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AUTH.NAME AUTHOR AFFILIATION
DISE,D.P. NIAGARA MOHAWK PWR
RECIP.NAME RECIPIENT AFFILIATION
IPPOLITO,T.A. ***OPERATING REACTORS BRANCH 3

SUBJECT: Responds to 781018 request for addl info re spent fuel mod for subj facil.Forwards detailed description of completed changes.

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NIAGARA MOHAWK

Donald P. Dise
Vice President
Engineering

NIAGARA MOHAWK POWER CORPORATION/300 ERIE BOULEVARD WEST, SYRACUSE, N.Y. 13202/TELEPHONE (315) 474-1511

December 21, 1978

Division of Operating Reactors
Attn: Mr. Thomas A. Ippolito
Operating Reactors Branch No. 3
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Re: Nine Mile Point Unit 1
Docket No. 50-220
DPR-63

Dear Mr. Ippolito:

Your letter of October 18, 1978 requested additional information regarding the spent fuel pool modification for Nine Mile Point Unit 1. The attached information is in response to your request.

Very truly yours,

NIAGARA MOHAWK POWER CORPORATION

D.P. Dise
Vice President, Engineering

SWW:bd

Attach.

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Responses to October 18, 1978

Nuclear Regulatory Commission Questions

Nine Mile Point Unit 1
Docket No. 50-220
DPR-63

1. Question

Provide a description of the modifications that have been made to the Nine Mile Point Unit 1 (NMP-1) spent fuel pool (SFP) after the pool was licensed to contain up to 1984 fuel assemblies. Discuss the effects of these modifications on operating the SFP. This should include the measured man-rem exposure to do the work, the change in radiation levels in the vicinity of the pool, the change in the amount of crud in the pool, and changes to the operation of the SFP purification system.

Response

Figure 1 outlines the current configuration of the spent fuel storage pool. Seventeen standard General Electric spent fuel storage racks and six channel storage racks were removed from the spent fuel pool. One control blade storage rack was relocated from the north end of the pool to the south end. Seven control blade storage racks were removed from the spent fuel pool and will eventually be relocated. Installed in the north end of the spent fuel pool were 1060 high density stainless steel spent fuel storage locations. Of the racks removed, 15 standard spent fuel storage racks and 2 channel storage racks were decontaminated, packaged and shipped off site.

Table 1 contains the measured man-rem exposure which resulted from performing the aforementioned modification.

