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Docket No. 50-508

Director of Nuclear Reactor Regulation
Attention: George W. Knighton, Chief
Licensing Branch No. 3
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: SUPPLY SYSTEM NUCLEAR PROJECT NO. 3
ENVIRONMENTAL REPORT - OPERATING LICENSE STAGE
RESPONSE TO NRC REQUEST FOR INFORMATION

Reference: Letter, GW Knighton (NRC), to DW Mazur (Supply System), dated July 19, 1983

A request for information resulting from the Environmental and Hydrologic Engineering review of the WNP-3 ER-OL was transmitted under the referenced letter. Please find the Supply System's response attached. You will note that we have renumbered the 290 series questions to be consecutive with previous requests for information.

If you require additional information or clarification, please contact K. W. Cook, Licensing Project Manager at WNP-3 (206/482-4428 Ext: 5436).

Very truly yours,

GC Sorensen

G. C. Sorensen, Acting Manager
Nuclear Safety and Regulatory Programs

Attachment

cc: WG Albert, NRC
D. Smithpeter, BPA - 762
A. Vietti, NRC

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ATTACHMENT

RESPONSES TO NRC QUESTIONS OF JULY 19, 1983 (Re: WNP-3 ER-OL)

240.14 Q. In response to our previous question 240.13, you provided an analysis of the radiological consequences of a liquid pathway release from a postulated core-melt accident. In that analysis you assumed that, following basemat penetration there would be contamination of the groundwater whose gradient and movement is northward toward the Chehalis River.

Because WNP-3 has a passive (gravity flow) dewatering system, we conclude that it is likely that contaminated groundwater would be intercepted by the dewatering system and carried southward to Workman Creek instead of northward as you have assumed. Interception by the dewatering system would result in contaminants entering the Chehalis River much more rapidly and in greater concentrations than you have calculated. You should therefore provide a detailed discussion and analysis of the effects of the dewatering system on the liquid pathway release from a core-melt accident.

If, based on your reanalysis, you still conclude that contaminated groundwater will move northward to the Chehalis River and will not be intercepted by the dewatering system, you should provide the basis for your conclusion, including all pertinent assumptions. If you conclude that a core-melt accident will destroy the dewatering system to the extent that it doesn't function even partially, you should describe how the core-melt will affect each portion of the dewatering system, i.e., the collector and half-round pipes, the perforated underdrains, the manholes and the drainage tunnels including the corrugated metal pipes inside the drainage tunnels. You should also address the potential for the core-melt to open new pathways to the dewatering system and/or to Workman Creek. In addition, you should provide the following information:

a) The value of permeability that you selected, 2.08×10^{-5} cm/sec, is the highest value determined using a Packer test in boring A-35 which is located in sandstone to the west of RAB-3. Since a spill to groundwater would move toward the north-northwest (if not intercepted by the dewatering system), it is questionable whether this permeability value would be applicable. Borings to the north-northwest of RAB-3 (Borings A-2, A-17 and A-45) show that groundwater movement would be mostly through sands and silty sands and not through sandstone as you assumed. Since the permeability of sands and silty-sands is generally several orders of magnitude greater than the permeability of sandstone, the movement of contaminated groundwater could be much more rapid than the 1938 years you calculated. You should therefore recompute travel time using the appropriate permeability for the soils located north-northwest of the plant unless you can show that 2.08×10^{-5} cm/sec is a conservative estimate of that permeability.

b) Explain how you determined a porosity of 0.35. In computing travel time, you should use effective porosity rather than total porosity. Generally the effective porosity of sandstone ranges from about .10 to .20. For sand and silty sand such as found to the north-northwest of RAB-3, a value of 0.35 appears to be a reasonable estimate.

A. The first part of this question addresses the core-melt, liquid-pathway release via the RAB foundation dewatering system. In responding to Q240.13, we judged that the mechanistic process resulting in a melt-through of the approximately fifteen (15) feet of reinforced concrete in the Reactor Building foundation and basemat would create an environment which rendered the 8-inch underdrains inoperable. Given the current state of knowledge, and attendant uncertainties, regarding factors such as accident sequence, release mechanisms, system and barrier integrity, and source term estimation, and lacking specific NRC guidance regarding degraded core evaluations, we are unable to conclusively demonstrate that the dewatering system pathway would be completely sealed or that liquid inventory would not remain after melt-through. Alternatively, we have estimated consequences, in terms of whole-body dose to the population, of a direct surface release (via under- drains) using some very conservative simplifying assumptions. These consequences are then compared with doses estimated for the land-based, small river site in the Liquid Pathway Generic Study (LPGS, NUREG-0440, 1978).

