5.0 ENVIRONMENTAL IMPACTS OF STATION OPERATION

5.1 LAND USE IMPACTS

The following sections describe the impacts of Nine Mile Point 3 Nuclear Power Plant (NMP3NPP) operations on land use at the site, the 6 mi (10 km) vicinity, and associated transmission line corridors, including impacts to historic and cultural resources. The operation of NMP3NPP is not anticipated to affect any current or planned land uses.

5.1.1 THE SITE AND VICINITY

Land use impacts from construction are described in Section 4.1.1. The only additional impacts to land use from operations will be the impacts of solids deposition from cooling tower drift. The cooling system for NMP3NPP will be a circular mechanical draft cooling tower. The tower will be approximately 177 feet (54 m) high with an overall diameter of 546 feet (166.4 m). Nine Mile Point Nuclear Station (NMPNS) will withdraw approximately 49.6 million gallons per day (187.8 Mega liters per day) from the Lake Ontario.

The cooling tower system will occupy an area of approximately 10 acres (4 hectares). Details of cooling tower design are discussed in Section 3.4.2 and impacts of the heat dissipation system, including salt deposition, are discussed further in Sections 5.3.3.1 and 5.3.3.2. The cooling tower for NMP3NPP will be located south-southeast of the NMP3NPP power block. The cooling tower will be approximately 4,000 ft (1219 m) from the center of the tower to the nearest site boundary to the east and approximately 900 ft (274 m) to the closest portion of the shore of Lake Ontario. The cooling tower plume could occur in all compass directions.

The maximum salt deposition rate from the cooling tower is provided in Table 5.3-9. The maximum predicted salt deposition rate is below the NUREG-1555 (NRC, 1999) significance level for possible vegetation damage of 8.9 lbs per acre per month (10 kg per hectare per month) in all directions from the cooling tower, during each season and annually. Therefore, impacts to vegetation from the salt deposition are not expected for both on-site and off-site locations.

The average plume length and height was calculated from the frequency of occurrence for each plume by distance from the tower. The average plume length will range from 2.6 miles (4.2 km) to the east in the summer, to 3.2 miles (5.2 km) to the north in the winter. The annual average plume length will be 2.3 miles (3.7 km) to the east. The average plume height in the winter will range from 2159 ft (654 m) in winter to 2932 ft (888 m) in the summer. The annual average plume height will be 1828 ft (554 m). Due to the varying directions and short average plume length, impacts from the larger plumes would be SMALL and not warrant mitigation.

The electrical switchyard for NMP3NPP will be located approximately 2,100 ft (640 m) to the south-southeast of the proposed location for the Circulating Water System (CWS) cooling tower A maximum predicted solids deposition rate of 0.0071733 lb/acre per month (0.008038212 kg/hectare per month) is expected at the NMP3NPP switchyard during the fall season. Additionally, the electrical switchyard for NMP Unit 1 and Unit 2 is located approximately 1500 ft (457 m) to the east from the proposed location of the NMP3NPP CWS cooling tower. The maximum predicted solids deposition expected at the NMP Unit 1 and Unit 2 electrical switchyard due to operation of the NMP3NPP CWS cooling tower will be 0.0002366 lbs per acre per month (0.000265128 kg per hectare per month) during the summer season. Salt deposition rates are presented in Table 5.3-9.

Based on industry experience, adjustments to maintenance frequencies (e.g., insulator washing) may be necessary due to solids deposition; however, the expected deposition rates will not affect switchyard component reliability or increase the probability of a transmission line outage at NMP Unit 1 and Unit 2, or NMP3NPP.

Impacts from salt deposition from the NMP3NPP cooling tower would be SMALL. The modeling predicts salt deposition at rates below the NUREG-1555 significance level of 8.9 lbs per acre per month (10.0 kgs per hectare per month), Section 5.3.3.2, Terrestrial Ecosystems, presents information on the sensitivity of specific species to salts.

Land use at the NMP3NPP site is indicated in Table 5.1-1. Shrub and brush lands are the most common land use at the NMP3NPP site, representing 27.7% of the NMP3NPP site acreage. Heavy manufacturing is the next highest land use area classification at the NMP3NPP site. The heavy manufacturing area represents 20.9% of the NMP3NPP site acreage.

Land use data for the 6.0 mi (10 km) site vicinity is presented in Table 5.1-2. Lake water is the largest land use category and represents 62.4% of the area in the 6.0 mi (10 km) site vicinity radius. Shrub and brush rangeland is the next largest land use and represents approximately 18.9% of the land area. Section 2.2.1 presents land use on the NMP3NPP site and its vicinity extending 6 mi (10 km) beyond the site boundary and includes maps showing land use and transportation routes.

As described in Section 2.5, the impact evaluation assumes that the residences of NMP3NPP employees will be distributed across the region in the same proportion as those of the NMP Unit 1 and Unit 2 employees. It is estimated that an additional operational work force of 363 on-site employees will be needed for NMP3NPP. Section 5.8.2 describes the impact of new employees on the region's housing market and the increases in tax revenues.

All of the new employees are expected to settle in Oswego and Onondaga Counties. Most of the current NMP Unit 1 and Unit 2 employees live in Oswego County. The area is rural, with utilities and amenities generally supplied by the townships in the county. It is likely that the new employees who choose to settle near the NMP3NPP site will purchase homes or acreage in the Oswego County and Onondaga County area. There is excess capacity to house new workers; as of 2000, there were approximately 7,309 vacant housing units. No land is owned by the Federal government in Oswego County. However, there is some land within the vicinity in Oswego County and Onondaga County owned by the Federal government and unavailable for development.

It is therefore concluded that impacts to land use in the vicinity will be SMALL and not warrant mitigation.

5.1.2 TRANSMISSION CORRIDORS AND OUTSIDE AREAS

As discussed in Section 2.2.2, the additional electricity generated from NMP3NPP will not require the addition of new off-site transmission lines. The existing 345 kV transmission system provides power to the existing nuclear plants (NMP Unit 1 and Unit 2, and James A. FitzPatrick Nuclear Power Plant) as follows:

1. The Clay substation currently supplies the NMP Unit 1 switchyard with a 345 kV transmission line, and

2. The Scriba substation currently supplies the NMP Unit 1 switchyard, NMP Unit 2, and the James A FitzPatrick Nuclear Power Plant (NPP) each with a separate 345 kV transmission line,

The following modifications will be provided to connect NMP3NPP to the existing transmission system:

- One new 345 kV switchyard will be built on the NMP3NPP site. The NMP3NPP connection to this switchyard consists of six overhead lines.
- This new NMP3NPP switchyard will be connected by a 345 kV line from the Clay substation, a 345 kV line from the Scriba Substation (which is owned by National Grid, but is located within the NMPNS site owner controlled area), and a 345 kV line from the NMP Unit 1 switchyard.
- The existing 345 kV line from Clay will be disconnected from NMP Unit 1 and connected to the new NMP3NPP switchyard.
- The NMP3NPP switchyard will be connected to the NMP Unit 1 switchyard by a 1030 MVA line on individual towers.
- The NMP3NPP switchyard will be connected to the Scriba switchyard by a new 345 kV transmission line.

An area transmission map is presented in Figure 1.2-5.

Numerous breaker upgrades and associated modifications will also be required at Scriba and Volney substations, but all of the changes will be implemented within the boundaries of the existing substations. The transmission lines will be designed with adequate separation from other transmission lines to minimize the likelihood of simultaneous failure under postulated accidents and adverse environmental conditions. There will be no operational impact to land use along the corridors as the result of the proposed action.

The on-site transmission line work necessary to support NMP3NPP will require a transmission line to connect a new switchyard for NMP3NPP to the existing NMP Unit 1switchyard. Line routing will be conducted to avoid or minimize impact on the existing Independent Spent Fuel Storage Installation, wetlands, and threatened and endangered species identified in the local area. No new operational land use impacts will occur as the result of the operation of the new segments of transmission lines or the NMP3NPP substation.

The transmission line owner (National Grid) typically ensures that land use in the corridors and underneath the high voltage lines is compatible with the reliable transmission of electricity. Vegetation communities in these corridors are kept at an early successional stage by mowing and application of herbicides and growth-regulating chemicals. National Grid's control and management of these rights-of-way precludes virtually all residential and industrial uses of the transmission corridors. As described in Section 3.7, National Grid has established corridor vegetation management and line maintenance procedures that will continue to be used to maintain the corridor and transmission lines.

There will be no need for additional access roads along the existing off-site transmission corridors. Therefore, it is concluded that land use impacts to off-site transmission corridors from operation of NMP3NPP will be identical to impacts from the existing NMP Unit 1 and Unit 2.

On-site transmission corridor activities are limited to tying approximately 0.4 mi (0.6 km) of on-site transmission line from a new NMP3NPP switchyard to the existing NMP Unit 1 switchyard. The basic transmission system electrical and structural design parameters for this new on-site transmission corridor are addressed in Section 3.7. Land use impacts from construction of the new on-site transmission corridor and new NMP3NPP switchyard are described in Section 4.1.

It is therefore concluded that impacts to land use in the existing transmission corridors or off-site areas would be SMALL and not require mitigation.

5.1.3 HISTORIC PROPERTIES AND CULTURAL RESOURCES

This section addresses potential impacts due to operation and maintenance of NMP3NPP on historic properties, which are those cultural resources that have been determined to meet eligibility criteria for listing on the National Register of Historic Places. The types of potential impacts would include direct impacts (disturbance or destruction due to activities necessary to operate and maintain NMP3NPP) and indirect impacts (visual or noise impacts to the settings of historic architectural structures).

As described in Section 2.5.3, Phase IA and IB investigations have been conducted to identify cultural resources within the Project's Areas of Potential Effect for direct and indirect impacts. Findings were presented in Section 2.5.3 and summarized in Section 4.1.3. Potential direct and indirect impacts from operation and maintenance of NMP3NPP on historic properties (i.e. significant cultural resources that meet eligibility criteria for inclusion on the National Register of Historic Places) are discussed by impact categories in the following sections.

Table 2.5-35 lists resources within the archaeological Area of Potential Effect (APE) for the construction of NMP3NPP that have been recommended in the phase I Archaeological Survey Report as potentially eligible for listing on the National Register of Historic Places (NRHP). The report has been submitted to the New York State Historic Preservation Office (NY SHPO) at the New York Office of Parks, Recreation and Historic Preservation (OPRHP) for review and concurrence with the eligibility recommendations.

As described in Section 2.5.3, the Phase I survey of the area identified eight historic archaeological sites, four of which are recommended as potentially eligible for inclusion on the NRHP. No prehistoric archaeological sites were identified. A review of available information prior to the Phase I field investigation found no archaeological sites or historic architectural structures that had been previously recorded within the archaeological APE or within the NMPNS site. No standing structures and therefore no historic architectural structures were found within the archaeological APE during the field investigation. Previously recorded archaeological resources and historic architectural structures within 16 km (10 miles) of the proposed site are shown on Tables 2.5-35 and 2.5-36, in accordance with NUREG 1555.

For those archaeological sites for which SHPO concurs with an eligibility recommendation, Phase II investigations will be conducted if the site cannot be avoided. Upon completion of Phase II investigations and SHPO consultations, assessment of effect on NRHP-eligible resources on the project site will be determined and consultation conducted with the SHPO to identify measures to avoid, minimize or mitigate any adverse effects, to comply with Section 106 of the National Historic Preservation Act (USC, 2007).

With maintenance and operations activities, there is there is always the possibility for the inadvertent discovery of previously unknown cultural resources or human remains. Prior to initiation of land disturbing activities, procedures will be developed which include actions to project cultural, historic or paleontological resources or human remains in the event of a discovery. These procedures will comply with applicable federal and State laws. These laws include the National Historic Preservation Act (USC, 2007), the Native American Graves Protection and Repatriation Act (CFR, 1995), and the New York State Historic Preservation Office at the New York Office of Parks, Recreation and Historic Preservation's Human Remains Discovery Protocol (OPRHP, 2008).

The continued use of the existing transmission corridors within the archaeological APE would not result in new impacts to cultural and historic resources, as none were identified. Should new and significant cultural and historic resources be encountered during maintenance activities, consultation with SHPO will be initiated.

If adverse effects are found, then measures for avoidance, minimization or mitigation would be developed in consultation with the SHPO, to comply with Section 106 of the National Historic Preservation Act (USC, 2007). Any identified measures would be delineated in a Memorandum of Agreement between NRC, the SHPO, UniStar Nuclear Operating Services, and the Advisory Council on Historic Preservation.

Those NRHP-eligible sites within the permanent footprint for operation of NMP3NPP will be identified, and efforts to avoid, minimize and mitigate the sites during operation will be undertaken, in consultation with the SHPO.

5.1.3.1 Direct Impacts

Ground disturbing activities would occur primarily during construction of NMP3NPP, but could also occur during maintenance activities. Potential direct impacts to historic properties, if identified within the APE for direct effects, were addressed in Section 4.1.3.1, and, as allowed in NUREG-1555 Section 5.1.3(III), are not repeated here.

Potential direct impacts to historic properties that would be unique to operation could include salt deposition and intermittent ice formation from the cooling tower plume. The salt deposition would only affect historic properties on and in the immediate vicinity of the NMP3NPP site, if any, that may be identified during the Phase IB and the historic architectural survey and are determined eligible for inclusion on the National Register of Historic Places by the NY SHPO.

An assessment of potential effects due to salt deposition and ice on NRHP eligible resources on the project site will be determined and consultation conducted with the SHPO to identify measures to avoid, minimize or mitigate any adverse effects, to comply with Section 106 of the National Historic Preservation Act (USC, 2007). However, due to the small quantities, short duration and intermittent frequency of salt anticipated to be deposited, the effect on historic properties, if identified within this APE, is anticipated to be SMALL and not warrant mitigation. Intermittent ice formation due to fogging of the plume would also not be expected to adversely affect historic properties, if identified, given the amount of ice and snow that the area experiences during the long winter months.

Potential direct impacts to unknown archaeological sites that may be discovered during maintenance activities requiring ground disturbance would be minimized through compliance with an Unanticipated Discovery Plan, which will be prepared for NMP3NPP. The Plan will detail protocols for personnel to follow in the event that a potential archaeological site is discovered. The Plan will be prepared in compliance with the NY SHPO Human Remains Discovery Protocol (OPRHP, 2008) and the Native American Graves Protection and Repatriation Act (CFR, 1995).

The Unanticipated Discovery Plan will be included in on-site documentation and provided to personnel involved in ground disturbance activities and supervisors. Compliance with the plan and any measures to avoid or minimize direct impacts to a significant archaeological site will be monitored by an on-site supervisor at NMPNS.

Efforts to avoid, minimize or mitigate adverse direct impacts to significant archaeological sites determined by the NY SHPO to meet eligibility criteria for the National Register of Historic Places will be undertaken, in consultation with the NY SHPO and applicable Tribal Historic Preservation Officers (THPOs), as appropriate.

5.1.3.2 Indirect Impacts

Indirect impacts that could affect historic properties due to operation and maintenance of NMP3NPP would include visual and noise impacts.

Noise impacts during operation are described in Section 5.3.4.

Project operation will result in indirect visual impacts to historic properties within the viewshed of the highest proposed structure at NMP3NPP. However, the highest proposed structure at NMP3NPP is significantly lower than the existing structures and cooling tower that have been operating at NMPNS since 1967. Nonetheless, to comply with the NYSDEC Program Policy for Assessing and Mitigating Visual Impacts (NYSDEC, 2000) and in accordance with the NY SHPO's request at a June 3, 2008 consultation meeting, an architectural survey and visual impact assessment will be conducted to identify historic structures within the viewshed whose settings may be altered by views of the built Project.

The visual impact assessment will be completed when the leaves are off the trees, during the fall and winter, and will include computer simulations of daytime views of models of the built NMP3NPP from representative locations. Simulations will also be produced from the locations to show views of the anticipated NMP3NPP operating plume, together with the existing structures and plume at NMPNS. The visual impact assessment will be conducted in compliance with the NYSDEC Program Policy for Assessing and Mitigating Visual Impacts (NYSDEC, 2000). An experienced architectural historian qualified in accordance with 36 CFR Part 61 (CFR, 1999) will render opinions on visual effects to those historic architectural structures determined eligible for inclusion on the NRHP and within the topographic viewshed will be assessed for potential visual impacts during the winter of 2009.

Efforts to avoid, minimize or mitigate adverse visual effects to historic architectural structures determined by the NY SHPO to meet eligibility criteria for the National Register of Historic Places will be undertaken, in consultation with the NY SHPO and applicable THPOs, as appropriate.

These studies and any measures to avoid, minimize or mitigate adverse operational impacts from NMP3NPP to historic properties (i.e. significant cultural resources determined to meet eligibility criteria for inclusion on the National Register of Historic Places) are undertaken to assist in compliance with Section 106 of the NHPA (USC, 2007).

It is therefore concluded that NMP3NPP operations would have a SMALL impact on historic or cultural resources and would not require mitigation.

5.1.4 REFERENCES

CFR, 1999. Title 36 Code of Federal Regulations, Part 61, Procedures for Approved State and Local Government Historic Preservation Programs, U.S. Departmentof the Interior, 1999.

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NRC, 1999. Standard Review Plans for Environmental Reviews for Nuclear Power Plants, NUREG-1555, Nuclear Regulatory Commission, October 1999.

USC,2007. Title16, United States Code, Part 470, National Historic Preservation Act, 2007.

OPRHP, 2008. New York State Office of Parks, Recreation and Historic Preservation. Human Remains Discovery Protocol, 2008.

Table 5.1-1—Land Use within the NMPNS Site

Land Use Category	No. of Acres (ac)	No. of Hectares (ha)	Percent of Vicinity (%)
Developed			
Heavy manufacturing	188	76	20.9
Communications	133	54	14.8
Recreation	17	7	1.9
Forest land			
Mixed forest	30	12	3.3
Deciduous forest	113	46	12.6
Rangeland			
Shrub and brush lands	249	101	27.7
Wetlands			
Shrub wetlands, bogs, marshes	26	10	2.7
Forested wetlands	35	14	3.8
Agricultural Land			
Active (orchard)	3	<1	0.3
Inactive agriculture	106	43	11.8
Total	**900**	**364**	**100.0**

Table 5.1-2—Land Use Categories within 6 mi (10 km) Vicinity

Land Use Category	No. of Acres (ac)	No. of Hectares (ha)	Percent of Vicinity (%)
Developed (Urban or Built-up Land)			
Residential			
High density	148	60	0.2
Medium density	79	32	0.1
Low density	531	215	0.7
Shoreline development	116	47	0.1
Recreation (public)	247	100	0.3
Commercial			
Strip development	69	28	0.1
Shopping center	20	8	<0.1
Industrial			
High density	257	104	0.3
Medium density	96	39	0.1
Low density	15	6	<0.1
Barren land			
Extractive	247	100	0.3
Transportation/Communications			
Railway facilities	10	4	<0.1
Area of service facilities	30	12	<0.1
Other Urban	86	35	0.1
Agriculture Land			
Cropland	2,911	1,178	3.7
Pasture and Hay	212	86	0.3
Orchards and Groves	143	58	0.2
Inactive Agricultural Land	5,216	2,111	6.6
Other Agricultural Land	346	60	0.4
Rangeland			
Shrub and Brush Rangeland	14,489	5,863	18.9
Forest land			
Deciduous Forest Land	1,056	427	1.3
Mixed Forest Land	230	93	0.3
Water			
Streams, Channels, and ponds	64	26	0.1
Lakes	49,040	19,846	62.4
Reservoirs	5	2	<0.1
Wetland			
Forested Wetland	1740	690	2.2
Non-Forested Wetland	817	331	1.0
Total	**78,220**	**31,645**	**100.0**

5.2 WATER RELATED IMPACTS

This section identifies impacts to surface water and groundwater resources associated with operation of the NMP3NPP site and transmission corridors. As described in Section 3.3, NMP3NPP will require water for cooling and operational purposes. The source of this water will be Lake Ontario, with potable water provided by the town of Scriba. Normal cooling system operations will require an estimated 49.6 mgd (187.8 million liters per day) of surface water for turbine condenser cooling. Approximately 67% of this water will be lost to the atmosphere as evaporation and cooling tower drift, and the remainder, approximately 8424 gpm (31,885 lpm), will be released as blowdown to Lake Ontario.

5.2.1 HYDROLOGIC ALTERATIONS AND PLANT WATER SUPPLY

Section 2.3.1 provides a description of surface water bodies and the groundwater aquifers, including their physical characteristics.

5.2.1.1 Regional Water Use

Section 2.3.2 describes surface water and groundwater uses that could affect or be affected by the construction or operation of NMP3NPP. Section 2.3.2.1 describes the potential sources of surface water, the current and future consumptive surface water uses in Oswego County, and the non-consumptive surface water uses. Section 2.3.2.2 describes the sources of groundwater available to the NMPNS site and the current and future trends in groundwater use in the vicinity of NMPNS, Oswego County, and by NMP Unit 1 and Unit 2.

The standards and regulations applicable to the use of surface water are presented in Section 2.3.2.1.4. The groundwater demands, regulations governing groundwater withdrawal permits, and the ongoing comprehensive assessment of groundwater resources are described and discussed in Section 2.3.2.2.7.

5.2.1.2 Plant Water Use

The following sections describe sources and uses of water associated with NMP3NPP. Additional detail on water sources, rates of consumption and return, and amounts used by various plant operating systems during normal operations and outages is presented in Section 3.3.

The average water demand from Lake Ontario for NMP3NPP operation is estimated at 49.6 mgd (187.8 million liters per day). During refueling outages, which occur approximately every two years and last approximately 1 month, the maximum water demand will rise to 3426 gpm (12,967 lpm) for the initial period of plant cool down and then decrease to include essentially only the potable water demand for the on-site workforce.

During outages, the permanent on-site workforce of approximately 363 would increase by an estimated 562 additional workers for a total of 925 workers. Using these estimates, potable water demand would increase from approximately 103 gpm (390 lpm) during normal operations, to 236 gpm (893 lpm) during major outages. Sanitary effluents are estimated to be apprximately the same as the potable water demand. These increases represent relatively small fractions of the Lake Ontario demand and plant effluent.

5.2.1.2.1 Surface Water

NMP3NPP is designed to use the minimum amount of water necessary to ensure safe, long-term operation of the plant. The two intake tunnels for NMP3NPP will be located approximately 3000 ft (914 m) west of the existing intake structure for NMP Unit 1. The two submerged intake tunnels will be located approximately 1,050 ft (320 m) offshore in a water depth of 23 ft (7.1 m). Approximately 16.1 mgd (60.9 million liters per day) of heated water from the NMP3NPP will pass through a submerged multi-port diffuser system structure before being released to Lake Ontario. The discharge tunnel will extend approximately 1,640 ft (500 m) offshore through two risers with 1.5 ft (0.46 m) diameter ports in water depth of about 39 ft (12 m). Additional details on the intake and discharge systems are presented in Section 3.4. Water withdrawals for the operation of NMP3NPP are described in detail in Section 3.3.1.

5.2.1.2.1.1 Circulating Water Supply System

NMP3NPP will utilize a closed cycle Circulating Water Supply System (CWS). The system will use a mechanical draft cooling tower for heat dissipation. The cooling tower system requires makeup water to replace that lost to evaporation, drift (entrained in water vapor), and blowdown (water released to purge solids).

Makeup water for the hybrid mechanical draft CWS cooling tower system will be withdrawn from the Lake Ontario. As indicated in Section 3.4, makeup water for the CWS will be pumped at a rate of approximately 25,296 gpm (95,745 lpm). Under maximum makeup water conditions, water lost by evaporation will be approximately 16,864 gpm (63,830 lpm) and blowdown returned to the lake will be approximately 8,424 gpm (31,885 lpm). The water balance is affected minimally by drift. Maximum drift losses will be less than 0.0010% of the circulating water flow (approximately 800,000 gpm (3.03 million lpm)). This results in a maximum expected drift of 8 gpm (30 lpm). The cooling tower will operate at between 3 and 5 cycles of concentration.

The Essential Service Water System (ESWS), will operate two cooling trains under normal plant conditions and with four cooling trains during plant shutdown and cooldown. The maximum water makeup rate required under normal operations is estimated to be 1,713 gpm (7,124 lpm) to the offset maximum evaporation rate (approximately 1124 gpm (4322 lpm)), maximum blowdown rate (approximately 569 gpm (2,154 lpm)), and drift loss (approximately 2 gpm (4 lpm).

Water released to Lake Ontario as blowdown is not lost to downstream users or downstream aquatic communities. Evaporative losses and drift losses are not replaced and are considered "consumptive" losses.

5.2.1.2.2 Groundwater Use

Groundwater monitoring wells are installed on the site to study and model the groundwater in the NMP3NPP site vicinity as described in Section 2.3. Groundwater withdrawals will not be used to support operation of NMP3NPP. Groundwater withdrawals during construction are discussed in Section 4.2. As discussed in Section 2.3.2, temporary groundwater dewatering controls are expected during construction activities; however, a permanent groundwater dewatering system is not anticipated to be a design feature for the NMP3NPP facility. No groundwater is planned to be used for plant operations

5.2.1.3 Hydrological Alterations

Operational activities that could result in hydrological alterations within the site and vicinity and at off-site areas are described in Section 3.3, 3.4, and 3.7.

The principal hydrological alteration on-site associated with NMP3NPP will occur during construction, when several ponds and at least one unnamed stream will be filled, as described in Section 4.2.2.2. Some on-site streams may be impacted by either sedimentation or reduced water flow due to measures taken to reduce sedimentation, as described in Section 4.3.2. Once construction is completed, and normal operations begin, it is expected that the streams will experience little ongoing impact due to hydrologic alterations.

There have been no clearly discernible on-site or off-site effects of hydrologic alterations for operation of NMP Unit 1 and Unit 2, and the supply of surface water has been sufficient (groundwater is not used). Operation of NMP3NPP with a closed loop cooling system will result in much smaller effects on withdrawals and discharges and correspondingly reduced operational effects than would be expected for an open loop cooling system.

The intake for NMP3NPP will be located approximately 3000 feet (914 m) west of the existing intake and discharge structures for NMP Unit 1. The intake will be installed using horizontal directional drilling, so that no dredging will be required. The in-water structures will be placed using a barge. A sheet pile cofferdam and dewatering system will be installed adjacent to NMP Unit 1 and Unit 2 intake structures to facilitate construction of the NMP3NPP circulating and service makeup water intake structure and pump house. Pilings may also be driven to facilitate construction of new discharge system piping.

Installation of the intake and discharge structures, pump house erection and the installation of mechanical, piping, and electrical systems follow the piling operations and continue through site preparation into plant construction.

Installation of the intake, discharge and pipeline areas is expected to be a one-time event. Consequently, any hydrologic alterations, such as disruption of the longshore current and drift mechanism, or temporary sediment disturbance are expected to be local, transitory, reversible, and small.

5.2.2 WATER USE IMPACTS

5.2.2.1 Surface Waters

5.2.2.1.1 Consumptive Use

The maximum evaporation loss for the NMP3NPP CWS cooling tower system is estimated to be approximately 16,864 gpm (63,830 lpm). Makeup water for the ESWS cooling towers is normally supplied from the plant CWS. Evaporation from the circulated ESWS flow will occur at the cooling towers, and will be approximately 2,284 gpm (8,645 lpm).

Lake Ontario contains 423 trillion gallons (1638 trillion liters) of fresh water. Approximately 80% of the water flowing into Lake Ontario comes from Lake Erie through the Niagara River, averaging approximately 205,000 ft^3/s (5,805 m^3/s). The remaining water flow comes from Lake Ontario basin tributaries and precipitation. Runoff directly into Lake Ontario from 27,300 sq mi (70,707 sq km) of watershed in New York State and the province of Ontario amounts to an additional 36,000 ft^3/s (1,019 m^3/sec). The volume of water that will be lost to evaporation from the NMP3NPP cooling towers and ESWS cooling towers is negligible compared with the amount of water in Lake Ontario, and consumptive losses of this magnitude will not be discernible. No measurable impact of consumptive water use on Lake Ontario water level is expected, and operation of NMP3NPP will therefore have a SMALL impact on the availability of water from Lake Ontario.

5.2.2.1.2 Non-Consumptive Use

Non-consumptive uses of water downstream from the plant are described in Section 2.3.2.1.3. The major non-consumptive surface water use categories in the vicinity of the site are recreation and transportation on Lake Ontario. The recreational activities include swimming, fishing and boating. Fisheries in Lake Ontario are described in Section 2.4.2. Recreation and transportation on Lake Ontario will not be affected by the construction or operation of NMP3NPP.

The existing intake system for NMP Unit 1 and Unit 2 includes intake structures located offshore at approximately 950 and 1,050 feet (290 and 320 m) offshore, submerged at 10 feet (3.0 m) below mean low surface water elevation. The two intake structures for NMP3NPP will be located approximately 3000 feet (914 m) west of the existing intake structure for NMP Unit 1. The NMP3NPP intake structures will be located approximately 1,050 ft (320 m) offshore in a water depth of 23 ft (7.1 m).

The NMP3NPP CWS and UHS makeup intakes will meet the U.S. Environmental Protection Agency (EPA) Phase 1 design criteria, as described in Section 5.3.1.1. The overall percentage of Lake Ontario water entrained will remain less than 0.03%, with the maximum additional makeup required to meet the NMP3NPP cooling water requirement of 25,296 gpm (95,745 lpm).

Design approach velocities for both NMP3NPP intake structures will be less than 0.5 ft/s (0.15 m/s). The screen wash system will provide a pressurized spray to remove debris from the water screens. In both intake structures, there is no need for a fish return system, because the flow velocities through the screens are less than 0.5 ft/s (0.15 m/s) in the worst case scenario. The fish loss associated with impingement/entrainment will be negligible.

The primary external impact will be the discharge of cooling tower blowdown water to Lake Ontario. The maximum NMP3NPP CWS cooling tower discharge is estimated to be 8,424 gpm (31,888 lpm). Prior to discharge into Lake Ontario, the cooling tower blowdown will be sent to a retention basin, thus reducing thermal impacts to receiving waters.

No effect on transportation or recreational use on Lake Ontario is expected.

5.2.2.2 Groundwater

Groundwater withdrawals will not be used to support operation of NMP3NPP. Thus, the operation of NMP3NPP will have no impact on the inventory of local groundwater systems.

5.2.3 WATER QUALITY IMPACTS

Water quality data for the Lake Ontario and other water bodies are presented in Section 2.3.3.

5.2.3.1 Chemical Impacts

None of the water bodies in the vicinity of NMPNS are included on the US EPA Clean Water Act Section 303(d) list. The effects of the discharge from all NMP units will be considered in developing the New York State Pollutant Discharge Elimination System (SPDES) permit for NMP3NPP.

NMP3NPP will utilize cooling tower based heat dissipation systems that remove waste heat by allowing water to evaporate to the atmosphere. The water lost to evaporation must be continuously replaced with makeup water. To prevent build up of solids, a small portion of the circulating water stream with elevated levels of solids is drained as blowdown.

Because cooling towers concentrate solids (minerals and salts) and organics that enter the system in makeup water, cooling tower water chemistry must be maintained with anti-scaling compounds and corrosion inhibitors. Similarly, because conditions in cooling towers are conducive to the growth of fouling bacteria and algae, biocides must be added to the system. This is normally a chlorine or bromine-based compound, but occasionally hydrogen peroxide or ozone is used. Table 3.6-1 lists water treatment chemicals used for NMP Unit 1 and Unit 2. Section 5.3 specifically deals with the impacts of the cooling system.

Limited treatment of raw water to prevent biofouling in the intake structures and makeup water piping may be required. Additional water treatment will take place in the cooling tower basin, and will include the addition of biocides, anti-scaling compounds, and foam dispersants. Sodium hypochlorite and sodium bromide are expected to be used to control biological growth in the Circulating Water Treatment System.

The New York SPDES permit will be acquired prior to the startup of NMP3NPP. This permit will specify threshold concentrations of Free Available Chlorine (when chlorine is used) and Free Available Oxidants (when bromine or a combination of bromine and chlorine is used) in cooling tower blowdown when the dechlorination system is not in use.

Dechlorination is a component of the NMP3NPP project site wastewater treatment plant, which is discussed below. Lower discharge limits would apply to effluent from the dechlorination system (which is released into Lake Ontario) when it is in use. The NMP3NPP SPDES permit will contain discharge limits for discharges from the cooling towers for two priority pollutants, chromium and zinc, which are widely used in the U.S. as corrosion inhibitors in cooling towers.

Typical operation of the NMP3NPP cooling tower systems will be based on three cycles of concentration. As a result, levels of solids and organics in cooling tower blowdown will be approximately three times as high as ambient concentrations in Lake Ontario. Blowdown wastewater from the cooling tower will discharge to a retention basin to allow time for settling of suspended solids and to allow additional chemical treatment of the wastewater, if required, prior to discharge to Lake Ontario. The final discharge will consist of cooling tower blowdown from the CWS cooling tower, and site waste streams, including the domestic water treatment and circulating water treatment systems.

Under normal conditions, approximately 9,173gpm (34,720 lpm) will be discharged by pipe from the retention basin into Lake Ontario; a maximum discharge of 9,891 gpm (37,437 lpm) is anticipated. Because the discharge stream volume will be small relative to the volume of Lake Ontario, concentrations of solids and chemicals used in cooling tower water treatment will rapidly dilute and approach ambient concentrations in Lake Ontario after exiting the discharge pipe.

The cooling tower blowdown and plant wastewater effluent volume entering Lake Ontario from the combined NMP3NPP retention basin will be small and any chemicals it contains low in concentration. The operation of NMP3NPP will comply with a New York State Department of Environmental Conservation-issued SPDES permit. All biocides or chemical additives in the discharge will be among those approved by the U.S. EPA and the State of New York as safe for humans and the environment.

Based on the above, impacts of chemicals in the permitted blowdown discharge to the water quality of Lake Ontario will be negligible and are not expected to warrant mitigation.

The NMP3NPP Wastewater Treatment Plant (WWTP) will also discharge chemically treated water to Lake Ontario. Wastewater generated on-site during operation of NMP3NPP will be treated using standard wastewater treatment plant processes. The treated wastewater will meet all applicable health standards and regulations as set by the New York State Department of Environmental Conservation and the U.S. EPA.

The NMP3NPP WWTP will be similar to the existing on-site WWTP that is currently being used for NMP Unit 1 and Unit 2. It will be designed with a typical two-stage clarifier type treatment system which incorporates a lift station, an anoxic mixing chamber, an oxidation ditch, a series of clarifiers, media filtration, a chlorination system, and a dechlorination system. The treatment process is described below.

Raw sewage generated during the operation of NMP3NPP will flow into a wet well and then be pumped to the anoxic mixing chamber. The collection of sewage and the subsequent pumping help to grind waste materials to a uniform size and add oxygen to the liquid waste stream. In the anoxic mixing chamber incoming sewage is mixed with activated sludge from the clarifiers. This begins the aerobic digestion process. The activated sludge adds the necessary microorganisms to the incoming sewage and the microorganisms digest the organic constituents in the incoming wastewater. Aerobic microorganisms use the incoming wastes for food, a source of energy, and reproduction. The products of aerobic digestion are water, carbon dioxide, and more microorganisms.

Microorganisms and oxygen must be present in sufficient numbers to consume the incoming organic material and oxidize ammonia and nitrogen. Optimum conditions for the microorganisms are maintained by controlling the pH, oxygen concentration, and biomass in the system.