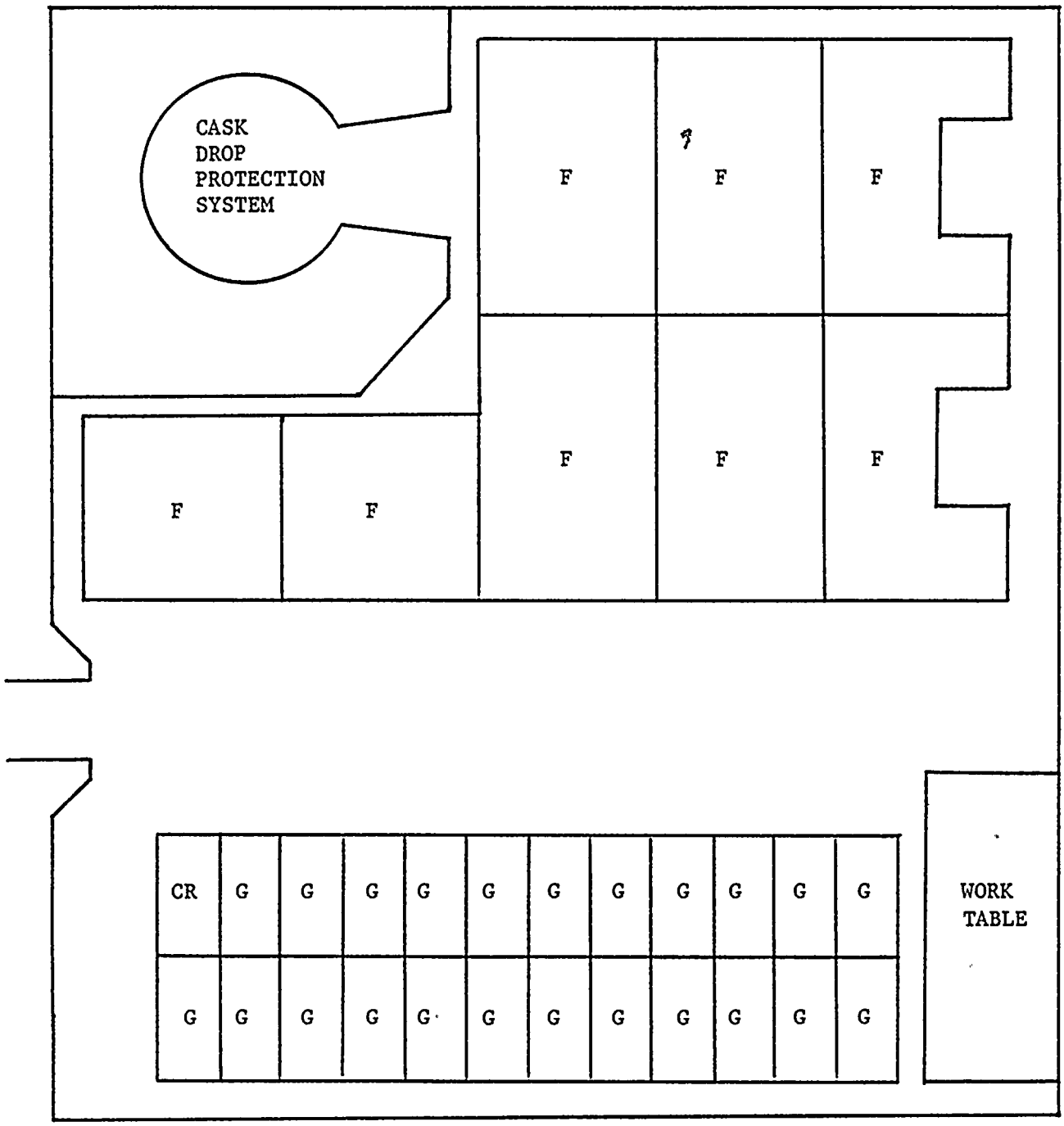
Table 2 contains a summary of the change in radiation levels in the vicinity of the spent fuel pool and changes to the operation of the spent fuel pool purification system. During normal operation the filter is changed out when approximately 1000 disintegrations/minute/milliliter is approached on the filter discharge which normally occurs every 2-3 months. Crud was stirred up from the pool floor during the rack removal and pool clean up prior to installation of the new racks. This necessitated a filter change on 7/11/78, after 22 days of filter residence time. Prior to installation of the new racks crud was removed by vacuum cleaner from the floor of the pool. Therefore, during the modification the total volume of crud in the pool was reduced.

FIGURE 1

NINE MILE POINT UNIT 1

SPENT FUEL POOL CONFIGURATION

FALL 1978



F - FLUXTRAP DESIGN HIGH DENSITY STAINLESS STEEL RACK
G - GENERAL ELECTRIC STANDARD SPENT FUEL STORAGE RACK
CR - CONTROL BLADE STORAGE RACK

Table 1

1978 SPENT FUEL POOL MODIFICATION
MAN-REM EXPOSURE

Activity	Exposure Man-Rem
General Preparation	1.1
Fuel Movements	0.2
Divers Exposure During Modification	2.6
Install Seismic Restraints and New Fuel Racks	2.8
Decontaminate Lifting Rig	0.5
Remove Old Racks, Decontaminate and Package	1.2
TOTAL	8.4

Table 2

1978 SPENT FUEL POOL MODIFICATION
FUEL POOL FILTER CHANGEOUT

		Gross Gamma - dpm/ml* BEFORE FILTER	AFTER FILTER	DOSE RATES ABOVE POOL-MR/hr
JUNE	5	803	654	5-20
JUNE	12	976	804	5-10
		FILTER CHANGEOUT		
JUNE	19	326	143	5-10
JUNE	26	398	229	5-15
JULY	2	605	576	5-20
JULY	11	1001	959	5-20
		FILTER CHANGEOUT		
JULY	18	408	396	5-20
JULY	24	396	237	5-20
JULY	31	555	461	5-20

*disintegrations/minute/milliliter

2. Question

You stated in your letter to NRC dated September 29, 1977, in your response to Question 5, that the dose rates around the spent fuel pool are kept between 5 and 10 mrem/hour by controlling the frequency of changing the pool filter. Justify why the radiation fields will be as low as reasonably achievable (ALARA) during each phase of the proposed pool modification. Relevant experience at nuclear power plants show typical values, in the vicinity of spent fuel pools, of 1 to 2 mrem/hour. Your response should consider increased purification system operation or increased filter change out frequency.

