination costs (for farms and residential, business, and public areas), relocation costs, property value, and food costs (dairy and non-dairy). Farm information specific to the WNP-3 region included planting/harvest months, fraction of state land devoted to farming, fraction of farm revenue from dairy production, annual average farm sale, and average farm land value. Also the state and land/water fraction for each area element were specified.

7.1.9.6 Evacuation Measures

Evacuation of inhabitants within a downwind fan-shaped area was considered in the accident consequence assessment. It is assumed that all people living in the plume exposure pathway, within 10 miles of the plant, would evacuate upon notification of an actual or imminent release of significant quantities of radioactivity. Of the parameters which are used as CRAC2 input, response time is the most critical. Response time is the sum of four separate phases:

1. time required by reactor operator to notify authorities;
2. time required by authorities to interpret information and decide to evacuate;
3. time required to notify public; and
4. time required by public, once notified, to respond.

Considerable planning and effort have gone into minimizing response time at WNP-3. A computerized emergency dose assessment system with graphics has been developed to provide responsible authorities accurate and easily interpreted data. This system should allow authorities to begin public notification within one-half hour of the reactor operator's recognition of an actual or imminent release. A warning system is being developed to provide effective notification of the public. The warning system will be composed primarily of multiple sirens, although other methods of warning may also be utilized in specific areas. 1

Because of the many factors affecting response time, and the large dependency of acute effects upon upon early warning, it is appropriate to separate the calculation into five response times which are shown in Table 7.1-10. Evacuation scenario I is equivalent to that used in the RSS.(4) Within five miles of the plant, the site-specific evacuation (scenario II) is more effective than assumed in the RSS; in the 5 to 10 mile zone the response times are similar to those used in the RSS. The additional 9-hour category in the 5 to 10 mile zone is reflective of EPA studies(9) which report 10 hours as the time necessary to completely evacuate a rural area. The efficiency of evacuation in the 5 to 10 mile range is expected to be better than indicated by the response times in Table 7.1-10.

Evacuation parameters common to both scenarios are the same as those used in the RSS and are listed in Table 7.1-10. The effective evacuation speed of 10 mph has been verified for the WNP-3 site using the CLEAR Code.(10)

Re: 450.01

References for Section 7.1

1. "Discussion of Accidents in Applicants' Environmental Reports: Assumptions", Federal Register, 36:22851, December 1, 1971.

2. "Nuclear Power Plant Accident Considerations Under the National Environmental Policy Act of 1969", Federal Register, 45(116):40101, June 13, 1980.

3. Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Pressurized Water Reactors, Regulator Guide 1.4, U.S. Nuclear Regulatory Commission, Washington, D.C., June 1974.

4. Reactor Safety Study: An Assessment of Accident Risks in U.S. Commercial Nuclear Power Plants, Appendix 6: Calculation of Reactor Accident Consequences, WASH-1400, U.S. Nuclear Regulatory Commission, Washington, D.C., October 1975.

5. Calculations of Reactor Accident Consequences, Version 2-CRAC2, SAND 81-1994 (Draft Report), NUREG/CR-2326, Sandia National Laboratories, Albuquerque, New Mexico, July 1981.

6. Final Environmental Statement, Comanche Peak Steam Electric Station Units 1 and 2, NUREG-0775, U.S. Nuclear Regulatory Commission, Washington, D.C., September 1981.

7. "Ostmeyer, R.M., Radionuclide Inventory Impacts on Reactor Accident Consequences", ANS Transactions, November 1981.

8. Liquid Pathway Generic Study, NUREG-0440, U.S. Nuclear Regulatory Commission, Washington, D.C., February 1978.

9. Evacuation Risks - An Evaluation, EPA-520/6-74-002, U.S. Environmental Protection Agency, Washington, D.C., June 1974.

10. CLEAR (Calculates Logical Evacuation and Response): A Generic Transportation Network Model for the Calculation of Evacuation Time Estimates, NUREG/CR-2504, U.S. Nuclear Regulatory Commission, Washington, D.C., March 1982. 1

RE: Q 450.01

TABLE 7.1-10

EVACUATION PARAMETERS

Response Times

	Distance (mi)	Time (hr)	Probability (%)
Evacuation Scenario I	0-10	1	30
	0-10	3	40
	0-10	5	30
Evacuation Scenario II	0-5	1	100
	5-10	1	25
	5-10	3	25
	5-10	5	25
	5-10	9	25