Sewage then flows into the oxidation ditch and then into the primary clarifier. The primary clarifier separates the solids (sludge) from the clear liquid. The sludge is then pumped back into the anoxic mixing chamber, or collected and sent to the sludge holding tank. The waste sludge is then removed and transported to a waste processing plant. All sludges are tested for radiological contaminants prior to shipping. If any radionuclides are detected, the waste is deemed radioactive and disposed of as low level radioactive waste.

The liquid portion of the waste stream flows into a secondary clarifier which further settles out the remaining suspended particles. The effluent of the secondary chamber then flows into a chlorine contact chamber where any remaining microorganisms are dosed with specified concentration of chlorine. The effluent is allowed to remain in the chlorine contact chamber for a set period which allows time for the chlorine to effectively kill any pathogenic organisms. The effluent flows into a dechlorination chamber. This step removes any residual chlorine which would be toxic to organisms in downstream environments. From the dechlorination chamber, the final effluent, which at this stage is basically water, is gravity fed to the main discharge pipe and released to Lake Ontario.

Based on the above, impacts of chemicals in thoroughly treated, permitted WWTP effluents to the water quality of Lake Ontario will be negligible and are not expected to warrant mitigation.

5.2.3.2 Thermal Impacts

As noted in Section 5.2.3.1, discharges from NMP3NPP will be permitted under the SPDES program, which regulates the discharge of pollutants into waters of the state. In this context, waste heat is regarded as a thermal pollutant and is regulated in much the same way as chemical pollutants. Thermal discharges are also regulated under the New York Codes, Rules and Regulations (NYCRR, 2008). Further information describing thermal discharge and the physical impacts associated with operation of NMP3NPP is presented in Section 5.3.2.1.1.

The NMP3NPP discharge diffuser system is designed to minimize the potential impact of the thermal plume as it enters Lake Ontario, making use of a multi-port diffuser located 500 ft (152 m) offshore in 39 ft (12 m) water depth. The area occupied by the plume is compared to the New York State water quality criteria presented below (NYCRR, 2008) and in Table 5.3-6. This comparison demonstrates that the NMP3NPP thermal plume conforms to each of the criteria.

The difference between intake water temperature and cooling water (ΔT) discharged to the discharge tunnel for NMP3NPP is 15°F (8.3°C) in summer and 30°F (16.7°C) in winter . The maximum temperature in the summer at the discharge structure is expected to be 90°F (32.2°C) During the worst case weather conditions (extreme summer and winter), NMP3NPP discharges would not increase the thermal plume area (ΔT >3°F (1.7°C) more than 1,400 acres (567 hectares) in summer and up to 800 acres (324 hectares) in winter. This difference was deemed to be not significant compared to existing NMP Unit 1 and Unit 2 operations.

5.2.3.3 New York State Thermal Regulations

The State of New York has established surface water mixing regulations (NYCRR 2008). Power plant thermal discharges into non-tidal waters must meet the following criteria:

- The natural seasonal cycle shall be retained.
- Annual spring and fall temperature changes shall be gradual.
- Large day-to-day temperature fluctuations due to heat of artificial origin shall be avoided.
- Development or growth of nuisance organisms shall not occur in contravention of water quality standards.
- Discharges which would lower receiving water temperature shall not cause a violation of water quality standards.
- For the protection of the aquatic biota from severe temperature changes, routine shut down of an entire thermal discharge at any site shall not be scheduled during the period from December through March.

In addition, for lake waters:

- The water temperature at the surface of a lake shall not be raised more than 3°F (1.7°C) over the temperature that existed before the addition of heat of artificial origin.
- In lakes subject to stratification, thermal discharges that will raise the temperature of the receiving waters shall be confined to the epilimnion.

- In lakes subject to stratification, thermal discharges that will lower the temperature of the receiving waters shall be discharged to the hypolimnion and shall meet the water quality standards.

Mixing zone criteria are as follows:

- The Department of Environmental Conservation shall specify definable, numerical limits for all mixing zones (e.g., linear distances from the point of discharge, surface area involvement, or volume of receiving water entrained in the thermal plume).

- Conditions in the mixing zone shall not be lethal in contravention of water quality standards to aquatic biota which may enter the zone.

- The location of mixing zones for thermal discharges shall not interfere with spawning areas, nursery areas and fish migration routes.

New York State Department of Environmental Conservation will provide information to the U.S. Environmental Protection Agency to ensure full compliance with federal law.

As discussed in Section 5.3.2 the results of the modeling, as shown in Table 5.3-6, indicate that the plume will meet the New York State Thermal Discharge criteria. Thermal impacts to the aquatic communities are therefore expected to be SMALL.

Concentrations of water treatment chemicals, such as chlorine and anti-foulants that are added to the cooling system and subsequently discharged in the cooling tower blowdown do not exceed surface water quality standards. Because of the treatment planned for some of the effluent streams and the large dilution factor expected in the NMP3NPP retention basin prior to discharge, possible impacts on the aquatic communities are also expected to be SMALL.

NMP3NPP will comply with applicable State of New York regulations requiring the design of the cooling water intake and discharge structures to incorporate the Best Technology Available to minimize adverse environmental impacts.

5.2.3.4 NMP Unit 1 and Unit 2 Discharge

Descriptions of the discharge location for NMP Unit 1 and Unit 2 and the discharge location for NMP3NPP are provided in Section 5.3.2. The discharge for NMP Unit 1 and Unit 2 influences the discharge location for NMP3NPP due to its discharge mixing zone. The three discharge locations must meet environmental regulations in order to be permitted.

5.2.3.5 Discharge Mixing Zone

The discharge outfall for NMP3NPP will be located on the shoreline of Lake Ontario, approximately 3000 ft (914 m) west of the NMP Unit 1 intake and discharge. The discharge piping will extend approximately 1,640 ft (500 m) from shore into Lake Ontario. The discharge structure will utilize two 1.5 ft (0.46 m) diameter ports which will release heated effluent through a multi-port diffuser located in a water depth of 39 ft (12 m). Riprap will be placed around the discharge point to resist potential scour due to the discharge jet from the nozzles.

5.2.3.6 Site Surface Water Impacts

The existing and proposed surface water bodies within the NMPNS site are described in Section 2.3.1 and Section 4.2.1. The potential for these bodies to be impacted by site operations are dependent upon operational conditions and compliance with site safety and spill containment training, a spill prevention, control and countermeasure plan (SPCC), and a stormwater pollution prevention plan (SWPPP). These plans are addressed in Section 1.3.

Spills or operational debris potentially occurring on outdoor facilities could mix with site precipitation or washing wastewater and be conveyed to downstream impoundments, streams, and eventually Lake Ontario. If proper spill and stormwater pollution prevention plans are implemented and practiced, the majority of polluted runoff can be controlled and prevented from escaping the NMPNS site. A monitoring plan implemented under the regulatory guidance for surface and groundwater monitoring could identify future sources of pollution which are above established surface water quality criteria. Those areas could be addressed and point-sources of pollution removed before the area water bodies are impacted further.

Environmental impacts on water quality during construction and operations for NMP3NPP would be minimal. Groundwater would not be used for NMP3NPP operation, and will only be used during construction for dewatering foundations. Surface water runoff and sedimentation effects will be minimized by implementation of a site safety and spill prevention plan and a stormwater pollution prevention plan. Effluent from the planned wastewater treatment plant will meet all applicable health standards, regulations, and water quality criteria as set by the New York State Department of the Environmental Conservation and the U.S. EPA.

A combined retention basin would collect cooling tower blowdown and effluent from the proposed wastewater treatment plant. Effluent from the retention basin, which will contain dilute quantities of chemicals and dissolved solids, and be slightly elevated in temperature, will be discharged to Lake Ontario within the limits of the site SPDES permit**.** When discharged and diluted, this small amount of slightly contaminated water, approximately 0.001% of low flow conditions in Lake Ontario, would be expected to have small impacts.

5.2.4 REFERENCES

NYCRR, 2008. New York Codes, Rules and Regulations (NYCRR) Chapter X §§Part 704.1-704.7, Criteria Governing Thermal Discharges, New York State Department of Environmental Conservation Website: http://www.dec.ny.gov/regs/4589.html, Date accessed June 11, 2008.

5.3 COOLING SYSTEM IMPACTS

This section describes potential impacts from operation of the cooling systems at NMP3NPP. The NMP3NPP Circulating Water System and Ultimate Heat Sink will be closed-cycle systems. Water is recirculated through the cooling tower to remove waste heat. Thus, the amount of water necessary for these systems is small compared to that of once-through cooling systems. To replace evaporative losses, blowdown, and drift losses, makeup water from the Lake Ontario is supplied to the: 1) Circulating Water System, 2) Essential Service Water System (ESWS), and 3) Ultimate Heat Sink under post-accident conditions lasting longer than 72 hours. In addition, Lake Ontario waters are supplied to the water treatment plant, which, in turn, supplies makeup water to the cooling towers associated with the ESWS and Ultimate Heat Sink during normal and shutdown/cooldown conditions.

Potential physical and aquatic impacts are associated with water withdrawal at the intake structures, heat dissipation to the atmosphere, and elevated temperature of the blowdown as it is returned to Lake Ontario.

5.3.1 INTAKE SYSTEM

Existing intake systems on the Nine Mile Point Nuclear site incl;ude the intake structures for NMP Unit 1 and Unit 2. NMP Unit 1 has a single intake structure located approximately 850 ft (259 m) from the existing shoreline in 18 ft (5.5 m) of water. Water enters the intake tunnel through a bellmouth-shaped inlet. The lake intake system for NMP Unit 2 conveys cooling water from Lake Ontario through two identical submerged intake structures located approximately 950 ft and 1,050 ft (289.6 m and 320 m) from the existing shoreline.

The NMP3NPP intake structure consists of NMP3NPP Tunnels A and B, with an intake structure at 220 ft (67.1 m) elevation of the lake bed, and will be an approximately 113 ft (34 m) long, 208 ft (63 m) wide structure with individual pump bays. The system consists of the safety-related intake tunnels, and the safety-related (seismic category I) and non-safety-related (seismic category II) portions of the intake structure on the shores of Lake Ontario. Section 3.4 provides the details regarding the design of these structures and systems.

In addition, the Circulating Water Treatment System provides treated water for the CWS and consists of three phases: makeup treatment, internal circulating water treatment and blowdown treatment. Water being treated will be both lake water influent (from Lake Ontario), as well as effluent into the waste water retention basin. Section 3.3.2 details this process.

Section 3.4.1.1 identifies that the maximum makeup rate from Lake Ontario to the CWS is 27,800 gpm (105,300 lpm) based on sizing of pumps with flow margin added. This accommodates the maximum evaporation rate, maximum blowdown rate, and drift losses.

Makeup water to the ESWS is normally supplied from the plant Raw Water Supply System (RWSS) which in turn is supplied from water drawn from Lake Ontario. The water loss from the ESWS is expected to be 1,713 gpm (6,484 lpm) per ESWS cooling tower based on maintaining three cycles of concentration. The water loss under shutdown/cooldown conditions will be approximately 3,426 gpm (12,969 lpm) based on 2,284 gpm (8,646 lpm) from evaporation, 1,138 gpm (4,308 lpm) from blowdown, and drift loss of 4 gpm (15 lpm) with all four ESWS cooling towers in operation.

The flow velocity into and through the intake channel from the Lake Ontario will be less than 0.5 ft/sec (0.15 m/sec) for NMP3NPP. The sloping of the intake tunnels allows any solids in the tunnels to collect at one end. There is no need for a fish return system in this unit since the flow velocities through the intake system are less than 0.5 ft/sec (0.15 m/sec). NMP3NPP does not rely on Lake Ontario water for safe shutdown since the UHS tower basins contain sufficient storage volume for shutdown loads. The probable maximum flood (PMF) level at the intake location is 269 ft (82 m) above mean sea level (msl). All safety-related structures have a minimum grade slab or entrance at approximately 271 ft (83 m) msl or higher.

In the safety-related UHS makeup water intake structure, one makeup pump will be located in each pump bay, along with one dedicated traveling screen and trash rack. There are cross bay stop log slots to permit isolation of pumps on an individual basis. The dual flow type of traveling screens with a flow pattern of double entry-center exit will be used for each bay. This arrangement prevents debris carry over. The screen panels have a mesh size of 0.08 in (2 mm) square. The traveling screens are non-safety-related, seismic Category II (Section 3.4.2.1).

5.3.1.1 Hydrodynamic Descriptions and Physical Impacts

Physical impacts of cooling water intake operation could include alteration of site hydrology and increased sediment scour. NMP Unit 1 and Unit 2 are currently withdrawing about 440 mgd (1666 million lpd) of cooling water from Lake Ontario. The circulating waters of NMP Unit 1 and 2 are withdrawn through separate submerged intake structures that lie about 850 ft (259 m) and 1,000 ft (305 m), respectively, offshore in about 18 ft (5.5 m) and 30 ft (9 m) of water, respectively. The proposed NMP3NPP will withdraw its circulating water through two submerged intake structures located about 1,050 ft (320 m) offshore in a water depth of about 23 ft (7.1 m). The layout of the NMP Unit 1 and Unit 2 and NMP3NPP intake and discharge structures are shown in Figure 5.3-1. Detailed drawings of the intake structures are shown in Section 3.4.

The bathymetry near the plant intake and discharge locations is relatively shallow, and varies from 5 ft (1.5 m) onshore to 65 ft (20 m) about a half mile offshore. This depth gradient remains relatively the same up to 3.5 miles (6 km) offshore where the water depths increase to about 260 ft (80 m) and then further increase sharply afterwards. The water depth at about 8 miles (13 km) offshore is nearly 490 ft (150 m) or deeper in the northwestern direction from NMPNS.

Sediment characteristics in the vicinity of the intake structures were determined from geotechnical borings. Additionally the bottom substrate was observed during a survey of aquatic ecology at the intake locations. In general, the substrate is dominated by large flat rocks and ledge and is covered with mussels. No sediments were observed.

The mean currents observed in Lake Ontario in the vicinity of NMPNS are in the range of 0.3 -0.7 ft/s (10-20 cm/s). NMP3NPP will withdraw a maximum of 49.6 mgd (188 million lpd) of cooling water from Lake Ontario, which will represent 0.03% of the total inflow to Lake Ontario.

A model study was conducted to determine design characteristics of the intake facilities. The model evaluated the spatial and temporal alterations of the ambient flow field and was utilized to determine the design horizontal and vertical approach velocities and geometry of intake canals. Design criteria that resulted from the model study included: 1) a limitation on change in temperature rise across the condensers; 2) the withdrawal of cooler waters from below the thermocline; 3) limiting impact on organisms in the upper photosynthetic zone; and 4) intake velocities less than 0.5 ft/sec (0.15 m/sec). Collectively, these mitigating measures serve to limit the potential impact of the addition of a closed-cycle unit to the NMP3NPP.

Due to the rocky nature of the bottom substrate and because the intake velocities approaching the NMP3NPP intake structures are expected to be low, it is not anticipated that physical impacts such as bottom scouring, induced turbidity, or silt build-up will be created by the new intake system. Because of the low induced velocities and minimal impact on the current patterns at the site, the operation of the intakes will not alter erosion of the shoreline, localized turbidity levels, or siltation patterns in the area.

The potential physical impacts associated with nuclear plant cooling water intakes were considered by the NRC in developing its generic environmental impact statement (GEIS) for license renewal and in its site-specific supplement for NMP Unit 1 and Unit 2 and James A. FitzPatrick NPP (NRC,1996) (NRC, 2006) (NRC, 2008). The NRC concluded that there would be no impacts on altered current patterns at intake and discharge structures and altered thermal stratification of lakes during the renewal term beyond those discussed in the GEIS. The comparatively small incremental water use should not alter this determination.

Based on the facts that (1) the amount of additional cooling water withdrawn for NMP3NPP is small compared to that of NMP Unit 1 and Unit 2 and James A. Fitzpatrick NPP, and (2) intake velocities will be less than 0.5 ft/sec (0.15 m/sec), it is concluded that the physical impacts of the intakes for the NMP3NPP CWS and UHS will be SMALL and will not warrant mitigation measures beyond the design features previously discussed.

5.3.1.2 Aquatic Ecosystems

Aquatic impacts attributable to operation of the NMP3NPP intake structures and cooling water systems are impingement and entrainment. Impingement occurs when larger organisms become trapped on the intake screens and entrainment occurs when small organisms pass through the traveling screens and subsequently through the cooling water system. Factors that influence impingement and entrainment include cooling system and intake structure location, design, construction and capacity. Clean Water Act Section 316(b) requires that cooling water intakes represent "Best Technology Available" for these criteria. The U.S. Environmental Protection Agency (EPA) promulgated regulations implementing Section 316(b) in 2001 for new facilities (Phase I) (USEPA, 2001). The NMP3NPP intake and cooling water systems conform to these criteria.

The U.S. EPA design criteria for Phase I new facilities are as follows:

- Reduce intake flow, at a minimum, to a level commensurate with that which can be attained by a closed-cycle recirculating cooling water system,
- Achieve a maximum through screen intake velocity of 0.5 ft/sec (0.15 m/sec),
- For intake structures located in a tidal estuary or tidal river, the total design flow over one tidal cycle of ebb and flow must be no greater than 1% of the volume of the water column within the area centered about the opening of the intake with a diameter defined by the distance of one tidal excursion at the mean low water level,
- Select and implement design and construction technologies or operational measures for minimizing impingement mortality of fish and shellfish, if:
    - There are threatened, endangered or otherwise protected species potentially impacted
    - Migratory, sport or commercial species pass through the hydraulic zone of influence

- Select and implement design and construction technologies or operational measures for minimizing entrainment of entrainable life stages of fish and shellfish, if:
    - There are threatened, endangered or otherwise protected species potentially impacted
    - There would be undesirable cumulative stressors affecting entrainable life stages of species of concern.

New York State cooling water system requirements require that "the location, design, construction and capacity of the cooling water intake structures shall reflect the best technology available (BTA) for mitigating impacts from cooling water intakes (NYSDEC, 2008a). The New York State Department of Environmental Conservation (NYSDEC) states on its Habitat Protection, Steam-Electric Generation webpage, "Mitigation is aimed at minimizing adverse environmental impacts, but not at a social and economic cost that is wholly disproportionate to the related environmental benefits." (NYSDEC, 2008a). As such, NYDEC may identify additional BTA mitigation measures beyond those required by the U.S. EPA.

The NMP3NPP CWS intakes will meet the U.S. EPA Phase 1 design criteria as discussed above. The intake structures for NMP3NPP will incorporate fish and invertebrate protection measures that maximize impingement survival. The through-trash rack and through-screen mesh flow velocities will be less than 0.5 ft/sec (0.15 m/sec). In the intake structures, there is no need for a fish return system, because the flow velocities through the screens and through the intake tunnel are less than 0.5 ft/sec (0.15 m/sec). An estimated 80% of the inflow to Lake Ontario comes from the Niagara River (NMP, 2004) and that flow is estimated as 210,000 cfs (5,947 m3/s) (USGS, 2005). Therefore the total estimated flow into Lake Ontario is 262,500 cfs (7,433 m3/s). The withdrawal rate at NMP3NPP is estimated at 49.6 mgd (187,756 m^3/day), which will represent 0.03% of the total inflow to Lake Ontario.

An extensive impingement and entrainment database exists for NMP Unit 1 and Unit 2 and the adjacent James A. Fitzpatrick NPP with which to evaluate potential impacts on important species as defined in Section 2.4.2 (NRC, 2006) (NRC, 2008) (NMP, 2004). Impingement monitoring was performed at NMP Unit 1 from 1972 to 1997 excluding 1996 (NMP, 2004) and the most recent available data is from James A. Fitzpatrick NPP, where an impingement study was conducted in 2004 (EA, 2005). Sixty-one species of fish were identified from over 30 years of sampling at NMP Unit 1, while 34 were identified from the James A. Fitzpatrick NPP study in 2004. Only the Silver Redhorse and Green Sunfish were identified at James A. Fitzpatrick NPP but not at NMPNS (LMSE, 2006) (NRC, 2008). The most commonly impinged species at NMPNS and James A. Fitzpatrick NPP were Alewife, Rainbow Smelt, and Threespine Stickleback (LMSE, 2006). The impingement rates and the composition of species that make up the majority of the catch are representative of lake-wide abundance and impingement is not a factor affecting lake populations (NMP, 2004) (NRC, 2008). From 1972 through 1997 at NMPNS, the total annual number of fish impinged ranged from 3,769 to over 5 million. Impingement during this time period was composed mainly of six species: Alewife, Rainbow Smelt, Threespine Stickleback, Gizzard Shad, Sculpin Sp., and White Perch. These fish composed greater than 97% of impingement catches.

Between 1973 and 1997 the total annual number of fish impinged at the NMPNS site averaged 692,605 (LMSE, 2006). At James A. Fitzpatrick NPP in 2004, total annual impingement was estimated at 239,357 (NYSDEC, 2005). Similar to the 1997 NMPNS impingement data, Threespine Sticklebacks made up the majority of the impingment at James A. Fitzpatrick NPP in

2004, reflecting long term lake-wide declines in Alewife and Rainbow Smelt abundance (LMSE, 2006) (NRC, 2008).

The data collected at James A. Fitzpatrick NPP are the most recent data available. Due to the changes in the Lake Ontario fish community, the James A. Fitzpatrick NPP recent data is used instead of the older data from NMP Unit 1 and Unit 2 to estimate impingement at NMP3NPP. The James A. Fitzpatrick NPP intake (adjacent to NMPNS site) is an offshore structure with a velocity cap similar to that proposed for NMP3NPP. Estimates of the impingement totals for NMP3NPP were based on the estimated water withdrawal rate of 49.6 mgd (187,756 m^3/day) and the 2004 impingement rates at James A. Fitzpatrick NPP . These impingment rates are considered overestimates of impingement at NMP3NPP because the velocities through the bar racks at the offshore intake at James A. Fitzpatrick NPP (1.6 ft/s, 0.48m/s) are greater than the proposed intake velocities of (0.5 ft/sec, 0.15 m/sec) for NMP3NPP.

The projected total impingement for NMP3NPP and impingement of the four most common species is:

- Total impingement = 23,398 fish/year
- Threespine Stickleback = 20,744 fish/year
- Alewife = 1710 fish/year
- Rainbow Smelt = 192 fish/year
- Sculpins = 139 fish/year

Of the fish above, Alewife and Rainbow Smelt are considered important species as identified in Section 2.4.2. Impingement estimates for the remaining important species not listed above are:

- Brown Bullhead = <1 fish/year
- Brown Trout = 1 fish/year
- Chinook Salmon = 2 fish/year
- Lake Trout = 11 fish/year
- Rainbow Trout = 1 fish/year
- Walleye = 1 fish/year
- White Perch = 40 fish/year
- Yellow Perch = 38 fish/year
- Smallmouth Bass = 105 fish/year

EPA has developed natural mortality rates for the recreationally or commercially important species identified in Section 2.4.2 and susceptible to impingement at NMP3NPP (USEPA, 2004). These rates are presented in Table 5.3-1.

Endangered, threatened, or species of special concern near NMP3NPP, including Round Whitefish, Deepwater Sculpin, Lake Sturgeon, Lark Chubsucker, and Redfin Shiner, are not susceptible to impingement. Other commercially or recreationally important species and keystone species in the NMP3NPP area include: Coho Salmon, Atlantic Salmon, White Bass, and American Eel; none of these species are susceptible to impingement.

Entrainment and related plankton studies were conducted at NMP Unit 1 and Unit 2 in the 1970s and most recently in 1997 (Bur, 1986). At the adjacent James A. Fitzpatrick NPP, entrainment studies were conducted in 2006 (Normandeau, 2008). Nine taxa were identified during the NMPNS 1997 entrainment sampling consisting primarily of: Alewife (96%), Tessellated Darter (2%), and Threespine Stickleback (1%). During the James A. Fitzpatrick NPP 2006 entrainment sampling, 14 taxa were identified consisting primarily of: Alewife (66%), Round Goby (12%) Common Carp (11%), and Rainbow Smelt (5%).

Recreationally and commercially important species may be found around the NMPNS site area on a seasonal basis during migrations, but egg and larval entrainment is relatively low. Studies conducted by Texas Instruments in the late 1970s determined that only Alewife and Rainbow Smelt use the shallow inshore areas of NMPNS for spawning (Normandeau, 2008) (NMP, 2004). This contention is supported by the continued dominant presence of Alewife in entrainment samples from the 1970s through 2004 LMSE, 2006. The only other important species listed in Section 2.4.2 identified in entrainment sampling at either plant were Yellow Perch at NMPNS in 1997 and White Perch at James A. Fitzpatrick NPP in 2004 (Normandeau, 2008). Both species made up a minor component of the overall catch and only larval forms were found.

Similar to impingement, the number and species and number entrained is determined by the local abundance of fish at NMP and by community trends occurring throughout Lake Ontario. Studies by Lawler, Matusky, and Skelly Engineers to predict potential loss of entrained fish at Unit 2 were based on 1976 entrainment at NMP Unit 1 and Lake Ontario fish stock estimates (NMP, 2004) (LMSE, 2006). It was estimated that:

- Losses due to Alewife egg entrainment equaled 0.0002% of the female lake population.
- Larvae entrained accounted for 0.014% of the Lake Ontario Alewife larval population.
- Losses due to Rainbow Smelt egg entrainment equaled 0.00001% of the female lake population.
- Larvae entrained accounted for 0.025% of the Lake Ontario Rainbow Smelt larval population.

Using the entrainment rates from the James A. Fitzpatrick NPP 2004 sampling and the estimated 49.6 mgd (187,756 m^3/day) withdrawal rate estimated for NMP3NPP, total entrainment at NMP3NPP and entrainment of the three most common species is estimated as:

- A total loss of 1,596,787 eggs, larvae and young-of-the-year (YOY) annually.
- Alewife losses of 1,055,387 eggs, larvae, and YOY annually.
- Round Goby losses of 185,035 larvae and YOY annually.
- Common Carp losses of 171,329 eggs and larvae annually

Of these three species, only Alewife is considered an important species in Section 2.4.2. Of the remaining important species only Rainbow Smelt (82,238 larvae) and White Perch (6,853 larvae) were susceptible to entrainment. These species were considered to be recreationally and commercially important. Natural mortality rates for White Perch and Rainbow Smelt eggs and larvae are presented in Table 5.3-2.

The relative impact of impingement and entrainment can also be assessed by comparison to commercial and recreational fisheries statistics. Historic accounts of harvest for sport fish in Lake Ontario are provided in Section 2.4.2. The recreational and/or commercial fish and shellfish in New York's Lake Ontario waters potentially affected by power plant operations include: Chinook Salmon, Coho Salmon, Atlantic Salmon, Brown Trout, Rainbow Trout, Lake Trout, Smallmouth Bass, Yellow Perch, White Perch, White Bass, Walleye, and Brown Bullhead. Sport catches for all salmonids in 2005 amounted to an estimated harvest of 109,138, consisting mainly of Chinook Salmon (68,957) and Brown Trout (22,785) (NYSDEC, 2006). Based on the predicted intake of 49.6 mgd (187,756 m^3/day) and the impingement rates from the 2004 James A. Fitzpatrick NPP study, an estimated 14 salmonids would be impinged, amounting to a very small portion of the total harvest each year. Similarly, Smallmouth Bass harvest estimates in 2005 were 32,816 and estimated impingement at NMP3NPP is 105. Yellow Perch (8,942) and Walleye (2,465) recreational harvests were also estimated, however, these estimates have a high degree of error due to low catch levels. In comparison, the NMP3NPP impingement estimates for Yellow Perch are 38 and for Walleye the predicted impingement is less than 1.

Commercial catch estimates for Yellow Perch accounted for 6,354 lbs (2,882.13 kg) worth $9,511 and Brown Bullhead commercial catch was 1,040 lbs (471.74 kg) worth $2,079 (NMFS, 2008). The estimated impingement at NMP3NPP of 38 Yellow Perch and Brown Bullhead combined suggests that this will have a negligible effect of the fishery.

No federally-protected aquatic species reside in the immediate area around NMP. However, New York state lists five species that may be found as transients. The state-listed fishes that might be encountered include the endangered Round Whitefish, the threatened Lake Sturgeon and Lake Chubsucker, and the Redfin Shiner, a species of special concern (NYSDEC, 2008b). These species are potentially found in the vicinity of the intake structures. Despite this, the only record of these fish being impinged or entrained or captured anywhere near NMP are from over 30 years ago (1975). In 1975, one Redfin Shiner was reported as being captured at NMP. Also in 1975 at the mouth of the Salmon River (5 m (8 km) north of NMP), a Lake Chubsucker was captured (LMSE, 2006).

Operation of NMP3NPP with closed-cycle cooling systems and fish protection measures incorporated into the intake should limit any incremental effect beyond that already evaluated.

Based on the facts that (1) the proposed cooling tower-based heat dissipation system will under normal circumstances, withdraw small amounts of Lake Ontario water (2), the design of the intake structures and cooling water system incorporates a number of features that will reduce impingement and entrainment, and (3) the experience that suggests that the Lake Ontario fish and shellfish populations have not been adversely affected by operation of NMP Units 1 and 2, it is concluded that the impacts of the intakes for the cooling water systems will be SMALL and will not warrant mitigation measures beyond the design features previously discussed.

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5.3.2 DISCHARGE SYSTEM

5.3.2.1 Thermal Description and Physical Impacts

A description of Nine Mile Point 3 Nuclear Power Plant (NMP3NPP) cooling water system and the blowdown return to Lake Ontario is found in Section 3.4. The parameters important in estimating the thermal impacts of the blowdown discharge are summarized in this section. The average blowdown flow for NMP3NPP is estimated to be 16.1 mgd (60,945,130 lpd). The discharge structure consists of a submerged dual-port diffuser located approximately 1640 ft (500 m) offshore of NMP3NPP, at a depth of 39 ft (12 m). The discharge structure consists of two risers, each with a 1.5 ft (0.46 m) diameter port located 3 ft (0.91 m) above the bottom. The submerged diffuser rapidly mixes blowdown discharge into Lake Ontario.

The temperature rise from intake to the blowdown discharge varies with electrical generation and seasonal performance of the cooling tower. For purposes of thermal plume modeling, a maximum delta-T of 15°F (8.3°C) was assumed for the summer months and 30°F (16.6°C) for the winter months.

5.3.2.1.1 Lake Ontario Datasets

Datasets describing Lake Ontario and its ambient conditions are required for the analysis because Lake Ontario serves as the source and receiving waterbody for the thermal discharge. The mean currents observed in Lake Ontario normally range between 0.33 and 0.66 ft/s (10-20 cm/s). A similar range of ambient currents (0.16-0.33 ft/s or 5-10 cm/s) were observed and used for the analysis, based on recent hydrodynamic surveys at the existing NMPNS site. A vertically well-mixed condition was assumed for the ambient water body near the NMPNS site because of the shallow water depth and the discharge turbulence. An average wind speed of 4.5 mph (2.0 m/s) and a heat loss coefficient of 100 $W/m^2/°C$ were assigned to account for heat loss from the thermal plume.

Observed Lake Ontario water temperatures at NMP Unit 1 and Unit 2 from 1988 to 2007 indicate a maximum monthly average temperature of 79°F (26.1°C) at Unit 1 Intake and 80°F (26.7°C) at Unit 2 Intake in August 2005. The minimum monthly average water temperature was 31°F (-0.6°C) recorded in January 1989.

Meteorological boundary conditions such as wind speed and direction, air temperature, cloud cover, and relative humidity were used as input to the model to determine atmospheric and solar heating and cooling. These data were obtained from the NMPNS 30-foot (9.1 m) tall wind tower and the weather station at the Oswego-Fulton Airport, which is located about 10 miles (16 km) southeast of the NMPNS site. The NMPNS 30-foot (9.1 m) tall wind tower measured all components required for the computation of heat fluxes except for cloud cover, which was measured at Oswego-Fulton Airport. A summary of values used in the near-field CORMIX simulations is shown in Table 5.3-3 Geophysical surveys of the Lake Ontario lake-bed along the proposed discharge pipeline and discharge structure site show that a thin veneer of surficial sediments overlies a basement surface, which is interpreted as sandstone. The surficial sediments extend offshore approximately 2900 feet (884 m).

5.3.2.1.2 Discharge Thermal Plume Regulations

A 2008 study was performed to analyze the thermal impact of discharges and to determine whether they are in compliance with local, state, and federal regulations such as the Federal

Water Pollution Control Act Section 316(a) and New York State Department of Environmental Conservation (NYSDEC) SPDES permit requirements. Specific New York state regulations (6 NYCRR 704) are: (NYCRR, 1974)

- The water temperature at the surface of a lake shall not be raised more than three Fahrenheit degrees over the temperature that existed before the addition of heat of artificial origin;

- In lakes subject to stratification as defined in Part 652 of this Title, thermal discharges that will raise the temperature of the receiving waters shall be confined to the epilimnion; and

- In lakes subject to stratification as defined in Part 652 of this Title, thermal discharges that will lower the temperature of the receiving waters shall be discharged to the hypolimnion and shall meet the water quality standards contained in Part 703 of this Title in all respects.

The thermal study also included additional sections 1) evaluating a "Global Warming" scenario, 2) dilution factors for particles originating from NMP3NPP within a 50-mile (80 km) radius, and 3) travel times of these particles at selected locations.

5.3.2.1.3 Discharge Plume Models

To compute the size and configuration of the thermal plume and to provide the dilution rates, two types of models were used. These models were Cornell Mixing Zone Expert System (CORMIX) for the near-field and Estuarine, Coastal and Ocean Model (ECOM) for the far-field. CORMIX is primarily a design tool that has also been used by regulatory agencies to estimate the size and configuration of proposed and existing mixing zones resulting from wastewater discharges. CORMIX is a near-field model (i.e., it applies to the region adjacent to the discharge structure in which the wastewater plume is recognizable as separate from the ambient water and its trajectory is dominated by the discharge rate, effluent density, and geometry of the discharge structure). To model the near-field thermal plume behavior, two ambient conditions were chosen for simulation, those with an ambient current of 0.16 and 0.33 ft/s (5 and 10 cm/s), as mentioned above in Section 5.3.2.1.1. A summary of values used in the near-field CORMIX simulations is shown in Table 5.3-3.

The hydrodynamic model chosen to assess the far-field characteristics of the thermal plume and dilution is ECOM, a three-dimensional, time-dependent, far-field hydrodynamic and hydrothermal model. The study conducted by HydroQual Near-Field and Far-field Modeling Studies for the NMP3NPP used a near-field (CORMIX) plume model and HydroQual's state-of-the-art, far-field hydrodynamic and thermal model (ECOM) to determine the near- and far-field temperature rise. ECOM is a three-dimensional, time-dependent, far-field hydrothermal model. It incorporates the near-field characteristics set by CORMIX. A coupled CORMIX -ECOM framework, not only provides background conditions of the lake during the calibration period, but also determines the behavior of the far field plume beyond the applicability of the CORMIX model.

