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March 21, 1983

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Byron Generating Station Units 1 and 2
Site Hydrology
NRC Docket Nos. 50-454 and 50-455

Reference (a): March 11, 1983, letter from T. R. Tramm to H. R. Denton.

Dear Mr. Denton:

This is to provide advance copies of revised pages for the Byron/Braidwood FSAR. These revisions were necessary to correct the values of transmissivity of ungrouted rock at the Byron site which was used in the analysis of accidental releases of radioactive liquids to the groundwater. Preliminary notice of these changes was provided in reference (a).

Attached to this letter are revised pages 2.4-29 thru 32 for the Byron/Braidwood FSAR. Changes have been highlighted by a vertical line in the right-hand margin. These revised pages will be incorporated into the Byron/Braidwood FSAR at the earliest opportunity.

Specifically, the estimate of hydraulic conductivity of ungrouted rock has been changed from 2.97 feet/day to 0.52 feet/day. This change was made after reevaluating data from the two pump tests conducted at local wells in the Galena-Platteville aquifer. It is apparent that an error was made in attempting to derive hydraulic conductivity from the pump test data referenced. These tests were not appropriate for the type of analysis documented in Chapter 2 of the FSAR.

To establish the appropriate value for hydraulic conductivity, data from core boring pressure tests have been reviewed. Pressure test data is available for a number of borings at the plant site. The revised hydraulic conductivity value is representative of actual site conditions and is appropriate for use in conservative revised calculations of radionuclide transport via liquid pathways.

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Please contact this office if there are further questions regarding this matter. More detailed information will be provided in direct testimony at the Byron Operating License hearing.

Very truly yours,

T. R. Tramm

T. R. Tramm
Nuclear Licensing Administrator

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SERVICE LIST

COMMONWEALTH EDISON COMPANY -- Byron Station
Docket Nos. 50-454 and 50-455

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A piezometric surface map of the site vicinity, as measured in the Galena-Platteville dolomite, is shown in Figure 2.4-24. As shown on the map, the main plant structures are situated on a recharge area of the Galena-Platteville portion of the aquifer. The aquifer is recharged by direct infiltration of precipitation through the overlying, thin glacial drift. The Galena-Platteville dolomites have little primary permeability and precipitation moves downward from the overlying drift into solution enlarged joints that provide secondary permeability. Groundwater flows radially from the site, but the principal discharge boundaries are the Rock River to the west and northwest of the site and Black Walnut Creek to the east and southeast of the site.

Table 2.4-26 lists recorded active, domestic, or agricultural groundwater wells east of the Rock River with 2.25 miles of the site. These wells are primarily completed in the Galena-Platteville dolomites. Figure 2.4-27 illustrates the location of each well within 2.25 miles from the plant site. Domestic and agricultural wells west of the Rock River are not shown on Figure 2.4-27 because the river is a common discharge boundary for wells, east and west of the river, which are completed in the Galena-Platteville dolomites.

Pump tests were performed on June 20 and July 2, 1974 in two domestic water supply wells that are completed in the Galena-Platteville dolomites. These two wells are located at the western edge of the site along Razorville Road. From the pump tests, aquifer parameters were derived based on July 1, 1974, piezometeric levels. Based on estimated saturated thicknesses of 111 feet and 90 feet at these two wells, the hydraulic conductivity of this portion of the aquifer was 3.6 gpd/ft^2 and 222.2 gpd/ft^2 respectively. The effective porosity of this portion of the aquifer is estimated to range from 0.05 to 0.10.

2.4.13.2.4 Future Site Groundwater Use

There are no anticipated changes in the present pattern of groundwater use in the site area.

2.4.13.2.5 Effects of Plant Groundwater Use

The projected effects of plant groundwater withdrawals of approximately 470 gpm have been evaluated using the Theis equations (Reference 25) with assumed values of 17,000 gpd/ft and $3.5 \times 10^{-}$[illegible] for the coefficients of transmissivity and storage (Reference 18). The projected effects were reevaluated using the values of 40,000 gpd/ft and 2.5×10^{-4} determined from the 1980 aquifer pumping test. Theoretical distance-drawdown and time-drawdown curves were constructed in order to determine the anticipated shape of the cone of depression and the radius of influence of the Byron Station wells. These theoretical curves indicate that the Byron groundwater withdrawals should not impose measurable interference drawdowns on the nearest public water supply wells completed in the Cambrian-Ordovician or Mt. Simon Aquifers. Indeed, the groundwater withdrawals at the Byron site will intercept groundwater that otherwise would naturally discharge from the aquifer into the Rock River.

The effects of pumping from Byron Station water wells will be minimal on domestic wells completed in the Galena-Platteville dolomites. As described in Subsection 2.4.13.2.3, the Galena-Platteville dolomites in the site vicinity are hydraulically separated from the lower portion of the Cambrian-Ordovician Aquifer by the Harmony Hill Shale Member of the Glenwood Formation. In addition, the Byron Station water wells are cased through the Galena-Platteville dolomites and the underlying Ancell Group (St. Peter Sandstone). Groundwater in the Galena-Platteville dolomites is perched on the Harmony Hill Shale Member and initially water levels in this aquifer will not be lowered by pumping for daily plant use from the lower portion of the Cambrian-Ordovician Aquifer and Mt. Simon Aquifer. As pumpage from the plant water wells continues with time, minor vertical leakage may occur through the Harmony Hill Shale Member. If recharge by rainfall infiltration is not considered, water levels in domestic and agricultural wells in the site vicinity may be lowered slightly as a result of long-term pumping of groundwater from the Byron Station water wells. Measurements made during the 1980 aquifer pumping test verified that the offsite drawdown effects in the Galena-Platteville dolomites and Ancell Group (St. Peter Sandstone) will be very minor.