Parameters Common to Evacuation Scenarios

Evacuation Speed (m/sec)	4.470E+00
Maximum Distance of Evacuation (m)	1.609E+04
Distance Moved by Evacuees (m)	2.414E+04
Sheltering Radius (m)	1.609E+04
Evacuation Scheme (1 or 2)	2.000E+00
Exposure Duration (days)	0.
Cloud Shielding - Stationary People	7.5005-01
Cloud Shielding - Moving Evacuees	1.000E-00
Cloud Shielding - Sheltering	5.000E-01
Cloud Shielding - No Emergency Action	7.500E-01
Ground Shielding - Stationary People	3.300E-01
Ground Shielding - Moving Evacuees	5.000E-01
Ground Shielding - Sheltering	8.000E-02
Ground Shielding - No Emergency Action	3.300E-01
Breathing Rate Stationary Evacuees ($m/^3sec$)	2.660E-04
Breathing Rate Moving Evacuees	2.660E-04
Breathing Rate Sheltering Region One	1.330E-04
Breathing Rate Sheltering Region Two	2.660E-04
Radius of Circular Area Evac Near Reactor (m)	8.045E+03
Width of Evacuated Arc (degrees)	9.000E+01
Evacuation Direct Cost ($/evacuee/day)	9.500E+01
Max Duration of Release for Key Shaped Evac (hr)	3.000E+00

451.01 Q. Provide a magnetic data tape of hourly meteorological data collected onsite. The tape should follow guidance in Appendix A of SRP 2.3.3 in NUREG-0800 for tape format. The amount of data should be provided in accordance with Section 2.3.3 of Regulatory Guide 1.70 which requests as a minimum two consecutive annual cycles including the most recent one-year period. If possible, the same data, 8760 consecutive hours used in your CRAC2 analysis should be identified and included on the tape.

A. The requested tape is provided with the original of this submittal. Data for October 1979 through September 1981 are included on File 1 of the enclosed tape. The meteorology used in the CRAC2 analysis is contained on File 2. The tape is nine track, 1600 BPI, with 160 characters per record and 50 records per block.

451.02 Q. Describe local air quality conditions and identify the type and levels of pollutants in the region and compare these to National Ambient Air Quality Standards.

A. Regional levels of six pollutants, TSP, SO_2 CO, O_3, NO_2 and Pb, are compared with standards in the report Pacific Northwest Region Environmental Quality Profile, US EPA Region 10, Seattle, WA, December 1980. The agriculatural/forest products region surrounding WNP-3 is considered to attain all standards. In the site area, only measurements of TSP are available on a long-term basis. Measurements at Elma (4 mi NW) compiled by the Olymic Air Pollution Control Authority indicate that from 1970-1980 annual average TSP varied from 24-56 $\mu g/m^3$ and averaged 31 $\mu g/m^3$.

451.03 Q. Describe any non-radioactive plant effluents that may be released during normal plant operation and their impact on local air quality.

A. The only notable sources of non-radioactive gaseous emissions are the emergency diesel engines. See Subsection 3.7.2 as amended.

451.04 Q. Identify any changes in extreme and severe weather phenomena observed since the issuance of the Environmental Report at the construction permit stage.

A. There have been no exceedences of design basis meteorological parameters since the CP stage (see FSAR Section 2.3). New maximum monthly precipitations totals at Elma were established in August 1977 (5.40 in.) and December 1977 (16.67 in.). A new September minimum was observed at Elma in 1975 (0.03 in.). We are aware of no other extreme observations relevant to the WNP-3 site since the CP stage.

470.01 Q. Reconfirm distance and direction for special locations (site boundary, milk cow, etc.) (See Table 2.1-8). Explain how these data were obtained and/or cite source of data used in computer run of Reference 5.2-2.

A. The locations listed in Table 2.1-8 were determined by field survey in January 1981. The data were used to determine the critical locations (by highest X/Q) for the various activities. Corrections to the locations and with the highest X/Qs are noted in Appendix B by amendment.

470.02 Q. Reconfirm that there is no drinking water withdrawal downstream, and that there will be none. Has recharge of wells via river water been considered? For those wells which may be recharged in this manner, and which are a source of drinking water (among those in Tables 2.1-12 and 2.1-13) provide transit times and dilution factors, and the basis or method of calculating these values. (Table 5.2-6 and Appendix B are incomplete because they do not provide these values for the various locations).

A. No public water systems downstream of WNP-3 withdraw drinking water from the Chehalis River and no such withdrawals are planned. Department of Ecology records (Reference 2.1-38) disclosed no private drinking water withdrawals. The treatment required to render the river water potable make such withdrawals unlikely. Domestic water wells in the Chehalis valley alluvium may be in communication with the river, however, for the low withdrawal rates for domestic uses and with the prevailing high water table, recharge would be from upslope areas. To conservatively estimate doses via a drinking water pathway, we have assumed a household withdrawal 2 miles downstream. The river transit time is one (1) hour and the dilution factor is 1:1100.