Response

Niagara Mohawk stated in its letter to the Nuclear Regulatory Commission dated September 29, 1977, in response to Question 5, that the dose rates above the pool generally vary between 5 and 10 millirem/hour. However, as stated in response to Question 6 of the aforementioned letter, effective dose rates for work carried on in the vicinity of the pool amount to less than 5 millirem/hour because rates in many areas of the floor are only 1 to 2 millirem/hour. Therefore, although normally the dose rates at the pool surface vary between 5 and 10 millirem/hour, the average dose rates in the vicinity of the pool, where work is carried on, is consistent with experience at other nuclear power plants.

During removal of the old spent fuel pool storage racks and during the general pool cleanup where crud was vacuumed from the floor of the spent fuel pool, radiation levels varied between 5-20 millirem/hour at the surface of the spent fuel pool. As shown on Table 2, it has been proven that increased filter change out does not appreciably reduce the dose rates at the surface of the spent fuel pool.

During each phase of installation, a general pool cleanup will be performed to remove a substantial portion of crud from the pool floor which in the long run is expected to result in decreased spent fuel pool purification system filter changeout frequency. In any event the modifications will not increase the total volume of crud in the spent fuel pool.

3. Question

You stated in your March 22, 1978 submittal that the additional spent fuel storage capacity you are requesting will be installed in steps as your storage needs dictate. Compare the man-rem exposure for the proposed stepwise pool modification with the exposure for completing the modification in a single step. Show that your proposed course of action is consistent with the ALARA philosophy of 10 CFR Part 20.1(c).

Response

The man-rem exposure for the proposed stepwise pool modification is expected to be approximately the same as the exposure for completing the modification in a single step. A majority of the work activities associated with the spent fuel pool modification such as new rack preparation, fuel movements, old rack removal, decontamination and disposal, and new rack and seismic restraint installation are in direct proportion to the number of new storage locations installed. A slight reduction in exposure due to less spent fuel inventory may result if the modification were completed in a single initial step, but it is expected this decrease would be minimal.

The timing of eventual offsite shipment of spent fuel is not known at this time. Installing the complete modification in a single step may result in non-utilization of locations should offsite shipment of fuel take place prior to the pool being filled. This would result in a higher man-rem exposure/required storage location. If the total requested capacity is not utilized in the plants lifetime, stepwise modification would result in less man-rem exposure, consistent with ALARA guidelines.

4. Question

Discuss the occupational exposure expected during each separate matrix listed in Table 1 of your March 22, 1978, submittal of this proposed SFP modification. Address the expected dose rates (from spent fuel pool water, spent fuel and the equipment to be disposed of), numbers of workers (including divers, if necessary) and occupancy times for each phase of the operation. Include removal and disposal of the present spent fuel racks and installation of the new higher density racks. Provide the estimated man-rem exposure. Compare the measured and estimated man-rem exposure for your 1978 SFP modification.

Response

Table 3 contains a summary of the possible storage matrices outlined in Table 1 of the March 22, 1978 submittal. The selection of future storage matrices will be made based on storage requirements and status of the ultimate disposition of the backend of the fuelcycle.

The spent fuel pool is currently licensed to contain 1984 stainless steel high density spent fuel locations (storage matrix no. 1 of Table 3). The current status of the spent fuel pool is also shown on Table 3. Storage matricies 1-3 outline possible future stepwise expansion of the spent fuel pool utilizing high density stainless steel racks. Storage matricies 4-6 outline the same stepwise expansion utilizing posion design spent fuel storage racks. Storage matrix 7 assumes the high density stainless steel racks installed during the 1978 modification are replaced with posion design spent fuel storage racks.

Table 4 contains the projected occupational exposure for each separate matrix. These projected exposures were extrapolated from data obtained during the 1978 modification. The expected dose rates around the spent fuel pool are expected to be the same as those summarized in Response 3 above.