A basic assumption regarding source term is that nearly all the available core inventory of radionuclides (per fractions specified in Table 2.2 of NUREG/CR-1596, 1981) is released directly and immediately to the Chehalis River (with no holdup in Stein and Workman Creeks). Dilution was provided by river flows (Chehalis, 6600 cfs; Wynoochee, 1660 cfs; Wishkah, 800 cfs), but no credit was taken for flushing and dilution in Grays Harbor. Nor was any credit taken for decay in river transit or sediment-water partitioning.

The exposure pathways considered for WNP-3 are fish consumption and shoreline exposure. The Chehalis River is not a drinking water source (response to Q470.02 and Q240.13). Fish consumption is based on landings reported in ER-OL Subsection 2.1.3 and referred to in response to Q240.13. Shoreline exposure is based on the LPGS user rates and an estimated downstream surface area, including Grays Harbor, of 47,600 acres. The resulting doses, in man-rem total body are compared below:

Pathway	WNP-3	LPGS LBP Small River
Drinking Water	0	1.1×10^6
Fish Consumption	7.6×10^6	6.1×10^5
Shoreline Exposure	7.0×10^6	5.5×10^5
Total	1.5×10^7	7.2×10^6

Although the above doses are comparable, the conservatism in the estimates for WNP-3 is emphasized by the following factors:

Source Term - The core inventory of high temperature volatile radionuclides was released directly to the river. More likely estimates (NUREG/CR-1596, p.105) indicate that only 10 percent of the core would be available for release via sump water escape. We have also assumed that all of the liquid is released through the underdrains. Since the core could melt many feet below the dewatering system and, once cooled, the core melt substance could be very porous, it is highly unlikely that the dewatering system could collect even the 10 percent of the activity available for release in the sump water.

River Concentration - Most radionuclides, and especially cesium, which are released to surface water quickly become associated with bottom sediment, making the water concentration many times lower than would be expected from solubility alone. Fish contamination and shoreline exposures in Grays Harbor are based on radionuclide concentrations in the river with no additional dilution in the estuary. Also, no credit was taken for radioactive decay.

Fish Exposure - Bioaccumulation factors are most accurate when equilibrium conditions are attained. Since most species in the Chehalis River fishery are anadromous and spend a maximum of one month in the river it is doubtful that equilibrium conditions are reached.

Shoreline Exposure - The LPGS usage rate (0.5 user-hr/ac-day) was applied to the Chehalis River and Grays Harbor estuary surface area. No data are readily available to substantiate a different number, however, it is judged that actual usage of these waters is substantially less. Commercial and recreational fishing activity in the Grays Harbor area is focused mostly on the Pacific Ocean. River shoreline activity is very seasonal and scattered.

In addition to the conservatism of the above factors, it must also be noted that this evaluation gives no consideration to the implementation of mitigating measures including denial of the consumption and exposure pathways. In summary, with this combination of conservative factors the consequences of a liquid pathway release from WNP-3 are estimated to be significantly less than estimated for the small river site in the LPGS.

The second part of the question concerns the permeability and is identical to FSAR Q240.07. The numbers alluded to in the question (e.g., 1938 years) come from FSAR Subsection 2.4.13.3 wherein the event considered is the rupture and spill of tanks at plant grade. Our response to FSAR Q240.07 will address that scenario.

Our response to ER-OL Q240.13 considered a contamination source originating at, or below, the base mat elevation. The basemat is founded in sandstone and the primary flow path for core material penetrating the foundation would be through sandstone. We used the conservative side of the best available site-specific data and the associated hydraulic gradient to derive a travel time of about 2600 years. If transport were through the sands and silts of the Helm Creek deposits, permeabilities could range from 10^{-3} to 10^{-8} cm/sec (FSAR Table 2.5-19). Therefore, the 2×10^{-5} cm/sec is mid-range for the overlying deposits.