470.03 Q Why was only the popluation of Montesano used for population doses via recreation pathways (shoreline usage, swimming, boating)? Where do these activities take place (locations of state parts, etc.), and what are the dilution factors transit times for each? (Table 2.1-6 lists the locations and distances, but no dilution factors and transition times).

A. An exposure to liquid radioactive releases by recreationists can only be on the Chehalis River downstream of the discharge. Recreational activities can take place almost anywhere on the twenty miles of river although boat launches at 7, 10, 18, and 20 river miles downstream can serve as foci of activities. There are no other public facilities downstream. Instead of somehow estimating the temporal and spacial distribution of water recreationists and assigning a dilution factor and transit time for each location, the population of Montesano was assumed (hypothetically) to engage in water activities at a point five miles downstream from the discharge. The hours assumed for each category of water users are given in Appendix B. From Table 5.2-9 it is seen that the water recreation pathway is a very small component of the estimated population dose.

470.04 Q. Subsection 3.5.3.2, p. 3.5-11 states that WPPSS has chosen the cost benefit option for ALARA compliance. Provide the following distributional data for each of the 22 1/2-degree radial sectors centered on the 16 cardinal compass directions for radial distance of 1, 2, 3, 4, 5, 10, 20, 30, and 50 miles from the reactor:

1. Present annual meat production (kg/yr),
2. Present annual milk production (liter/yr),
3. Present annual vegetable production (kg/yr).

A. The data in Table 2.1-9 are compiled from information provided by the various offices of the Cooperative Extension Service and represent best estimates of the present agricultural production in segments of each county within 50-miles of the plant. To estimate doses via the food pathways, it was assumed that the total 50-mile production was uniformly distributed about the plant. Such an assumption is an option in the GASPAR Code (Reference 5.2-7). The effect of this assumption is to place a much larger than actual percentage of the production in near-plant sectors which do not and can not support food production. These include large portions of the land in the southerly (SE to WSW) directions which border on the site boundary and which are managed for timber production (Figure 2.1-6). For example, two-thirds of the 50-mile milk production is in areas of Pierce, Thurston, and Lewis Counties (Figure 2.1-4) which are greater than 30 miles from WNP-3. The assumption of uniformity of production, therefore results in a conservative estimate of population doses.

470.05 Q. Confirm that fish harvest data includes all fish taken within 80 km downstream of the plant radwaste discharge. (See Table 2.1-10.)

A. Only sport and commercial fish harvested from the Chehalis and lower Chehalis River were used in the dose calculations of Section 5.2. Fish catches from Grays Harbor and the ocean (Table 2.1-10) were not considered because it was expected that the additional dilution would make the incremental dose insignificant. We have since recalculated the doses using the previously neglected fish and invertebrate harvests. Amendments reflecting calculations are noted in Section 5.2 and Appendix B.

470.06 A. What is the basis for the irrigation data of Table 5.2-6 and Appendix B?

A. The irrigation rate of 110 l/m^2/month (4.3 in/month) was taken from: Fletcher, J. F. and W. L. Dotson, HERMES-Digital Computer Code

<u>for Estimating Regional Radiological Effects from the Nuclear Power Industry</u>, USAEC Rept. HEDL-TME-71-168, Hanford Engineering Development Laboratory, Richland, WA, 1971. As used in the LADTAP Code (Reference 5.2-3) for WNP-3 the irrigation rate results in application of about 26 in/year to pasture, whereas the actual irrigation is less than 24 in/yr.

470.07 Q. How was dilution factor calculated/obtained? (It is not necessarily the same for aquatic food/shoreline/drinking water nor are dilutions for any individual necessarily the same as for population. Justify!)

A. A river dilution factor of 1100 was used for all liquid pathways and was based on the average annual blowdown rate and the average annual river flow at the discharge (and thus disregarded other dilution flows downstream). As noted in response to Question 470.02, we are aware of no drinking water withdrawals downsteam and, for calculational purposes, assumed an individual withdrawal at a point where the discharge is assumed to be fully mixed with the river. In response to Question 470.03 we noted that recreation activities were assumed at a location 5 mi downsteam where the dilution factor would be 1100. For the recalculation of the aquatic food pathway (Questions 470.05 and 470.08) dilution factors related to each of the three harvest locations were assumed: 1100 for Chehalis River; 11,000 for Grays Harbor; and 110,000 for Pacific Ocean.

470.08 Q. The ER-OL assumed that all fish consumed was to be from one (1) location i.e., Chehalis River? Why? Table 2.1-10 of Section 2.1.3 indicates higher fish catches at Grays Harbor and Ocean (off Grays Harbor) than at Chehalis River.