2.4.13.3 Accident Effects

As described in Subsection 2.4.12, the largest tanks located outside the containment building and containing radioactive effluents are the boron recycle holdup tanks. These tanks are located in a portion of the Seismic Category I Auxiliary Building where the floor elevation is 815.0 feet. Each of the recycle holdup tanks has a capacity of 125,000 gallons. The design-basis radionuclide content of each tank is given in Table 2.4-20.

The plant grade elevation is 869.0 feet. The site area piezometric surface map, as measured on July 1, 1974, showed a groundwater elevation of approximately 840.0 feet. However, taking seasonal variations into account, it is conservatively assumed that the groundwater elevation at the time of the postulated accident would be 808.0 feet. The nearest offsite downgradient groundwater user is located at about 1960 feet from the auxiliary building (Well 55, Figure 2.4-27). The prevailing hydraulic gradient between the Auxiliary Building and the nearest well is 0.019. There is a spring located at a distance of about 3630 feet downgradient from the Auxiliary Building. The hydraulic gradient between the Auxiliary Building and this spring is 0.011 which is flatter than the gradient to the nearest offsite well. It is, therefore, concluded that the critical path

The rock mass in the vicinity of the Auxiliary Building was grouted to fill solution features and joints. This would greatly restrict the seepage of any accidentally released effluents into the surrounding groundwater environment. However, for a conservative evaluation of the accident effects, the following analysis was performed.

It is postuled that a 0.1-inch wide crack develops throughout the width of the Auxiliary Building. At the same time, one of the boron recycle holdup tanks ruptures and spills its entire content over the floor of the building which leaks into the underlying rock mass through the postulated crack. The effluents are postulated to move through the grouted rock mass to the ambient groundwater and then follow a calculated maximum hydraulic gradient of 0.0186, measured between the floor of the Auxiliary Building foundation mat and the nearest well number 7 located at the Commonwealth Edison real estate office.

The observed hydraulic conductivity of the grouted rock mass directly under the excavation is 0.282×10^{-6} cfs. The rate of vertical leakage of effluents through the postulated crack is estimated to be 2.03×10^{-8} cfs per foot length of the crack.

Field assessments of the hydraulic characteristics of site bedrock natural fractures were performed by drilling holes which intersected joints and bedding planes and injecting water under constant pressure between packers set in the bore hole. The hydraulic conductivity of the ungrouted rock was determined from water pressure test data presented in the following borings P2 through P7, P9, P10, P15A, P22, and P23. Previous interpretations of hydraulic conductivity were derived primarily from off-site pump tests, however; as a result of reevaluation of the test methods, brevity of the test, and location of the test site it was concluded plant site data would be more representative of the aquifer characteristics.

The effective porosity of the Galena-Platteville aquifer was estimated from the geophysical logs performed on the G series borings to range from 0.05 to 0.10. The average saturated thickness of the aquifer based upon the Auxiliary Building floor mat elevation and the lowest measured water surface of well number 7 is 135 feet.

Many phenomena can combined to reduce concentrations of radioactivity released to ground water. These include initial dilution by the receiving body of water, subsequent dilution and dispersion enroute, absorption and ion exchange enroute, dilution of waters at a well by other waters drawn into its core of depression, and radioactive decay experienced due to the travel time. To be conservative, the present analysis considers only the effects of initial dilution and radioactive decay. The acceptance criteria are 10 CFR Part 20, Appendix B, concentration limits for liquids in an unrestricted area.

For travel time in excess of 0.5 years, the concentrations of all but three nuclides given in Table 2.4-20 will be reduced by radioactive decay alone to values which are less than 10 CFR 20 limits. The three exceptions are CS-134, CS-137, and H-3 with half-lives of 2.06y, 30.17y and 12.3y respectively; these would require reductions by factors of 2555, 750, and 1167, respectively, to reach 10 CFR 20 limits.

The present analysis results in an initial dilution factor of 2,203 and a transient time of 30.49 years which in configuration are more than sufficient to result in concentrations at the nearest well to be within 10 CFR 20 limits.

2.4.13.4 Monitoring

A continuing site groundwater monitoring program was begun in December 1975. This monitoring program is being performed (1) to define existing conditions as a base for future comparisons; (2) to monitor the effects of construction; (3) to check for either plant operation or groundwater use by others; and (4) to protect offsite groundwater users in case of detrimental changes in groundwater quality. The existing site groundwater monitoring program is not part of any future radiological monitoring program.

Six domestic and agricultural water wells are being monitored for monthly changes in piezometric levels. Three of the water wells are now owned by Commonwealth Edison and are located on the inside perimeter of the Byron site boundaries. The other three wells are on the outside perimeter of the site boundary. Data from this ongoing monitoring program indicate no changes in groundwater chemistry or piezometric levels attributable to excavation, grouting, groundwater pumping or other activities at the Byron site. Groundwater chemistry and water level data gathered to date will provide the basis for comparison with future data collected during the monitoring program. The groundwater chemistry and water level data are provided in Tables 2.4-27 and 2.4-28, respectively.

In addition to this site groundwater monitoring program, the detailed site geotechnical investigation identified on area groundwater contamination by toxic materials prior to the purchase of the land by Commonwealth Edison. An investigation of the nature and the extent of the contamination was performed (Reference 26) and groundwater and surface water monitoring is presently being conducted by Commonwealth Edison Company.

2.4.13.5 Design Bases for Subsurface Hydrostatic Loading

The design parameters for groundwater induced hydrostatic loadings on subsurface portions of site safety-related structures are based on a piezometric level of 869.0 feet MSL. This design groundwater level corresponds to plant grade.

For the design and implementation of site construction dewatering systems refer to Subsections 2.5.4.5 and 2.5.4.6.