The last part of the question (also posed in FSAR Q240.07) notes that our travel time calculations used total porosity for sandstone rather than an effective porosity. It is true that an effective porosity of about 0.15 would be more appropriate. This reduces our calculated groundwater travel time from 2600 to about 1100 years. Radionuclide travel times would be reduced by the same ratio from the times estimated in response to Q240.13. If, on the other hand, we were to concede a flow path through the overlying deposits the water travel time would be about 26 years with the effective porosity of 0.35 and a conservative permeability of 2×10^{-3} cm/sec. The travel times for Sr-90 and Cs-137 would be about 1.3×10^4 years and 1.27×10^5 years, respectively (assuming respective K_d of 10 and 100 from NUREG/CR-0912, Vol. 1, Table 4-3). In summary, any combination of conservative assumptions shows the groundwater pathway for WNP-3 to have travel times much greater than those which characterize the small river site used in the LPGS.

290.13 Q. This question was asked previously (Q290.06). The answer is inadequate. The isopleths provided in Figure 5.1-4 should be superimposed on an aerial photograph or map of the site in order to be able to evaluate which land use will be impacted by the drift. In addition Figure 5.1-4 does not have either an isopleth for 2 lb/acre-yr or any indication of where the 20 lb/acre-yr area is located or where the 45 lb/acre-yr will occur. Please provide.

A. In the attached figure the drift deposition isopleths of Figure 5.1-4 (Amendment 1) are superimposed on a map of the site. Also indicated is the location of where the highest annual deposition (45 lb/acre) beyond 1500 feet from the tower is expected. This figure may be compared with Figure 2.2-1 (discussed in response to Q290.14 below) to compare impacted area with land use.

290.14 Q. ER-OL Figure 2.2-1 should have an outline of the site. Page 2.1-1, ER-OL stages that land owned by the Supply System in the site proper totals about 1,120 acres. On P. 2.2-1 it states the WNP-3 site is approximately 800 acres. The FES-CP P. 2-1 states that the site encompasses approximately 2,270 acres. To clear up the confusion provide a recent period photograph or map of the site on which is superimposed the current site boundary, the exclusion zone and the site boundary at the CP stage. Provide the number of hectares (acres) contained within these three boundaries.

A. ER-OL Figure 2.1-1 has an outline of the central site area (e.g., site proper) consistent with FES-CP Figure 2.2. When the ER-OL was filed, Supply System ownership in this area totaled 1,120 acres with the remainder (approximately 1,070 acres) under exclusion zone easements. This is consistent with the 2,170 acres cited in the FES at Page 2-1. The total area and the ownership-easement split were altered slightly (to 1,360 acres fee-owned/830 acres easement) in March 1983 with the conclusion of condemnation proceedings on a parcel of land south of the plant. Both the FSAR and ER-OL will be amended to reflect the change. Supply System ownership of land for support facilities (makeup water wells, barge unloading dock, access right-of-way, etc.,) outside the site proper totals about 380 acres. At the CP stage the lands required for access and support facilities outside the central site area were not well defined and it was intended that many of the areas would be under lease or easement agreements. Included with this response is a property map which indicates changes in site area since the CP stage.

Reference to 800 acres on P. 2.2-1 is confusing. It was intended to note the total area affected by construction. It will be clarified by amendment. Figure 2.2-1 has been amended to include the central site outline.

290.15 Q. ER-OL Figure 2.2-2 should have the roads and site boundary indicated. Also the stippled area should not be identified.