A. As noted in response to Question 470.05 we have recalculated the doses assuming consumption of all downstream (including ocean) fish catches. We have also changed the consuming population to include all persons within 50 miles instead of the less conservative assumption which used only the population (50,000) in sectors encompassing the river and harbor. See Tables 5.2-8 and 5.2-9 as amended.

RE: Q 470.05

5.2.4 Dose Rate Estimates For Man

Estimated doses to the population within 50 miles of WNP-3 and to individuals subject to maximum exposure because of their place of residence or life-style were calculated using the methodology of Regulatory Guides 1.109[6] and 1.111,[1] and NRC Codes XOQDOQ,[2] LADTAP[3] and GASPAR.[7] Detail on the calculation model input parameters is included in Appendix B. These input parameters are summarized in Tables 5.2-6 and 5.2-7 for the liquid and gaseous pathways, respectively. Table 5.2-8 summarizes the annual radiation doses to an individual from WNP-3 effluents included in Tables 5.2-1 and 5.2-2. Table 5.2-9 provides the estimates of doses to the general population.

5.2.4.1 Liquid Pathways

People may be exposed to the radioactive material in the liquid effluent by drinking water, eating fish, eating irrigated farm products and by participating in recreational activities on or along the Chehalis River.

Although there is no drinking water withdrawal downstream, it was assumed, for calculation purposes, that a household located 2 miles downstream of the discharge withdraws drinking water from the Chehalis River. The postulated doses are listed in Table 5.2-8 and were obtained using the LADTAP Code.[3]

Because fish will concentrate most radionuclides from the water they inhabit, the potential radiation dose from consumption of fish harvested downstream of the site was estimated for both an individual and the general population within 50 miles of the plant. The dose to an individual by this pathway is included in Table 5.2-8. The dose potentially received from consumption of waterfowl which had consumed contaminated fish or aquatic plants is considered negligible. | 1

Swimming, boating, and picnicking along the shores of the Chehalis River downstream of the site could result in very small doses to the local population. Doses to individuals from these activities and the irrigated foodstuff pathway are included in Table 5.2-8.

5.2.4.2 Gaseous Pathways

People may be exposed to radioactive material released to the atmosphere via inhalation, external radiation and ingestion of farm products. The maximum ground level concentration at the nearest residence offsite is approximately 1.0 mile from the plant in the north sector.

An individual living at the nearest resident (1.0 mi N) would potentially receive a very small dose due to inhalation of tritium, radioiodines and particulates as well as absorption of tritium through the skin. This dose is included in Table 5.2-8. All other dose estimates to people offsite would be less than this estimate.

RE: Q 470.01

TABLE 5.2-2

GASEOUS RADIONUCLIDE RELEASES

Radionuclide	WNP-3 Annual Release (Ci)	Concentration (uCi/cc)(a) Restricted Area Boundary	Vegetable Garden	Milk Cow	Milk Goat	Meat Cattle	North Resident
H-3	1.4E+03	1.8E-10	3.6E-11	1.0E-10	6.2E-11	1.2E-10	1.3E-10
C-14	8.0E+00	1.0E-12	2.1E-13	5.8E-13	3.5E-13	7.1E-13	3.5E-13
Ar-41	2.5E+01	3.2E-12	6.5E-13	1.8E-12	1.1E-12	2.2E-12	2.4E-12
Kr-83m	2.0E+00	2.5E-13	5.2E-14	1.5E-13	8.7E-14	1.8E-13	1.9E-13
Kr-85m	1.7E+01	2.2E-12	4.4E-13	1.2E-12	7.5E-13	1.5E-12	1.6E-12
Kr-85	2.7E+02	3.4E-11	7.0E-12	2.0E-11	1.2E-11	2.4E-11	2.6E-11
Kr-87	5.0E+00	6.3E-13	1.3E-13	3.6E-13	2.2E-13	4.4E-13	4.7E-13
Kr-89	2.6E+01	3.3E-12	6.7E-13	1.9E-12	1.2E-12	2.3E-12	2.5E-12
Xe-131m	5.0E+00	6.3E-13	1.3E-13	3.6E-13	2.2E-13	4.4E-13	4.7E-13
Xe-133	2.7E+01	3.4E-12	7.0E-13	2.0E-12	1.2E-12	2.4E-12	2.6E-12
Xe-135m	1.3E+03	1.6E-10	3.4E-11	9.5E-11	5.8E-11	1.2E-10	1.2E-10
Xe-137	6.5E+01	8.2E-12	1.7E-12	4.7E-12	2.9E-12	5.8E-12	6.2E-12
Xe-138	3.0E+00	3.8E-13	7.8E-14	2.2E-13	1.3E-13	2.7E-13	2.8E-13
I-131	5.8E-02	7.3E-15	1.5E-15	4.2E-15	2.6E-15	5.1E-15	5.5E-15
I-133	6.7E-02	8.5E-15	1.7E-15	4.9E-15	3.0E-15	5.9E-15	6.4E-15
Mn-54	4.4E-04	5.6E-17	1.1E-17	3.2E-17	1.9E-17	3.9E-17	4.2E-17
Fe-59	1.5E-04	1.9E-17	3.9E-18	1.1E-17	6.6E-18	1.3E-17	1.4E-17
Co-58	1.5E-04	1.9E-16	3.9E-17	1.1E-16	6.6E-17	1.3E-16	1.4E-16
Co-60	6.7E-04	8.5E-17	1.7E-17	4.9E-17	3.0E-17	5.9E-17	6.4E-17
Sr-89	3.3E-05	4.2E-18	8.6E-19	2.4E-18	1.5E-18	2.9E-18	3.1E-18
Cs-134	4.4E-04	5.6E-17	1.1E-17	3.2E-17	1.9E-17	3.9E-17	4.2E-17
Cs-137	7.4E-04	9.4E-17	1.9E-17	5.4E-17	3.3E-17	6.5E-17	7.0E-17