Niagara Mohawk stated in its letter to the Nuclear Regulatory Commission dated September 29, 1977 in response to Question 6, that the conservative estimate of exposure during removal of the old racks and installation of the new ones would be approximately 16 man-rems. The measured man-rem exposure for the 1978 modification was 8.4 man-rems.

TABLE 3

NINE MILE POINT UNIT 1

SPENT FUEL POOL STORAGE MATRIX

Pool Area	Current Status	Possible Future Storage Matricies 1	2	3	4	5	6	7
I	1060/F	1060/F	1060/F	1060/F	1060/F	1060/F	1060/F	1292/P
II	460/G	924/F	924/F	924/F	1080/P	1080/P	1080/P	1080/P
III	C	C	C	440/F	C	C	517/P	517/P
IV	T	T	96/F	96/F	T	120/P	120/P	120/P
Projected Capacity	1520	1984	2080	2520	2140	2260	2777	3009

F - Currently Licensed stainless steel high density flux trap spent fuel storage rack.
G - Standard General Electric spent fuel storage rack.
P - High density poison design spent fuel storage rack.
C - Control blade storage rack.
T - Work table.

TABLE 4

NINE MILE POINT UNIT 1

PROJECTED REQUIREMENTS FOR SPENT FUEL POOL MODIFICATIONS

	Possible Future Storage Matricies*						
	1*	2**	3**	4*	5**	6**	7**
Number of Workers (Approximate)	80	80	80	80	80	80	80
Projected Manhours (Approximate)	3200	3300	4000	3200	3300	4000	5500
Contaminated Material Shipped Offsite (Cubic Feet)	7600	7600	9100	7600	7600	9100	14300
Pool Modification (Man-Rems)	13.5	14.1	17.1	13.5	14.1	17.1	24.2
Removal & Disposal of Old Racks (Man-Rems)	1.8	1.8	2.8	1.8	1.8	2.8	4.8
Total Man Rems	15.3	15.9	19.9	15.3	15.9	19.9	29.0

* Includes manhours, contaminated material shipped offsite, and exposures accumulated during the 1978 modification.

** Includes manhours, contaminated material shipped offsite, and exposures accumulated during the previous steps of the modification.

5. Question

Provide the additional occupational exposure (in man-rem) from normal operation in the spent fuel pool area, including refueling, over the time period for the complete SFP modification proposed in your March 22, 1978, submittal. Include the expected exposure from more frequent changing of SFP filters and demineralizers, from spent fuel pool water and from spent fuel.

Response

It is anticipated the additional occupational exposure from normal operation in the spent fuel pool area over the time period for the complete spent fuel pool modification will be minimal. Most of the dose rate contribution above the pool is due to activity in the water from recently discharged spent fuel bundles. Since the proposed expansion would not increase the number of recently discharged bundles, the change in dose rates above the pool is expected to be minimal.

A slight increase in the spent fuel pool filter change out frequency may be required due to the spent fuel pool modification. However, filter change out is performed remotely and usually results in less than 5 millirem of exposure. Additionally, general pool cleanup performed during the modification may result in decreased filter changeout frequency over the life of the pool.

6. Question

Describe the method that will be used to dispose of the present racks (i.e., crating intact racks or cutting and packaging). If the racks are to be cut and packaged, show that the exposure received by this disposal method, as compared to crating the intact racks for disposal, will provide as low as is reasonably achievable (ALARA) exposure to personnel. Your response should include a description of the method that was used to dispose of the racks and resultant exposures from the 1978 SFP modification.

Response

The method of disposing of the present racks has not yet been determined. The methods of crating intact racks or cutting and packaging appear at this time to be the most likely options. Prior to disposal of racks, Niagara Mohawk will evaluate both the economic and personnel exposure costs and benefits of all proposed methods of disposing of racks. The results of this evaluation will determine the method which will be used.

The racks which were disposed of from the 1978 spent fuel pool modification were crated intact, shipped in low specific activity boxes and disposed of at a low level burial site. Our evaluation at that time showed that the disposal costs saved by cutting and packaging did not warrant the added exposure which was required for cutting. The resultant exposure from the removal, decontamination and packaging of old racks from the 1978 spent fuel pool modification was 1.2 man-rems.

7. Question

Discuss the leakage of water from the spent fuel pool and the pool leak collection system. Where would the pool leakage be transferred to?