Thermal plume configuration and size for the NMP3NPP thermal discharge for two scenarios are reported: August and January temperatures. To show the combined thermal effects of discharges from NMP Unit 1 and Unit 2, NMP3NPP, and neighboring James A. Fitzpatrick NPP, the cumulative thermal plume was simulated using the ECOM far-field model. For the CORMIX near-field, only the NMP3NPP discharge was modeled because CORMIX is incapable of modeling multiple plumes simultaneously. This approach is satisfactory because in the near-field, the plumes do not overlap due to a separation of over 2000 ft (610 m) between NMP3NPP's discharge structure and the nearest discharge structure (NMP Unit 1). For each seasonal scenario (August and January), design values of each unit's intake and discharge rates and temperatures were used as shown in Table 5.3-4. Winter temperature rises for the blowdown discharge for NMP3NPP are significantly higher than the summer temperature rises due to differences in cooling tower performance from winter to summer.

5.3.2.1.4 Thermal Plume Configuration and Size

NMP3NPP's CORMIX-derived plume dimensions are shown in Table 5.3-5. for the10:1 dilution and for CORMIX's near field region (NFR). The 10:1 dilution distance is often required by the New York Department of Environmental Quality for sizing acute and chronic mixing zones. The CORMIX model defines the NFR as the area where strong initial mixing occurs (USEPA, 1986). Figure 5.3-2 and Figure 5.3-3 illustrate the plume dimensions (width, depth, and dilution) for the 0.16 and 0.33 ft/s (5 cm/s and 10 cm/s) near-field scenarios.

ECOM modeled a of the portion of Lake Ontario in the vicinity of NMPNS to determine the far-field extent of the thermal plume. Model calibration was demonstrated by comparing the model predicted temperature, current velocities at varying depths, and horizontal surface plume sizes against observations recorded at sampling stations and thermal plume measurements surveyed during October 2007. Model simulations were performed for summer and winter critical conditions with the proposed NMP3NPP discharges to assess surface plume sizes ($\Delta T > 3°F$) (1.7°C). Model results indicate that the plume size was quite variable in time and was correlated with the ambient wind conditions. During the summer (Figure 5.3-4), onshore winds piled-up the plume against the shoreline, resulting in a larger plume size. Offshore winds during the same time period dispersed the plume in the offshore direction resulting in a relatively smaller plume size. Model results indicate that the size of the thermal plumes during the summer months varies from 100 and 400 acres (40.5 to 162 hectares) (Table 5.3-6). In winter months (Figure 5.3-5), the plume area-wind relationship was the same as that during the summer, but the sizes of thermal plumes ($\Delta T > 3°F$) (1.7°C) were reduced. Overall, during both summer and winter conditions, the proposed NMP3NPP discharges would not significantly increase the thermal area ($\Delta T > 3°F$) (1.7°C) compared to those under existing NMPNS operating conditions.

Statistical analysis of the positions of the thermal plume during summer critical simulations indicated that 90% of the time the plume would remain within about 5,000 ft (1524 m) of the plant, with the plume traveling less frequently as much as 9,000 ft (2743 m) from the plant (Figure 5.3-6). The model predictions also showed that the $\Delta T > 3°F$ (1.7°C) plume remains within a few thousand feet of the power plant most of the time. With respect to surface area, model results show that 90% of the time, the summer thermal plume is limited to 556 acres (225 hectares) or less and the winter thermal plume is limited to 249 acres (101 hectares) or less. Under extreme wind conditions, however, the plume could grow to approximately 1,400 acres (567 hectares) during the summer and up to 800 acres (324 hectares) during the winter. Plume sizes are listed in Table 5.3-6.

5.3.2.2 Aquatic Ecosystems

Power plant discharge effects could include attraction of fish to the thermal plume, cold shock, blockage to movement and migration, changes in benthic species composition, growth of nuisance species, alteration of reproductive patterns and chemical effects of biocides. These effects have been studied extensively at NMP Unit 1 and Unit 2 as well as the adjacent James A. Fitzpatrick NPP and provide a basis for assessing the potential ecological consequences of the NMP3NPP discharge. (LMSE, 2006) (EA, 1998a) (EA, 1998b) (EA 2007) (Normandeau, 2008)

The absence of harm caused by the NMP Unit 1 and Unit 2 discharges to key species of concern including recreationally and commercially important species provides evidence that the incremental discharge of cooling tower blowdown and wastewaters from NMP3NPP will have minimal impact on Lake Ontario in the NMPNS site area. These comparisons are based on the relatively small size of the projected discharge at NMP3NPP (16.1 mgd; 60,945 m^3/day) (LMSE, 2006) compared to the discharge at Unit 2 (72.0 mgd; 272,550 m^3/day) and Unit 1 (417.6 mgd; 1,580,788 m^3/day). (NYSDEC, 2004)

5.3.2.2.1 Thermal Effects

The U.S. EPR proposed at NMP3NPP will have a closed cycle cooling system similar to the existing NMP Unit 2. The thermal plume produced by the NMP Unit 2 discharge system meets the requirements of the SPDES permit and the New York Code of Rules and Regulations 704.2 and 704.3. (NYSDEC, 2003) (NYCRR, 1974)

Overall, it was determined that the thermal plume from NMP Unit 1 was small and did not require mitigation. There was no aspect of the biotic community affected by the plume for NMP Unit 1 which is larger than NMP3NPP, indicating that the effect of NMP3NPP would be less.

NMP3NPP will have closed cycle cooling water system with a maximum discharge of 16.1 mgd (60,945 m^3/day). The discharge will comply with the regulation established by the State of New York for surface water mixing. (NYCRR, 1974) Power plant thermal discharges into non-tidal waters must meet the following criteria:

- ♦ The natural seasonal cycle shall be retained.
- ♦ Annual spring and fall temperature changes shall be gradual.
- ♦ Large day-to-day temperature fluctuations due to heat of artificial origin shall be avoided.
- ♦ Development or growth of nuisance organisms shall not occur in contravention of water quality standards.
- ♦ Discharges which would lower receiving water temperature shall not cause a violation of water quality standards.
- ♦ For the protection of the aquatic biota from severe temperature changes, routine shut down of an entire thermal discharge at any site shall not be scheduled during the period from December through March.

In addition, for lake waters:

- ♦ The water temperature at the surface of a lake shall not be raised more than 3°F (1.7°C) over the temperature that existed before the addition of heat of artificial origin.
- ♦ In lakes subject to stratification, thermal discharges that will raise the temperature of the receiving waters shall be confined to the epilimnion.
- ♦ In lakes subject to stratification, thermal discharges that will lower the temperature of the receiving waters shall be discharged to the hypolimnion and shall meet the water quality standards.

Mixing zone criteria are as follows:

- The Department of Environmental Conservation shall specify definable, numerical limits for all mixing zones (e.g., linear distances from the point of discharge, surface area involvement, or volume of receiving water entrained in the thermal plume).
- Conditions in the mixing zone shall not be lethal in contravention of water quality standards to aquatic biota which may enter the zone.
- The location of mixing zones for thermal discharges shall not interfere with spawning areas, nursery areas and fish migration routes.

The NYSDEC will provide information to the U.S. EPA to ensure full compliance with federal law. The numerical modeling for NMP3NPP accounted for contributions from NMP Unit 1, Unit 2, and James A. Fitzpatrick NPP. The results of the modeling, as discussed in Section 5.3.2.1 and as shown in Table 5.3-3 through Table 5.3-6 indicate the degree of compliance with New York State Thermal Discharge criteria. During summer extreme conditions, 90% of the time the $\Delta T > 3°F$ (1.7°C) will remain within 5,000 feet (1,524 m) of the plant and the plume will cover an area of no more than 52 acres (21 hectares). During winter extreme conditions $\Delta T > 3°F$ (1.7°C) will remain within 4,000 feet (1,219 m) of the plant and will cover an area of no more than 2 acres (0.8 hectare).

The environmental impacts of the discharge from NMP Unit 1 have been determined small and alternate thermal limitations for NMP Unit 1 were granted by EPA Region II. The proposed maximum discharge from NMP3NPP of 16.1 mgd (60,945 m^3/day) is much smaller than the permitted daily maximum of 417.6 mgd (1,580,788 m^3/day) from NMP Unit 1. The relatively small cross sectional area of the NMP3NPP thermal plume is not expected to significantly affect fish movements.

The diffuser technology used at the discharge structure will prevent a concentrated thermal barrier from forming. The open coastline of Lake Ontario at the NMP3NPP site and lack of physical constrictions that may exist in riverine sites will help ensure that zones of fish passage exist around the mixing zone. Since fish are unlikely to become acclimated to the small plume, the potential for gas bubble disease, and thermal shock if the plant shuts down in the winter, are minimized. Additionally, the buoyant thermal plume is expected to rise to the surface. Therefore any impact to benthic organisms will be limited to scour and is expected to be SMALL.

It is concluded that the thermal impacts to the aquatic communities will be SMALL and will not warrant mitigation.

5.3.2.2.2 Chemical Effects

Currently, NMP Unit 1 and Unit 2 are permitted to use biocides to limit fouling within the cooling water system and other chemical agents to limit scaling. (NYSDEC, 2003) Discharge concentrations of these constituents will be limited by the New York State Pollutant Discharge Elimination System (SPDES) permit. No bioassay testing is required by the SPDES permit to assess the potential toxicity of the discharge for NMP Unit 1 and Unit 2. Bioassay testing is not expected as a permit condition for NMP3NPP.

Concentrations of water treatment chemicals, such as chlorine and anti-foulants that are added to the cooling system and subsequently discharged in the cooling tower blowdown are subject to surface water quality standards. Because of the treatment planned for some of the effluent streams and the large dilution factor expected in the NMP3NPP retention basin prior to discharge, possible impacts on the aquatic communities are also expected to be SMALL.

NMP3NPP will comply with applicable State of New York requirements for the design of the cooling water intake and discharge structures to incorporate the Best Technology Available to minimize adverse environmental impacts.

It is concluded that any impacts to aquatic biota will be SMALL, and will not warrant mitigation.

5.3.2.2.3 Physical Effects

Physical and related ecological impacts of the NMP3NPP will most likely be similar to those that have occurred at NMP Unit 2 due to the relative similarity of the volume of the discharges. At NMP Unit 2 these impacts have been limited to sediment scour in the vicinity of the high velocity discharge ports. The upward orientation of the discharge ports and the relatively low flow minimize the environmental effects. The benthic scouring at NMP Unit 2 was limited to a projected area of 150 ft^2 ($45m^2$). Previous studies at NMP Unit 1 and James A. Fitzpatrick NPP showed that discharge had no measurable effect on species assemblages or abundances. As the discharge for NMP Unit 2 was smaller than that at NMP Unit 1 and James A. Fitzpatrick NPP, it was determined that the effect of the Unit 2 discharge would also have no measurable effect on the benthic community. (NMP, 1984) NMP3NPP, most similar to NMP Unit 2, would also have a smaller discharge.

It is concluded that the impacts to aquatic communities will be SMALL, and will not warrant mitigation.

5.3.2.3 References

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5.3.3 HEAT DISCHARGE SYSTEM

5.3.3.1 Heat Dissipation to the Atmosphere

NMP3NPP requires water for cooling and operational uses. Primary water consumption is for turbine condenser cooling. Cooling water for the turbine condenser and closed cooling heat exchanger for normal plant operating conditions is provided by the Circulating Water Supply System (CWS). The excess heat from the CWS is dissipated to the environment with a closed loop cooling system. A closed loop cooling system recirculates water through the plant components and cools this water for reuse by transferring excess heat to air, or the atmosphere, with a cooling tower.

The cooling system for NMP3NPP will be a closed-cycle, wet cooling system, consisting of a single, non-plume abated round mechanical draft cooling tower for heat dissipation. The existing NMP Unit 1 uses an open loop cooling system, or once through, where water is withdrawn from Lake Ontario, heated in plant components providing the necessary cooling, and then returned to the Lake. NMP Unit 2 uses a closed loop cooling system with a natural draft cooling tower.

There will also be four smaller ESWS cooling towers to dissipate heat from system. The ESWS provides cooling water to the Component Cooling Water System heat exchangers and the cooling jackets of the Emergency Diesel Generators. Each of these four safety-related trains uses a safety-related two-cell mechanical draft cooling tower to dissipate heat. Heated ESWS water returns through piping to the spray distribution header of the UHS cooling tower. Water exits the spray distribution piping through spray nozzles and falls through the tower fill. Two fans provide upward air flow to remove latent heat and sensible heat from the water droplets. The heated air exits the tower and mixes with ambient air, completing the heat rejection process. The cooled water is collected in the tower basin for return to the pump suction for recirculation through the system. Table 3.4-1 provides nominal heat loads and flow rates in different operating modes for the ESWS. Makeup water is normally provided from the plant potable water system but can also be supplied from the safety-related UHS makeup water system pumps housed in their own intake structure near the CWS makeup intake structure. Table 3.4-3 provides the UHS cooling tower design specifications.

5.3.3.1.1 Circulating Water Supply System Cooling Tower Plume

A visible mist or plume is created when the evaporated water from the cooling tower undergoes partial recondensation. The plume creates the potential for shadowing, fogging, icing, localized increases in humidity, and possibly water deposition. In addition to evaporation, small water droplets drift out of the tops of the wet cooling tower. The drift of water droplets can deposit dissolved solids on vegetation or equipment.

For NMP3NPP, the impacts from fogging, icing, shadowing, and drift deposition were modeled using the Electric Power Research Institute's Seasonal/Annual Cooling Tower Impact (SACTI) prediction code. This code incorporates the modeling concepts (Policastro, 1993) which were endorsed by the NRC in NUREG-1555 (NRC, 1999). The model provides predictions of seasonal, monthly, and annual cooling tower impacts from mechanical or natural draft cooling towers. It predicts average plume length, rise, drift deposition, fogging, icing, and shadowing, providing results that have been validated with experimental data (Policastro, 1993).

Detailed cooling tower design information is provided in Section 3.4. This information was used to develop input to the SACTI model. A summary of the design parameters are provided in Table 5.3-7. The meteorological data was obtained from the NMPNS site meteorological tower for the years 2001 through 2007. Missing data was provided by the SACTI users guide (Rochester, NY) and the Buffalo, NY airport meteorological station.

Site specific meteorological data acquired from the existing NMPNS main meteorological tower for the past several years were provided as input for the SACTI code. The meteorological data included hourly observations of wind speed, wind direction, and dry-bulb and dew point temperatures. The data for the years 2001 through 2007 was selected for analysis. Concurrent observations from Rochester Airport were used for ceiling height and cloud cover. Wind speed and direction was collected at 30, 100 and 200 feet (9, 30, 61 m). Wind data from the 200-foot (61-m) level were used where available as the cooling tower is 164 feet (50 m) tall. Missing wind data was replaced with valid data from the 100-ft (30-m) level.

In the cases where both the 200-ft (61-m) and 100-ft (30-m) level data was missing, wind data from the 30-ft (9-m) level was used, and if necessary Rochester data. Rochester temperature data was used to substitute for missing on-site temperatures. Rochester dew point temperatures that were greater than the on-site dry-bulb temperatures were reset to the dry-bulb temperature. The monthly clearness index and solar insolation, also required by the code, for Rochester, NY was obtained from the SACTI User's Manual: Cooling Tower-Plume Prediction Code. The remaining parameters required for the meteorological input file, relative humidity and wet bulb temperature, were calculated. Relative humidity, wet bulb temperature, dry bulb temperature and dew point are all related and any two can be determined using relationships with the other two. Seasonal mixing height data for Buffalo was obtained from the SACTI User's Guide.

The normal heat loads from the ESWS cooling towers are approximately 3% of the heat load to the CWS cooling tower. The maximum heat load is less than 7% of the CWS cooling tower heat load. Any impacts from the heat dissipation to the atmosphere by the ESWS cooling towers would be much less than the CWS cooling tower. In addition, a cumulative effect would be negligible. Therefore, the ESWS cooling towers are not considered further in the analysis.

5.3.3.1.2 Length and Frequency of Elevated Plumes

The SACTI code calculated the expected plume lengths annually and for each season by direction for the CWS cooling towers. The plumes would occur in all compass directions. The average plume length and height was calculated from the frequency of occurrence for each plume by distance from the tower. Modeled plume parameters for the cooling tower are provided in Table 5.3-8

The average plume length would range from 2.6 mi (4.0 km) in the fall season to 3.8 mi (6.1 km) for the spring season. The annual prediction for average plume length would be 2.3 mi (3.7 km). The median plume lengths would range from 0.7 mi (1.0 km) in the summer season to 5.9

mi (9.5 km) in the spring season. The annual median plume length is 2.8 mi (4.4 km). The maximum hours of off-property shadowing is 765 hours or less than 10% of the year.

The average plume height would range from 2,003 ft (606 m) in the fall season to 3,016 ft (913 m) in the spring season. The annual prediction for average plume height would be 1,828 ft (554 m). The median plume height would range from 1,147 ft (347 m) in the fall season to 4,636 ft (1,404 m) in the summer season. Based on model predictions for the cooling tower for NMPNS Unit 2, the plume height for the NMP3NPP would be expected to be similar.

The water vapor plume from the NMP3NPP cooling tower will also be noticeable, given the heights to which the plume may rise, especially during the winter months. The frequency of the plume direction, its height, and its extent will vary, depending on the season and wind direction. The impact of the visual intrusion by the cooling tower plume, however, is anticipated to be SMALL because the NMPNS site is already aesthetically altered by the presence of the existing NMP Unit 2 cooling tower plume.

5.3.3.1.3 Ground-Level Fogging and Icing

Fogging from the mechanical draft cooling towers occurs when the visible plume intersects with the ground, appearing like fog to an observer. Fogging would occur for a maximum of 0.43 hours in the east direction during the winter season. Fogging during the fall season would occur for a maximum of 0.74 hours in the south-southwest direction. Fogging during the spring season would occur for a maximum of 0.29 hours to the northwest direction. Fogging is not predicted to occur in the summer months. The prediction for annual fogging would be 1.1 hours in the south-southwest direction. The total annual fogging in all directions would be 3.1 hours. The fogging would occur most frequently on-site, with a prediction that the fogging would reach the site boundary for less than 0.29 hours per year or 0.005%. This represents a very small percentage of the total hours per year. No fogging is predicted to occur at the closest road or agricultural area.

Icing from a mechanical draft cooling tower occurs when ambient temperatures are below freezing during a fogging event. Icing is predicted to occur for a maximum of 0.20 hours during the winter season in the south-southwest direction. Icing is not predicted to occur during the spring, summer or fall seasons. Annually, the icing would occur for a maximum of 0.61 hours in all directions. Like fogging, icing is most likely to occur on-site, and would occur off-site for less than 1 hour per year. This represents a very small percentage of the total hours per year 0.01%. No icing is predicted to occur at the closest road or agricultural area

Fogging and icing would occur for only a small percentage of the time and would occur most frequently on-site. Impacts from the cooling tower from fogging and icing, therefore, would be SMALL and would not require mitigation.

Salt Deposition

Cooling tower drift is water droplets in the cooling tower that get entrained in the buoyant air of the cooling tower exhaust and leave the tower. These droplets eventually evaporate or settle out of the plume onto the ground, vegetation or equipment nearby.

The drift rate was based on 0.001% of the Circulating Water Supply System flow. The makeup water for the CWS has a maximum chloride concentration of 70 milligrams per liter of water. The Circulating Water Supply System was assumed to have five cycles of concentration, yielding a chloride concentration of 350 milligrams per liter in the circulating water. The equivalent concentration of sodium chloride of 576.8 milligrams per liter was conservatively used for the salt concentration of the makeup water. Water droplets drifting from the cooling tower would have the same concentration of salt as the water in the Circulating Water Supply System. Therefore, as these droplets evaporate, either in the air or on vegetation or equipment, they deposit these salts.

The maximum salt deposition rate from the cooling tower is provided in Table 5.3-9. The maximum predicted salt deposition is well below the NUREG-1555, Section 5.3.3.2 significance level for possible vegetation damage of 8.9 pounds per acre per month (10 kg per hectare per month) in all directions from the cooling tower during each season and annually. The SACTI model output for salt deposition was "0.00" indicating that the maximum predicted salt deposition is less than 0.005 pounds per acre per month (0.006 kg/hectare per month). Therefore, no impacts to vegetation from the salt deposition would be expected for both on site and off site locations.

The electrical switchyard for NMP3NPP will be located approximately 2,400 ft (730 m) to the south southeast of the proposed location for the CWS cooling tower. The SACTI model output for salt deposition was "0.00" indicating that a maximum predicted solids deposition rate less than 0.005 pounds per acre per month (0.006 kg per hectare per month) is expected at all locations. Additionally, the electrical switchyard for NMP Unit 1 and Unit 2 is located approximately 3,200 ft (975 m) to the east southeast from the proposed location of the NMP3NPP CWS cooling tower. The SACTI model output for solids deposition was also "0.00" indicating that a maximum predicted solids deposition expected at the NMP Unit 1 and Unit 2 electrical switchyard due to operation of the NMP3NPP CWS cooling towers is less than 0.005 pounds per acre per month (0.006 kg per hectare per month), during the fall season.

The ESWS cooling towers will be operated using fresh water from Lake Ontario. Salt deposition at the NMP Unit 1 and Unit 2 and NMP3NPP electrical switchyards resulting from operation of the NMP3NPP ESWS cooling towers will be SMALL, and is bounded by the salt deposition estimates for the NMP3NPP CWS cooling tower.

In summary, impacts from salt deposition from the NMP3NPP cooling tower would be SMALL. The modeling predicts salt deposition at rates below the NUREG-1555 significance level where visible vegetation damage may occur for both on-site and off-site locations.

5.3.3.1.4 Cloud Shadowing and Additional Precipitation

Vapor from a cooling tower can create clouds or contribute to existing clouds. The clouds would prevent or reduce the amount of sunlight reaching the ground. This shadowing is of particular importance in agricultural areas. There are several agricultural areas in the NMPNS site vicinity as described in Section 2.2. Cloud shadowing is predicted to occur for a maximum of 455 hours in the summer season at the nearest agricultural area. Cloud shadowing at the nearest roadway would occur for a maximum of approximately 283 hours during the fall season. Annually, cloud shadowing is predicted to occur for 398 hours at nearest roadway. Cloud shadowing at the Route 1 and Route 29 intersection, is predicted to occur for a maximum of 455 hours in the summer season and annually for 758 hours.

Rain and snow from vapor plumes are known to have occurred at some locations. The SACTI code predicted the precipitation expected from the proposed cooling tower. The tower would produce a maximum of less than one inch (2.5 cm) of precipitation per month during each of the seasons in varying directions. The maximum annual water deposition is 0.00026 inches (0.004 mm) at a distance of 0.6 miles (1 km) in the eastern direction. This value is small compared to the average annual rainfall at various nearby New York cities:

Oswego East - 42.93 in (1090.42 mm)

Syracuse - 40.05 in (1017.27 mm)

Rochester - 33.98 in (863.09 mm).

Impacts from cloud shadowing would be SMALL and would not require mitigation.

5.3.3.1.5 Ground-Level Humidity Increase

The relative humidity in the vicinity of the NMP3NPP site is typically high. The monthly mean relative humidity at the Greater Rochester International Airport was between 67% for 78% during the years of 1971 through 2000. The monthly mean relative humidity at Syracuse Hancock International Airport was between 66% for 77% during the years of 1971 through 2000. The monthly mean relative humidity at the NMPNS site was between 67.9% for 76.6% during the years of 2001 through 2005. Since the relative humidity in the vicinity of the NMP3NPP site is typically high, increases in the ground level relative humidity from the operation of the cooling tower would not be noticeable. Increases in the ground level humidity during periods when the ambient relative humidity is low would only increase the humidity to more typical levels.

Therefore, the potential for increases in absolute and relative humidity exist where there are visible plumes. However, the increase in ground level humidity at the NMP3NPP site would be SMALL and mitigation would not be warranted.

5.3.3.1.6 Noise

The noise levels generated by a typical mechanical draft cooling tower of the type for NMP3NPP is approximately 87 dBA at a distance of approximately 50 feet (15 m) from the cooling tower. The noise level is estimated to be 55 dBA at a distance of 2,000 feet (610 m) from the cooling tower. At the plant boundary, the cooling tower wind wall also acts as a sound barrier. ER Section 5.8.1 further discusses noise impacts of cooling tower operation.

5.3.3.1.7 Similar Operating Heat Dissipation Systems

Data and information on a similar heat dissipation system is available for the NMP Unit 2 cooling tower. NMP Unit 2 uses a natural draft cooling tower with Lake Ontario as the makeup water. At this plant, impacts from salt drift were not observed. Based on the distances between the heat dissipation systems and the predicted impacts, no synergistic effects with the proposed CWS cooling tower with respect to mixing fog or drift is anticipated.

The NRC described impacts from mechanical and natural draft cooling towers in the Generic Environmental Impact Statement (GEIS) for License Renewal of Nuclear Plants (NRC, 1996). Based on the information in the GEIS, the NRC found that impacts from salt drift, icing, fogging, or increased humidity associated with cooling tower operation have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term (for NMP Unit 1 and Unit 2).

Interaction with Existing Pollution Sources

Four industrial facilities, NMP Unit 1 and Unit 2, the James A. Fitzpatrick NPP, Independence Station and Novelis Corporation, are located in the vicinity of the NMP3NPP site. NMP Unit 1 and Unit 2 are located adjacent to the NMP3NPP site. The James A. Fitzpatrick Nuclear Power Plant is located approximately 0.9 mi (1.4 km) east of the NMP3NPP site. The Novelis Corporation is located approximately 2.4 mi (3.9 km) southwest of the NMP3NPP site. Existing diesel generators and boilers at NMP Unit 1 and Unit 2 and the James A. Fitzpatrick NPP operate for limited periods. Diesel generators that are associated with NMP3NPP will also operate for limited periods. Interactions between pollutants emitted from these sources and the plumes from the cooling tower for NMP Unit 2 are of sufficient distance and would not have a significant impact on air quality. As a result, impacts would be SMALL and would not require mitigation.

5.3.3.1.8 References

NRC, 1999. Standard Review Plans for Environmental Reviews of Nuclear Power Plants, NUREG-1555, Nuclear Regulatory Commission, October 1999.

NRC 2006a. NUREG-1437, Supplement 24, "Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants Regarding Nine Mile Point Nuclear Station, Units 1 and 2, May 2006.

NYSDEC, 2001. "Assessing and Mitigating Noise Impacts: Program Policy." New York State Department of Environmental Conservation, Revised February 2, 2001.

5.3.3.2 Terrestrial Ecosystems

Heat dissipation systems associated with nuclear power plants have the potential to impact terrestrial ecosystems through salt drift, vapor plumes, icing, precipitation modifications, noise, and avian collisions with cooling towers.

5.3.3.2.1 Potential Impacts Due to Salt Drift

The cooling towers constructed to provide heat dissipation for NMP3NPP will release drift capable of depositing as much as 0.00056 lb/acre per month (0.00063 kg/hectare per month) of dissolved solutes, primarily originating from the proposed Lake Ontario makeup water during the fall season, on the terrestrial ecosystems located adjacent to NMP3NPP. This value represents the maximum overall deposition rate during the fall. Maximum overall deposition rates during the winter, spring and summer were similar and ranged from 0.000027 lb/acre per month (0.000030 kg/hectare per month) to 0.00011 lb/acre per month (0.00012 kg/hectare per month.

The component of terrestrial ecosystems most vulnerable to cooling tower drift is vegetation, especially the upper stratum of vegetation whose foliage lies directly under the released droplets of water forming the drift (NRC, 1996). Most areas of natural vegetation in the terrestrial areas subject to the greatest drift consist of forest (NRC, 1996). Hence, woody vegetation forming the tree canopy and woody understory is subject to the greatest exposure.

5.3.3.2.1.1 Plant Communities Potentially Affected by Salt Deposition Isopleths

The salt deposition rates predicted in Section 5.3.3.1 are well below 1 kg/hectare per month (NUREG-1555). The results of the vapor plume analysis for the NMP3NPP mechanical draft cooling tower indicated that salt deposition rates are well below levels with documented impacts to vegetation as discussed in Section 5.3.3.2.1.2. Therefore isopleths of deposition at ground levels on a seasonal basis is not provided. No vegetation anywhere would be exposed to monthly or seasonal salt deposition rates exceeding 0.00056 lb/acre per month (0.00063 kg/hectare per month) or 0.0017 lb/acre/season (0.0019 kg/hectare per season), respectively.

5.3.3.2.1.2 Potential Effects of Salt Deposition to Specific Plant Species

Salt drift deposited at rates approaching or exceeding 10 kg/ha (8.9 lb/acre) per month in any month during the growing season may cause leaf damage in many species. However, deposition rates of 1 to 2 kg/ha per month (0.9 to 1.8 lb/acre) are generally not damaging to plants (NRC, 1996). Since the highest salt deposition rate projected for the proposed NMPNS site cooling towers is less than 0.00056 lb/acre per month (0.00063 kg/hectare per month), the risk of acute injury to vegetation is low. However, information in the published scientific literature regarding the sensitivity of individual plant species to salt deposition is limited. This is especially true with respect to low level chronic injury such as stunted growth that is not as visually apparent as acute injury such as browned leaves (NRC, 1996).

The native plant with the highest sensitivity to salt deposition reported in NUREG-1437 (NRC 1996), is flowering dogwood (Cornus florida), which experiences acute injury at salt deposition rates exceeding approximately 4.7 lb/acre (5.2 kg/hectare) per month. However, no flowering dogwood was observed during the flora survey at NMPNS. NUREG-1437 provides information for four species which are present at the NMPNS site, white ash (Fraxinus americana), eastern hemlock (Tsuga canadensis), white pine (Pinus strobus), and red maple (Acer rubrum).

Ash (green and white) is the most abundant species on the NMPNS site and is dominant in both upland and wetland vegetation communities. Red maple is also common on-site. The minimum salt deposition rates reported to cause acute injury to these species range from approximately 36 lb/acre (41 kg/hectare) per month for eastern hemlock to approximately 1833 lb/acre (2054 kg/hectare) per month for red maple. These values are more than several orders of magnitude higher than the maximum projected deposition rate for the NMP3NPP cooling tower. Although the potential for chronic injury to these species can not be definitively ruled out, the risk appears to be low.

5.3.3.2.1.3 Potential Overall Effects on Terrestrial Ecosystems

Since the highest predicted salt deposition rate of 0.00056 lb/acre per month (0.00063 kg/hectare per month) is below the rates reported in the scientific literature to cause acute injury to woody vegetation, the likelihood of salt drift causing rapid or extensive changes to the general structure and composition of affected vegetation is low. The tree canopy in forested areas is unlikely to die rapidly or extensively. Hence, conversion of forest to scrub-shrub vegetation unsuited to wildlife favoring forested habitat, including forest interior dwelling species, is unlikely.

Occasional trees or shrubs, especially in the area of higher salt deposition, could experience chronic injury such as reduced vigor, reduced growth rate, or slow and gradual die off. The risk is greatest for individuals that are simultaneously of a salt-sensitive species, old, or subject to localized environmental stresses synergistically with the projected low salt deposition levels to injure trees. Small gaps in the tree canopy resulting from the death of individual trees would mimic the natural die-off of individual trees in mature forests and not substantially alter the suitability of the forests for most wildlife species. Dead trees would be left in place to provide nesting cavities and snags for wildlife.

The potential for injury to terrestrial vegetation or to terrestrial wildlife inhabiting areas of terrestrial vegetation, as a result of salt drift, is low. Thus, the impacts of salt drift on terrestrial ecology would be small, and would not warrant mitigation.

5.3.3.2.2 Potential Impacts of increased Fogging, Humidity, and Precipitation

The NMP3NPP site occurs in a variably humid climate where the natural vegetation is adapted to occasional fog and high humidity, as well as occasional rime ice (white or milky opaque granular deposit of ice that occurs when supercooled water drop below freezing) during the winter. Maximum hours of fogging are predicted to range from 0.29 hour in the northwest direction during the spring season to 0.74 hour in the south-southwest direction during the fall season. The maximum hour for annual fogging is predicted to be 1.1 hours in the south-southwest direction. This represents a very small percentage (0.01%) of the total hours per year.

As indicated in Section 2.7, the annual mean relative humidity for the NMPNS site from 2001 to 2005 is 72.1% . Increases in ground level relative humidity from the operation of the cooling tower would therefore not be substantial. Natural vegetation close to the cooling tower might benefit from the slightly increased humidity during drought periods. During wet periods, the slightly increased humidity might create a more favorable microenvironment for growth of fungal plant pathogens. However, the generally humid climate in forest settings around the shoreline of Lake Ontario already provides a favorable environment for fungal plant pathogens, whose distribution is mostly a factor of conveyance by wind, animals, or human-carried nursery stock. The potential impacts from the slight increases in ground level humidity are therefore expected to be small and not require mitigation.

The maximum hour for rime icing is predicted to be 0.2 hour in the south-southwest direction during the winter season. This represents a very small percentage of the total hours per year (0.002%). Rime icing is not predicted to occur during the spring, summer, or fall seasons. Plume fogging and rime icing is not predicted to occur at any of the closest receptors including the Ontario Bible Camp, closest road, or agricultural area. Viability of acorns collected from red oak trees, located near mechanical-draft towers at the Prairie Island Nuclear Generating Plant in Red Wing, Minnesota was reported to be low.

Icing from plume downwash, which occurred frequently, is reported to have damaged developing embryos in the acorns. Red oak is a relatively common species at the NMPNS site. Physical damage to limbs of loblolly pine (Pinus taeda) was reported to have resulted from icing within 200 ft (61 m) of the cooling towers for the Catawba Nuclear Generating Station in South Carolina. However, loblolly pine and other long-needled southern yellow pines do not occur on the NMPNS site. Most of the natural forest vegetation on and surrounding the NMPNS site is dominated by deciduous trees (NRC, 1996), whose crowns are generally less susceptible to breakage from icing than are the crowns of evergreen trees.

Maximum rates of additional precipitation at the NMPNS site are predicted to range from 0.00003 inch (0.00076 mm) per acre in the north direction during the winter season to 0.00012 inch (0.003 mm) per acre in the east direction during the summer season. The maximum annual water deposition or additional precipitation is predicted to be 0.00026 inch (0.0066 mm) per acre in the east direction. Therefore, increase in precipitation in the form of wet deposition is expected to be minimal. The potential adverse impacts from icing events caused by cooling tower drift are therefore expected to be small and not require mitigation.

5.3.3.2.3 Potential Impacts from Cooling Tower Noise

Noise caused by human and vehicular activity at the NMP3NPP could discourage use by terrestrial wildlife of adjoining natural habitats on the NMPNS site. However, noise generated by operation of the cooling tower is unlikely to have deleterious effects on wildlife. Like other mechanical draft cooling towers, the proposed cooling tower would emit broadband noise, which is considered to be largely indistinguishable and unobtrusive. Wildlife is generally more sensitive to sudden and random noise events, which can induce a startle response similar to that induced by a predator, than to the steady continuous noise produced by operation of a cooling tower (USFWS, 1988). Furthermore, the typical noise level expected at a distance of 1,000 ft (305 m) from a mechanical draft cooling tower is 55 dB(A). Most of the documented adverse noise-related impacts to mammals, birds, and other terrestrial wildlife are greater than

80 to 90 dB (USFWS, 1988). The potential adverse impacts to terrestrial wildlife caused by cooling tower noise are therefore expected to be small and not require mitigation.

5.3.3.2.4 Potential Impacts Due to Bird Collisions with Cooling Towers

As summarized in Section 4.3.1, the proposed cooling tower would not be expected to cause substantially elevated bird mortality due to collisions. Although infrequent bird collisions with the proposed cooling tower are possible, the overall mortality potentially resulting from bird collisions with cooling towers are reported to have only minor impacts on bird species populations (NRC, 1996). Lights would be installed on the cooling tower to reduce the probability of collision by eagles or raptors migrating through the area. No other mitigation appears to be necessary to prevent substantial adverse impacts to bird species populations caused by collisions with the cooling tower.