(a) Based on X/Q values:

Restricted area boundary - 4.0E-06 sec/m^3
Vegetable garden - 3.1E-06 sec/m^3
Milk cow - 3.1E-06 sec/m^3 | 1
Milk goat - 1.4E-06 sec/m^3
Meat cattle - 2.8E-06 sec/m^3
Resident (north) - 3.0E-06 sec/m^3

RE: Q 470.05

TABLE 5.2-6

PARAMETERS TO CALCULATE MAXIMUM INDIVIDUAL DOSE FROM LIQUID EFFLUENTS

Drinking Water

River Dilution:	1100
River Transit Time:(a)	1 hr
Water Treatment and Delivery Time:	24 hrs
Usage Factors:	Adult = 730 l/yr; Teenager = 510 l/yr; Child = 510 l/yr; Infant = 370 l/yr

Aquatic Foods

Dilution:	River - 1100, Harbor - 11000, Ocean - 110000
Time to Consumption:	24 hours
Usage Factors, Fish:	Adult = 21 kg/yr; Teenager = 16 kg/yr; Child = 7 kg/yr; Infant = 0
Usage Factors, Invertebrate:	Adult = 5.0 kg/yr; Teenager = 3.8 kg/yr; Child = 1.7 kg/yr; Infant = 0

Recreation

River Dilution:	1:1100	
Shoreline Width Factor:	0.2	
Usage Factors:	Shoreline Activities:	Adult = 12 hr/yr; Teenager = 67 hr/yr; Child = 14 hr/yr; Infant = 0
	Swimming:	Adult = 40 hr/yr; Teenager = 40 hr/yr; Child = 40 hr/yr
	Boating(b):	Adult = 200 hr/yr; Teenager = 40 hr/yr; Child = 40 hr/yr; Infant = 0

Irrigated Foodstuffs

River Dilution:	1100
River Transit Time:	12 hours

	Vegetables	Milk	Meat	Leafy Vegetable
Food Delivery Time:	24 hours	24 hours	24 hours	24 hours
Usage Factors:				
Adult	520 kg/yr	310 l/yr	110 kg/yr	64 kg/yr
Teenager	630 kg/yr	400 l/yr	65 kg/yr	42 kg/yr
Child	520 kg/yr	330 l/yr	41 kg/yr	26 kg/yr
Infant	0	330 l/yr	0	0
Monthly Irrigation Rate:	110 l/m^2	110 l/m^2	110 l/m^2	110 l/m^2
Annual Yield:	0.5 kg/m^2	4.0 kg/m^2	4.0 kg/m^2	2.0 kg/m^2
Annual Growing Period:	70 days	180 days	180 days	70 days
Annual Production(c):	2.5E+06 kg	9.5E+06 l	3.5E+06 kg	2.2E+03 kg

(a) Two miles downstream
(b) Assumed to be used for fishing
(c) Downstream irrigated production