Response

The spent fuel pool at Nine Mile Point Unit 1 does not have drains or hose connections that by maloperation or failure could cause loss of coolant. The spent fuel pool filtering and cooling system (described in Section X.H of the Nine Mile Point Unit 1 FSAR) is a seismic Category 1 system, and is provided with siphon breakers to prevent loss of coolant in the event of a line break. Based upon the preceding information, leakage is not possible from any piping connections to the spent fuel pool.

Niagara Mohawk has performed an evaluation to determine if there would be leakage in the event of a rupture of the spent fuel pool liner. The results of the evaluation indicate that inconsequential leakage through the construction joints at elevation 318 feet 0 inches may be present should the liner be ruptured. This leakage would be collected in the reactor floor drain system and processed as liquid waste.

8. Question

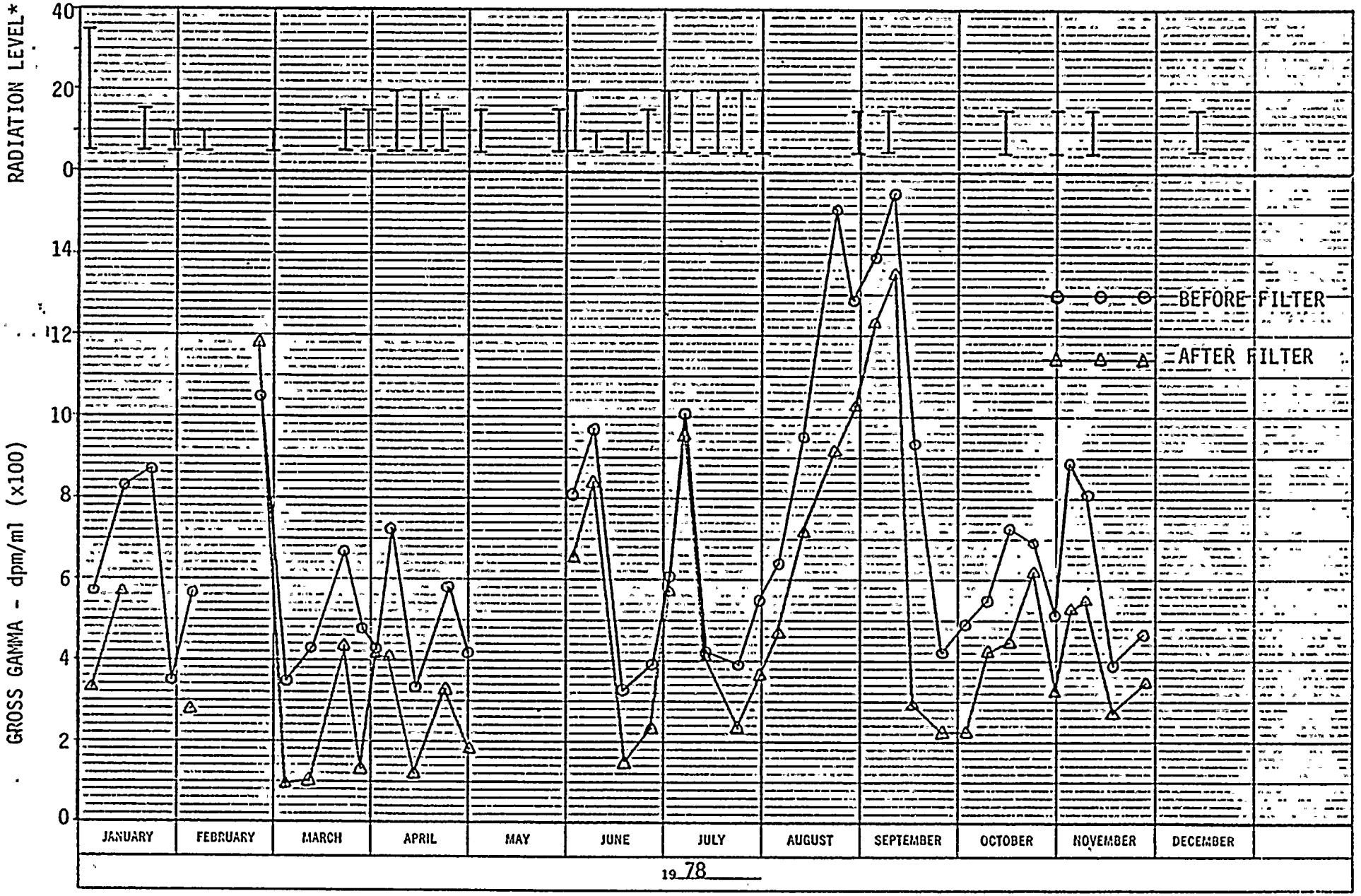
Discuss the effect of the fuel assembly movements during your 1978 SFP modification on the amount of crud in the pool water and the radiation levels in the vicinity of the pool. Your response should include measured radioactivity concentrations of SFP water and general radiation levels in the vicinity of the pool before, during and after the 1978 SFP modification.