5.3.3.2.5 References

NRC, 1996. Generic Environmental Impact Statement for License Renewal of Nuclear Plant, NUREG-1437, Nuclear Regulatory Commission, May 1996.

USFWS, 1988. Effects of Aircraft Noise and Sonic Booms on Domestic Animals and Wildlife: A Literature Synthesis, U.S. Fish and Wildlife Service, National Ecology Research Center, NERC-88/29, p 88, K. Manci, D. Gladwin, R. Villella, and M. Cavendish, 1988.

5.3.4 IMPACTS TO MEMBERS OF THE PUBLIC

Operation of the NMP3NPP cooling water systems includes heat transfer to the atmosphere from the mechanical draft cooling towers and the discharge of blowdown to Lake Ontario. Potential impacts to the public include the release of thermophilic bacteria from within the towers and noise from tower operation.

5.3.4.1 Thermophilic Microorganism Impacts

Thermophilic organisms are typically associated with fresh water. Health consequences of thermally enhanced microorganisms have been linked to plants that use cooling ponds, lakes, or canals that discharge to small rivers. Elevated temperatures within cooling tower systems are known to promote the growth of thermophilic bacteria including the enteric pathogens Salmonella sp. and Shigella sp, as well as Pseudomonas aeruginosa and fungi. The bacteria Legionella sp, and the amoeba Naegleria and Acanthamoeba have also been found in these systems. The presence of the amoeba N. fowleri in fresh water bodies adjacent to power plants has also been identified as a potential health issue linked to thermal discharges (CDC, 2007) (NRC, 1999).

The Center for Disease Control (CDC) maintains records of outbreaks of waterborne diseases and reported 2 cases of Legionella sp. infection in New York between 2002 and 2004, all associated with drinking water (CDC, 2004) (CDC, 2006).

The Circulating Water Supply System (CWS) design hot year cooling tower outlet temperature is approximately 90°F (32.2°C). Biocide treatment of the inlet water should minimize the propagation of micro-organisms. As a result, pathogenic thermophilic organisms are not expected to propagate within the NMP3NPP condenser cooling tower system and should not create a public health issue.

Makeup water for the mechanical draft towers will be supplied from Lake Ontario. The CWS will require approximately 23,808 gpm (90,113 lpm) of makeup water. Of this, approximately 7,928 gpm (30,007 lpm) will be used in blowdown. Biocide treatment of the CWS will limit the propagation of thermophilic organisms. Blowdown will discharge to Lake Ontario as discussed in Section 3.4.1 and Section 5.2).

Potential health impacts to workers from routine maintenance activities associated with the towers will be controlled through the application of industrial hygiene practices including the use of appropriate personal protective equipment.

It is concluded that the risk to public health from thermophilic microorganisms will be SMALL and will not warrant mitigation, except for the noted biocide treatment of the condenser cooling and service water systems.

5.3.4.2 Noise Impacts

Operation of the CWS cooling towers for NMP3NPP will generate additional noise.

The New York State Department of Environmental Conservation (NYSDEC) uses an ambient guideline based on the perceptibility of the new source above the existing ambient sound level rather than an absolute noise limit. For a new broadband noise source without distinguishable tones or character, a cumulative increase in the total sound level of about 5 or 6 dBA at a given point of interest is required before the new sound begins to be clearly perceptible or noticeable to most people. Thus a cumulative increase in the total ambient sound level of 6 dBA or less is unlikely to constitute an adverse community impact (NYSDEC, 2001).

The U.S. Environmental Protection Agency (EPA) developed human health noise guidelines to protect against hearing loss and annoyance and established an outdoor activity guideline of 55 dBA.

To determine ambient noise levels in the vicinity of the NMP3NPP site, a survey was conducted during the October - November 2007 leaf-off period at various locations on and adjacent to the NMPNS site, including locations representative of nearby residences. Existing facility noise emissions were not detectable except for one occasion at one location, the nearest residence to the east of the NMPNS site. A steady low-level "hum" was heard and it is presumed that this originates from the James A. Fitzpatrick NPP which is closest to this location. The maximum sustained L50 level evident at all locations correlates to sustained area westerly winds at a velocity of 17 mph (27.4 kph) with gusts to 25 mph (40.2 kph). The LA90 metric average daily minimum hourly levels found during this survey ranged between 29 and 37 dBA (Hessler, 2008).

As indicated in ER Section 5.8.1.3, modeled noise contours show Leq sound levels less than the HUD Ldn guideline value of 65 dBA.

Power plants generally do not result in off-site noise levels greater than 10 dBA above background and noise at levels between 60 and 65 dBA was generally considered of small significance (NRC 1999). While the modeled results are below 65 dBA, NYSDEC policy dictates that further evaluation of the cooling tower sound pressure levels may be required for incremental sound levels above 6 dBA. The NYSDEC policy states that an increase of 10 dBA deserves consideration of avoidance and mitigation measures in most cases (NYSDEC, 2001).

Final design of the cooling tower has yet to be completed. However, during final design, equipment alternatives will be evaluated to mitigate the impact of noise. Sound attenuation through the use of baffles and louvers at air inlets and discharge emission areas will be evaluated. NYSDEC also recommends substituting quieter equipment to reduce noise levels and modifying machinery using flexible noise control covers and dampening plates and pads (NYSDEC, 2001). Low noise fans and premium efficiency motors represent quieter equipment. Enclosures for pumps, fans and motors will also be evaluated for effectiveness in reducing noise levels. There are also environmental options to be considered, primarily erecting sound barriers such as screens or berms around either the noise generating equipment or the receptor. The nearer the barrier is to either the source or the receptor the more effectively it will perform to reduce noise.

5.3.4.3 References

CDC, 2004. Surveillance for Waterborne-Disease Outbreaks Associated with Drinking Water --- United States, 2001-2002," Centers for Disease Control, Website: www.cdc.gov/mmwr/preview/mmwrhtml/ss5308a4.htm, Date accessed: August, 2008.

CDC, 2006. Surveillance Summaries: Surveillance for Waterborne Disease and Outbreaks Associated with Drinking Water and Water not Intended for Drinking - United States, 2003-2004, Report 55(SS12);31-58, Center for Disease Control, 2006.

CDC, 2007. Fact Sheet, Naegleria Infection, Center for Disease Control, Website: www.cdc.gov/ncidod/dpd/parasites/naegleria/2007_Naegleria.pdf, Date accessed: March 12, 2007.

HAI, 2008. Estimated Cooling Tower Sound Emissions for the Nine Mile Point Unit 3 (NMP3NPP) project, Report Number 090508-1, September 2008.

Hessler, 2008. Baseline Environmental Noise Survey, Leaf-off Season, Nine Mile Nuclear Power Station (NMP) Expansion Project, Report No. 012908-1. Hessler Associates Inc, 2008.

NRC, 1999. Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Regarding the Calvert Cliffs Nuclear Power Plant, NUREG-1437, Supplement 1, Nuclear Regulatory Commission, 1999.

NYSDEC, 2001. Assessing and Mitigating Noise Impacts: Program Policy, New York Department of Environmental Conservation, Revised February, 2001.

Table 5.3-1—Mortality Rates For Commercially and Recreationally Important Species Suseptible to Impingement At NMP3NPP (Bold type indicatesage at first maturity for females)

Species	Natural Mortality per Lifestage					
	Juvenile	Age 1	Age 2	Age 3	Age 4	Age 5
Alewife	6.21	0.500	0.500	0.500	0.500	0.500
Brown bullhead	1.39	0.446	0.223	0.223	0.223	0.223
Brown trout	0.250	0.250	0.250	0.250	0.250	0.250
Chinook salmon	0.250	0.250	0.250	0.250	0.250	0.250
Lake trout	0.250	0.250	0.250	0.250	0.250	0.250
Rainbow smelt	0.916	0.400	0.400	0.400	0.400	0.400
Smallmouth bass	0.446	0.860	1.17	0.755	1.05	0.867
Walleye	1.93	0.431	0.161	0.161	0.161	0.161
White perch	1.71	0.693	0.693	0.693	0.689	1.58
Yellow perch	2.53	0.361	0.249	0.844	0.844	0.844

Table 5.3-2—Mortality Rates For Eggs and Larvae of Commercially and Recreationally Important Species Suseptible to Entrainment At NMP3NPP

Species	Natural Mortality per Lifestage	
	Eggs	Larvae
White perch	2.75	5.37
Rainbow smelt	11.5	5.50

Table 5.3-3—Parameter Values for the Near-field CORMIX Simulations

Parameter	Units	Value	Source
Mean ambient temperature	ºF (ºC)	65 (18.3)	Ref. 5.1-1
Discharge temperature	ºF (ºC)	80 (26.7)	Ref. 5.1-1
Temperature rise	ºF (ºC)	15 (8.3)	Ref. 5.1-1
Maximum discharge rate	Mgd (lpd)	16.1 (60,945,130)	Ref. 5.1-1
Low Lake Ontario velocity	ft/s (cm/s)	0.16 (5)	Ref. 5.1-1
High Lake Ontario velocity	ft/s (cm/s)	0.33 (10)	Ref. 5.1-1
Heat exchange coefficient (K)	$W/m^2/^oC$	100	Ref. 5.1-1
Equilibrium Temperature (E)	ºF (ºC)	34 (1.1)	Ref. 5.1-1

Table 5.3-4—Far-field Simulation Summary

Parameter	August	January
NMP Unit 1		
Temperature rise, deg F (deg C)	35 (19.4)	35 (19.4)
Discharge rate, mgd (lpd)	417.6 (1,580,787,968)	417.6 (1,580,787,968)
NMP Unit 2		
Temperature rise, deg F (deg C)	35 (19.4)	35 (19.4)
Discharge rate, mgd (lpd)	80 (302,832,944)	80 (302,832,944)
NMP3NPP		
Temperature rise, deg F (deg F)	15 (8.3)	30.0 (16.7)
Discharge rate, mgd (lpd)	16.1 (60,945,130)	16.1 (60,945,130)
J A Fitzpatrick		
Temperature rise, deg F (deg C)	28 (15.6)	28 (15.6)
Discharge rate, mgd (lpd)	570 (2,157,684,726)	570 (2,157,684,726)

Table 5.3-5—CORMIX NMP3NPP Individual Discharge Model Results

	5 cm/s	10 cm/s
Distance to 10:1 dilution	29.0 m (95.1 ft)	27.3 m (89.6 ft)
Plume width at 10:1 dilution	5.0 m (16.4 ft)	4.4 m (14.4 ft)
Dilution at end of NFR	27.9	47.2
Distance to end of NFR	49.8 m (163.3 ft)	49.9 m (163.7 ft)
Plume width at end of NFR	65.0 m (213.2 ft)	18.3 m (60.0 ft)

Table 5.3-6—Model Results of NMPNS Combined Discharge ΔT > 3°F Plume Areas

Model Simulation	ΔT > 3°F plume	
	acres	hectares
Summer 2005	100 to 400	40.5 to 162
Winter 2001	N/A	N/A
Summer 90% probability	556	225
Winter 90% probability	249	101
Summer 1% probability	1356	552
Winter 1% probability	808	327

Table 5.3-7—CWS Cooling Tower Design Parameters

Design Parameter	Value
Number of cooling towers	1
Diameter overall	546 ft (166.4 m)
Diameter outlet	344 ft (104.9 m)
Height total	177 ft (53.9 m)
Altitude (above mean sea level)	271.5 ft (82.7 m)
Design duty	11,081 MMBtu/hr (3,238 MW)
Typical drift rate (percentage of circulating water flow rate)	0.001%
Circulating water flow rate	800,000 gpm (50.5 m3/sec)
Cooling range	24.8°F (13.9°C)
Approach	16?F (8.9°C)
Air flow rate total	53,053,000 ft3/min (25,416 m3/sec)
Air mass flow rate	55,384 lb/sec (25,174 kg/sec)
Cycles of concentration	5.0
Salt (NaCl) concentration (mg/l)	576.8 max. 311.3 ave.

Table 5.3-8—Modeled Plume Parameters

Predominant direction	Winter North	Spring East	Summer East	Fall North	Annual East
Average plume length	3.2 mi (5.2 km)	3.8 mi (6.1 km)	2.6 mi (4.2 km)	2.6 mi (4.1 km)	2.3 mi (3.7 km)
Median plume length	4.1 mi (6.5 km)	5.9 mi (9.5 km)	0.7 mi (1.1 km)	0.8 mi (1.3 km)	2.8 mi (4.5 km)
Predominant direction	North	East	East	North	East
Average plume height	2,159 ft (654 m)	3,016 ft (913 m)	2,932 ft (888 m)	2,003 ft (606 m)	1,828 ft (554 m)
Median plume height	2,692 ft (815 m)	3,691 ft (1,118 m)	4,636 ft (1,404 m)	1,147 ft (347 m)	2,679 ft (811 m)

Table 5.3-9—Maximum Salt Deposition Rate

Maximum deposition rate	0.0071733 lbs/acre per month (0.008038212 kg/hectare per month)
Distance to maximum deposition	NA
Direction to maximum deposition	NA
Maximum deposition at the NMP3NPP substation/switchyard	0.0001841 lbs/acre per month (0.000206298 kg/hectare per month)
Maximum deposition at the NMP Unit 1 and Unit 2 substation/switchyard	0.0002366 lbs/acre per month (0.000265128 kg/hectare per month)

Note:

SACTI Code output was "0.00" for all locations
NA - Not Applicable

Figure 5.3-1—NMP Unit 1 and Unit 2, and NMP3NPP Intake Tunnel Location

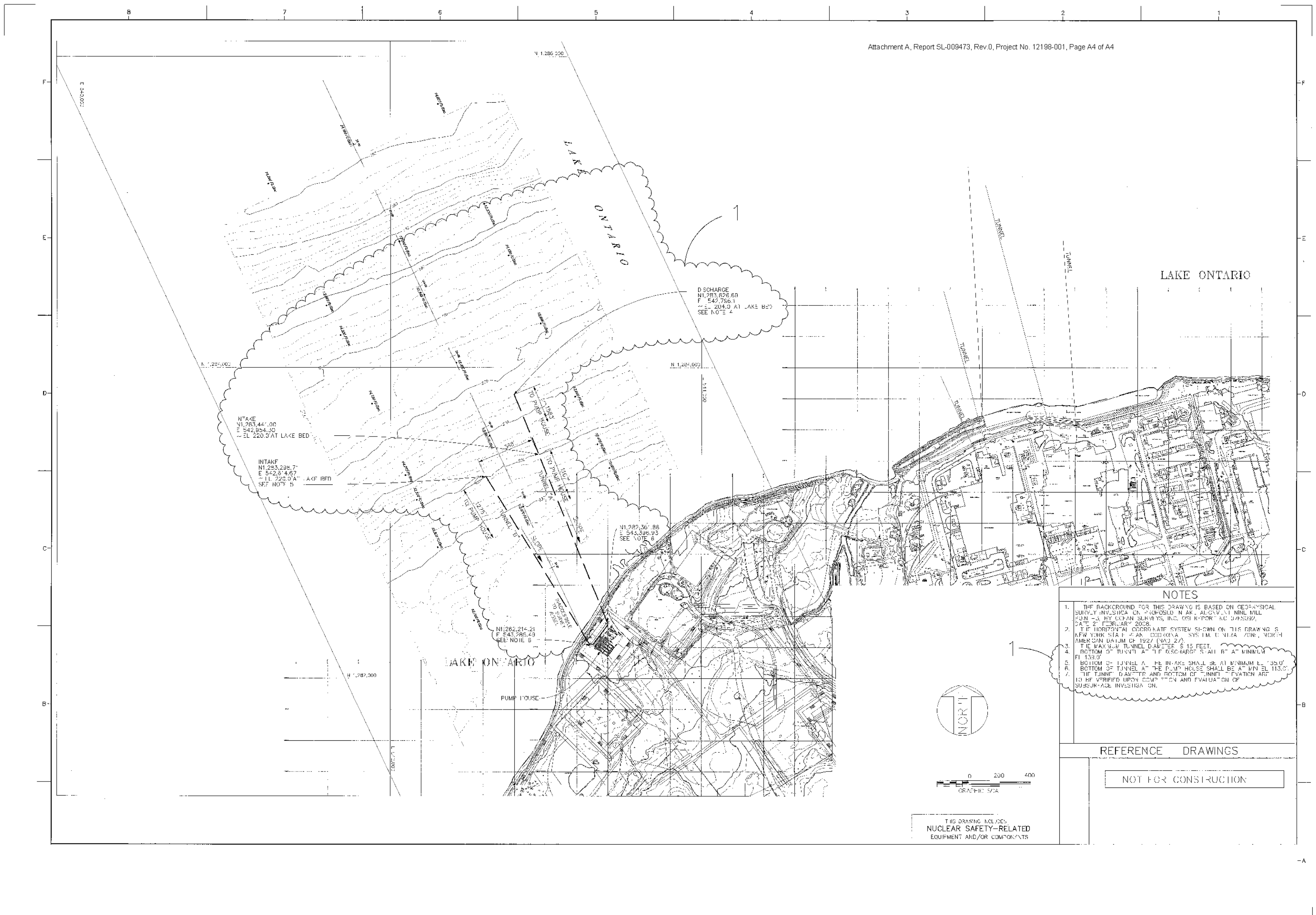


Figure 5.3-2—CORMIX Results of NMP3NPP Discharge Under 5 cm/s Ambient Current

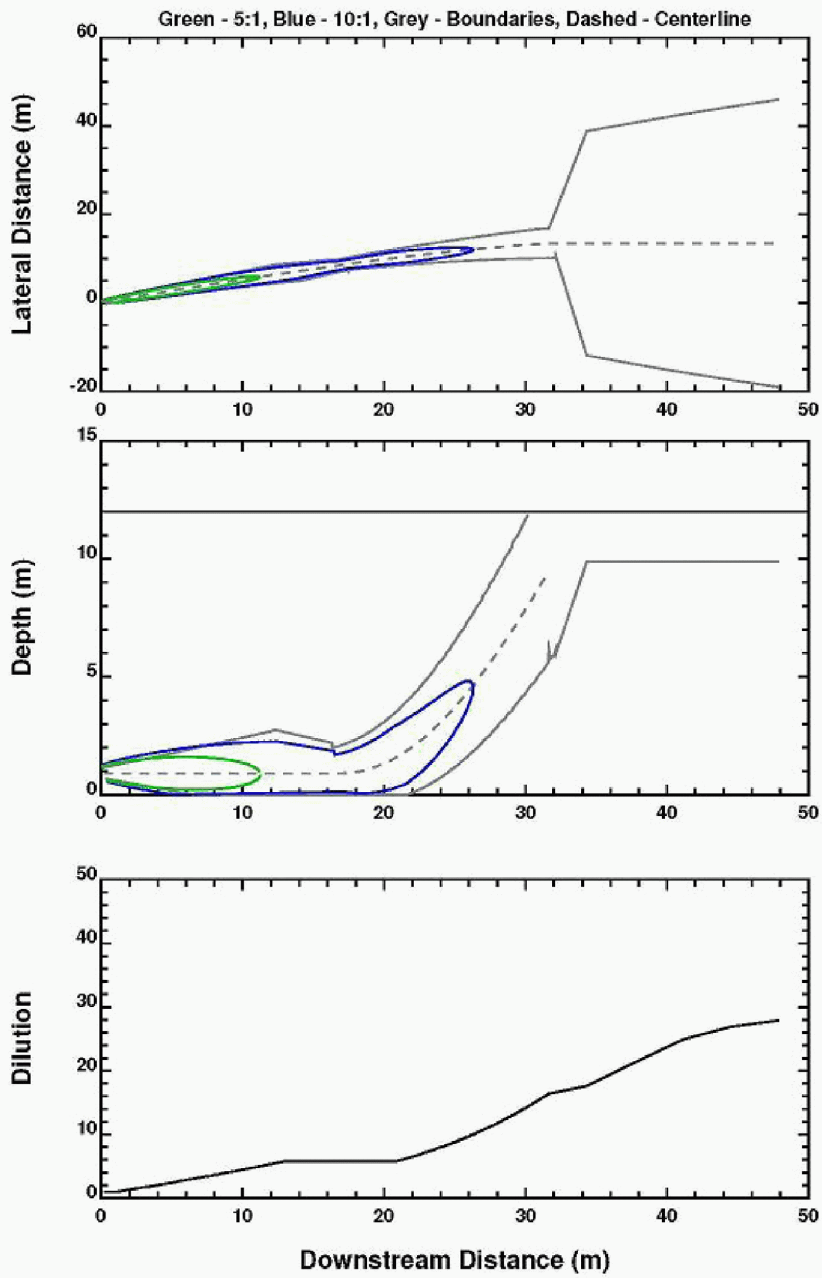


Figure 5.3-3—CORMIX Results of NMP3NPP Discharge Under 10 cm/s Ambient Current

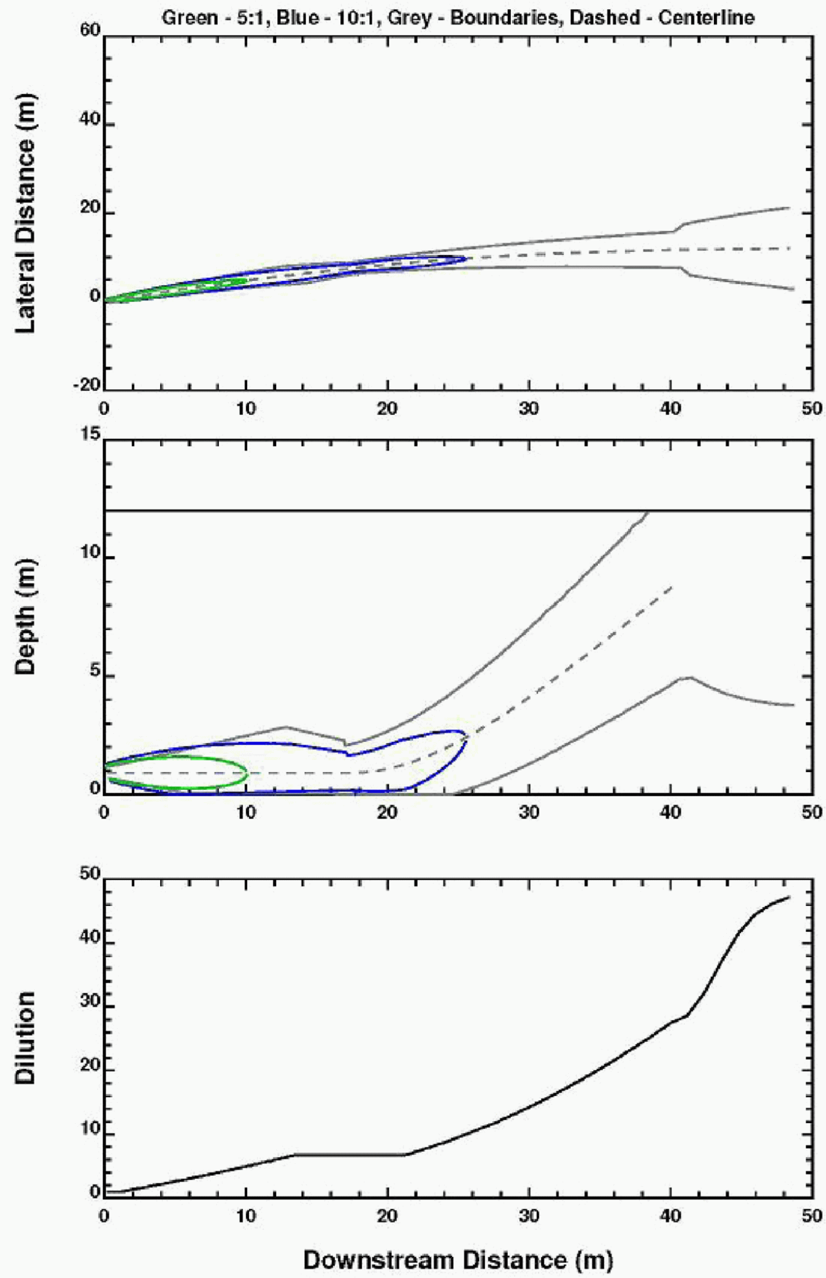


Figure 5.3-4—Plume (DT > 3°F and 6°F) Occuring Under Various Summer Wind Conditions

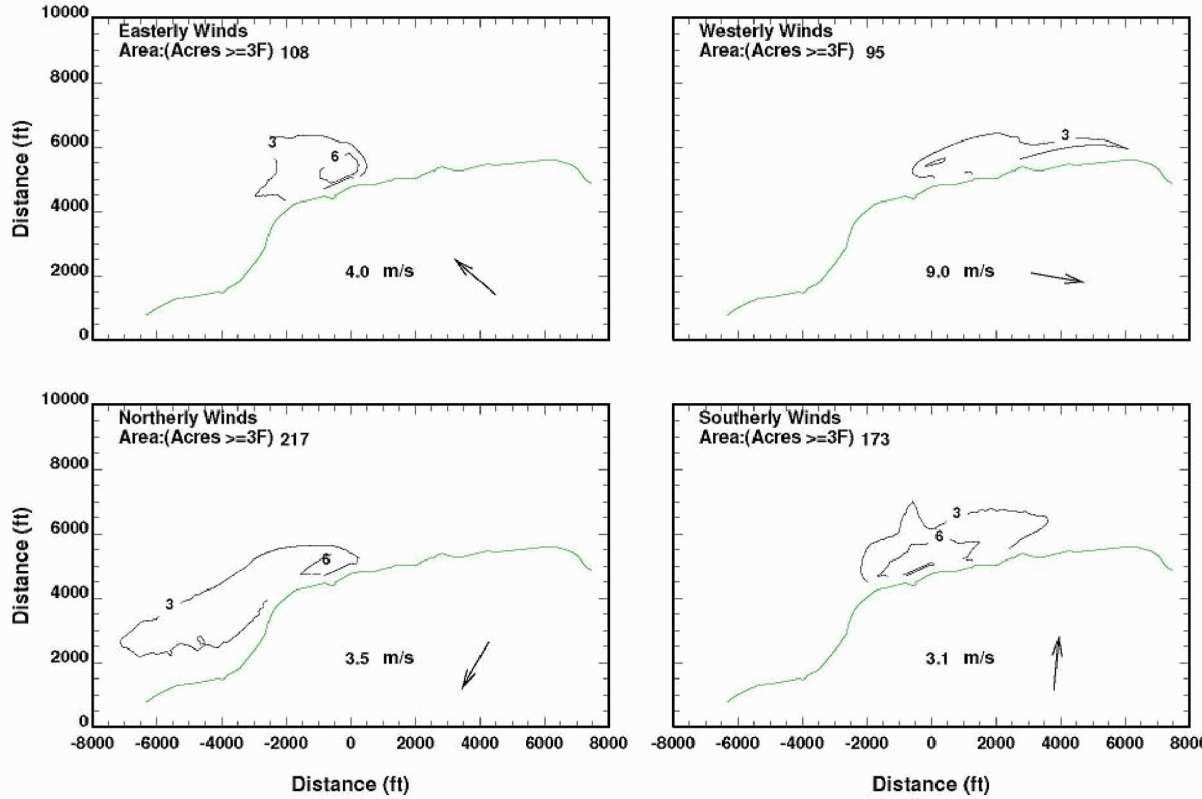


Figure 5.3-5—Plume (DT > 3°F and 6°F) Occuring Under Various Winter Wind Conditions

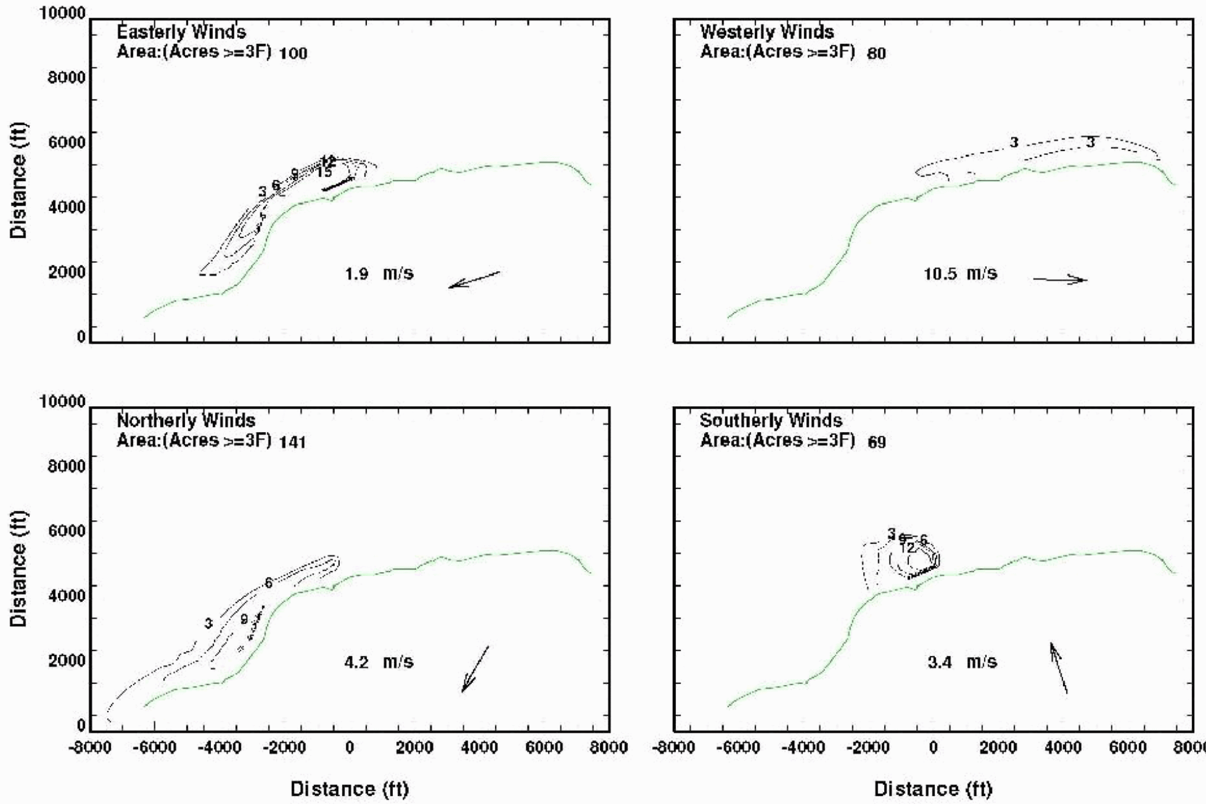


Figure 5.3-6—Probability of DT > 3°F Plume Occuring Under Summer Conditions

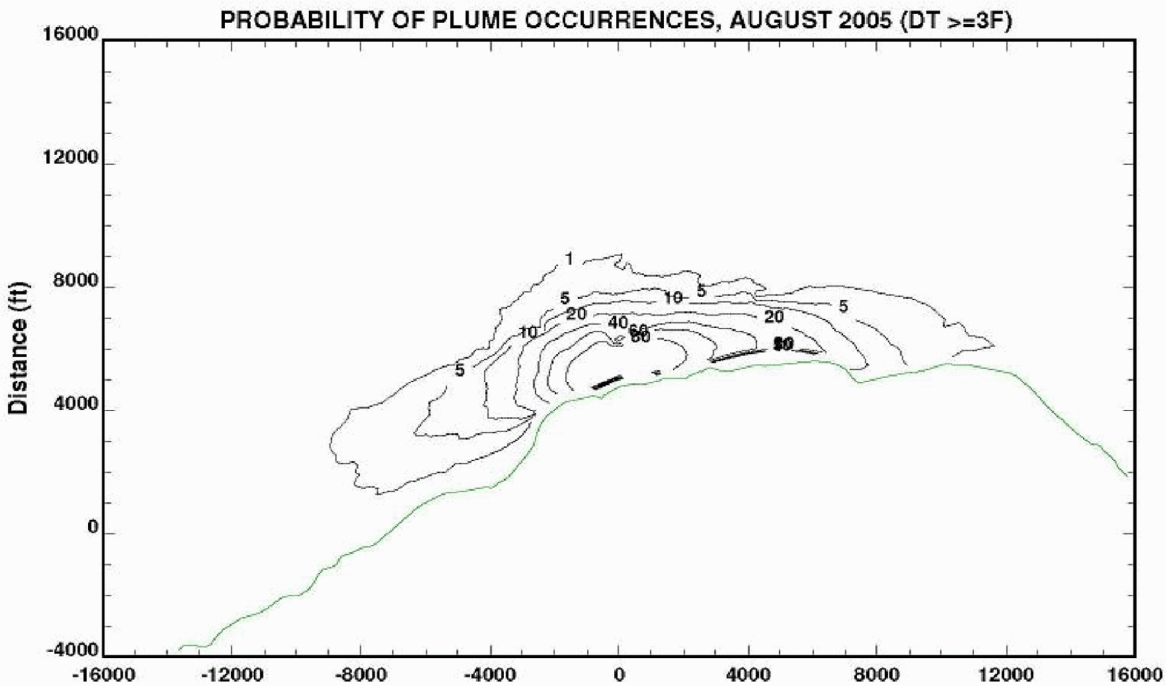
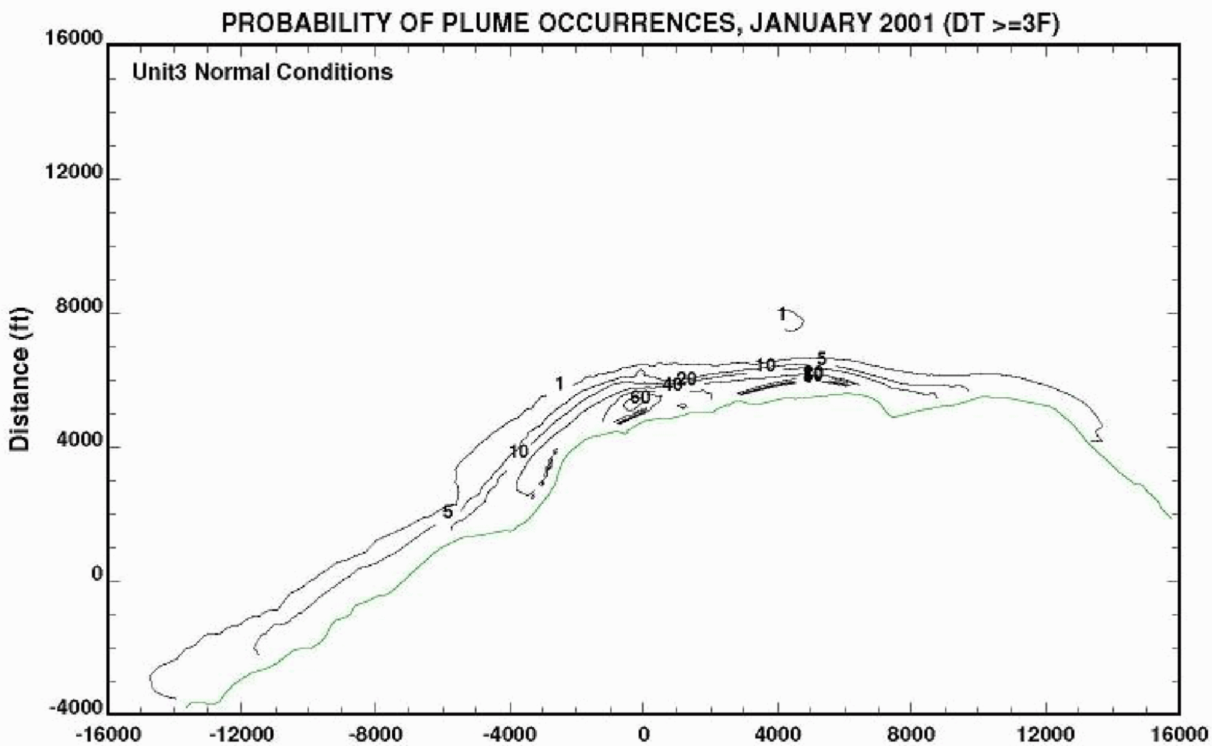


Figure 5.3-7—Probability of DT > 3°F Plume Occuring Under Winter Conditions



5.4 RADIOLOGICAL IMPACTS OF NORMAL OPERATIONS

The radioactive waste management systems, as discussed in Section 3.5, are designed such that the radiological impacts due to the normal operational releases from NMP3NPP are within guidelines established in Appendix I to 10 CFR 50. This section evaluates the impacts of radioactive effluents on human beings and other biota inhabiting the general vicinity of the NMP3NPP site resulting from expected routine operations. Primary exposure pathways to man are examined and evaluated according to the mathematical model described in Regulatory Guide 1.109 (NRC, 1977a). The resulting radiological impacts for NMP3NPP are compared to regulatory limits for a single unit.