TABLE 5.2-8

ESTIMATED MAXIMUM ANNUAL DOSE TO AN INDIVIDUAL FROM WNP-3

Pathway	Annual Exposure	Location	Dilution Factor	Annual Dose (mRem) to an Adult: Skin	Total Body	GI-LLI	Thyroid	Bone
Liquid								
Drinking Water	730 l	2.0 mile downstream	1/1100		2.3E-03	2.0E-03	2.1E-02	3.9E-04
Fish	21 kg	2.0 mile downstream	1/1100		3.0E-02	2.2E-03	9.4E-03	2.1E-02
Shoreline	12 hr	2.0 mile downstream	1/1100	2.3E-05	2.0E-05	2.0E-05	2.0E-05	2.0E-05
Food Products								
Vegetables	520 kg	2.0 mile downstream	1/1100		1.4E-03	1.3E-03	1.3E-03	1.1E-04
Leafy Vegetation	64 kg	2.0 mile downstream	1/1100		1.7E-04	1.6E-04	1.6E-04	1.3E-05
Milk	310 l	2.0 mile downstream	1/1100		9.5E-04	7.6E-04	3.4E-03	1.5E-04
Meat	110 kg	2.0 mile downstream	1/1100		2.9E-04	3.0E-04	3.5E-04	1.7E-05
Invertebrate Seafood	5 kg	2.0 mile downstream[b]	1/11000		1.3E-04	4.5E-03	1.9E-04	1.4E-03
Swimming	40 hr	2.0 mile downstream	1/1100		2.3E-06	2.3E-06	2.3E-06	2.3E-06
Boating	200 hr	Downstream	1/1100		5.8E-06	5.8E-06	5.8E-06	5.8E-06
			Total[a]	2.3E-05	3.5E-02	1.1E-02	3.6E-02	2.3E-02
Air								
Submersion	8766 hr	1.0 mile N	3.0E-06	1.6E-01	5.2E-02	5.2E-02	5.2E-02	5.2E-02
Inhalation	8000 m^3	1.0 mile N	3.0E-06	1.7E-01	1.7E-01	1.7E-01	2.4E-01	2.7E-04
Ground Contamination	8766 hr	1.0 mile N	3.0E-06	5.0E-03	4.3E-03	4.3E-03	4.3E-03	4.3E-03
Food Products								
Vegetables	520 kg	1.5 mile NNE	3.1E-06	5.0E-01	5.0E-01	5.0E-01	6.0E-01	6.5E-01
Cow Milk	310 l	1.5 mile NNE	3.1E-06	1.9E-01	2.0E-01	1.9E-01	9.4E-01	2.9E-01
Infant[d]	330 l	1.5 mile NNE	3.1E-05	9.7E-01	9.8E-01	9.7E-01	6.6E+00	2.6E+00
Goat Milk	310 l	1.7 mile NE	1.4E-06	1.5E-01	1.5E-01	1.5E-01	5.2E-01	1.3E-01
Infant[d]	330 l	1.7 mile NE	1.4E-06	6.4E-01	6.4E-01	6.4E-01	2.8E+00	1.2E+00
Meat	110 kg	1.6 mile NNE	2.8E-06	1.0E-01	1.0E-01	1.0E-01	1.2E-01	2.4E-01
			Total[c]	1.1E-00	1.0E-01	1.0E-00	2.0E+00	1.2E-00

(a) Person assumed to drink Chehalis River water, eat fish caught in the river, consume crab caught in Grays Harbor, eat food grown with river irrigation, and use the river for recreation.
(b) Harvested in Grays Harbor.
(c) Adult cumulative dose from all pathways, excluding goat milk.
(d) Consumption of goat milk by an infant is assumed to be the same as the consumption of cow milk. It is also assumed that infant milk consumption is the same as child consumption.

1

RE: Q 470.01
Q 470.08

RE: Q 470.08

TABLE 5.2-9

ESTIMATED ANNUAL POPULATION DOSES FROM WNP-3

Pathway	Thyroid Dose (thyroid-rem)	Total Body Dose (man-rem)	
Air			
Submersion	1.4E-01	1.4E-01	
Ground Contamination	8.7E-03	8.7E-03	
Inhalation	1.5E+00	1.1E+00	
Farm Products			
Milk	2.1E+00	1.0E+00	
Meat	1.3E-01	1.2E-01	
Vegetation	6.1E-01	4.7E-01	
Total:	4.6E+00	2.9E+00	
Water			
Drinking Water	1.4E-05	1.1E-06	
Aquatic Foods (a)			
Fish	7.4E-03	3.9E-02	1
Invertebrates	6.5E-05	5.5E-05	
Water Recreation(b)	4.6E-05	4.6E-05	
Farm Products			
Milk	1.2E-01	3.0E-02	
Meat	1.2E-02	9.4E-03	
Vegetation(c)	6.6E-03	7.0E-03	1
Total:	1.5E-01	8.6E-02	

(a) Sport and commercial fishing.
(b) Shoreline activities, swimming and boating combined.
(c) Vegetation and leafy vegetables combined.