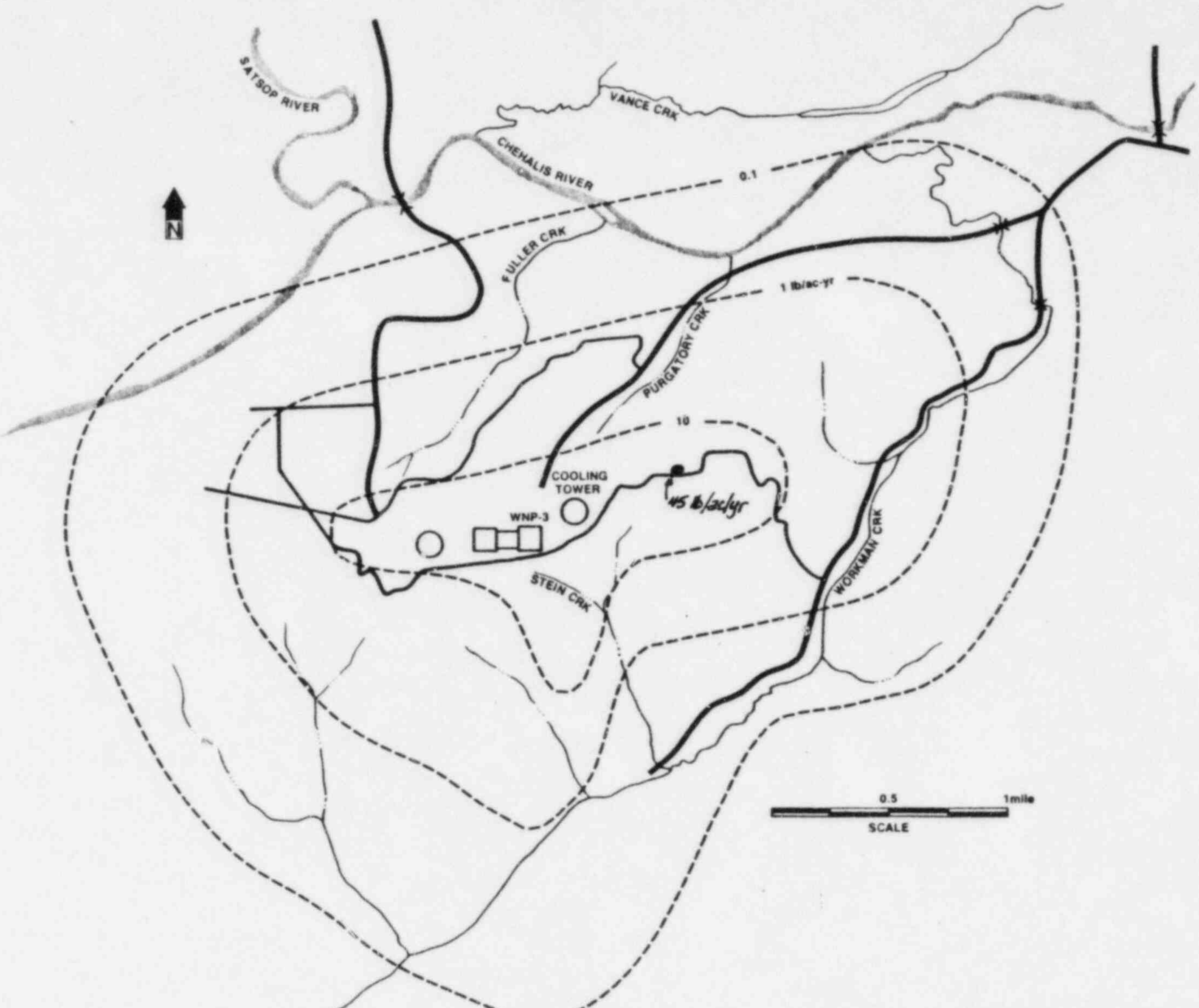
A. Figure 2.2-2 has been revised to show roads for reference. The stippled area approximates the plant island construction area which was cleared in site preparation.

290.16 Q. If any portion of the site could have been classified as prime agricultural land (this includes prime forest land) before construction was begun provide an aerial photograph or map indicating those areas and the number of hectares (acres) of prime agricultural land that will be occupied permanent facilities and the total prime agricultural land onsite.

A. As noted in response to Q290.14, the site area totals about 2570 acres (1,360 owned for exclusion area, about 830 acres under exclusion area easement, and about 380 acres owned for support facilities). Prior to the start of construction most of this acreage was managed for timber production. Other uses were pasture (about 50 acres), cropland (about 40 acres), power line transmission corridor (perhaps 150 acres), river bottom and wetlands (about 80 acres) and residential property. The crop and timber land are the only areas which can be considered prime agricultural land. These total about 2000 acres.