In addition, the radiological impact of NMP3NPP in conjunction with NMP Unit 1 and Unit 2 and James A. FitzPatrick NPP, including direct radiation, is compared to the corresponding regulatory limits under 40 CFR 190.

As part of a radioactive waste system's cost benefit analysis, the dose impact to the general population within a 50 mi (80 km) radius from routine operations of NMP3NPP is also assessed.

Finally, consideration of the dose impact to biota other than man that appear along the exposure pathways or that are on endangered species lists is presented.

5.4.1 EXPOSURE PATHWAYS

Routine radiological effluent releases from NMP3NPP are a potential source of radiation exposure to both humans and biota other than man. The major pathways are those that could lead to the highest potential radiological dose to humans and biota. These pathways are determined from the amount and isotopic distribution of activity released in liquids and gases, the environmental transport mechanism, and how the NMP3NPP site environs are utilized (e.g., location of site boundary, residences, gardens, beaches, etc.) and the consumption or usage factors applied to exposed individuals. The environmental transport mechanism includes the NMP3NPP site-specific meteorological dispersion of airborne effluents and aquatic dispersion in Lake Ontario of liquid releases. This information is used to evaluate how the radionuclides will be distributed within the surrounding area.

The potential exposure pathways are impacted by both aquatic (liquid) and gaseous effluents. The radioactive liquid effluent exposure pathways include internal exposure due to ingestion of aquatic foods (fish and invertebrates), external exposure due to recreational activities on the shoreline and in the water (swimming and boating). (Note that there is no internal exposure from ingestion of crops irrigated with water from Lake Ontario). The radioactive gaseous effluent exposure pathways include external exposure due to immersion in airborne effluent and exposure to a deposited material on the ground plane. Internal exposures are due to ingestion of agricultural products impacted by atmospheric deposition and inhalation.

The radioactive gaseous effluent exposure pathways include external exposure due to immersion in airborne effluent and exposure to a deposited material on the ground plane. Internal exposures are due to ingestion of food products grown in areas under influence of atmospheric releases, and inhalation.

An additional exposure pathway considered is the direct radiation from the facility structures during normal operation of NMP3NPP.

The description of the exposure pathways and the calculation methods utilized to estimate doses to the maximally exposed individual and to the population surrounding the NMP3NPP site are based on Regulatory Guide 1.109 (NRC 1977a) and Regulatory Guide 1.111 (NRC 1977b). The source terms used in estimating exposure pathway doses are based on the projected normal effluent values provided in Section 3.5. The source term for both liquids and gases are calculated using the Nuclear Regulatory Commission GALE code for PWRs (NRC, 1985).

5.4.1.1 Liquid Pathways

Treated liquid radwaste effluent is released to the Lake Ontario at a flow rate of 11 gpm (42 lpm) via the NMP3NPP discharge line situated downstream of the waste water retention basin. The average discharge flow rate from the retention basin for waste water streams other than treated liquid radwaste, is conservatively assumed to be approximately 8,579 gpm (32,475 lpm) assuming three cycles of concentration, resulting in a total average flow of 8,590 gpm (32,517 lpm) for all liquid effluents discharged to Lake Ontario. Retention basin flow provides dilution flow to discharged treated liquid radwaste. As shown in Table 5.4-1, a minimum near-field dilution factor of 10 (a mixing ratio of 0.1) was utilized for calculating the maximum individual dose to man for exposures associated with fish ingestion and boating pathways. For swimming and shoreline exposure pathways, an environmental dilution factor of 1200 (a mixing ratio of 8.333E-04) was applied for the nearest shore with the minimum tidal average mixing. These dilution factors are based on a submerged, multi-port diffuser (with two nozzles), a discharge line situated approximately 1580 ft (482 m) off the near shoreline with the nozzles directed out into Lake Ontario and into the overhead water column. Table 5.4-2 provides far-field dilution factors.

The physical description of the cooling water discharge system is provided in Section 3.4. Dilution effects for both near-field and far-field mixing are described in Section 5.3. Table 5.4-3, Table 5.4-4, and Table 5.4-5 provide information on fisheries and major catch locations within 50 mi (80 km) of the NMPNS site. For conservatism, no credit is taken for radioactive decay in the environment during transit time from the release point to the receptors in unrestricted areas.

The ability of suspended and bottom sediments to absorb and adsorb radioactive nuclides from solution is recognized as contributing to important pathways to man through the sediment's ability to concentrate otherwise dilute species of ions. The pathways of importance in the site area are by direct contact with the populace such as those persons engaged in shoreline activities, and by transfer to aquatic food chains and potable water derived from Lake Ontario.

The models used to determine the concentration of radioactivity in sediments and aquatic foods for the purpose of estimating doses were taken from Regulatory Guide 1.109, Appendix A (NRC, 1977a) . The concentration of radioactivity in the sediment is assumed to be dependent upon the concentration of activity in the water column plus a transfer constant from water to sediment. The concentration in potable water is dependent upon the water concentration at the point of withdrawal.

The LADTAP II computer program (NRC, 1986) was used to calculate the doses to the maximum exposed individual (MEI), population groups, and biota other than humans. This program implements the radiological exposure models described in Regulatory Guide 1.109 (NRC, 1977a) for radioactivity releases in liquid effluent. The following exposure pathways are considered in the LADTAP II model for the NMP3NPP site:

- Internal exposure from ingestion of aquatic foods (fish; note there are no invertebrates harvested from Lake Ontario)

- Internal exposure from ingestion of potable water
- External exposure due to recreational activities on the shoreline and in the water (boating & swimming)

The input parameters for the liquid pathway are presented in Table 5.4-6 and Table 5.4-7 in addition to default maximum individual food consumption factors from Regulatory Guide 1.109 (Table E-5), (NRC, 1977a).

5.4.1.2 Gaseous Pathways

The GASPAR II computer program (NRC, 1987) was used to calculate the doses to the maximum exposed individual (MEI), population groups, and biota. This program implements the radiological exposure models described in Regulatory Guide 1.109 (NRC 1977a) to estimate the radioactivity released in gaseous effluent and the subsequent doses. The following exposure pathways are considered in the GASPAR II model for the NMP3NPP:

- External exposure to airborne plume
- External exposure to deposited radioactivity on the ground plane
- Internal exposure from inhalation of airborne radioactivity
- Internal exposure from ingestion of agricultural products (meat, milk, and vegetables) impacted by atmospheric deposition

The gaseous effluent is transported and diluted in a manner determined by the prevailing meteorological conditions. Section 2.7 discusses the meteorological modeling which has been used for all dose estimates, including estimated dispersion values for the 50 mi (80 km) radius of the NMP3NPP site. Dilution factors due to atmospheric dispersion are deduced from historical on-site meteorological data and summarized for the maximum exposed individual in Table 5.4-8. The gaseous source term for NMP3NPP is expected routine operations provided in Section 3.5. The NMP3NPP stack is located adjacent to the reactor building and qualifies as a mixed mode release point. All ventilation air from areas of significant potential contamination, along with waste gas processing effluents, is released through the plant stack.

The input parameters for the gaseous pathway are presented in Table 5.4-9 and Table 5.4-10, and the receptor locations are shown in Table 5.4-11 (ORNL, 1983) (NOAA, 2002).

5.4.1.3 Direct Radiation From Station Operations

The U.S. EPR design contains all radioactive sources and systems, including tanks, inside shielded structures such that the radiation levels at the outside surface of the building is not expected to require any radiation protection monitoring for general occupancy beyond the immediate area of the buildings. The nearest shoreline on Lake Ontario (over 1000 ft (305 m) southwest of the NMP3NPP power block) falls within the control area of the NMPNS site property, thereby limiting access by the general public. For this direction, there are three buildings that could contribute to the dose at the shoreline: the Nuclear Auxiliary, the Radioactive Waste Processing, and the Fuel Buildings.

The shielding design for these buildings limit the projected annual dose at the shoreline to not more than 0.327 μSv/yr (0.0327 mrem/yr), assuming an occupancy time from Regulatory Guide 1.109 (NRC 1977a) of 67 hrs/year for a maximum exposed individual. With respect to the

NMPNS site boundary bordered by land, the Nuclear Auxiliary and Radioactive Waste Processing Buildings are the only structures which contain significant radiation sources that could contribute to direct dose at the boundary line. This is due to the shielding effect of other plant structures that are situated between buildings with radiation sources and the NMP3NPP site boundary line. The exterior walls of the Auxiliary Building and the Radioactive Waste Processing Building provide sufficient shielding to limit the exterior dose rate to 1.79E-02 μSv/hr (1.79E-03 mrem/hr) at 1 ft (30 cm) from the exterior walls. The projected direct annual dose at the NMPNS site boundary (approximately 910 ft (277 m) southwest) from NMP3NPP would not exceed 1.35 μSv/yr (0.135 mrem/yr) for uninterrupted occupancy over the year.

Radiological impacts to construction workers at NMP3NPP from the operation of NMP Unit 1 and Unit 2 and James A. Fitzpatrick NPP are discussed in Section 4.5, including dose rate projections for direct sources associated with NMP Unit 1 and Unit 2 and James A. Fitzpatrick NPP.

Implementation of a radiation environmental monitoring program for the new facility, compliance with requirements for maintaining dose ALARA, and attention to design of plant shielding to ensure dose is ALARA, will result in doses to the public and to construction workers due to direct radiation being minimal (i.e., less than the effluent dose limits of 10 CFR 20, 40 CFR 190, and 10 CFR 50).

5.4.2 RADIATION DOSES TO MEMBERS OF THE PUBLIC

For members of the public, doses to MEIs from liquid and gaseous effluents from routine operation of NMP3NPP are estimated using the methodologies and parameters specified in Section 5.4.1. Additionally, the collective occupational doses to plant workers at NMP3NPP during normal operations and the performance of in-service inspections and maintenance activities is expected to be less than 0.5 person-Sv/yr (50 person-Rem/yr) for the U.S. EPR design.

5.4.2.1 Liquid Pathway Doses

NMP3NPP liquid radioactive effluent is periodically mixed with the cooling tower blowdown discharge downstream of the cooling tower blowdown retention basin. As discussed in Section 3.4.2 and Section 5.3.2, discharge from NMP3NPP is not combined with the discharge from NMP Unit 1 and Unit 2 or James A. Fitzpatrick NPP, but has its own discharge line approximately several hundred yards west of the NMP Unit 1 and Unit 2 and James A. Fitzpatrick NPP outfall in Lake Ontario.

Mixing of the diluted radioactive effluent with the Lake Ontario water provides for both near and far field mixing zones as described in Section 5.3.2. The isotopic releases in the liquid effluent and the concentration at the point of discharge to the environment are given in Section 3.5.

Maximum dose rate estimates to man due to liquid effluent releases were determined for the following activities:

- Eating fish caught near the point of discharge (note there are no invertebrates harvested from Lake Ontario);
- Swimming and using the shoreline for recreational activities at the nearest shoreline of maximum impact;

- Boating on Lake Ontario near the point of discharge; and
- Drinking water from downstream sources.

The estimates for whole-body and critical organ doses from each of these interactions, calculated using LADTAP II, are presented in Table 5.4-12 and Table 5.4-13. These doses are within the limits given in 10 CFR 50, Appendix I, and would only occur under conditions that maximize the resultant dose. Table 5.4-14 summarizes the annual liquid dose impact to the maximum exposed individual compared to the dose objectives of 10 CFR 50, Appendix I.

5.4.2.2 Gaseous Pathway Doses

Dose rates for the maximum exposed individual via the gaseous pathways are evaluated based on the models and dose factors given in Regulatory Guide 1.109, Appendices B and C (NRC, 1977a), and according to site area land use information listed in Table 5.4-15

Three locations for maximum radiological impact are specified, as shown in Table 5.4-8, according to the dose pathway being evaluated: the site boundary, nearest garden, and the nearest meat animal. Only sectors where populations or gardens would be expected are evaluated, therefore, sectors extending into Lake Ontario are not considered. In addition, NMP3NPP portions of sectors extending into Canada are not considered. The locations for the NMP3NPP site boundary, vegetable gardens, and meat animal locations selected for analysis correspond to the respective locations with the most limiting atmospheric dispersion and deposition factors, not necessarily the location of the site boundary or garden closest to the reactor centerline. It is conservatively assumed that meat animals exist at the NMPNS site boundary with the most limiting dispersion characteristics.

A dose assessment for a hypothetical individual where all applicable receptors are located at the site boundary is also calculated to account for the possibility of future land use changes.

5.4.3 IMPACTS TO MEMBERS OF THE PUBLIC

Appendix I to 10 CFR Part 50 (CFR, 2007a) provides design objectives on the levels of exposure to the general public from routine effluent releases that may be considered to be "as low as reasonably achievable" (ALARA). The estimated doses to individuals in the general public in the site vicinity, for the pathways described in Section 5.4.2.1 and Section 5.4.2.2, demonstrate that the proposed plant design is capable of keeping radiation exposures consistent with the ALARA objectives.

In addition to the ALARA dose objectives for individuals, 10 CFR 50 Appendix I also requires that an evaluation of alternate radwaste system designs be made to determine the most cost-benefit effective system to keep total radiation exposures to the public as low as reasonably achievable. This cost-benefit evaluation, comparing costs of alternate radwaste systems against their ability to reduce the population doses from plant effluents, is discussed in Section 3.5.2.3 for liquid waste systems process options, and Section 3.5.3.3 for the gaseous waste system alternative design. The cost-benefit ratios for the alternative radwaste augments investigated indicate that no alternate system to the present plant design can be justified on a cost effective basis.

For gaseous effluent ingestion pathways of exposure, the production of milk, meat and vegetables grown within 50 mi (80 km) has been included in the estimation of dose along with plume, ground plane exposures and inhalation. For liquid pathways, the population that can be supported by the recorded harvest of fish and shellfish (invertebrates) within 50 mi (80 km), along with estimated recreational uses of beaches and boating activities, are factored into the aquatic pathway population dose impact assessment.

The population dose assessments which were used in the cost-benefit analysis are based on the models and dose factors given in Regulatory Guide 1.109 (NRC, 1977a). The population which is projected to be contained within 50 mi (80 km) of the site for in the year 2080 has been used for calculating annual population doses for the gaseous releases.

In addition to the NMP3NPP dose impacts assessed for the maximum exposed individual and general population, the combined historical dose impacts of NMP Unit 1 and Unit 2 and James A. Fitzpatrick NPP are added to the NMP3NPP projected impacts to compare to the uranium fuel cycle dose standard of 40 CFR 190. The combined impacts for four units, which are the only fuel cycle facilities within 5 miles (8 km) of NMP3NPP, can be used to determine the total impact from liquid and gaseous effluents along with direct radiation from fixed radiation sources on-site to determine compliance with the dose limits of the standard (25 mrem/yr (0.25 mSv/yr) whole body, 75 mrem/yr (0.75 mSv/yr) thyroid, and 25 mrem/yr (0.25 mSv/yr) for any other organ). Table 5.4-16 illustrates the impact from NMP Unit 1 and Unit 2 and James A. Fitzpatrick NPP over the recent nineteen year historical period. Using the highest observed annual dose impact from NMP Unit 1 and Unit 2 and James A. Fitzpatrick NPP, Table 5.4-17 shows the combined impact along with the projected contributions from NMP3NPP.

5.4.3.1 Impacts From Liquid Pathways

Release of radioactive materials in liquid effluents to the discharge flow, from where they mix with Lake Ontario waters, results in minimal radiological exposure to individuals and the general public.

Public water supplies derived from Lake Ontario are described in Table 5.4-18. The annual average dilution for these public water intake locations is estimated to be 1200 to 1 and the transit time to the nearest intake is estimated to be 9.3 hours. The combined pumping capacity of the public water supply intakes is 37.3 mgd (141 Ml/day). Lake Ontario supplies water to a population of 467,763.

The NMP3NPP annual radiation exposures to the maximum exposed individual via the pathways of aquatic foods and shoreline deposits, are provided in Table 5.4-13 for total body dose to four ages groups (Adult, Teen, Child, Infant) from each dose pathway of exposure, and Table 5.4-12 for the limiting organ dose for each pathway and age group. Population dose impacts within a 50 mi (80 km) radius of the NMPNS site are listed in Table 5.4-19.

For the cost-benefit assessment of liquid radwaste equipment options, the annual release source terms produced with and without demineralizer processing of evaporator and centrifuge treated liquid waste streams are listed in Section 3.5.2.3. The cost-benefit population dose assessment evaluated the "unadjusted" releases from the two waste processing options in order to assess the relative difference between the two cases of processing with and without a waste demineralizer. However, total expected annual radioactivity release used to determine the expected liquid population dose in Table 5.4-19 includes an adjustment to account for the potential anticipated operational occurrences that add to the expected treated discharge stream. This adjustment factor adds 0.16 curies per year to the normal effluent. The liquid effluent population doses provided in Section 3.5.2.3 uses the unadjusted releases so as not to be dominated by the adjustment factor which is not impacted by any treatment option.

As can be seen from Table 5.4-14 the maximum exposed individual annual doses from the discharge of radioactive materials in liquid effluents projected fromNMP3NPP meets the design objectives of Appendix I to 10 CFR Part 50. In addition, Section 3.5 shows that the effluent concentration being discharged to Lake Ontario also meets the effluent release standards of 10 CFR Part 20, (Appendix B, Table 2, Column 2). The maximally exposed individual dose calculated from liquids was also included in the NMPNS site assessment of 40 CFR 190 criteria as shown in Table 5.4-17.

Based on this, the release of radioactive materials in liquid effluents results in minimal radiological exposure to individuals and the general public. As such, the impacts would be SMALL and do not warrant mitigation.

5.4.3.2 Impacts From Gaseous Pathways

The release of radioactive materials in gaseous effluents from NMP3NPP to the environment results in minimal radiological impacts. Annual radiation exposures to the maximum exposed individual near the NMP3NPP site via the pathways of submersion, ground contamination, inhalation and ingestion are provided in Table 5.4-15 for the four age groups of interest. Table 5.4-20 provides a summary of the dose to the MEI compared to the dose limits of 10 CFR 50, Appendix I. Table 5.4-20 indicates that the critical organ dose to the MEI is 23.2 µSv/yr (2.32 mrem/yr) to a child's bone via the identified exposure pathways in the NMPNS site vicinity. All projected dose impacts are well within the design objectives of Appendix I. If a hypothetical individual is postulated to be exposed to all potential pathways (ground plane, inhalation, vegetable gardens, goat's milk and meat) at the same limiting NMPNS site boundary location, the maximum critical organ (child bone) dose increases to 35.0 µSv/yr (3.50 mrem/yr) which is still below the dose objective of 10 CFR 50, Appendix I, Section II.C.

Population dose impacts within a 50 mi (80 km) radius of the NMPNS site from atmospheric releases from NMP3NPP are listed in Table 5.4-21. Annual production rates of milk, meat, and vegetables for the 50 mi (80 km) radius are provided in Table 5.4-22 through Table 5.4-25. For the cost-benefit assessment of gaseous radwaste equipment options, the annual release source terms produced by processing the waste purge gas through the base configuration of three charcoal delay beds, as well as the effect of adding a fourth delay bed in series, are provided in Section 3.5.3.3. The estimated holdup times for decay before release are also provided along with the estimated reduction in the population dose afforded by the treatment option.

The estimated population distribution in the year 2010 within a 50 mi (80 km) radius of the NMPNS site is given in Section 2.5.1. This is the year with the maximum population. The total effective dose equivalent to individuals living in the U.S. from all sources of natural background radiation averages about 3 mSv/yr (300 mrem/yr) (NCRP, 1987). Therefore, the 50 mi (80 km) population (978,840) in year 2010 projected in the NMPNS site area will receive a collective population dose of 2,937 person-Sv/yr (2.937E+05 person-rem/yr) from natural background radiation.

Since the guidelines of Appendix I to 10 CFR Part 50 for maximum individual exposures via atmospheric pathways are much more restrictive (by a factor of 100) than the standards of 10 CFR Part 20, it can be inferred that radioactive releases via gaseous effluents from NMP3NPP meet the standards for concentrations of released radioactive materials in air (at the locations of maximum annual dose to an individual and hence, at all locations accessible to the general public), as specified in Column 1 of Table 2 of 10 CFR Part 20. Table 5.4-26 shows that the cumulative air concentration of all radionuclides released is approximately 0.977% of the levels permissible under 10 CFR 20, Appendix B.

In addition, the maximally exposed individual dose calculated was also compared to 40 CFR 190 criteria as shown in Table 5.4-17.

Based on this, the release of radioactive materials in gaseous effluents from NMP3NPP to the environment results in SMALL radiological impacts and do not warrant mitigation.

5.4.3.3 Direct Radiation Doses

Direct radiation doses are discussed in Section 5.4.1.3. Table 5.4-17 includes a projected direct dose (assuming time occupancy) to the nearest land bordered site boundary from NMP3NPP as part of the NMPNS site dose assessment for compliance with the uranium fuel cycle dose standard of 40 CFR 190.

Based on these projections, direct radiation doses from NMP3NPP to the environment results in SMALL radiological impacts and do not warrant mitigation.

5.4.4 IMPACTS TO BIOTA OTHER THAN MEMBERS OF THE PUBLIC

Environmental exposure pathways in which biota other than humans could be impacted by plant radiological effluents were examined to determine if doses to biota could be significantly greater than those predicted for humans. This assessment was based on the use of surrogate species that provide representative information on the various dose pathways potentially affecting broader classes of living organisms. Surrogates are used since important attributes are well defined and are accepted as a method for judging doses to biota.

Site specific important biological species include any endangered, threatened, commercial, recreationally valuable, or important to the local ecosystem. Section 2.4 identifies important biota for the NMP3NPP site. Surrogate biota used includes algae (surrogate for aquatic plants), invertebrates (surrogate for fresh water mollusks and crayfish), fish, muskrat, raccoon, duck, and heron. Table 5.4-27 identifies the important species near the NMP3NPP site and the assigned surrogate species employed in the assessment of radiation doses.

This assessment uses dose pathway models adopted from Regulatory Guide 1.109 (NRC 1977a). Exposure pathways are outlined in Table 5.4-28.

Internal exposures to biota from the accumulation of radionuclides from aquatic food pathways are determined using element-dependent bioaccumulation factors. The terrestrial doses are calculated as total body doses resulting from the consumption of aquatic plants, fish, and invertebrates. The terrestrial doses are the result of the amount of food ingested, and the previous uptake of radioisotopes by the "living" food organism. The total body doses are calculated using the bioaccumulation factors corresponding to the "living" food organisms and dose conversion factors for adult man, modified for terrestrial animal body mass and size. The use of the adult factors is conservative since the full 50 year dose commitment predicted by the adult ingestion factors would not be received by biota due to their shorter life spans. These models show that the largest contributions to biota doses are from liquid effluents via the food pathway.

5.4.4.1 Liquid Pathways

The model used for estimating nuclide concentrations in the near-field discharge environment is similar to that used in the analysis for doses to man described in Section 5.4.2. The dose to biota that can swim (fish, invertebrate, algae, muskrat and duck) is based upon the near-field mixing credit of 13.3 to 1. The dose to biota that are confined to the shoreline (raccoon and heron) is based upon the minimum shoreline mixing credit of 69 to 1. The calculation of biota doses was performed using LADTAP II (NRC, 1986). The near-field concentrations are used in estimating the dose of aquatic biota (fish, invertebrates, algae) and of biota that could swim into the near-field (muskrat and duck). The far-field concentrations are used in estimating the dose of biota that primarily inhabit the shoreline (heron and raccoon). Ingestion rates, body mass, and effective size used in the dose calculations are shown in Table 5.4-29 (NRC 1986). Residence times for the surrogate species are shown in Table 5.4-30. Surrogate biota doses from liquid effluents are shown in Table 5.4-31.

Gaseous pathway doses for wildlife populations in the NMPNS site area are estimated at the site boundary with the highest calculated human exposure potential. Though on-site locations may have higher dose rates due to being closer to the plant facilities, the site boundary provides a reasonable reference distance away from the human occupied spaces of the plant proper for estimating the dose impact to biota as they tend to avoid human contact. The cooling tower retention basin, as an open water source, may attract some birds and mammals. However, the nature of the retention basin will provide little feed material to support wildlife, while the release of liquid radioactive waste is to a point downstream of the basin thereby limiting the potential exposure to any biota that finds their way to it.

5.4.4.2 Gaseous Pathway

Gaseous effluents also contribute to terrestrial biota total body doses. External exposures occur due to immersion in a plume of noble gases, and deposition of radionuclides on the ground from a passing gas plume. The inhalation of radionuclides followed by the subsequent transfer from the lung to the rest of the body also contributes to total body doses. Inhaled noble gases are poorly absorbed into the blood and do not contribute significantly to the total body dose. The noble gases do contribute to a lung organ dose but do not make a contribution via this path to the total body dose.

Immersion and ground deposition doses are largely independent of organism size and the doses for the maximally exposed individual located at the site boundary as described in Section 5.4.2 can be applied to all terrestrial biota doses. The external ground doses described in Section 5.4.2 calculated by GASPAR II (NRC, 1987) are increased by a factor of 2 to account for the closer proximity to the ground of terrestrial species. This approach is similar to the adjustments made for biota exposures to shoreline sediment performed in LADTAP II (NRC 1986). The inhalation pathway doses for biota are the internal total body doses calculated by GASPAR II as described in Section 5.4.2 for man (NRC, 1987). The total body inhalation dose (rather than organ specific doses) is used since the biota doses are assessed on a total body basis. Surrogate biota doses from gaseous effluents are shown in Table 5.4-31.

5.4.4.3 Biota Doses

Doses to biota from both liquid and gaseous effluents from NMP3NPP are shown in Table 5.4-31. Table 5.4-32 compares the biota doses to the criterion given in 40 CFR 190. These dose criteria are applicable to man, and are considered conservative when applied to biota. The total body dose is taken as the sum of the internal and external dose for all pathways considered as outlined in Table 5.4-32 shows that annual doses to four of the seven surrogate biota species meet the dose criterion of 40 CFR 190. The total pathway doses for all surrogate biota are less than 1 mSv/yr (100 mrem/yr).

Use of exposure guidelines, such as 40 CFR 190, which apply to members of the public in unrestricted areas, is considered very conservative when evaluating calculated doses to biota. The International Council on Radiation Protection states that "...if man is adequately protected then other living things are also likely to be sufficiently protected" and uses human protection to infer environmental protection from the effects of ionizing radiation. This assumption is appropriate in cases where humans and other biota inhabit the same environment and have common routes of exposure. It is less appropriate in cases where human access is restricted or pathways exist that are much more important for biota than for humans. Conversely, it is also known that biota with the same environment and exposure pathways as man can experience higher doses without adverse effects. Species in most ecosystems experience dramatically higher mortality rates from natural causes than man. From an ecological viewpoint, population stability is considered more important to the survival of the species than the survival of individual organisms. Thus, higher dose limits could be permitted. In addition, no biota have been discovered that show significant changes in morbidity or mortality to radiation exposures predicted for nuclear power plants.

The NRC reports in NUREG-1555, Section 5.4.4, that existing literature including the "Recommendations of the International Commission on Radiological Protection (ICRP, 1977), found that appreciable effects in aquatic populations would not be expected at doses lower than 1 rad/day (10 mGy/day) and that limiting the dose to the maximally exposed individual organisms to less than this amount would provide adequate protection of the population. The NRC also reports in NUREG-1555 that chronic dose rates of 0.1 rad/day (1 mGy/day) or less do not appear to cause observable changes in terrestrial animal populations. The assumed lower threshold occurs for terrestrials rather than for aquatic animals primarily because some species of mammals and reptiles are considered more radiosensitive than aquatic organisms. The permissible dose rates are considered screening levels and higher species-specific dose rates could be acceptable with additional study or data.

Based on this, operation of NMP3NPP will result in SMALL radiological impacts to biota and do not warrant mitigation.

5.4.4.4 References

ICRP, 1977. Recommendations of the International Commission on Radiological Protection, ICRP Publication 26, International Commission on Radiological Protection, 1977.

NRC, 1977a. Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I, Regulatory Guide 1.109, Revision 1, Nuclear Regulatory Commission, October 1977.

NRC, 1977b. Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors, Regulatory Guide 1.111, Revision 1, Nuclear Regulatory Commission, July 1977.

NRC, 1985. Revision 1, Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Pressurized Water Reactors, PWR-GALE Code, NUREG-0017, Nuclear Regulatory Commission, April 1985.

NRC, 1986. LADTAP II - Technical Reference and User Guide, Nuclear Regulatory Commission, NUREG/CR-4013, (by Pacific Northwest Laboratory), April 1986.

NRC, 1987. GASPAR II - Technical Reference and User Guide, NUREG/CR-4653, Nuclear Regulatory Commission (by Pacific Northwest Laboratory), March 1987.

NRC, 1999. Standard Review Plans for Environmental Reviews for Nuclear Power Plants, NUREG-1555, Nuclear Regulatory Commission, October 1999.

Table 5.4-1—Near Field Environmental Dilution Values for NMP3NPP Discharges to Lake Ontario

Minimum Dilution at Mixing Zone Perimeter(1)	Distance to 10:1 Dilution ft (m)	Plume Width at 10:1 Dilution ft (m)
10	95.1 (29.0)	16.4 (5.0)

Notes:

1. The NYSDEC regulations require acute and chronic mixing zones to be sized based on where 10:1 dilution of the discharge occurs.

Table 5.4-2—Far Field Environmental Dilution Values for NMP3NPP Discharges to Lake Ontario

Location	Transit Time (hrs)	Time Average Dilution
NMP3NPP Eastern Intake	0.1	150
NMP3NPP Western Intake	0.1	150
Nearest Shoreline	0.3	150
NMP Unit 1 Intake	0.7	330
NMP Unit 2 Intake	1.0	330
JAF Intake	1.6	440
Eastern Property Line	0.7	330
Western Property Line	1.3	740
Oswego Public Water Supply Intake	9.3	1200
Mexico Point State Park	9.9	570
Selkirk Shore	13.7	600

Table 5.4-3—Principal Fishing Ports within 50-Miles of Nine Mile Point Nuclear Station

Port Name	Direction	Distance (Miles)
Henderson Harbor	NNE	26 (42)
Sandy Pond	NE	16 (26)
Salmon River	ENE	12 (19)
Mexico Bay	E	8 (13)
Oswego Harbor	SW	5 (8)
Fair Haven	SW	18 (29)
Sodus Point	WSW	28 (45)

Table 5.4-4—Lake Ontario Commercial Fish Landings 2001-2005

Year Species	2001		2002		2003		2004		2005		Average	
	lbs	**kg**	**lbs**	**kg**	**lbs**	**kg**	**lbs**	**kg**	**lbs**	**kg**	**lbs**	**kg**
BROWN BULLHEAD	5,875	2,665	3,970	1,801	4,815	2,184	2,525	1,145	1,040	472		
ROCKBASS	15	7										
SUNFISH AND BASS	16	7										
WHITE PERCH	442	200										
YELLOW PERCH	40,323	18,290	37,113	16,834	6,153	2,791	37,066	16,813	6,354	2,882		
TOTAL HARVEST (POUNDS)	**46,671**	**21,170**	**41,083**	**18,635**	**10,968**	**4,975**	**39,591**	**17,958**	**7,394**	**3,354**	**29,141**	**13,218**

Table 5.4-5—Lake Ontario Landings, Recreational Fisheries

Species	Pounds per fish [a,b]	Past [c]			Present [d]			Projected [e]		
		Number	Weight lb	Weight kg	Number	Weight lb	Weight kg	Number	Weight lb	Weight kg
Trout and Salmon	7.08	84,357	597,162	270,868	65,350	462,610	209,836	74,853	529,886	240,352
Smallmouth Bass	1.50	77,838	116,757	52,960	77,456	116,184	52,700	77,647	116,471	52,830
Yellow Perch	0.38	65,392	24,522	11,123	88,130	33,049	14,991	76,761	28,785	13,057
Walleye	1.00	16,493	16,493	7,481	7,123	7,123	3,231	11,808	11,808	5,356
Northern	1.25	4,326	5,408	2,453	2,668	3,335	1,513	3,497	4,371	1,983
Bullhead	0.80	6,281	5,025	2,279	14,811	11,849	5,375	10,546	8,437	3,827
Total		254,687	765,366	347,164	255,538	634,150	287,646	255,112	699,758	317,405
Edible Portion [f]		191,015	574,025	260,373	191,653	475,612	215,734	191,334	524,818	238,054

Notes:

a. Fish of the Great Lakes, Wisconsin Sea Grant (http://www.seagrant.wisc.edu/greatlakesfish/sitemap.html) Average weights except Trout and Salmon, which is a catch weighted average.
b. Bullhead weight from Fisheries and Oceans, Canada http://www.dfo-mpo.gc.ca/regions/CENTRAL/pub/fact-fait-ogla-rglo/brownbullhead_e.htm
c. Values for 1998 are used for the Past Recreational harvest.
d. Values for 2003 are used for the Present Recreational harvest.
e. The average of the Past and Present harvest values is used for the Future Recreational harvest.
f. Edible portion is taken as 75% of round weight for headed and gutted fish (primary processing) Appendix C, Salmon Report. http://worldwildlife.org/trade/salmonreport.cfm

Table 5.4-6—Liquid Pathway Parameters

Description	Parameter
Effluent Discharge Flow (normal)[1]	8,579 gpm (32,475 lpm)
Source Term[2]	See Section 3.5
Mixing Ratios (in Lake Ontario)	See Table 5.4-1 and Table 5.4-2
Shore Width factor[3]	1.0
Transit Time; shoreline, boating swimming	0.0 (assumed in calculations) See Table 5.4-2 for transit times
Commercial Fish harvest[4]	13,218 kg/yr (29,141 lb/yr)
Commercial invertebrate harvest[5]	0
Recreational Fishing harvest[6]	238,054 kg/yr (524,819 lb/yr)
Recreational Invertebrate harvest[7]	0
Recreational Usage for 50 mi (80 km) population : Shoreline[9]	4,547,646 person-hrs/yr
Recreational Usage for 50 mi (80 km) population : Boating[8]	14,548,379 person-hrs/yr
Recreational Usage for 50 mi (80 km) population : Swimming[9]	1,515,882 person-hrs/yr

Notes:

1. Assumes three cycles of concentration
2. See Section 3.5 for annual expected effluent releases per the GALE code.
3. From Regulatory Guide 1.109, Table A-2 for a tidal basin.
4. Projected edible total commercial fish landings from Table 5.4-2.
5. No commercial invertebrate harvest from Lake Ontario
6. Projected edible total recreational fish landings
7. No documented recreational invertebrate harvest used as human food from Lake Ontario within 50 mi (80 km) of station discharge
8. Derived from Strategic Research Group 2002 National Recreational Boating Survey Report commissions by the USCG.