RE: Q 470.01
Q 470.08

TABLE 5.2-11

SUMMARY OF ANNUAL DOSES

Individuals	WNP-3	App I 10CFR50	
Air Patnway			
Total Body (mrem/yr)	1.0	5	1
Skin (mrem/yr)	1.1	15	
Any Organ (mrem/yr)	2.0	15	
Gamma Air Dose (mrad/yr)	0.08	10	
Beta Air Dose (mrad/yr)	0.2	20	
Liquid Patnway			
Total Body (mrem/yr)	0.035	3	
Any Organ (mrem/yr)	0.036	10	

Population		
Total Body, liquid pathway	0.1 man-rem/yr	
Total Body, gaseous pathway	2.9 man-rem/yr	1
Thyroid, radioiodines and particulates, gaseous pathway	4.6 thyroid-rem/yr	

Amended Re: Q 470.01
Q 470.05
Q 470.07

APPENDIX B

RADIOLOGICAL DOSE CALCULATION PARAMETERS

Parameters for Calculating Doses from Liquid Effluents Using LADTAP Code (Reference 5.2-3)

Parameter	Value	Source/Comment	
Liquid Discharge (blowdown)	6 cfs	Figure 3.4-1	
Population, 50-Mile Radius in Year 2000	755,800	Table 2.1-2	1
Source Terms		Tables 3.5-6 and 5.2-1	
Shorewidth Factor	0.2	Reg. Guide 1.109 (Reference 5.2-6), Table A-2	
Dilution Factors:			
Aquatic food, Chehalis River	1,100	Average river flow = 6600 cfs, Page 2.4-1	
River shoreline & water recreation	1,100		
Drinking and irrigation water	1,100		
Aquatic food, Grays Harbor	11,000	Assumed 10x of river dilution	1
Aquatic food, Ocean	110,000	Assumed 100x of river dilution	
Transit Time (hr)			
Maximum individual, drinking (hypothetical)	1	2 mi downstream at average velocity = 2.6 fps	
Maximum and average individual, water activities	2.8	5 mi at average velocity	
Water Consumption (l/yr)			
Average individuals	Adult - 370 Teen - 260 Child - 260 Infant - 260	Reg. Guide 1.109, Table E-4. No downstream withdrawls for internal consumption. Assumed consumption by one person	1
Maximum individuals	Adult - 730 Teen - 510 Child - 510 Infant - 370	Reg. Guide 1.109, Table E-5. Assumed household 2 mi downstream	1
Fish Consumption (kg/yr)			
Average individual	Adult - 6.9 Teen - 5.2 Child - 2.2 Infant - 0	Reg. Guide 1.109, Table E-4	
Maximum individual	Adult - 21.0 Teen - 16.0 Child - 6.9 Infant - 0	Reg. Guide 1.109, Table E-5	

Parameter	Value	Source/Comment
Invertebrate (seafood) Consumption (kg/yr)		
Average individual	Adult - 1.0 Teen - 5.2 Child - 2.2 Infant - 0	Reg. Guide 1.109, Table E-4
Maximum individual	Adult - 5.0 Teen - 3.8 Child - 1.7 Infant - 0	Reg. Guide 1.109, Table E-5
Algae Consumption	0	
Shoreline Usage		
Average individual (hr/yr)	Adult - 8.3 Teen - 47.0 Child - 9.5 Infant - 0	Reg. Guide 1.109, Table E-4
Maximum individual (hr/yr)	Adult - 23.0 Teen - 67.0 Child - 14.0 Infant - 0	Reg. Guide 1.109, Table E-5
Population (man-hr/yr)	27,000	Montesano population x average adult (8.3 hr/yr)
Swimming Usage		
Average individual (hr/yr)	4	PSAR, Page 11.6-10a
Maximum individual (hr/yr)	40	Assumed 10 times average.
Population (man-hr/yr)	12,800	Montesano population x 4 hr/yr.
Boating Usage		
Average individual (hr/yr)	4	PSAR, Page 11.6-10a
Maximum individual (hr/yr)	Adult - 200 Teen - 40 Child - 40	Assumed adult spent 200 hrs fishing, others 10 times average.
Population (man-hr/yr)	12,800	Montesano population x 4 hr/yr.
Fish Harvest (kg/yr)		
Sport	23,200	Chehalis catch (2,900 per Subsection 2.1.3) x 8 kg/fish average.
Commercial	50,000	Table 2.1-10, Chehalis and Lower Chehalis
	75,000	Table 2.1-10, Grays Harbor 1
	910,000	Table 2.1-10, Ocean