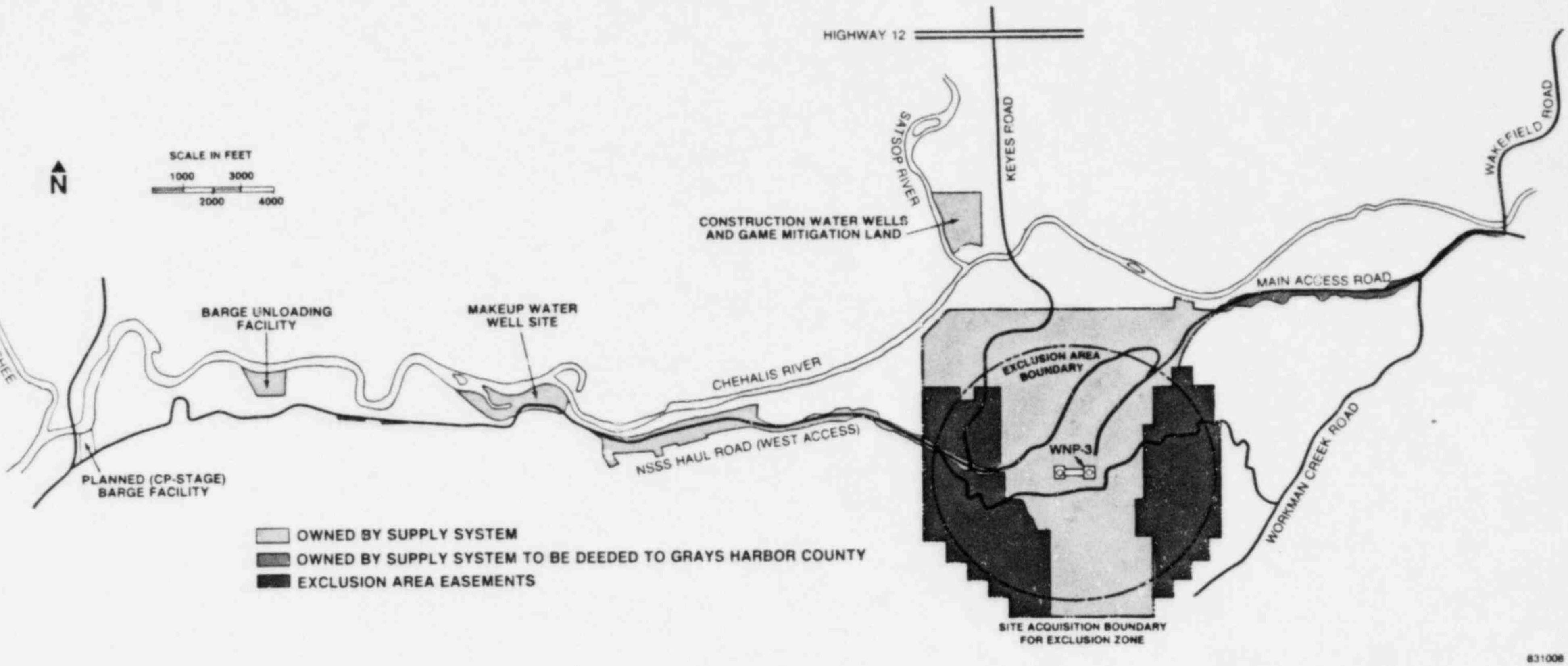
Specific plans for permanent operational facilities have not been formulated. However, it is estimated that permanent facilities in the plant island area will occupy about 150 acres of land formally forested. Support facilities, such as makeup water wells, warehouses, and access and haul road corridors, could occupy an additional 200 acres of agricultural land.

Several high-level and low-level oblique aerial photos of the project from various directions were provided the staff Project Manager at conclusion of the environmental site visit on March 16. They may be helpful in understanding land use in the site area.



WNP-3 COOLING TOWER DRIFT
(lb/acres/yr)
Re: Q290.13

WNP-3 SITE PROPERTY MAP
Re: Q290.14



KEY

DOUGLAS	Df
RED ALDER	Ra
HEMLOCK	H
RED ALDER - DOUGLAS FIR MIX	Ra/Df
VINE MAPLE - RED ALDER MIX	Vm/Ra
COTTONWOOD	C
AGRICULTURAL	Ag
CLEAR CUT	CC