Table 5.4-7—Recreational Liquid Pathway Usage Parameters for MEI

Usage Parameter	Age Group	Value Used in Calculations[1] (hrs/yr)
Shoreline Usage	Adult	200
	Teen	200
	Child	200
	Infant	200
Swimming Usage	Adult	100
	Teen	100
	Child	100
	Infant	100
Boating Usage	Adult	200
	Teen	200
	Child	200
	Infant	200

Note:

1)The shoreline usage values used in the MEI calculation are conservative compared to the default values cited in Regulatory Guide 1.109, Table E-5 for maximum individual. Regulatory Guide 1.109 does not provide usage figures for swimming or boating, but are reasonably conservative based on the population usage noted on Table 5.4-6.

Table 5.4-8—Locations for Gaseous Effluent Maximum Dose Evaluations

Location (Distance, Sector)	Dose Pathways Evaluated	Undecayed, Undepleted χ/Q (sec/m^3)	Depleted χ/Q (sec/m^3)	D/Q (1/m^2)
Site Boundary	Plume Ground Inhalation Meat Milk Vegetables	2.615E-06	2.487E-06	1.060E-08
Nearest Residence	Plume Ground Inhalation	1.733E-06	1.670E-06	7.860E-09
Nearest Garden	Vegetables	2.312E-07	2.001E-07	2.124E-09

Table 5.4-9—Gaseous Pathway Parameters

Parameter Description	Value
Growing season, fraction of year (April – December)[1]	0.750
Fraction time animals on pasture per year[1]	0.750
Intake from Pasture when on Pasture	1.0
Absolute Humidity (g/m^3)	6.6
Average Temperature in growing Season: °F (°C)[1]	55.5 (13.1)
Population[2]	978,840
Milk Production within 50 mi (80 km): L/yr (gal/yr)[3]	1,089,000,000 (287,600,000)
Meat Production within 50 mi (80 km): kg/yr (lbs/yr)[4]	4,206,000 (9,274,000)
Vegetable/Grain Production within 50 mi (80 km): kg/yr (lbs/yr)[5]	438,840,000 (967,460,000)

Notes:

1. The growing season is the span of months when the temperature is above freezing for all days during the month. This occurs from April through December.
2. 50 mile (80 km) population in year 2010 (year with highest projected population)
3. From 50 mi (80 km) cow and goat milk production shown on Table 5.4-25
4. From 50 mi (80 km) meat and poultry production shown on Table 5.4-24
5. From 50 mi (80 km) grain and leafy vegetable production shown on Table 5.4-22 and Table 5.4-23

Table 5.4-10—Gaseous Pathway Consumption Factors for MEI

Consumption Factor	Adult	Teen	Child	Infant
Leafy vegetables: kg/yr (lbs/yr)	64 (141)	42 (93)	26 (57)	0
Meat Consumption: kg/yr (lbs/yr)	110 (243)	65 (143)	41 (90)	0
Milk Consumption: liter/yr (gal/yr)	310 (82)	400 (106)	330 (87)	330 (87)
Vegetable/fruit consumption: kg/yr (lbs/yr)	520 (1146)	630 (1389)	520 (1146)	0

Table 5.4-11—Distance to Nearest Gaseous Dose Receptors[1]

Sector	Site Boundary (mi/km)	Residence (mi/km)	Vegetable Garden (mi/km)
N[2]	0.312 (0.502)	-	-
NNE[2]	0.414 (0.667)	-	-
NE[2]	0.506 (0.814)	-	-
ENE[2]	0.802 (1.291)	-	2.08 (3.34)
E[2]	0.822 (1.323)	1.57 (2.53)	2.37 (3.81)
ESE[2]	0.822 (1.323)	1.68 (2.71)	1.73 (2.78)
SE	0.912 (1.470)	1.61 (2.59)	-
SSE	0.655 (1.054)	1.37 (2.20)	-
S	0.466 (0.749)	0.63 (1.01)	-
SSW	0.403 (0.649)	0.49 (0.78)	-
SW	0.267 (0.430)	-	-
WSW	0.223 (0.359)	-	-
W	0.223 (0.359)	0.28 (0.45)	-
WNW	0.261 (0.420)	-	-
NW	0.239 (0.377)	-	-
NNW[2]	0.236 (0.380)	-	-

Notes:

1. There are no animals producing milk or meat for human consumption within a five mile radius of the site
2. Sector includes portions bordering or over water; distance measured are to the nearest shoreline property boundary.

Table 5.4-12—Limiting Organ Dose from Liquid Effluent to MEI

Dose Pathway	Adult (Liver) μSv/yr (mrem/yr)	Teen (Liver) μSv/yr (mrem/yr)	Child (Liver) μSv/yr (mrem/yr)	Infant (Thyroid) μSv/yr (mrem/yr)
Fish	2.03E+00 (2.03E-01)	2.05E+00 (2.05E-01)	1.79E+00 (1.79E-01)	0
Potable Water	3.58E-02 (3.58E-03)	2.53E-02 (2.53E-03)	4.86E-02 (4.86E-03)	1.33E-01 (1.33E-02)
Shoreline	8.70E-03 (8.70E-04)	8.70E-03 (8.70E-04)	8.70E-03 (8.70E-04)	8.70E-03 (8.70E-04)
Swimming	9.09E-05 (9.09E-06)	9.09E-05 (9.09E-06)	9.09E-05 (9.09E-06)	9.09E-05 (9.09E-06)
Boating	1.36E-03 (1.36E-04)	1.36E-03 (1.36E-04)	1.36E-03 (1.36E-04)	1.36E-03 (1.36E-04)
Total	2.07E+00 (2.07E-01)	2.09E+00 (2.09E-01)	1.85E+00 (1.85E-01)	1.43E-01 (1.43E-02)

Table 5.4-13—Total Body Dose from Liquid Effluent to MEI

Dose Pathway	Adult µSv/yr (mrem/yr)	Teen µSv/yr (mrem/yr)	Child µSv/yr (mrem/yr)	Infant µSv/yr (mrem/yr)
Fish	1.52E+00 (1.52E-01)	8.89E-01 (8.89E-02)	3.88E-01 (3.88E-02)	0
Potable Water	3.57E-02 (3.57E-03)	2.51E-02 (2.51E-03)	4.81E-02 (4.81E-03)	4.73E-02 (4.73E-03)
Shoreline	8.70E-03 (8.70E-04)	8.70E-03 (8.70E-04)	8.70E-03 (8.70E-04)	8.70E-03 (8.70E-04)
Swimming	9.09E-05 (9.09E-06)	9.09E-05 (9.09E-06)	9.09E-05 (9.09E-06)	9.09E-05 (9.09E-06)
Boating	1.36E-03 (1.36E-04)	1.36E-03 (1.36E-04)	1.36E-03 (1.36E-04)	1.36E-03 (1.36E-04)
Total	1.56E+00 (1.56E-01)	9.24E-01 (9.24E-02)	4.46E-01 (4.46E-02)	5.74E-02 (5.74E-03)

Table 5.4-14—Summary Liquid Effluent Annual Dose to MEI

Type of Dose	NMP3NPP Calculated Dose µSv (mrem)	10 CFR 50, Appendix I Limit(1) µSv (mrem)	Fraction of Appendix I Objective
Total Body	1.56 (0.156)	30 (3)	0.052
Maximum Organ	2.09 (0.209)	100 (10)	0.0209

Note:

1. Numerical dose objectives from 10 CFR 50, Appendix I, Section II.A.

Table 5.4-15—Gaseous Pathway Doses for Maximally Exposed Individuals (MEI)

Location	Pathway	Total Body µSv/yr (mrem/yr)	Limiting Organ µSv/yr (mrem/yr)	Skin µSv/yr (mrem/yr)
Nearest Residence	Plume	3.54E+00 (3.54E-01)		3.38E+01 (3.38E+00)
	Ground	1.11E-02 (1.11E-03)	1.11E-02 (1.11E-03)	1.30E-02 (1.30E-03)
	Inhalation[1]			
	Adult		1.65E-01 (1.65E-02)	
	Teen		1.92E-01 (1.92E-02)	
	Child		2.07E-01 (2.07E-02)	
	Infant		1.68E-01 (1.68E-02)	
Nearest Garden	Vegetable[2]			
	Adult		5.03E-01 (5.03E-02)	
	Teen		8.18E-01 (8.18E-02)	
	Child		1.96E+00 (1.96E-01)	

Notes:

1 Most limiting organ is the thyroid.
2 Most limiting organ is the bone.

Table 5.4-16—Annual Historical Dose Compliance with 40 CFR 190 for NMP Unit 1 and Unit 2 and James A. Fitzpatrick NPP

Year	Whole Body µSv (mrem)	Thyroid µSv (mrem)	Maximum Organ µSv (mrem)
2007	1.52E+01 (1.52E+00)	9.32E-01 (9.32E-02)	9.32E-01 (9.32E-02)
2006	2.01E+01 (2.01E+00)	9.28E-01 (9.28E-02)	9.28E-01 (9.28E-02)
2005	1.51E+01 (1.51E+00)	1.55E+00 (1.55E-01)	1.55E+00 (1.55E-01)
2004	1.80E+00 (1.80E-01)	1.12E+00 (1.12E-01)	1.12E+00 (1.12E-01)
2003	1.90E+01 (1.90E+00)	4.21E-01 (4.21E-02)	4.21E-01 (4.21E-02)
2002	3.60E-01 (3.60E-02)	6.10E-01 (6.10E-02)	6.10E-01 (6.10E-02)
2001	2.45E+00 (2.45E-01)	3.25E+00 (3.25E-01)	3.25E+00 (3.25E-01)
2000	5.90E+00 (5.90E-01)	6.10E+00 (6.10E-01)	6.10E+00 (6.10E-01)
1999	4.20E-01 (4.20E-02)	4.20E-01 (4.20E-02)	4.20E-01 (4.20E-02)
1998	8.70E-01 (8.70E-02)	9.20E-01 (9.20E-02)	9.20E-01 (9.20E-02)
1997	7.60E-01 (7.60E-02)	8.30E-01 (8.30E-02)	8.30E-01 (8.30E-02)
1996	7.22E-01 (7.22E-02)	8.24E-01 (8.24E-02)	8.24E-01 (8.24E-02)
1995	7.79E-01 (7.79E-02)	7.05E-01 (7.05E-02)	7.05E-01 (7.05E-02)
1994	2.55E-01 (2.55E-02)	6.14E-01 (6.14E-02)	6.14E-01 (6.14E-02)
1993	3.97E-01 (3.97E-02)	1.67E+00 (1.67E-01)	1.67E+00 (1.67E-01)
1992	7.62E-01 (7.62E-02)	1.31E+00 (1.31E-01)	1.31E+00 (1.31E-01)
1991	2.57E-01 (2.57E-02)	1.92E+00 (1.92E-01)	1.92E+00 (1.92E-01)
1990	1.50E-01 (1.50E-02)	6.78E-01 (6.78E-02)	6.78E-01 (6.78E-02)
1989	3.61E-01 (3.61E-02)	4.86E-01 (4.86E-02)	4.86E-01 (4.86E-02)
1988	1.30E-01 (1.30E-02)	2.00E+00 (2.00E-01)	2.00E+00 (2.00E-01)
Max Value Any Year	**2.01E+01 (2.01E+00)**	**6.10E+00 (6.10E-01)**	**6.10E+00 (6.10E-01)**

Table 5.4-17—40 CFR 190 Annual Site Dose Compliance

NMP3NPP		Whole Body µSv (mrem)	Thyroid µSv (mrem)	Max. Organ[6] µSv (mrem)
NMP3NPP Liquids External	Shoreline Activity	8.70E-03 (8.70E-04)	8.70E-03 (8.70E-04)	8.70E-03 (8.70E-04)
	Boating	1.36E-03 (1.36E-04)	1.36E-03 (1.36E-04)	1.36E-03 (1.36E-04)
	Swimming	9.09E-05 (9.09E-06)	9.09E-05 (9.09E-06)	9.09E-05 (9.09E-06)
Ingestion	Fish	1.52E+00 (1.52E-01)	1.34E+00 (1.34E-01)	2.05E+00 (2.05E-01)
	Potable Water	3.57E-02 (3.57E-03)	6.12E-02 (6.12E-03)	2.53E-02 (2.53E-03)
NMP3NPP Gaseous External	Plume[1]	5.34E+00 (5.34E-01)	5.34E+00 (5.34E-01)	5.10E+01 (5.10E+00)
	Ground Plane[2]	1.50E-02 (1.50E-03)	1.50E-02 (1.50E-03)	1.76E-02 (1.76E-03)
Ingestion	Vegetable[2]	4.65E+00 (4.65E-01)	8.32E+00 (8.32E-01)	4.63E+00 (4.63E-01)
	Meat[2]	6.71E-01 (6.71E-02)	7.30E-01 (7.30E-02)	6.70E-01 (6.70E-02)
	Milk[2,3]	2.36E+00 (2.36E-01)	1.90E+01 (1.90E+00)	2.35E+00 (2.35E-01)
Inhalation		9.60E-02 (9.60E-03)	2.53E-01 (2.53E-02)	9.55E-02 (9.55E-03)
Direct		4.28E+01 (4.28E+00)	4.28E+01 (4.28E+00)	4.28E+01 (4.28E+00)
Total (NMP3NPP)[4]		**5.75E+01 (5.75E+00)**	**7.78E+01 (7.78E+00)**	**1.04E+02 (1.04E+01)**
Total (NMP Unit 1, Unit 2 and James A. Fitzpatrick NPP)[5]		**2.61E+01 (2.61E+00)**	**2.65E+01 (2.65E+00)**	**2.65E+01 (2.65E+00)**
NMP Site Total		**8.36E+01 (8.36E+00)**	**1.04E+02 (1.04E+01)**	**1.31E+02 (1.31E+01)**

Notes:

1. External dose from plume is calculated at the W site boundary (0.22 mi (0.36 km)) only for noble gases and is used for assessment of compliance with 40 CFR 190.
2. Exposure pathway assumed to exist at the maximum site boundary (W, 0.22 mi (0.36 km)).
3. Doses from goat milk are used as they are higher than doses from cow milk.
4. NMP3NPP doses projected based on design performance calculations using the GALE code, and both real and potential maximum pathway locations.
5. Unit 1 & 2 doses based on actual plant recorded effluents and exposure pathways (different basis from that applied to NMP3NPP projected assessments).
6. For liquid effluents critical organ is teen liver; for gaseous effluents, critical organ is child skin. These are conservatively added to represent maximum dose.

Table 5.4-18—Public Water Supplies Systems within 50 Miles of NMP3NPP in the US
(Page 1 of 3)

Name of System (Intake County)	County	Distance (km/mi) Direction	Average Withdrawal m^3/day	Average Withdrawal mgd	Communities Served	Population Served
Ontario Town Water District	Wayne	74/46 WSW	8,089	2.137	Town of Ontario Monroe Co. Water Authority Town of Walworth Town of Macedon	26,000
Williamson Water District	Wayne	66/41 WSW	7,571	2.00	Town of Williamson Monroe Co. Water Authority Town of Arcadia Town of Palmyra Town of Marion	25,000
Sodus Village	Wayne	58/36 WSW	984	0.085	Sodus Point	3,250
Wolcott Village	Wayne	40/25 SW	587	0.155	Wayne Co. Water & Sewer Town of Huron Town of Wolcott	1,938
City of Oswego	Oswego	10/6 SW	30,283	8.00	City Of Oswego Oswego Steam Station Town Of Scriba Novelis Aluminum Town Of New Haven Independence Station Nine Mile Point Unit 1 and Unit 2 James A Fitzpatrick	100,000

Table 5.4-18—Public Water Supplies Systems within 50 Miles of NMP3NPP in the US
(Page 2 of 3)

Name of System (Intake County)	County	Distance (km/mi) Direction	Average Withdrawal m^3/day	Average Withdrawal mgd	Communities Served	Population Served
Metropolitan Water Board (Onondaga County Water Authority (O.C.W.A) purchases 98% of MWB of MWB output) Oswego County Onondaga County Madison County Oneida County	Oswego	10/6 SW	90,850	24.00	Oswego County Town Of Granby Town of Minetto Town of Oswego Town Of Volney Onondaga County Town Of Clay Town Of Onondaga Town Of Cicero Town Of Manlius Town Of Baldwinsville Town Of Van Buren Town Of Camillus Madison County Town Of Sullivan Town Of Chittenango Town Of Canastota Town Of Lenox Oneida County Village Of Sylvan Beach Town of Verona Town of Vienna	300,000
Town of Henderson	Jefferson	43/27 NNE	98	0.026	Village of Henderson Town of Henderson	325
Sackets Harbor Village	Jefferson	55/34 NNE	1,136	0.300	Sackets Harbor Town of Honsfield D.A.N.C. Water Line	3,750

Table 5.4-18—Public Water Supplies Systems within 50 Miles of NMP3NPP in the US
(Page 3 of 3)

Name of System (Intake County)	County	Distance (km/mi) Direction	Average Withdrawal m^3/day	Average Withdrawal mgd	Communities Served	Population Served
Cape Vincent Village	Jefferson	71/44 N	2,271	0.600	Town of Cape Vincent D.A.N.C. Water Line Lime Chaumont Dexter Brownville Glen Park	7,500

Table 5.4-19—General Population Doses from Liquid Effluents[1]

Total Body Person-Sieverts (Person-Rem)	Thyroid Person-Thyroid-Sieverts (Person-Thyroid-Rem)
8.94E-03 (0.894)	1.55E-02 (1.55)

Note:

1. Includes dose contribution from commercial and sport harvest of fish and shellfish, shoreline, swimming and boating exposures to the 50 miles (80 km) population.

Table 5.4-20—NMP3NPP Gaseous Effluent MEI Dose Summary

10 CFR 50; Appendix I Section	Type of Dose	Calculated Dose	10 CFR 50; Appendix I Limit
II.B.1	Beta Air Dose µGy/yr (mrad/yr)	46.1 (4.61)	200 (20)
	Gamma Air Dose µGy/yr (mrad/yr)	5.63 (0.563)	100 (10)
II.B.2	External Total Body Dose µSv/yr (mrem/yr)(1)	3.54 (0.354)	50 (5)
	External Skin Dose µSv/yr (mrem/yr)(1)	33.8 (3.38)	150 (15)
II.C	Organ Dose µSv/yr (mrem/yr)(2)	23.2 (2.32)	150 (15)

Notes:

1. Exposure from plume and ground plane pathways at the nearest residence.
2. Exposure from the vegetable pathway at the nearest garden for child bone.

Table 5.4-21—50 Mi (80 km) Population Doses from Gaseous Effluents[1]
Person-Sieverts
(Person-Rem)

Pathway	Total Body	Skin	Thyroid	Critical Organ Bone
Plume	3.06E-03 (3.06E-01)	3.94E-02 (3.94E+00)	3.06E-03 (3.06E-01)	3.06E-03 (3.06E-01)
Ground Plane	2.26E-05 (2.26E-03)	2.64E-05 (2.64E-03)	2.26E-05 (2.26E-03)	2.26E-05 (2.26E-03)
Inhalation	8.48E-05 (8.48E-03)	8.44E-05 (8.44E-03)	2.15E-04 (2.15E-02)	1.79E-06 (1.79E-04)
Vegetable Ingestion	4.72E-04 (4.72E-02)	4.65E-04 (4.65E-02)	4.96E-04 (4.96E-02)	2.24E-03 (2.24E-01)
Milk	2.43E-04 (2.43E-02)	2.38E-04 (2.38E-02)	1.86E-03 (1.86E-01)	1.08E-03 (1.08E-01)
Meat	1.56E-05 (1.56E-03)	1.55E-05 (1.55E-03)	2.06E-05 (2.06E-03)	7.29E-05 (7.29E-03)
Total	3.91E-03 (3.91E-01)	4.03E-02 (4.03E+00)	5.68E-03 (5.68E-01)	6.49E-03 (6.49E-01)

Notes:

1 Based on projected 50 mi (80 km) population for year 2010 (decade with the greatest population). Food production within 50 mi (80 km) is presented in Table 5.4-22 through Table 5.4-25. Values based on 2060 population and scaled up 24% to account for the 24% greater population in 2010.

Table 5.4-22—Grain Production kg/yr (lb/yr)Grain Production kg/yr (lb/yr)

Sector	Distance miles (km)										
	0-1 (0-1.6)	1-2 (1.6-3.2)	2-3 (3.2-4.8)	3-4 (4.8-6.4)	4-5 (6.4-8.1)	5-10 (8.1-16.1)	10-20 (16.1-32.2)	20-30 (32.2-48.3)	30-40 (48.3-64.4)	40-50 (64.4-80)	Total
N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	266,500 (587,600)	559,700 (1,234,000)	1,199,000 (2,644,000)	2,026,000 (4,466,000)
NNE	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	79,960 (176,300)	1,599,000 (3,526,000)	1,866,000 (4,113,000)	4,558,000 (10,050,000)	8,103,000 (17,860,000)
NE	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	639,700 (1,410,000)	2,665,000 (5,876,000)	3,732,000 (8,227,000)	4,798,000 (10,580,000)	11,830,000 (26,090,000)
ENE	0 (0)	3,375 (7,441)	1,607 (3,543)	0 (0)	0 (0)	0 (0)	361,600 (797,200)	2,666,000 (5,877,000)	3,732,000 (8,227,000)	1,381,000 (3,045,000)	8,145,000 (17,960,000)
E	1,607 (3,543)	4,821 (10,630)	7,634 (16,830)	7,875 (17,360)	7,232 (15,940)	72,320 (159,400)	482,100 (1,063,000)	803,600 (1,772,000)	6,129,000 (13,510,000)	7,880,000 (17,370,000)	15,400,000 (33,940,000)
ESE	1,607 (3,543)	4,821 (10,630)	8,036 (17,720)	11,250 (24,800)	14,460 (31,890)	120,500 (265,700)	482,100 (1,063,000)	803,600 (1,772,000)	5,812,000 (12,810,000)	7,472,000 (16,470,000)	14,730,000 (32,470,000)
SE	1,607 (3,543)	4,821 (10,630)	8,036 (17,720)	11,250 (24,800)	14,460 (31,890)	120,500 (265,700)	482,100 (1,063,000)	7,053,000 (15,550,000)	8,474,000 (18,680,000)	17,250,000 (38,030,000)	33,420,000 (73,680,000)
SSE	1,607 (3,543)	4,821 (10,630)	8,036 (17,720)	11,250 (24,800)	14,460 (31,890)	120,500 (265,700)	482,100 (1,063,000)	10,080,000 (22,210,000)	14,110,000 (31,100,000)	18,160,000 (40,030,000)	42,980,000 (94,760,000)
S	1,607 (3,543)	4,821 (10,630)	8,036 (17,720)	11,250 (24,800)	14,460 (31,890)	120,500 (265,700)	9,650,000 (21,270,000)	16,960,000 (37,380,000)	23,740,000 (52,330,000)	25,940,000 (57,190,000)	76,440,000 (168,500,000)
SSW	1,607 (3,543)	4,821 (10,630)	8,036 (17,720)	11,250 (24,800)	14,460 (31,890)	120,500 (265,700)	10,160,000 (22,390,000)	16,930,000 (37,330,000)	32,910,000 (72,560,000)	38,090,000 (83,960,000)	98,250,000 (216,600,000)
SW	1,607 (3,543)	4,821 (10,630)	8,036 (17,720)	10,690 (23,560)	13,020 (28,700)	120,500 (265,700)	8,126,000 (17,920,000)	16,090,000 (35,460,000)	17,170,000 (37,860,000)	42,370,000 (93,400,000)	83,910,000 (18,500,000)
WSW	1,527 (3,366)	1,929 (4,252)	2,411 (5,315)	1,125 (2,480)	0 (0)	0 (0)	0 (0)	613,400 (1,352,000)	6,870,000 (15,140,000)	13,250,000 (29,210,000)	20,740,000 (45,720,000)
W	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
WNW	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
NW	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
NNW	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Total	12,780 (28,170)	39,050 (86,100)	59,870 (132,000)	75,940 (167,400)	92,570 (204,100)	795,500 (1,754,000)	30,940,000 (68,220,000)	76,520,000 (168,700,000)	125,100,000 (275,800,000)	182,300,000 (402,000,000)	416,000,000 (917,100,000)

Table 5.4-23—Leafy Vegetable Production kg/yr (lb/yr)

Sector	Distance miles (km)										
	0-1 (0-1.6)	**1-2 (1.6-3.2)**	**2-3 (3.2-4.8)**	**3-4 (4.8-6.4)**	**4-5 (6.4-8.1)**	**5-10 (8.1-16.1)**	**10-20 (16.1-32.2)**	**20-30 (32.2-48.3)**	**30-40 (48.3-64.4)**	**40-50 (64.4-80)**	**Total**
N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	6,637 (14,630)	13,940 (30,730)	29,870 (65,850)	50,440 (111,200)
NNE	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1,991 (4,390)	39,820 (87,790)	46,460 (102,400)	113,500 (250,200)	201,800 (444,800)
NE	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	21,120 (46,560)	66,370 (146,300)	92,920 (204,900)	119,500 (263,400)	299,900 (661,100)
ENE	0 (0)	362.4 (789.9)	172.6 (380.4)	0 (0)	0 (0)	0 (0)	38,830 (85,600)	88,000 (194,000)	123,200 (271,600)	116,100 (255,900)	366,600 (808,300)
E	172.6 (380.4)	517.7 (1,141)	819.7 (1,807)	845.6 (1,864)	776.5 (1,712)	7,765 (17,120)	51,770 (114,100)	86,280 (190,200)	120,800 (266,300)	116,100 (255,900)	385,800 (850,600)
ESE	172.6 (380.4)	517.7 (1,141)	862.8 (1,902)	1,208 (2,663)	1,553 (3,424)	12,940 (28,530)	51,770 (114,100)	86,280 (190,200)	114,800 (253,000)	40,220 (88,680)	310,300 (684,100)
SE	172.6 (380.4)	517.7 (1,141)	862.8 (1,902)	1,208 (2,663)	1,553 (3,424)	12,940 (28,530)	51,770 (114,100)	251,200 (553,700)	301,800 (665,500)	614,500 (1,355,000)	1,237,000 (2,726,000)
SSE	172.6 (380.4)	517.7 (1,141)	862.8 (1,902)	1,208 (2,663)	1,553 (3,424)	12,940 (28,530)	51,770 (114,100)	358,800 (791,000)	502,300 (1,107,000)	646,800 (1,426,000)	1,577,000 (3,477,000)
S	172.6 (380.4)	517.7 (1,141)	862.8 (1,902)	1,208 (2,663)	1,553 (3,424)	12,940 (28,530)	74,360 (163,900)	358,800 (791,000)	502,300 (1,107,000)	549,000 (1,210,000)	1,502,000 (3,311,000)
SSW	172.6 (380.4)	517.7 (1,141)	862.8 (1,902)	1,208 (2,663)	1,553 (3,424)	12,940 (28,530)	78,270 (172,600)	705,400 (1,555,000)	1,025,000 (2,261,000)	264,300 (582,600)	2,091,000 (4,609,000)
SW	172.6 (380.4)	517.7 (1,141)	862.8 (1,902)	1,148 (2,530)	1,398 (3,082)	12,940 (28,530)	62,620 (138,100)	670,100 (1,477,000)	987,600 (2,177,000)	11,890,000 (26,210,000)	13,630,000 (30,040,000)
WSW	163.9 (361.4)	207.1 (456.5)	258.8 (570.7)	120.8 (266.3)	0 (0)	0 (0)	0 (0)	35,270 (77,760)	395,000 (870,900)	761,800 (1,680,000)	1,193,000 (2,630,000)
W	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
WNW	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
NW	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
NNW	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Total	**1,372 (3,024)**	**4,193 (9,242)**	**6,428 (14,170)**	**8,154 (17,980)**	**9,940 (21,910)**	**85,410 (188,300)**	**484,300 (1,068,000)**	**2,753,000 (6,069,000)**	**4,227,000 (9,318,000)**	**15,260,000 (33,650,000)**	**22,840,000 (50,360,000)**

Table 5.4-24— Meat and Poultry Production kg/yr (lb/yr)

Sector	Distance miles (km)										
	0-1 (0-1.6)	**1-2 (1.6-3.2)**	**2-3 (3.2-4.8)**	**3-4 (4.8-6.4)**	**4-5 (6.4-8.1)**	**5-10 (8.1-16.1)**	**10-20 (16.1-32.2)**	**20-30 (32.2-48.3)**	**30-40 (48.3-64.4)**	**40-50 (64.4-80)**	**Total**
N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	5,667 (12,500)	11,900 (26,240)	25,510 (56,220)	43,070 (94,950)
NNE	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1,700 (3,748)	34,000 (74,960)	39,670 (87,460)	96,900 (213,600)	172,300 (379,800)
NE	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	13,840 (30,500)	56,670 (125,000)	79,330 (175,000)	102,000 (224,900)	251,800 (555,300)
ENE	0 (0)	146.1 (322.2)	69.60 (153.4)	0 (0)	0 (0)	0 (0)	15,660 (34,520)	57,660 (127,100)	80,710 (178,000)	17,820 (39,290)	172,100 (379,400)
E	69.60 (153.4)	208.8 (460.3)	330.5 (729)	341.0 (751.8)	313.1 (690.4)	3,131 (6,904)	20,880 (46,030)	34,790 (76,710)	50,430 (111,200)	50,710 (111,800)	161,200 (355,400)
ESE	69.60 (153.4)	208.8 (460.3)	347.9 (767)	487.2 (1,074)	626.4 (1,381)	5,219 (11,510)	20,880 (46,030)	34,790 (76,710)	47,910 (105,600)	48,170 (106,200)	158,700 (349,900)
SE	69.60 (153.4)	208.8 (460.3)	347.9 (0,767)	487.2 (1,074)	626.4 (1,381)	5,219 (11,510)	20,880 (46,030)	24,760 (54,580)	40,170 (88,550)	81,400 (179,500)	174,200 (384,000)
SSE	69.60 (153.4)	208.8 (460.3)	347.9 (767)	487.2 (1,074)	626.4 (1,381)	5,219 (11,510)	20,880 (46,030)	35,360 (77,970)	39,980 (88,130)	85,360 (188,200)	188,500 (415,600)
S	69.60 (153.4)	208.8 (460.3)	347.9 (767)	487.2 (1,074)	626.4 (1,381)	5,219 (11,510)	43,770 (96,500)	76,790 (169,300)	107,500 (237,000)	117,500 (259,100)	352,500 (777,200)
SSW	69.60 (153.4)	208.8 (460.3)	347.9 (767)	487.2 (1,074)	626.4 (1,381)	5,219 (11,510)	46,070 (101,600)	90,610 (199,800)	594,700 (1,311,000)	688,200 (1,517,000)	1,427,000 (3,145,000)
SW	69.60 (153.4)	208.8 (460.3)	347.9 (767)	462.8 (1,020)	563.7 (1,243)	5,219 (11,510)	36,860 (81,260)	86,070 (189,700)	95,510 (210,600)	764,700 (1,686,000)	990,000 (2,183,000)
WSW	66.12 (145.8)	83.51 (184.1)	104.4 (230.1)	48.72 (107.4)	0 (0)	0 (0)	0 (0)	3,410 (7,521)	38,210 (84,220)	73,680 (162,400)	115,600 (254,800)
W	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
WNW	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
NW	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
NNW	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Total	**553 (1,220)**	**1,691 (3,729)**	**2,592 (5,715)**	**3,288 (7,251)**	**4,009 (8,837)**	**34,450 (75,940)**	**241,400 (532,200)**	**540,600 (1,192,000)**	**1,226,000 (2,703,000)**	**2,152,000 (4,744,000)**	**4,206,000 (9,274,000)**

Table 5.4-25—Total Milk Production L/yr (gal/yr)

Sector	Distance miles (km)										
	0-1 (0-1.6)	1-2 (1.6-3.2)	2-3 (3.2-4.8)	3-4 (4.8-6.4)	4-5 (6.4-8.1)	5-10 (8.1-16.1)	10-20 (16.1-32.2)	20-30 (32.2-48.3)	30-40 (48.3-64.4)	40-50 (64.4-80)	Total
N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2,063,000 (545,100)	4,332,000 (1,144,000)	9,283,000 (2,452,000)	15,680,000 (4,142,000)
NNE	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	618,900 (163,500)	12,380,000 (3,270,000)	14,440,000 (3,814,000)	35,270,000 (9,318,000)	62,710,000 (16,570,000)
NE	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4,951,000 (1,308,000)	20,630,000 (5,451,000)	28,890,000 (7,631,000)	37,130,000 (9,808,000)	91,600,000 (24,200,000)
ENE	0 (0)	7.511 (1.984)	3.577 (0.945)	0 (0)	0 (0)	0 (0)	1,634,000 (431,600)	20,630,000 (5,451,000)	28,890,000 (7,631,000)	29,590,000 (7,818,000)	80,750,000 (21,330,000)
E	3.577 (0.9450)	10.73 (2.834)	16.99 (4.488)	17.52 (4.629)	32,670 (8,630)	326,700 (86,300)	2,178,000 (575,300)	3,630,000 (958,900)	23,020,000 (6,082,000)	29,590,000 (7,818,000)	58,780,000 (15,530,000)
ESE	3.577 (0.9450)	10.73 (2.834)	17.88 (4.724)	25.04 (6.615)	65,340 (17,260)	544,500 (143,900)	2,178,000 (575,300)	3,630,000 (958,900)	20,290,000 (5,361,000)	26,100,000 (6,895,000)	52,810,000 (13,950,000)
SE	3.577 (0.9450)	10.73 (2.834)	17.88 (4.724)	25.04 (6.615)	65,340 (17,260)	544,500 (143,900)	2,178,000 (575,300)	14,900,000 (3,936,000)	20,780,000 (5,489,000)	42,290,000 (11,170,000)	80,760,000 (21,330,000)
SSE	3.577 (0.9450)	10.73 (2.834)	17.88 (4.724)	25.04 (6.615)	65,340 (17,260)	544,500 (143,900)	2,178,000 (575,300)	21,280,000 (5,622,000)	29,800,000 (7,873,000)	44,520,000 (11,760,000)	98,400,000 (25,990,000)
S	3.577 (0.9450)	10.73 (2.834)	17.88 (4.724)	25.04 (6.615)	65,340 (17,260)	544,500 (143,900)	25,200,000 (6,658,000)	44,230,000 (11,690,000)	61,930,000 (16,360,000)	67,680,000 (17,880,000)	199,700,000 (52,740,000)
SSW	3.577 (0.9450)	10.73 (2.834)	17.88 (4.724)	25.04 (6.615)	65,340 (17,260)	544,500 (143,900)	26,540,000 (7,010,000)	44,230,000 (11,680,000)	61,930,000 (16,360,000)	71,650,000 (18,930,000)	205,000,000 (54,150,000)
SW	3.577 (0.9450)	10.73 (2.834)	17.88 (4.724)	23.79 (6.284)	58,810 (15,530)	544,500 (143,900)	21,220,000 (5,607,000)	42,020,000 (11,100,000)	15,840,000 (4,184,000)	44,090,000 (11,650,000)	123,800,000 (32,710,000)
WSW	3.397 (0.8970)	4.291 (1.134)	5.364 (1.417)	2.504 (0.661)	0 (0)	0 (0)	0 (0)	565,700 (149,400)	6,336,000 (1,674,000)	12,220,000 (3,229,000)	19,120,000 (5,052,000)
W	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
WNW	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
NW	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
NNW	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Total	**28.43 (7.511)**	**86.90 (22.96)**	**133.2 (35.20)**	**169.0 (44.65)**	**418,200 (110,500)**	**3,594,000 (949,400)**	**88,880,000 (23,480,000)**	**230,200,000 (60,800,000)**	**316,500,000 (83,610,000)**	**449,400,000 (118,700,000)**	**1,089,000,000 (287,600,000)**