Parameter	Value	Source/Comment
Invertebrate Harvest (kg/yr)	18,000	Assumed Grays Harbor catch per Table 2.1-10 Washington Dept. of Fisheries (telecon April 5, 1982) suggested that crab were caught in ocean, not harbor.
Sport	0	
Commercial	0	
Food Yield (kg/m^2)		
Vegetation	0.5	Table 2.1-9, Grays Harbor County
Leafy vegetables	2.0	Reg. Guide 1.109, Table E-15 1
Milk and meat (cow feed)	4.0	Table 2.1-9, Grays Harbor County
Food Production Downstream		
Vegetation (kg/yr)	2.5×10^6	Table 2.1-9, Grays Harbor County
Leafy vegetables (kg/yr)	2.2×10^3	Estimated per calc. log
Milk (l/yr)	9.5×10^6	Grays Harbor Cnty, adjusted per calc. log
Meat (kg/yr)	3.5×10^6	Table 2.1-9, Grays Harbor County
Irrigation Rate (l/m^2/month)	110	ER-CP, Page A5 2.4
Growing Period (days)		
Vegetation	70	Typical crop irrigation periods for western Washington.
Leafy Vegetables	70	
Milk and Meat	180	1

Parameters for Calculating Doses from Gaseous Effluents Using GASPAR Code (Reference 5.2-7)

Parameter	Value	Source/Comment	
Population within 50-miles in year 2000	755,800	Table 2.1-2	
Source Terms		Tables 3.5-9 and 5.2-2	
X/Q by Sector		Table 5.2-3	
D/Q by Sector		Table 5.2-4	
Fraction Of The Year:			
Leafy vegetables grown	0.4	PSAR, Subsection 2.1.4.2	
Cows or goats on pasture	1.0	Supply System telecon with Grays Harbor Co. Extension Agent, April 5, 1982	
Fraction of Cow or Goat Intake From Pasture	1.0	Reference 5.2-7, Page 2-3	
Fraction of Crop From Garden	0.76	Reg. Guide 1.109, Table E-15	
Total Food Production, 50 Miles		Table 2.1-9	1
Vegetation (kg/yr)	2.5 E+07		
Leafy Vegetables (kg/yr)	7.4 E+05		
Milk (l/yr)	1.5 E+08		
Meat (kg/yr)	8.8 E+06		
Annual Average Humidity (%)	64	PSAR, Subsection 2.3.2	
Annual Average Temperature (°F)	50.7	PSAR, Subsection 2.3.2	
Number of Special Locations	6		
Location (name)	Vegetable Garden	Information from computer run of Reference 5.2-2	
Distance/Direction	1.5 mi NNE		
X/Q no decay, undepleted (Sec/m^3)	3.1 E-06		
X/Q 2.26 days decay, undepleted (Sec/m^3)	3.0 E-06		1
X/Q 8.0 days decay, depleted (Sec/m^3)	2.6 E-06		
D/Q (1/m^2)	6.3 E-09		

Parameter	Value	Source/Comment
Location (name)	Milk Cow	Information from computer run of Reference 5.2-2
Distance/Direction	1.5 mi NE	
X/Q no decay, undepleted (Sec/m^3)	3.1 E-06	
X/Q 2.26 days decay, undepleted (Sec/m^3)	3.0 E-06	1
X/Q 8.0 days decay, depleted (Sec/m^3)	2.6 E-06	
D/Q (1/m^2)	6.3 E-09	
Location (name)	Resident	Information from computer run of Reference 5.2-2
Distance/Direction	1 mi N	
X/Q no decay, undepleted (Sec/m^3)	3.0 E-06	
X/Q 2.26 days decay, undepleted (Sec/m^3)	2.9 E-06	
X/Q 8.0 days decay, depleted (Sec/m^3)	2.6 E-06	
D/Q (1/m^2)	5.0 E-09	
Location (name)	Site Boundary	Information from computer run of Reference 5.2-2
Distance/Direction	0.8 mi NE	
X/Q no decay, undepleted (Sec/m^3)	4.0 E-06	
X/Q 2.26 days decay, undepleted (Sec/m^3)	3.9 E-06	
X/Q 8.0 days decay, depleted (Sec/m^3)	3.5 E-06	
D/Q (1/m^2)	9.4 E-09	
Location (name)	Milk Goat	Information from computer run of Reference 5.2-2
Distance/Direction	1.7 mi NE	
X/Q no decay, undepleted (Sec/m^3)	1.4 E-06	
X/Q 2.26 days decay, undepleted (Sec/m^3)	1.4 E-06	
X/Q 8.0 days decay, depleted (Sec/m^3)	1.2 E-06	
D/Q (1/m^2)	2.6 E-09	

Parameter	Value	Source/Comment
Location (name)	Meat Cattle	Information from computer run of Reference 5.2-2
Distance/Direction	1.6 mi NNE	
X/Q no decay, undepleted (Sec/m^3)	2.8 E-06	
X/Q 2.26 days decay, undepleted (Sec/m^3)	2.8 E-06	
X/Q 8.0 days decay, depleted (Sec/m^3)	2.4 E-06	
D/Q (1/m^2)	5.6 E-09	