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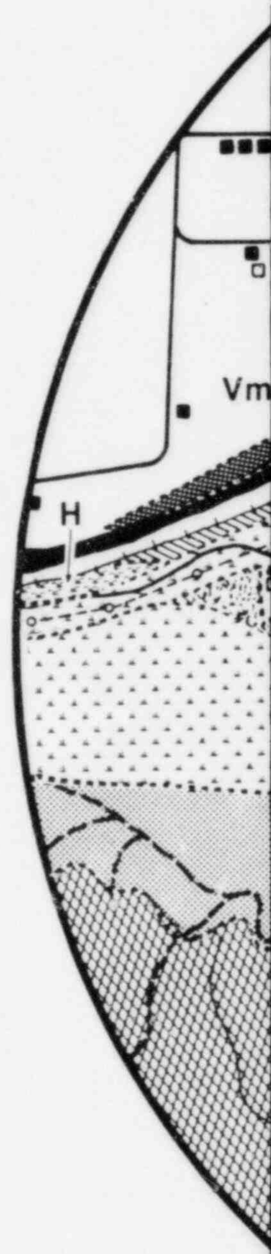
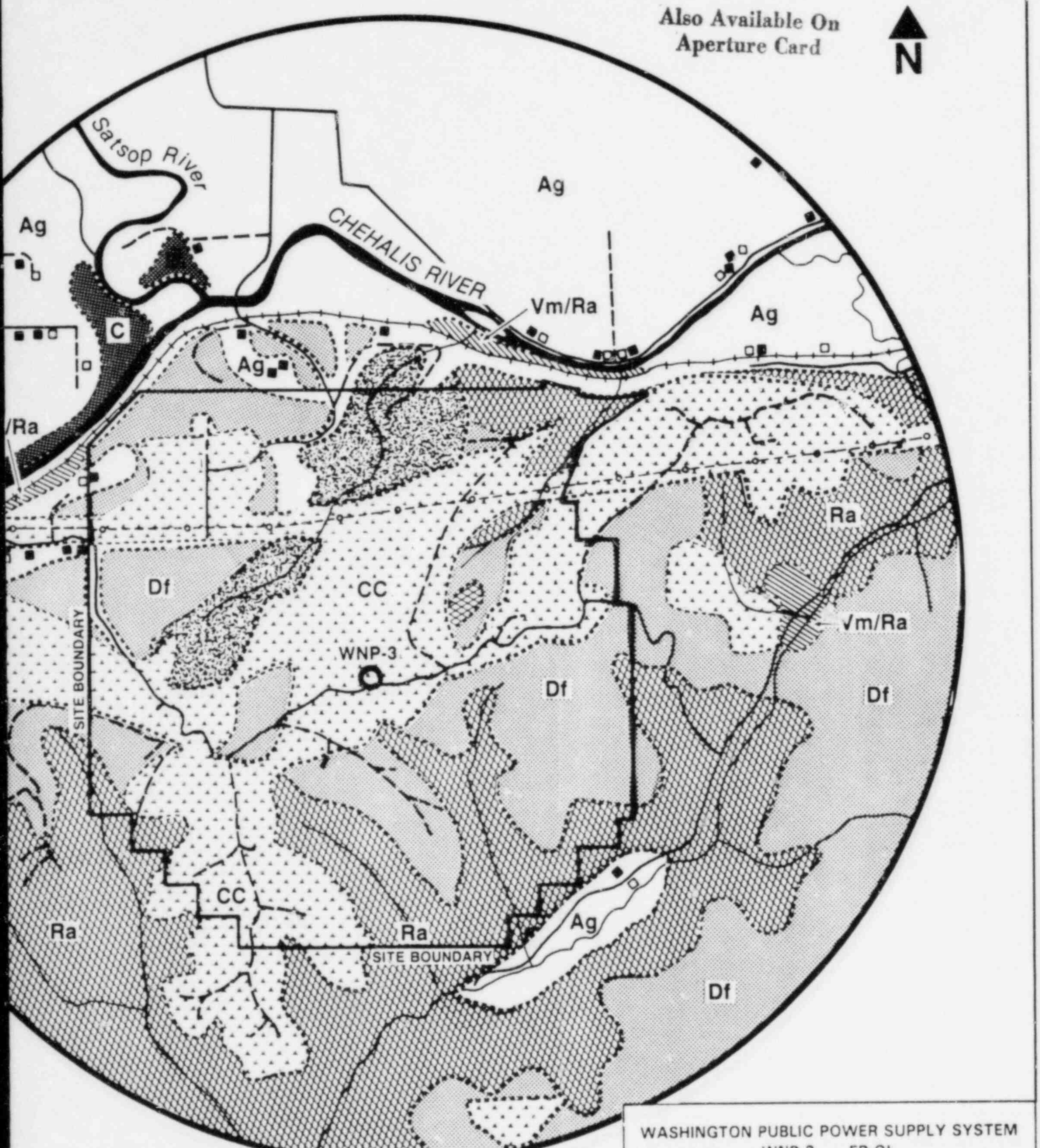