Table 5.4-26—Site Boundary Air Concentrations by Nuclide

Radionuclides	GALE Normal Release Rate Ci/yr (Bq/yr)	Gale Normal Release Rate µCi/sec (Bq/sec)	Air Concentration at Site Boundary µCi/mL (Bq/mL)	10 CFR 20 Appendix B Limit(1) µCi/mL (Bq/mL)	Fraction of Limit(2)
I-131	8.80E-03 (3.26E+08)	2.79E-04 (1.03E+01)	7.30E-16 (2.70E-11)	2.00E-10 (7.40E-06)	3.65E-06
I-133	3.20E-02 (1.18E+09)	1.01E-03 (3.75E+01)	2.65E-15 (9.82E-11)	1.00E-09 (3.70E-05)	2.65E-06
Kr-85M	1.50E+02 (5.55E+12)	4.76E+00 (1.76E+05)	1.24E-11 (4.60E-07)	1.00E-07 (3.70E-03)	1.24E-04
Kr-85	3.40E+04 (1.26E+15)	1.08E+03 (3.99E+07)	2.82E-09 (1.04E-04)	7.00E-07 (2.59E-02)	4.03E-03
Kr-87	5.30E+01 (1.96E+12)	1.68E+00 (6.22E+04)	4.39E-12 (1.63E-07)	2.00E-08 (7.40E-04)	2.20E-04
Kr-88	1.80E+02 (6.66E+12)	5.71E+00 (2.11E+05)	1.49E-11 (5.52E-07)	9.00E-09 (3.33E-04)	1.66E-03
Xe-131M	3.50E+03 (1.30E+14)	1.11E+02 (4.11E+06)	2.90E-10 (1.07E-05)	2.00E-06 (7.40E-02)	1.45E-04
Xe-133M	1.80E+02 (6.66E+12)	5.71E+00 (2.11E+05)	1.49E-11 (5.52E-07)	6.00E-07 (2.22E-02)	2.49E-05
Xe-133	8.60E+03 (3.18E+14)	2.73E+02 (1.01E+07)	7.13E-10 (2.64E-05)	5.00E-07 (1.85E-02)	1.43E-03
Xe-135M	1.40E+01 (5.18E+11)	4.44E-01 (1.64E+04)	1.16E-12 (4.30E-08)	4.00E-08 (1.48E-03)	2.90E-05
Xe-135	1.20E+03 (4.44E+13)	3.81E+01 (1.41E+06)	9.95E-11 (3.68E-06)	7.00E-08 (2.59E-03)	1.42E-03
Xe-138	1.20E+01 (4.44E+11)	3.81E-01 (1.41E+04)	9.95E-13 (3.68E-08)	2.00E-08 (7.40E-04)	4.98E-05
Cr-51	9.70E-05 (3.59E+06)	3.08E-06 (1.14E-01)	8.04E-18 (2.98E-13)	3.00E-08 (1.11E-03)	2.68E-10
Mn-54	5.70E-05 (2.11E+06)	1.81E-06 (6.69E-02)	4.73E-18 (1.75E-13)	1.00E-09 (3.70E-05)	4.73E-09
Co-57	8.20E-06 (3.03E+05)	2.60E-07 (9.62E-03)	6.80E-19 (2.52E-14)	9.00E-10 (3.33E-05)	7.56E-10
Co-58	4.80E-04 (1.78E+07)	1.52E-05 (5.63E-01)	3.98E-17 (1.47E-12)	1.00E-09 (3.70E-05)	3.98E-08
Co-60	1.10E-04 (4.07E+06)	3.49E-06 (1.29E-01)	9.12E-18 (3.37E-13)	5.00E-11 (1.85E-06)	1.82E-07
Fe-59	2.80E-05 (1.04E+06)	8.88E-07 (3.29E-02)	2.32E-18 (8.59E-14)	5.00E-10 (1.85E-05)	4.64E-09
Sr-89	1.60E-04 (5.92E+06)	5.07E-06 (1.88E-01)	1.33E-17 (4.91E-13)	2.00E-10 (7.40E-06)	6.63E-08
Sr-90	6.30E-05 (2.33E+06)	2.00E-06 (7.39E-02)	5.22E-18 (1.93E-13)	6.00E-12 (2.22E-07)	8.71E-07
Zr-95	1.00E-05 (3.70E+05)	3.17E-07 (1.17E-02)	8.29E-19 (3.07E-14)	4.00E-10 (1.48E-05)	2.07E-09
Nb-95	4.20E-05 (1.55E+06)	1.33E-06 (4.93E-02)	3.48E-18 (1.29E-13)	2.00E-09 (7.40E-05)	1.74E-09
Ru-103	1.70E-05 (6.29E+05)	5.39E-07 (1.99E-02)	1.41E-18 (5.22E-14)	9.00E-10 (3.33E-05)	1.57E-09
Ru-106	7.80E-07 (2.89E+04)	2.47E-08 (9.15E-04)	6.47E-20 (2.39E-15)	2.00E-11 (7.40E-07)	3.23E-09
Sb-125	6.10E-07 (2.26E+04)	1.93E-08 (7.16E-04)	5.06E-20 (1.87E-15)	7.00E-10 (2.59E-05)	7.23E-11
Cs-134	4.80E-05 (1.78E+06)	1.52E-06 (5.63E-02)	3.98E-18 (1.47E-13)	2.00E-10 (7.40E-06)	1.99E-08
Cs-136	3.30E-05 (1.22E+06)	1.05E-06 (3.87E-02)	2.74E-18 (1.01E-13)	9.00E-10 (3.33E-05)	3.04E-09
Cs-137	9.00E-05 (3.33E+06)	2.85E-06 (1.06E-01)	7.46E-18 (2.76E-13)	2.00E-10 (7.40E-06)	3.73E-08
Ba-140	4.20E-06 (1.55E+05)	1.33E-07 (4.93E-03)	3.48E-19 (1.29E-14)	2.00E-09 (7.40E-05)	1.74E-10
Ce-141	1.30E-05 (4.81E+05)	4.12E-07 (1.53E-02)	1.08E-18 (3.99E-14)	8.00E-10 (2.96E-05)	1.35E-09
H-3	1.80E+02 (6.66E+12)	5.71E+00 (2.11E+05)	1.49E-11 (5.52E-07)	1.00E-07 (3.70E-03)	1.49E-04
C-14	7.30E+00 (2.70E+11)	2.31E-01 (8.56E+03)	6.05E-13 (2.24E-08)	3.00E-09 (1.11E-04)	2.02E-04
Ar-41	3.40E+01 (1.26E+12)	1.08E+00 (3.99E+04)	2.82E-12 (1.04E-07)	1.00E-08 (3.70E-04)	2.82E-04
Sum of Fractions					**9.77E-03**

Notes:

1. Regulatory limits for annual average air concentrations in unrestricted areas. Values taken from 10 CFR 20, Appendix B, Table 2, Column 1.
2. Fraction of Regulatory limits for annual average air concentrations in unrestricted areas.

Table 5.4-27—Important Biota Species and Analytical Surrogates

Ecology	Species Type	Species	Status	Surrogate Species
Terrestrial	Mammal	White-tailed deer		Racoon
	Birds	Osprey	Special Concern	Heron
	Herptiles	Northern Frog		Muskrat
		Pickerel Frog		Muskrat
Aquatic	Fish	Deepwater Sculpin	Endangered	Fish
		Round Whitefish	Endangered	Fish
		Lake Sturgeon	Threatened	Fish
		Lake Chubsucker	Threatened	Fish
		Redfin Shiner	Special Concern	Fish

Note:

1. No direct surrogate species for terrestrial insects.

Table 5.4-28—Biota Exposure Pathways

Biota	Aquatic Pathways	Atmospheric Pathways	Direct Radiation
Fish	Internal exposure from bioaccumulation of radionuclides. External exposure from swimming and the shoreline.	N/A	External exposure from fixed sources of radiation
Invertebrates	Internal exposure from bioaccumulation of radionuclides. External exposure from swimming and the shoreline.	N/A	External exposure from fixed sources of radiation
Algae	Internal exposure from bioaccumulation of radionuclides. External exposure from immersion in water.	N/A	External exposure from fixed sources of radiation
Muskrat	Internal exposure from ingestion of aquatic plants. External exposure from swimming and the shoreline.	External gaseous plume immersion. External exposure to ground plane deposition. Gaseous effluent inhalation.	External exposure from fixed sources of radiation
Raccoon	Internal exposure from ingestion of invertebrates. External exposure from exposure to the shoreline.	External gaseous plume immersion. External exposure to ground plane deposition. Gaseous effluent inhalation.	External exposure from fixed sources of radiation
Heron	Internal exposure from ingestion of fish. External exposure from swimming and exposure to the shoreline.	External gaseous plume immersion. External exposure to ground plane deposition. Gaseous effluent inhalation.	External exposure from fixed sources of radiation
Duck	Internal exposure from ingestion of aquatic plants. External exposure from swimming and exposure to the shoreline	External gaseous plume immersion. External exposure to ground plane deposition. Gaseous effluent inhalation.	External exposure from fixed sources of radiation

Table 5.4-29— Terrestrial Biota Parameters

Terrestrial Biota	Food Organism	Food Intake Lb/day (gm/day)	Body Mass Lb (gm)	Effective Body Radius in (cm)
Muskrat	Aquatic Plants	0.22 (100)	2.21 (1,000)	2.36 (6)
Raccoon	Invertebrates	0.44 (200)	26.5 (12,000)	5.51 (14)
Heron	Fish	1.32 (600)	10.1 (4,600)	4.33 (11)
Duck	Aquatic Plants	0.22 (100)	2.21 (1,000)	1.97 (5)

Table 5.4-30—Biota Residence Time

Biota	Shoreline / Sediment Exposure (hr/yr)	Swimming Exposure Time (hr/yr)
Fish	4380	8760
Invertebrates	8760	8760
Algae	-	8760
Muskrat	2922	2922
Raccoon	2191	-
Heron	2922	2920
Duck	4383	4383

Table 5.4-31—Dose to Biota from Liquid and Gaseous Effluents

	Liquid Effluents		Gaseous Effluents		Direct Sources	Total
Biota	**Internal Dose[1] µGy/yr (mrad/yr)**	**External Dose[1] µGy/yr (mrad/yr)**	**Internal Dose µSv/yr (mrad/yr)**	**External Dose µSv/yr (mrad/yr)**	**µSv/yr (mrad/yr)**	**µSv/yr (mrad/yr)**
Fish	3.96E+00 (3.96E-01)	2.92E+00 (2.92E-01)	N/A	N/A	4.27E+01 (4.27E+00)	4.96E+01 (4.96E+00)
Invertebrate	1.86E+01 (1.86E+00)	5.77E+00 (5.77E-01)	N/A	N/A	4.27E+01 (4.27E+00)	6.71E+01 (6.71E+00)
Algae	7.97E+01 (7.97E+00)	5.97E-02 (5.97E-03)	N/A	N/A	4.27E+01 (4.27E+00)	1.23E+02 (1.23E+01)
Muskrat	2.03E+01 (2.03E+00)	1.93E+00 (1.93E-01)	5.34E+00 (5.34E-01)	3.00E-02 (3.00E-03)	4.27E+01 (4.27E+00)	7.04E+01 (7.04E+00)
Raccoon	2.29E+00 (2.29E-01)	5.72E-01 (5.72E-02)	5.34E+00 (5.34E-01)	3.00E-02 (3.00E-03)	4.27E+01 (4.27E+00)	5.10E+01 (5.10E+00)
Heron	2.97E+01 (2.97E+00)	7.66E-01 (7.66E-02)	5.34E+00 (5.34E-01)	3.00E-02 (3.00E-03)	4.27E+01 (4.27E+00)	7.87E+01 (7.87E+00)
Duck	1.86E+01 (1.86E+00)	2.87E+00 (2.87E-01)	5.34E+00 (5.34E-01)	3.00E-02 (3.00E-03)	4.27E+01 (4.27E+00)	6.97E+01 (6.97E+00)

Note:

1. For approximations of total doses, assume that 1 mrad = 1 mrem (1mGy = 1mSv).

Table 5.4-32—Biota Doses Compared to 40 CFR 190 Whole Body Dose Criterion (25 mrem/yr)

Biota Meeting 40 CFR 190	Biota Exceeding 40 CFR 190
Fish	
Invertebrates	
Algae	
Muskrat	None
Raccoon	
Heron	
Duck	

5.5 ENVIRONMENTAL IMPACT OF WASTE

This section describes the potential environmental impacts that may result from the operation of the nonradioactive waste system and from storage and disposal of mixed wastes. As demonstrated in the following subsections, environmental impacts from NMP3NPP operational wastes will be minimal because of regulatory control and the small quantities generated.

5.5.1 NONRADIOACTIVE WASTE SYSTEM IMPACTS

A detailed description of nonradioactive waste management and effluents is provided in Section 3.6, which also includes estimates of nonradioactive liquid and gaseous effluents, and solid waste quantities.

All nonradioactive waste generated at NMP3NPP (i.e., solid wastes, liquid wastes, air emissions) will be managed in accordance with applicable federal, State of New York, and local laws, regulations, and permit requirements. Management practices will be similar, if not the same as those implemented for NMP Unit 1 and Unit 2, and will include the following:

- Nonradioactive solid wastes (e.g., office waste, recyclables) would be collected temporarily on the NMP3NPP site and disposed of at off-site licensed commercial waste disposal and recycling facilities.
- Debris (e.g., vegetation) collected on trash racks and screens at the water intake structure would be disposed of as solid waste in accordance with the State Pollutant Discharge Elimination System (SPDES) permit applicable at the time of operation.
- Scrap metal, used oil, antifreeze (ethylene or propylene glycol), and universal waste will be collected and stored temporarily on the NMP3NPP site and recycled or recovered at an off-site permitted recycling or recovery facility, as appropriate. Used oil is not a hazardous waste in New York unless the used oil has been combined with a listed hazardous waste or combined with a characteristic hazardous waste and the resulting mixture exhibits the hazardous waste characteristic (NYCRR, 2008a). Used oil and antifreeze are regulated hazardous substances in New York (NYCRR, 2008b).Typically, used oil and antifreeze are recycled. If they are not recyclable or recoverable, they will be disposed of as a solid or hazardous waste in accordance with the SPDES permit applicable at the time of operation.
- Water from cooling and auxiliary systems will be discharged to Lake Ontario through permitted SPDES outfalls.
- Sewage sludge will be transported to a permitted off-site waste treatment plant for disposal.

Nonradioactive waste systems for NMP3NPP include the Circulating Water Treatment System, the Essential Service Water Treatment System, the Liquid Waste Processing System and the Waste Water Treatment System. Quantities, composition, and frequency of waste discharges to water, land, and air are shown in Section 3.6.

5.5.1.1 Impacts of Discharges to Water

Nonradioactive wastewater discharges from NMP3NPP to surface water will include cooling tower blowdown, permitted wastewater from the NMP3NPP auxiliary systems, and storm water runoff from impervious surfaces. In addition, potential impacts from chemical constituents in the cooling water and plant auxiliary systems discharges from NMP3NPP will be minimal via SPDES permit compliance. NMP3NPP will maintain engineering controls that prevent or minimize the release of chemical constituents to Lake Ontario. Concentrations in the cooling water discharge will be limited by SPDES requirements and will be minimal or non-detectable in Lake Ontario as discussed in Section 5.3.2 and listed in Table 5.5-1.

The SPDES permit will also require a Storm Water Pollution Prevention Plan (SWPPP), which prevents or minimizes the discharge of potential pollutants with the storm water discharge, to reflect the addition of new paved areas and facilities and changes in drainage patterns. Impacts from increases in volume or pollutants in the storm water discharge will be minimized by implementation of best management practices (BMPs). As such, impacts are expected to be SMALL.

5.5.1.2 Impacts of Discharges to Land

Operation of NMP3NPP will result in an increase in the total volume of nonradioactive solid waste generated at the NMP3NPP site. Anticipated volumes of nonradioactive solid wastes are discussed in Section 3.6. However, there will be no expected fundamental change in the characteristics of these wastes or the way in which they are currently managed at NMP Unit 1 and Unit 2. Applicable Federal, State, and Local requirements and standards will be met for handling, transporting, and disposing of the solid waste. Solid waste will be reused or recycled to the extent possible. Solid wastes appropriate for recycling or reclamation (e.g., used oil, antifreeze (e.g., ethylene or propylene glycol), scrap metal, and universal waste) will be managed using approved and licensed contractors. Nonradioactive solid waste destined for off-site land disposal will be disposed of at approved and licensed off-site commercial waste disposal sites. Therefore, potential impacts from land disposal on nonradioactive solid waste will be SMALL.

5.5.1.3 Impacts of Discharges to Air

Operation of NMP3NPP will increase gaseous emissions to the air, primarily from equipment associated with the diesel generators. Six diesel generators (four to provide emergency power and two to provide power in the event of a station blackout) will be utilized by NMP3NPP. The impact of air emissions from the diesel generators is addressed in Section 3.6 . Emissions from these systems are addressed in Section 3.6. Cooling tower impacts on terrestrial ecosystems are addressed in Section 5.3.3.2.

All air emission sources associated with NMP3NPP, as described in Section 5.8.1, will be managed in accordance with Federal, State, and Local air quality control laws and regulations. Hence, impacts to air quality will be SMALL and would not warrant mitigation.

5.5.1.4 Sanitary Waste

The Waste Water Treatment Plant will collect sanitary wastes during the operation of NMP3NPP. It will be designed for sanitary waste only and exclude industrial materials, such as chemical laboratory wastes. The NMP3NPP Waste Water Treatment Plant will be independent of NMP Unit 1 and Unit 2. The NMP3NPP Sewage Treatment Plant System will be sized to accommodate the needs of personnel associated with this unit. The Waste Water Treatment Plant will be monitored and controlled by trained operators (NYCRR, 2008c).

Operation of the NMP3NPP Waste Water Treatment Plant will be contracted to a private company whose personnel are licensed by the State of New York as Waste Water Treatment Plant Operators. NMP3NPP Environmental personnel will have oversight of this company to ensure the new plant meets required effluent parameters. The waste sludge from NMP3NPP will be removed by a private company and transported to a waste processing plant. Section 3.6 lists anticipated liquid and solid effluents.

5.5.2 MIXED WASTE IMPACTS

Mixed waste contains hazardous waste and a low level radioactive source, special nuclear material, or byproduct material. Currently, NMPNS manages mixed waste at NMP Unit 1 and Unit 2 in accordance with New York State regulations (NYCRR, 2008a) and the United States Environmental Protection Agency's (EPA's) 1991 Mixed Waste Enforcement Policy (EPA, 1991). NMPNS has obtained a conditional exemption from NYSDEC from the requirements of a TSDF permit for low-level mixed waste.

Nuclear power plants, in general, are not significant generators of mixed waste, with quantities accounting for less than 3% of the annual low level radioactive waste generated (NRC, 1996).

Typical types of mixed waste generated include:

- Waste oil from pumps and other equipment;
- Chlorinated fluorocarbons resulting from cleaning, refrigeration, degreasing, and decontamination activities;
- Organic solvents, reagents, and compounds, and associated materials such as rags and wipes;
- Metals such as lead from shielding applications and chromium from solutions and acids;
- Metal-contaminated organic sludges and other chemicals;
- Aqueous corrosives consisting of organic and inorganic acids;
- Outdated laboratory chemicals;
- Dilute acid from heat exchanger cleanings; and
- Lead paint debris;

Mixed waste generation at NMP Unit 1 and Unit 2, in particular, is limited. During the period between 2001 through 2007, no mixed waste shipments to disposal were made for the years 2001, 2002, 2003, and 2006.

In 2004, three shipments of mixed wastes were made to a permitted disposal facility. One shipment was a 30 pound shipment of sulfuric acid and lead from broken batteries. Another shipment was a 2,360 pound shipment of unused outdated laboratory chemicals. The third shipment was a 625 pound shipment of unused outdated laboratory chemicals.

In 2005, three shipments of mixed waste to a permitted disposal facility were made. One shipment was a 200 pound shipment of sulfuric acid. Another shipment was a 1,000 pound shipment of lead contaminated debris. The third shipment was a 1,350 pound shipment of chromated water.

In 2007, three shipments of mixed waste were made to a permitted disposal facility. One shipment was a 4,620 pound shipment of corrosive liquids. Another shipment was a 1,680 pound shipment of sodium hydroxide solution. The third shipment was a 750 pound shipment of lead paint materials. The mixed waste was shipped under Uniform Hazardous Waste Manifest to a permitted facility for treatment by stabilization.

NUREG 1437, Supplement 1 (NRC, 1999), determined that the relatively small quantities of mixed waste generated by nuclear power plants as having a Small impact.

Nine Mile Point 3 Nuclear Project, LLC and UniStar Nuclear Operating Services, LLC are committed to pollution prevention and waste minimization practices and will incorporate RCRA pollution prevention goals, as identified in 40 CFR 261 (CFR, 2008). A Pollution Prevention and Waste Minimization Plan will be developed to meet the waste minimization criteria of NRC, EPA, and state regulations. The Pollution Prevention and Waste Minimization Plan will describe how design procedures for operation will minimize (to the extent practicable) the generation of radioactive, mixed, hazardous, and non-hazardous solid waste.

Based on the size of NMP3NPP compared to NMP Unit 1 and Unit 2, the types and quantities of mixed waste generation are anticipated to be equal to or less than NMP Unit 1 and Unit 2. As a result, the potential impacts will be the same or less, i.e., minimal. The small quantities of mixed waste will be temporarily stored on-site, similar to NMP Unit 1 and Unit 2, and then shipped for treatment and disposal to an off-site permitted facility.

Currently, mixed wastes at NMP Unit 1 and Unit 2 are stored in containers that are compatible with the material within the container, the containers are kept within inside storage areas that are protected by containment measures, trained individuals conduct regular inspections of the mixed waste, annual inventories of mixed wastes are performed, and an extensive emergency plan has been developed and shared with local response authorities.

Minimal environmental impacts would result from storage or shipment of mixed wastes. In the event of a spill, emergency procedures would be implemented to limit any on-site impacts. Emergency response personnel would be properly trained and would maintain a current facility inventory, which would include types of waste, volumes, locations, hazards, control measures, and precautionary measures to be taken in the event of a spill.

5.5.2.1 References

CFR, 2008. Titel 40, Code of Federal Regulations, Part 261, Identification and Listing of Hazardous Waste, U.S. Environmental Protection Agency, 2008.

EPA, 1991. US EPA's 1991 Mixed Waste Enforcement Policy, Volume 56 Federal Register 42730-42734, August 29, 1991.

NRC, 1999. NUREG-1437, Generic Environmental Impact Statement (GEIS) for License Renewal of Nuclear Plants, Supplement 1, Regarding the Calvert Cliffs Nuclear Power Plant, October 1999.

NYCRR, 2008a. Title 6 Code of New York Codes, Rules and Regulations, Part 372.

NYCRR, 2008b. Title 6 Code of New York Codes, Rules and Regulations, SubPart 374-2.

NYCRR, 2008c. Title 6 Code of New York Codes, Rules and Regulations, Part 650.

Table 5.5-1—Anticipated Water Chemical Concentrations in Lake Ontario Downstream of NMP3NPP Discharge

Parameter		Average Concentration In Lake Upstream of Diffuser	Average Diffuser Discharge Concentration	Estimated Concentration in Lake Downstream of Diffuser	Units
Total Residual Chlorine			0.2	0.02	mg/l
Free Available Chlorine			0.5	0.05	mg/l
Spectrus CT 1300®			50	4.55	ug/l
EVAC®			1.0	0.09	mg/l
HEDP			5	0.45	mg/l
Total Dissolved Solids		175	532	207	mg/l
Alkalinity	(as CaCO3)	88.5	249	103	mg/l
Calcium	(as Ca)	45.64	137	54	mg/l
Magnesium	(as Mg)	6.67	20	8	mg/l
Chloride	(as Cl)	37.78	113	45	mg/l
Sulfate	(as S04)	29.4	88.2	34.7	mg/l
Ortho-P	(as PO4)	0.0325	0.10	0.04	mg/l
Silica	(as SiO2)	0.56	1.68	0.66	mg/l
Iron	(as Fe)	0.134	0.40	0.2	mg/l
Copper	(as Cu)	0.0667	0.20	0.08	mg/l
Zinc	(as Zn)	0.0628	0.19	0.07	mg/l

Key:

mg/l - milligrams per liter
ug/l - micrograms per liter
N/A - Not applicable

Notes:

a. The anticipated concentration in the diffuser discharge is based on SPDES permit limits for NMP Unit 1 and Unit 2.
b. The anticipated concentration in the diffuser discharge is based on mean Lake water concentrations multiplied by 3 cycles of concentration.
c. The estimated chemical concentration in Lake Ontario downstream of the NMP3NPP diffuser, Conc Effluent dilute , was estimated at a 10 to 1 dilution ratio using the following equation:

$$\text{Conc Effluent}_{\text{dilute}} = \frac{\text{Conc}_{\text{Lake}} \times 10 + \text{Conc}_{\text{Discharge}} \times 1}{11}$$

5.6 TRANSMISSION SYSTEM IMPACTS

This section discusses transmission system operation and maintenance impacts on terrestrial and aquatic ecosystems and members of the public. The significance of these predicted impacts are evaluated and alternative practices to mitigate the impacts are proposed, as needed. The discussion is limited to the transmission facilities associated with NMP3NPP and modifications or upgrades to the existing transmission system required to connect the additional generation capacity from the unit. Impacts from the existing transmission system, constructed and operated for NMP Unit 1 and Unit 2, were addressed in the Environmental Report submitted with the original plant license application (NMP, 1984) and re-evaluated in the Environmental Report submitted with the license renewal application (NMP, 2004).

The proposed transmission system is described in Section 3.7. Transmission lines will run approximately 0.4 mi (0.6 km) connecting the new NMP3NPP switchyard to the existing transmission system operated by National Grid. The NMP3NPP switchyard will be supplied by a 345 kV line from the Clay substation, a 345 kV line from the Scriba Substation, and a 345 kV line from the NMP Unit 1 switchyard. Currently, the transmission line from the Clay substation connects directly to the NMP Unit 1 switchyard. A portion of this transmission line will be removed and looped through the NMP3NPP switchyard to facilitate NMP3NPP's interconnection to both NMP Unit 1 and the Clay substation.

A new 345 kV transmission line will be built from the existing Scriba substation to the NMP3NPP switchyard, which resides on the NMPNS site. The New York Independent System Operator (NYISO) manages New York's electricity transmission grid in New York State, and is a not-for-profit corporation regulated by the Federal Energy Regulatory Commission. The new NMP3NPP transmission facilities will be owned and operated by National Grid, and the operation and maintenance procedures for the existing transmission facilities will be applied to the new NMP3NPP facilities. Figure 5.6-1 shows the proposed transmission facilities and the ecological features of the vicinity.

5.6.1 TERRESTRIAL ECOSYSTEMS

This section considers the effects of transmission facility operation and maintenance on the terrestrial ecosystem. The review evaluates the significance of these predicted impacts on important terrestrial species and habitats, and evaluates alternative practices to mitigate the impacts, as needed.

5.6.1.1 Terrestrial Ecosystems

The terrestrial ecology of the NMP3NPP construction area was characterized in a series of field studies conducted over a one-and-a-half year period extending from December 2006 to July 2008. The field studies included flora and faunal surveys and a wetland delineation.

The 2008 NMP3NPP site vegetation survey identified the following major plant communities/vegetation cover types in the project area:

- Successional Hardwood Forest
- Beech-Maple Mesic Forest
- Beech-Maple Rich Mesic Forest
- Old Field

- Infrequently Mowed Areas
- Lawns and Developed Areas
- Forested Wetland
- Scrub-shrub Wetland
- Emergent/Open Water Wetland

The majority of the project site landscape consists of second growth deciduous upland and wetland forests, with lesser amounts of old field, infrequently mowed areas, scrub-shrub wetland, emergent/open water wetland, and lawns/developed areas.

5.6.1.2 Important Terrestrial Species and Habitats

As noted in Section 2.4.1, the following species and habitats of the project site have been designated as important according to Federal or State of New York criteria:

Species important because of rarity:

- Pied-billed Gebe (Podilymbus podiceps): state threatened
- Osprey (*Pandion haliaetus*): State Special Concern
- Golden-winged Warbler (*Vermivora chrysoptrera*): State Special Concern
- Grasshopper Sparrow (*Ammodramus savannarum*): State Special Concern

Species protected by the State of New York due to concerns about over collection:

- Trillium (*Trillium*)
- Baneberry (*Actaea*)
- Ground Cedar (*Diphasiastrum*)
- Native Fern Species (Cinnamon Fern (*Osmunda cinnamomea*), Interrupted Fern (*Osmunda claytoniana*), Royal Fern (*Osmunda regalis*), Christmas Fern (*Polystichum acrostichoides*), Lady Fern (*Athyrium filix-femina*), woodfern (*Dryopteris spinulosa* complex), and Marsh Fern (*Thelypteris palustris*)

Commercially or recreationally valuable species:

- White-tailed Deer (*Odocoileus virginianus*)
- Sugar Maple (*Acer saccharum*)

Species critical to the structure and function of local terrestrial ecosystems:

- Beaver (Castor Canadensis)
- Green Ash (*Fraxinus pennsylvanicum*)

- Sugar Maple
- American Beech (*Fagus grandifolia*)
- Silky Dogwood (*Cornus amomum*)
- Poison Ivy (*Toxicodendron radicans*)

Species that could serve as biological indicators of effects on local terrestrial ecosystems:

- Northern leopard and Pickerel Frogs (*Rana pipiens* and *Rana palustris*)
- Sugar Maple
- American Beech
- Trillium
- Baneberry
- Native Ferns

Important habitats:

- On-site emergent/open water wetlands – jurisdictional wetland
- On-site Scrub-shrub wetlands - jurisdictional wetland
- On-site deciduous forested wetlands – jurisdictional wetland
- Off-site NYSDEC-regulated wetlands complex – jurisdictional wetland
- Off-site teal marsh – jurisdictional wetland; Significant Coastal Fish and Wildlife Habitat
- Lake Ontario, near shore open water – NYSDEC-designated waterfowl habitat
- Off-site rich shrub fen – jurisdictional wetland; rare natural community in state

Of the Important Species and Habitats identified above, the following were observed or are likely to occur within the transmission corridor at the NMP3NPP site:

- Osprey
- Golden-winged Warbler
- Grasshopper Sparrow
- White-tailed Deer
- Beaver
- Leopard and Pickerel Frogs

- Ground Cedar
- Marsh Fern
- Lady Fern
- Royal Fern
- Silky Dogwood
- Emergent/Open Water Wetlands
- Scrub-shrub Wetlands

The following non-native invasive plant species occur within the transmission corridor at the NMP3NPP site:

- Common Reed (*Phragmites australis*) – dominant in Emergent/Open Water Wetlands
- Common Buckthorn (*Rhamnus cathartica*) – common in many wetland areas at the site
- Autumn Olive (*Elaeagnus umbellate*) – scattered shrubs in transmission corridor
- Bush Honeysuckle (*Lonicera* sp.) – scattered shrubs in transmission corridor
- Spotted Knapweed (*Centaurea biebersteinii*) – scattered patches in transmission corridor
- Cypress Spurge (*Euphorbia cyparissias*) – scattered patches in transmission corridor
- Purple Loosestrife (*Lythrum salicaria*) – common in wetlands at the site.
- Other non-native invasive plant species observed at the NMP3NPP site include Japanese Knotweed, Multiflora Rose, and Garlic Mustard.

5.6.1.3 Potential Adverse Effects of Operation and Maintenance Practices

The NMPNS site follows the standard industry practices for operation and maintenance of transmission line right-of-ways. Vegetation management is practiced to avoid any power outages and injury to the public and company employees from overgrown or diseased trees. Trees are pruned or cut, and integrated vegetation management performed, according to the relevant ANSI standards (ANSI, 2001; ANSI, 2006).

Routine maintenance in and along the transmission corridor rights-of-way requires managing herbaceous and low woody growth, saplings, larger shrubs and small trees by various mechanical means, as well as the application of herbicides, as prescribed by the National Grid integrated vegetation management program for their transmission rights-of-way (NG, 2003). To meet the standards set forth in the National Grid Transmission Right-of-Way Management Program, the length of the maintenance cycle varies from four to eight years, based on local conditions (NG, 2003).

As with the existing facilities, herbicides will be applied at the proposed transmission facilities occasionally and only when necessary to control woody growth that cannot be effectively managed by regular mowing or other mechanical means. Herbicides used by National Grid may include triclopyr, glyphosate, picloram, 2,4-D, fosamine and imazapyr or similar products. These products generally biodegrade rapidly (e.g., less than 10 weeks for triclopyr, picloram, and 2,4-D) and given their typical methods of application are highly unlikely to leach into groundwater (NG, 2003). The following application methods and associated application rates may be used:

- High-volume hydraulic stem-foliar (rate: generally less than 1% active ingredient applied at an average of 60 - 120 mixture gallons/acre);
- Low-volume hydraulic stem-foliar (rate: generally 1-2% active ingredient applied at an average of 10 - 40 mixture gallons/acre);
- Low-volume backpack foliar (rate: generally 4-6% active ingredient applied at an average of 3 - 6 mixture gallons/acre);
- Cut and stump treatment (rate: water-based herbicide concentrate diluted by 50% in water and applied to cut surface or oil-based applied to bark surface and exposed roots); and
- Basal application (traditional basal application, which is less selective is not normally used; instead herbicides are combined with basal bark penetrants at rates of 10-50%, lightly applied to brush and trees less than 6 inches in diameter (NG, 2003)).

Because the proposed transmission system is located wholly within the footprint of the NMP3NPP project area, all ground disturbing activities associated with transmission system construction will be subject to the project Stormwater Pollution Prevention Plan, as described in Section 2.3.3. As such, any potential erosion and sedimentation impacts due to construction of the transmission facility are subject to project control, and are not anticipated to be significant. Herbaceous vegetation will be encouraged to cover disturbed surfaces within the transmission line corridor to improve long-term post-construction stability.