Response

Figure 2 summarizes the spent fuel pool filter gross gamma count and the general radiation levels above the surface of the pool before, during and after the 1978 spent fuel pool modification. Fuel assembly movements were conducted between June 2-9 and resulted in very little increase in crud disposition. The greatest disturbance of crud was encountered during removal of the old spent fuel storage racks and during the general pool clean-up where the crud was vacuumed from the floor of the spent fuel pool. During the modification, due to the pool cleanup, the total volume of crud in the spent fuel pool was decreased.

FIGURE 2

NINE MILE POINT UNIT 1 SPENT FUEL POOL DATA



*Radiation level above the surface of the spent fuel pool in millirem per hour.

9. Question

Your March 22, 1978 submittal did not completely address the impact of the proposed SFP modification on the environment. Discuss in some detail the impact of the proposed SFP modification on the following:

a) radioactive liquid effluents from the plant, including leakage of water from the pool and

b) radioactive solid wastes from the plant, including the change in the frequency of replacing the SFP filter demineralizer resin.

Response

The proposed spent fuel pool modification will not result in any change in the radioactive liquid effluents from the plant. All liquid wastes from the spent fuel pool including filter sludge and possible leakage of water from the pool will be processed by the Liquid Radwaste System.

There may be a slight increase in the volume of filter sludge due to the possible slight increase in filter change frequency.

At the present time, the spent fuel pool filter sludge is filtered and concentrated. The filter cake and concentrator waste are disposed of off site as solid radioactive waste. The modification is expected to increase the Liquid Radwaste System usage by less than 1 percent.

10. Question

Provide the estimated volume of contaminated material (e.g., spent fuel racks, seismic restraints) expected to be removed from the spent fuel pools during each step of the entire modification and shipped from the plant to a licensed burial site.

Response

During the 1978 spent fuel pool modification, approximately 4600 cubic feet of contaminated material including standard General Electric spent fuel storage racks and channel racks were decontaminated, packaged and shipped offsite. Table 4 contains the estimated volume of contaminated material to be removed and shipped from the plant for the possible future storage matrices.

11. Question

Provide a list of typical loads that might be carried near or over the spent fuel pool. Provide the weight and dimensions of each load. Discuss the load transfer path, including whether the load must be carried over the pool, the maximum height at which it could be carried and the expected height during transfer. Provide a description of any written procedures instructing crane operators about loads to be carried near the pool. Provide the number of spent fuel assemblies that could be damaged by dropping and/or tipping each typical load into the pool.

Response

In a letter from D. P. Dise to V. Stello dated July 17, 1978, Niagara Mohawk submitted information relative to heavy load movement near the spent fuel storage pool. This information was requested by Mr. Stello on May 17, 1978 in a letter to all Licensees of Power Reactors except those in the Systematic Evaluation Program.

12. Question

Discuss the instrumentation to indicate the spent fuel pool water level and water temperature. Include the capability of the instrumentation to alarm and the location of the alarms.

Response

This question was previously answered in response to question 20 of our letter to NRC dated December 20, 1978.

13. Question

Propose a technical specification which prohibits carrying loads greater than the weight of a fuel assembly over the spent fuel in the storage pool; or justify why this specification is not needed to limit the potential consequences of accidents involving dropping heavy loads, other than casks, onto spent fuel to those of the design basis fuel handling accident.

Response

As stated in response to Question 11, the Nuclear Regulatory Commission has received information concerning movement of heavy loads over the spent fuel pool. It is assumed that when this review is completed, recommendations will be published relative to heavy load movement over spent fuel pools.