Also Available On
Aperture Card



WASHINGTON PUBLIC POWER SUPPLY SYSTEM
WNP-3 ER-OL

VEGETATION IN THE SITE AREA

FIGURE 2.2-1

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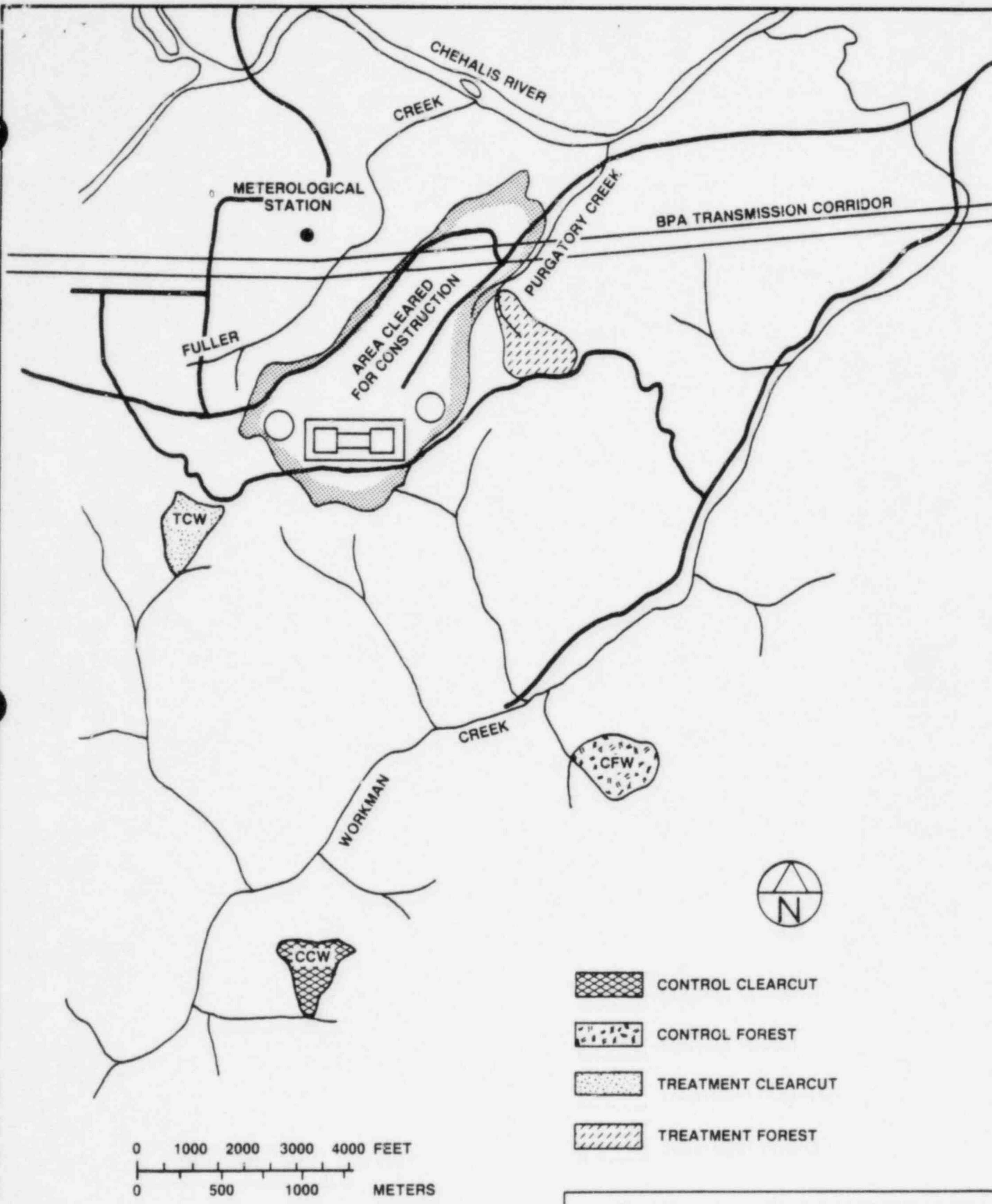

ADAPTED FROM FIGURE 3-1
OF REFERENCE 2.2-4

WASHINGTON PUBLIC POWER SUPPLY SYSTEM
WNP-3 ER-OL

TERRESTRIAL ECOLOGY SAMPLING SITES

FIGURE 2.2-2

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