Impacts on land use and scenery are considered to remain virtually unaltered by the proposed changes to power line corridor operation and maintenance activities, and do not warrant mitigation as discussed in Section 4.1.

Because the construction of the transmission facility will require clearing a forested area, it will incrementally increase the amount of forest edge on-site, which might provide new opportunities for the Brown-headed Cowbird, a nest parasite that is currently abundant on-site, to penetrate the forest edge and impair the nesting success of host birds. Although considered a slight impact, this adverse impact would persist as long as the power line corridor is maintained in a primarily old-field stage of ecological succession adjoining sizeable forest tracts.

The power line corridor is subject to direct adverse impacts in the form of intermittent disruptions associated with control of corridor vegetation by maintenance cutting activities. These impacts could include the mortality of small, relatively sedentary vertebrates and invertebrates, and the reduction of breeding success for other animal species. None of the species that are listed as important species in Section 2.4.1 are likely to be subject to these impacts.

Although the additional acreage of old field habitat created by construction of the transmission facility is minor compared to the amount currently present on-site, White-tailed Deer should continue to benefit over the long term from operation and maintenance of the power line right-of-way. White-tailed deer use old-field habitat preferentially, due to its abundant supply of low vegetation for grazing and browsing.

As described above, forest-nesting birds may undergo a slight negative effect of nest parasitism in proximity to the right-of-way. There also may be continuously adverse impacts on this and other forest-interior bird species from competition with and predation by forestedge vertebrate species.

Three of the five plant species critical to the structure of the local terrestrial ecosystem discussed in Section 5.6.1.2 would have no significant interaction, either positive or negative, with power line operation and maintenance activities. These species are Green Ash, Sugar Maple, and American Beech. The other two species, Silky Dogwood and Poison Ivy, may be positively impacted.

Green Ash is the dominant overstory species in the forested wetlands, and Sugar Maple and American Beech together comprise the majority of the tree canopy in the natural upland forested areas on or surrounding the NMP3NPP site. Silky Dogwood is a widespread shrub on the NMP3NPP site in locations that have a well developed shrubby understory. It grows best in moist to wet sites, with full sun to partial shade (UCONN, 2008). Poison Ivy is the most widespread ground cover plant and forms large dense patches in both wetland and upland locations, and grows readily under a wide range of light and moisture regimes, reaching some of its highest densities along forest edges (USDA, 2008). Therefore, while the open field environment in the transmission line right-of-way would not be conducive to new trees or hinder the growth of existing trees in the adjacent forest, it may provide ideal growing conditions for new populations of Silky Dogwood and Poison Ivy. The open environment afforded by the transmission corridor also provides habitat for the exploitably vulnerable Ground Cedar.

Maintenance of the transmission line corridor would not be conducive to the growth or spread of trillium, baneberry and many native fern species which require moist forested habitats. However, some exploitably vulnerably fern species, such as Marsh Fern and Royal Fern, which flourish in open sunny wet areas, would be anticipated to grow well in wetlands within the transmission corridor. Vegetation maintenance activities will help to maintain wetlands within the transmission line corridor as scrub-shrub and emergent marsh. These wetland types are less common than forested wetlands at the site and provide habitat for different plant and animal species than those found in forested wetlands.

As noted in Section 3.7.2.2, the height of the transmission lines will meet the National Electric Safety Code requirements (ANSI/IEEE) to prevent induced current due to electrostatic effects for any ecological species by assuming a large truck or farm machinery may travel underneath the transmission lines. Therefore, there are no adverse effects due to induced current. Also, as noted in Section 3.7.3.1, noise impacts associated with the transmission system lines are due to corona discharge (a crackling or hissing noise). Corona noise for a 500 kV line has been estimated to be 59.3 dBA during a worst case rain with heavy electrical loads (SCE, 2006). For reference, normal speech has a sound level of approximately 60 dB. Therefore, noise from the transmission lines will not have an adverse effect on the terrestrial ecology.

5.6.1.4 Measures and Controls to Mitigate Potential Impacts

Project design attempts first to avoid impacts on wetlands, and on other important habitats as well as important species. Where impacts are unavoidable, they are minimized to the greatest possible extent. Unavoidable impacts are then mitigated as part of the overall project plan.

The bare soil exposed on access roads will be rendered stable by covering it with a permeable cover of loose stone through which vegetation will be encouraged to grow to improve long-term post-construction stability. All other areas of disturbed soil will be similarly revegetated and maintained in such condition as a routine part of right-of-way management.

Herbicides will be used as indicated by the standards set forth in the National Grid Transmission Right-of-Way Management Program. The program complies with all applicable federal, state, county and municipal laws, rules, and regulations. The standards prohibit the use of herbicides within 100 feet of a potable water supply or DEC regulated wetland, unless otherwise allowed by permit, rule, or regulation.

Any herbicide applications within DEC regulated wetlands or the adjacent 100-foot buffer zone are performed under the National Grid statewide freshwaters wetlands permit. Under this permit, National Grid may apply herbicides with aquatic labeling to control target vegetation within regulated wetlands and adjacent buffer zones using the low-volume hydraulic foliar, low-volume backpack foliar, or cut-stump treatment methods. Herbicides are applied under the exclusive control of a licensed biocide applicator. At a minimum, the following buffer zones are adhered to for application of nonaquatic herbicides near aquatic resources such as streams, lakes, rivers, pond, or nonjurisdictional wetlands with standing water:

- 5 feet for cut/stump treatment,
- 15 feet for low-volume backpack foliar,
- 25 feet for low-volume hydraulic foliar, and
- 50 feet for high-volume hydraulic stem foliar (NG, 2003).

5.6.1.5 Wildlife Management Practices

There are no ongoing formal wildlife management practices on the project site.

5.6.1.6 Consultation with Agencies

Affected Federal, State and Regional agencies will be contacted regarding the potential impacts to the terrestrial ecosystem resulting from transmission system operation and maintenance. The New York Natural Heritage Program (NYNHP), operated by the New York State Department of Environmental Conservation (NYSDEC), was consulted for information on known occurrences of Federally-listed and State-listed threatened, endangered, or special status species and critical habitats (NYSDEC, 2008). Additionally, the USFWS NY Field Office website (USFWS, 2008) was consulted for a listing of all species with federal status known to occur in Oswego County. Subsequent to the check of the website, contact was made with USFWS NYFO personnel, regarding the status of bog turtles in the vicinity of NMPNS. A survey to determine bog-turtle habitat suitability on-site was recommended, the survey was conducted in July 2008, and no suitable habitat for bog turtles was observed. Additional consultations with USFWS will be required as part of the project permitting phase.

5.6.1.7 References

ANSI,2001. Pruning Standard, A300 (PART 1), American National Standards Institute (ANSI), 2001.

ANSI, 2006. Integrated Vegetation Management Standard, A300 (PART 7), American National Standards Institute (ANSI), 2006.

ANSI/IEEE, applicable version. National Electric Safety Code, ANSI/IEEE C2, American National Standards Institute/Institute of Electrical and Electronic Engineers, version in effect at time of design.

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USFWS, 2008. Oswego County Federally Listed Endangered and Threatened Species and Candidate Species. Website: http://www.fws.gov/northeast/nyfo/es/CountyLists/OswegoDec2006.htm Date accessed: June 12, 2008.

5.6.2 AQUATIC ECOSYSTEMS

This section considers the effects of transmission facility operation and maintenance on the aquatic ecosystems. The review evaluates the significance of these predicted impacts on important aquatic species and habitats, and evaluates alternative practices to mitigate the impacts, as needed.

5.6.2.1 Aquatic Ecosystems

Waterbodies that could be potentially impacted by the project are the wetlands designated as AA, BB, and CC in Section 2.3. These waterbodies are shown in Figure 5.6-1. The new substation and transmission lines would be constructed in areas that, at present, contain areas of isolated depressional scrub/shrub forested wetlands that are heavily vegetated. Wetland BB is similar to AA except that it receives runoff from across Strike Road and is not entirely isolated.

5.6.2.2 Important Aquatic Species and Habitats

Section 2.4.2 describes the important habitats and species located in the vicinity of NMPNS with emphasis to those found within Lake Ontario. The transmission lines will only have the ability to affect inland waterbodies as they do not cross the waters of Lake Ontario.

Studies to identify important species and habitats for inland water bodies in the vicinity of the site were conducted in June 2008 and are described in Section 2.4.2.1. No rare or unique species were identified in the freshwater systems on site. The most common fish species identified included white sucker (*Catostomus commersoni*) and central mudminnow (*Umbra Limi*). Largemouth bass (*Micropterus salmoides*) were identified in the quarry pond in subarea A, although these were most likely stocked at some point and have persisted. The benthic macroinvertebrate communities in Lakeview Creek were taxonomically rich and the most commonly identified species were the crustaceans *Crangonyx sp.* and *Caecidotea sp*. The habitat evaluated in Lakeview Creek ranked as optimal/sub-optimal and no important habitats were designated by the federal or New York State governments within the site area.

One important identified species, due to its value as a sport fish, was rainbow trout (*Oncorhychus mykiss*). A 2007 site visit to evaluate wetlands reported seeing dead adult rainbow trout and chinook salmon (Oncorhynchu tshawytscha) in Lakeview Creek (UniStar, 2007) and the June 2008 survey identified rainbow trout young of the year and a single parr. While this does present evidence for Lakeview Creek as an important nursery and rearing habitat for rainbow trout, this species is mainly sustained through stocking and Lakeview Creek is unlikely to represent a significant portion of the Lake Ontario steelhead population.

The only function of wetlands to be impacted by the transmission system would be wildlife habitat. Wetland MM also functions as a groundwater recharge, although not as a primary function. The lack of consistent year round standing water in wetlands AA, BB, and CC also makes these areas poor habitat for juvenile stage aquatic insects.

5.6.2.3 Potential Impacts from Operation and Maintenance

NMP3NPP will interconnect with the transmission system infrastructure currently in place via three transmission lines. Based on the most current Site Utilization Plot Plan available for NMP3NPP, the proposed transmission system switchyard will be located south of Lake Road west of the existing transmission right-of-way (ROW). Transmission lines will run southeast and then northeast to connect with the existing power lines.

Ownership of the new lines and corridors will be transferred to the transmission system owner, National Grid, once constructed and operational. All transmission right-of-way maintenance and vegetative management will be conducted by National Grid and follow the procedures in the Transmission ROW Management Program described in Section 5.2.1. The management program is designed to provide safe, reliable electric power in an economical and environmentally friendly way. The program supports the International Organization for Standardization (ISO) environmental management standard (National Grid, 2003) and incorporates the best industry management standards while maintaining good stewardship of the environmental resources.

Annual aerial inspections and maintenance of the transmission system and right-of-way corridors are performed, while comprehensive foot patrol inspections are performed on a rotating five year schedule by forestry personnel. Maintenance is performed on an 'as needed' basis as dictated by the results of the line inspections.

Routine maintenance in and along the transmission corridor right-of-way requires the creation of a wire zone border, defined as the vegetation-free area surrounding the transmission lines that should be achieved during routine maintenance, by trimming trees and shrubs and applying herbicides as well as maintaining access roads and maintaining or installing drainage devices to prevent damage to roads and facilities. The proposed transmission system is to be located entirely within the NMP3NPP site, making all potential erosion and sedimentation a responsibility of the project stormwater management plan, described in Section 4.2.

The NMP3NPP substation and transmission lines would be constructed in areas that, at present are vegetated and contain delineated wetlands. The new transmission lines do not cross over any on-site open waterbodies.

Transmission systems operations and maintenance have the potential to cause impacts to water bodies and aquatic systems. While rainbow trout, an important species, and other aquatic species are present in on-site water bodies, the proposed transmission system does not cross any of the streams or ponds on site. In addition, the only function designated to these wetlands was wildlife habitat. No fish and shell fish habitat, ground water recharge, flood/flow alteration or other functions that might directly or indirectly affect aquatic species living in nearby waterbodies were associated with these wetlands. Transmission lines also do no cross Lake Ontario, and therefore have no ability to impact associated resident species.

Increased runoff from impervious surfaces from the switchyard could cause a modification to the hydrograph and increases in temperature, sediment and nutrients in receiving water bodies, and corresponding impacts to aquatic invertebrates, plants, and fish. Impacts from these affects should be minimal as none of the proposed transmission system and facilities will be adjacent to an on-site water body. Additionally, the only function associated with the affected wetlands is wildlife habitat which suggests that runoff will not affect on-site waterbodies nearby.

Runoff of defoliants and herbicides could potentially contaminate water bodies and affect aquatic species. Preventative measures and methods will be used to minimize the impact of these chemicals. No temporary or permanent changes in the biological processes of plants and wildlife in the vicinity of the new transmission corridor are anticipated.

No access for recreation is permitted within the transmission system area, so no impacts to water-based recreational use are anticipated.

Transmission system operations and maintenance have the potential to cause impacts to waterbodies and aquatic ecology. Since the transmission facilities are not proximal to Lake Ontario, no direct impacts to the aquatic ecosystem in the Lake from transmission system operations are anticipated.

Section 5.2.1 describes potential hydrologic impacts from the transmission system construction. During construction of the transmission system, Stormwater Best Management Practices such as retention basins will be employed to minimize potential sedimentation, increased runoff and construction water demand. After construction activities are completed, impacts of the nature described above should be minimal and not significant.

5.6.2.4 Measures and Controls to Mitigate Potential Impacts

The project plan will attempt to avoid impacts on important aquatic habitats and species that are found within the proposed transmission system.

The bare soil exposed on transmission facility access roads will be rendered stable by covering it with a permeable cover through which vegetation will be encouraged to grow to improve long-term post-construction stability. All other areas of disturbed soil will be similarly revegetated and maintained in such condition as a routine part of right-of-way management.

Herbicide use, as indicated by the Transmission Right of Way Management Program, will be applied and only by licensed personnel as described in Section 5.2.1.

The maintenance practices used in the protection of sensitive aquatic resources from the impacts of maintenance activities are described below as they are listed in the National Grid Transmission Right of Way Management Program:

- Maintenance of buffer zones of low growing shrubs at sensitive aquatic resources.
- Utilize highly selective stem specific treatments within buffer zones together with herbicides approved for stream band or aquatic use.
- Employment of non-herbicide methods in areas where potential contamination risk exists.
- Obtaining proper permits and continuing contact with the NYSDEC regarding herbicide use in state-regulated wetlands and wetland buffer zones.
- Providing the county Department of Health with schedules and maps of proposed treatment areas to identify public drinking water sources.
- The establishment of buffer zones to protect water quality of areas adjacent to ROW's.
- Conducting treatment work adjacent to water bodies to maximize the amount of retainable vegetation, reducing the potential for erosion.

Important species and habitats found in Lake Ontario are listed in Section 2.4; however, no adverse impacts to these species or habitats are anticipated from operation of the transmission facilities. The New York Natural Heritage Program (NYNHP) was consulted for information on state protected species, significant natural communities and significant habitats. The NYNHP stated there were no protected species or habitats in the vicinity of Lake Ontario except for the waterfowl winter concerntration area which is located offshore (NYNHP, 2008). This area will not be adversely affected by the construction, operation, and maintenance of the transmission system.

5.6.2.5 Consultation with Agencies

Affected Federal, State and Regional agencies have already been or will be contacted regarding the potential impacts to the terrestrial ecosystem resulting from transmission system operation and maintenance.

The New York Natural Heritage Program, regarding protected species and habitats, stated that no species or habitats other than the waterfowl winter concentration area in Lake Ontario existed, which would not be affected by the construction, operation, and maintenance of the transmission system. No contact with the United States Fish and Wildlife Service is required prior to permitting. The only important habitat currently listed is an offshore Winter Waterfowl area which is unlikely to be affected by the transmission facility construction, operation, or maintenance.

5.6.2.6 References

National Grid, 2003. Transmission Right-of-Way Management Program, National Grid Environmental Affairs and Transmission Forestry Departments, November 2003.

NYNHP, 2008. Letter to Mr. George Wrobel, UniStar Nuclear Energy from Tara Seone, Information Services, New York Natural Heritage Program, dated May 14, 2008.

5.6.3 IMPACTS TO MEMBERS OF THE PUBLIC

This section describes the transmission system impacts from the NMP3NPP substation to its connection with existing systems. The description is limited to the transmission facilities associated with the new NMP3NPP and modifications or upgrades to the existing transmission system required to connect the additional generation capacity from the proposed unit. Impacts from the existing transmission system, constructed and operated for NMPNS, were addressed in the Environmental Report submitted with the original plant license application (NMPC, 1985) for NMP Unit 2 and re-evaluated in the Environmental Report submitted with the license renewal application for the NMPNS (NMPNS, 2004)

5.6.3.1 Electrical Design Parameters

As described in Section 3.7, the NMP3NPP substation will be electrically integrated with the existing 345 kV station by constructing a new 345kV switchyard and three, 345 kV lines on individual towers entirely within the boundary of the NMPNS site. The detailed design of the transmission lines circuits has not begun but the conductors would be selected to meet the power delivery requirements.

The three 345 kV lines will connect to the existing transmission system at three points: the Scriba 345 kV Substation; NMP Unit 1; and the Clay 345kV Substation. Each phase would use the same three-subconductor bundles comprised of three 1590 circular mills, 45/7 aluminum conductor, steel reinforced (ACSR) conductors with 18 in (46 cm) separation. There would typically be two overhead ground wires of 19#9 Alumoweld® or 7#8 Alumoweld®, but the final design could specify OPGW fiber optic cable in place of the Alumoweld® ground wire (Section 3.7). The new lines would be designed to preclude crossing of lines wherever possible.

The design of the new transmission circuits would consider the potential for induced current as a design criterion. The National Electric Safety Code (NESC) has provisions that describes how to establish minimum vertical clearances to the ground for electric lines having voltages exceeding 98 kV alternating current to ground (NESC, 2007). The design and construction of the NMP3NPP substation and transmission circuits would comply with these NESC provisions. At a minimum, conductor clearances over the ground would equal or exceed 29 ft (9 m) phase-to-ground over surfaces that could support a large truck or farm machinery, while clearance over railroad lines would equal or exceed 37 ft (11 m) phase-to-ground.

The three circuits will be constructed in such a manner to provide sufficient physical separation to minimize the risk of simultaneous failure. The two lines will be constructed in accordance with established National Electric Safety Code (NESC) standards (ANSI/IEEE, applicable version), Transmission Owner (National Grid) and New York Independent System Operator (NYISO) standards.

Environmental impacts are limited to the proposed plant and construction area on the NMP3NPP site. No new corridors, or crossings over main highways, primary and secondary roads, waterways, or railroad lines is required.

5.6.3.2 Structural Design Parameters

As described in Section 3.7, the number and location of the transmission towers between the existing NMPNS substations and the NMP3NPP substation will be determined during the detailed design of NMP3NPP. The NMP3NPP substation would occupy a tract of land approximately 710 ft (216 m) by 560 ft (171 m) approximately 1,000 ft (305 m) south east of the NMP3NPP containment. The NMP3NPP substation would be electrically integrated with the existing 345 kV substations by constructing three 345 kV lines on individual towers. The three circuits will be constructed in such a manner to provide sufficient physical separation to minimize the risk of simultaneous failure. The three lines will be constructed in accordance with established National Electric Safety Code (NESC) standards (ANSI/IEEE, applicable version), Transmission Owner (National Grid) and NYISO standards.

The existing 345 kV transmission towers are designed and constructed to National Electric Safety Code (NESC) recommendations (NMPNS, 2004). The towers added to support NMP3NPP will also conform to these criteria. These towers will be steel tubular or lattice designs, and will provide minimum clearances in accordance with the aforementioned standards. The three circuits connecting the NMPNS existing substations and the NMP3NPP substation will be carried on separate towers. All structures will be grounded with a combination of ground rods and a ring counterpoise system. None of the transmission structures will exceed a height of 200 ft (61 m) above ground surface; thus, Federal Aviation Administration permits (FAA, 2000) will not be required.

5.6.3.3 Maintenance Practices

The new transmission lines and towers for NMP3NPP are located entirely within the boundary of the NMPNS site. Environmental impacts would be limited to the proposed project plant and construction area on the NMPNS site. Thus, no new corridors and associated vegetation buffer zones would be required to minimize visual impacts along roadways.

The use of pesticides and herbicides for vegetation control is described in the National Grid, New York State Public Service Commission approved, long-range vegetation management plan for the rights-of-way as revised in 2003 (NG, 2003). The aim of the vegetation management program is to maintain a low-growing vegetative community and to keep the transmission facility free of interruptions from trees and tall growing shrub species.

The prescription on chemical mixes, application methods, and rates would be made by certified applicators in accordance with the provisions of Environmental Conservation law 6NYCRR, Part 325. All chemicals would be registered by the appropriate federal and state regulatory agencies. Special care would be exercised when working around streams, crops, lawns, and wetlands so as not to allow any chemical contact with these areas. Adherence to these policies and procedures would minimize any additional impacts to the ecosystem in the on-site transmission corridor. Ongoing transmission corridor surveillance and maintenance of the facilities ensure continued conformance to design standards. National Grid performs an annual assessment of each ROW in the spring and mid-summer to ensure the continued safe and reliable operation of the transmission system.

5.6.3.4 Aircraft Visibility

The Federal Aviation Administration normally requires that structures that exceed a height of 200 ft (61 m) above ground level be marked and/or lighted for “increased conspicuity to ensure safety to air navigation” (FAA, 2000). The transmission structures connecting the NMP3NPP substation with existing systems will be designed with sufficient height to eliminate impacts to personnel or equipment on the ground at the NMPNS site but would be less than the 200 ft (61 m) criterion.

Helicopters, however, may land periodically at the NMPNS site and the design of the transmission towers and lines will include lights and markers, where appropriate, to alert helicopter traffic to potential hazards created by the proposed structures. For example, lighting may be incorporated into tower design and painted spherical markers may be attached to overhead lines for increased conspicuity to ensure air safety (FAA, 2000).

Aesthetic impacts are also considered in the design of the new transmission structures. Buildings and equipment will be painted to blend with the existing facilities and will not significantly increase the visual impact of the NMPNS site. While the new transmission towers will be of sufficient height to avoid safety impacts on the ground, the towers will not be excessively high such that aircraft safety is compromised or unnecessary visual impacts result from excessive tower height.

5.6.3.5 Electric Field Gradients

The maximum electric field gradients for the proposed transmission lines can be predicted through calculation. While there are no specific criteria for maximum electric field gradients, induced currents resulting from high electric fields created by overhead transmission lines are a concern and must be considered in the system design in accordance with the NESC (ANSI/IEEE, applicable version).

As part of the design process, the transmission lines will be analyzed to determine electrical field strengths and to verify conformance with NESC requirements on line clearance to limit shock from induced currents. The minimum clearance to the ground, for lines having voltages exceeding 98 kV alternating current, must limit the potential induced current due to electrostatic effects to 5 milliamperes if the largest anticipated truck, vehicle, or other equipment were shortcircuited to ground. For this determination, the NESC specifies that the lines be evaluated assuming a final unloaded sag at 120°F (49°C). The calculation is a 2-step process in which the average field strength at 1.0 m (3.3 ft) above the ground beneath the minimum line clearance is calculated, and then the steady-state current value is determined. The 345 kV lines to be constructed between the NMP3NPP substation and the NMPNS substation will be designed to meet the NESC (ANSI/IEEE, applicable version).

5.6.3.6 Proposed Transmission Corridors

The transmission lines to support NMP3NPP will consist of new and existing transmission lines on the NMPNS site and existing lines to the Clay substation, such that no new corridors or widening of existing corridors is required. A map showing the routes for the three existing 345 kV circuits connecting the power output from the NMPNS site to grid is shown in Figure 3.7-1. Two of these lines connect to the Unit 1 345 kV Switchyard and the remaining line connects to the Unit 2 345 kV Switchyard. The on-site transmission lines are anticipated to cross over railroad tracks, the NMPNS plant access road, a construction road and laydown areas associated with the project. Since these lines are not expected to be constructed until the end of the project, exposure of the construction phase work force to field gradients would be minimal. Areas under the transmission lines would be cleared of any vegetation that might pose a safety threat. Any maintenance access roads are not anticipated to increase public exposure to electric field gradients. The anticipated reestablishment of native grasses and shrub vegetation, rather than tall trees, in the corridor will also limit wildlife exposure for smaller animal species.

5.6.3.7 Impacts to Communication Systems

Generally, the cause of radio or television interference from transmission lines is from corona discharge from defective insulators or hardware. Complaints on electromagnetic interference with radio or television reception have not been received on the 345 kV lines running from the NMPNS site.

Complaints that occur are investigated for cause and, as necessary, defective components replaced to correct the problem. The existing NMPNS transmission lines are designed and constructed to minimize corona. The lines supporting NMP3NPP will also be designed and constructed to minimize corona. As such, it is expected that radio and television interference from these new lines will be minimal.

5.6.3.8 Grounding Procedures for Stationary Objects

There are no new off-site lines and associated rights-of-way required for NMP3NPP. The structures and equipment on the NMPNS site will be adequately grounded in the course of designing and constructing the proposed NMP3NPP. No new off-site rights-of-way and associated grounding of stationary objects is required.

5.6.3.9 Electric Shock Potentials to Moving Vehicles

There is minimal potential for electric shock in moving vehicles such as buses or cars since the vehicles are insulated from ground by their rubber tires. As a result, occupants in cars and buses are generally safe from potential shock from overhead high voltage lines. In addition, since the vehicle is moving, there is little opportunity for the vehicle to become “capacitively charged” due to immersion in a transmission line electrical field. In the unlikely event that a moving vehicle becomes charged, it is also unlikely that a grounded person outside the moving car or bus will touch the vehicle, thereby discharging a current through the person’s body.

5.6.3.10 Noise Levels

Corona discharge is the electrical breakdown of air into charged particles caused by the electrical field at the surface of the conductors, and is increased by ambient weather conditions such as humidity, air density, wind, and precipitation and by irregularities on the energized surfaces. During wet conditions audible noise from the corona effect can exceed 50 dBA for a 500 kV line. Corona noise for a 500 kV line may range between 59 and 64 dBA during a worst case rain with heavy electrical loads (CA, 2006). For reference, normal speech has a sound level of approximately 60 dBA and a bulldozer idles atapproximately 85 dBA.

There are no local or county noise ordinances for the site area. The New York State Department of Environmental Conservation published a guideline for evaluating potential community impacts from any new noise source based on the perceptibility of the new source above the existing ambient sound level (NYSDEC, 2001). The guideline states that “Increases from 3-6 dBA may have potential for adverse noise impact only in cases where the most sensitive receptors are present.” Cumulative increases of between 3 and 5 dBA are generally regarded as negligible or hardly audible. Thus a cumulative increase in the total ambient sound level of 6 dBA or less is unlikely to constitute an adverse community impact.

NMPNS transmission lines are designed and constructed with hardware and conductors that have features to eliminate corona discharge. Nevertheless, during wet weather, the potential for corona discharge increases, and nuisance noise could occur if insulators or other hardware have any defects. Coronainduced noise along the existing transmission lines is very low or inaudible, except possibly directly below the line on a quiet, humid day. Such noise does not pose a risk to humans. Complaints on transmission line noise are monitored but reports of nuisance noise have not been received from members of the public.

The NMP3NPP substation and transmission lines interconnecting the NMP3NPP substation with the existing transmission network will be constructed entirely on the NMPNS site. Substations include transformer banks and circuit breakers that create “hum,” normally around 60 dBA, and occasional instantaneous sounds in the range of 70 to 90 dBA during activation of circuit breakers (CA, 2006). The NMP3NPP substation will introduce these new noise sources (transformers and circuit breakers) to its location. The noise levels surrounding the substation would likely be close to 60 dBA near the substation fence but would be significantly reduced near the site property line, approximately 1,900 ft (850 m) to the southwest.

According to NUREG-1437 (NRC, 1996), noise levels below 60 to 65 decibels are considered to be of small significance.

5.6.3.11 References

ANSI/IEEE, applicable version. National Electric Safety Code, ANSI/IEEE C2, American National Standards Institute/Institute of Electrical and Electronics Engineers, version in effect at time of design.

CA, 2006. Southern California Edison's Devers-Palo Verde 500 kV Project (Application Number A.05-04-015), Final Environmental Impact Report/Environmental Impact Statement, Section D.8 Noise, California Public Utilities Commission, October 2006. Accessed June 2008. Website: http://www.cpuc.ca.gov/Environment/info/aspen/dpv2/feir/d08_noise.pdf

FAA, 2000. Advisory Circular: Obstruction Marking and Lighting, Federal Aviation Commission, U.S. Department of Transportation, August 2000.

NESC, 2007. National Electric Safety Code, Part 2, Rules 232C.1.c and 232D.3.c, 2007.

NG, 2003. "Transmission Right-of-Way Management Program." Environmental Affairs and Transmission Forestry Departments, National Grid, Westboro MA. November 2003.

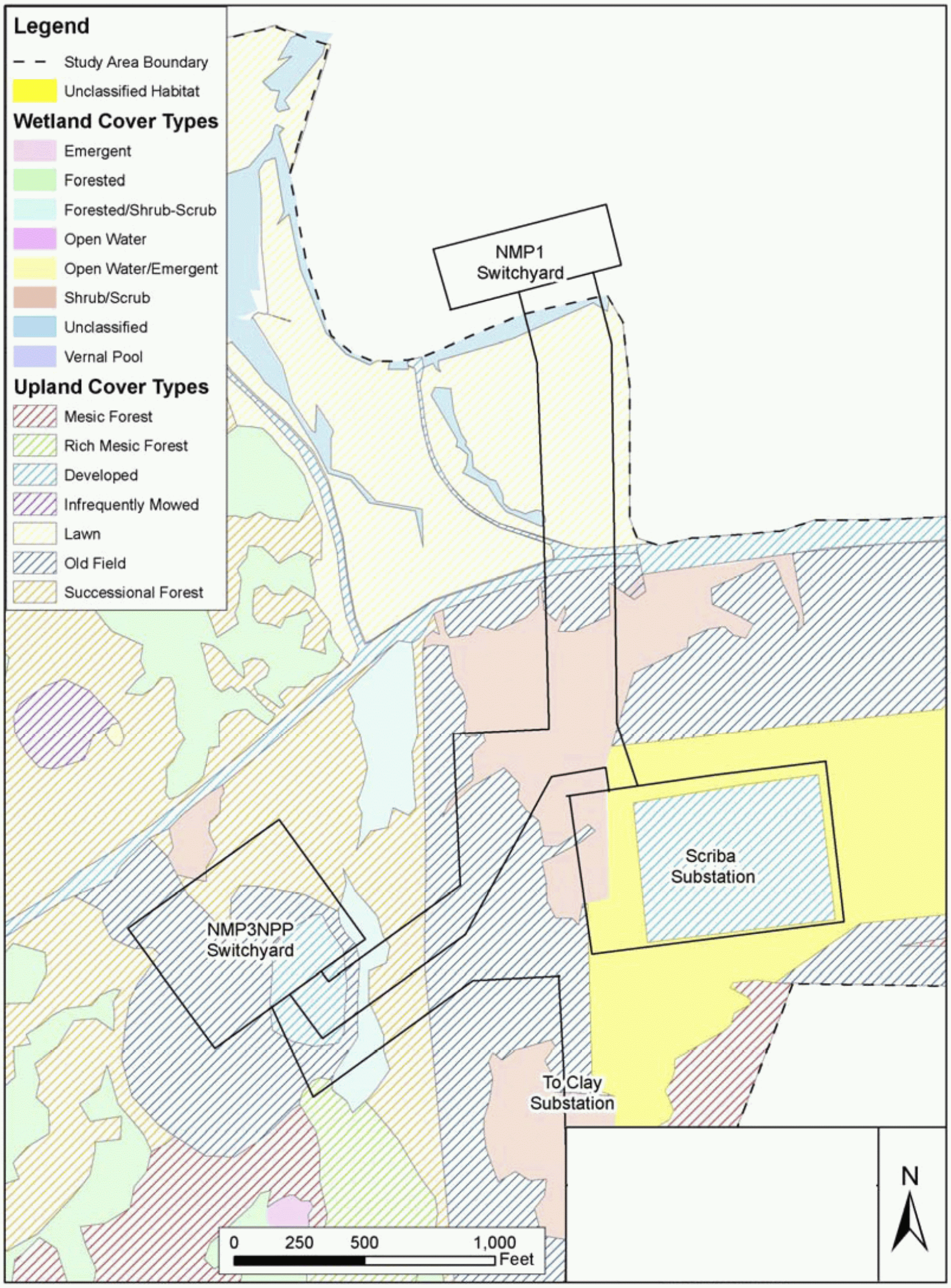
NMPC, 1985. "Environmental Report Operating License Stage Nine Mile Point Nuclear Station Unit 2, Volume 1." Niagara Mohawk Power Corporation (NMPC), February 8, 1985.

NMPNS, 2004. "Applicant's Environmental Report -Operating License Renewal Stage, Nine Mile Point Nuclear Station (NMPNS)." May 2004.

NRC, 1996. Generic Environmental Impact Statements for License Renewal of Nuclear Plants, NUREG-1437, Nuclear Regulatory Commission, May 1996.

NYSDEC, 2001. "Assessing and Mitigating Noise Impact: Program Policy." New York State Department of Environmental Conservation, Revised February 2, 2001.

Figure 5.6-1—Proposed Transmission System and Ecological Features in the Vicinity



5.7 URANIUM FUEL CYCLE IMPACTS

This section discusses the environmental impacts from the uranium fuel cycle for the U.S. EPR. The uranium fuel cycle is defined as the total of those operations and processes associated with provision, utilization, and ultimate disposal of fuel for nuclear power reactors.

The regulations in 10 CFR 51.51(a) (CFR, 2007a) state that:

> Every environmental report prepared for the construction permit stage of a light water-cooled nuclear power reactor, and submitted on or after September 4, 1979, shall take Table S-3, Table of Uranium Fuel Cycle Environmental Data, as the basis for evaluating the contribution of the environmental effects of uranium mining and milling, the production of uranium hexafluoride, isotopic enrichment, fuel fabrication, reprocessing of irradiated fuel, transportation of radioactive materials and management of low level wastes and high level wastes related to uranium fuel cycle activities to the environmental costs of licensing the nuclear power reactor. Table S-3 shall be included in the environmental report and may be supplemented by a discussion of the environmental significance of the data set forth in the table as weighed in the analysis for the proposed facility.

NRC Table S-3 is used to assess environmental impacts. Its values are normalized for a reference 1,000 MWe light water reactor (LWR) at an 80% capacity factor. The 10 CFR 51.51(a), Table S-3 (CFR, 2007a) values are reproduced as the "Reference Reactor" column in Table 5.7-1. A typical U.S EPR unit has been evaluated operating at a 95% capacity factor. The results of this evaluation are also included in Table 5.7-1.

Specific categories of natural resource use are included in NRC Table S-3 (and duplicated in Table 5.7-1). These categories relate to land use, water consumption and thermal effluents, radioactive releases, burial of transuranic and high level and low level wastes, and radiation doses from transportation and occupational exposure. In developing NRC Table S-3, the NRC considered two fuel cycle options, which differed in the treatment of spent fuel removed from a reactor. "No recycle" treats all spent fuel as waste to be stored at a Federal waste repository; "uranium only recycle" involves reprocessing spent fuel to recover unused uranium and return it to the system. Neither cycle involves the recovery of plutonium. The contributions in NRC Table S-3 resulting from reprocessing, waste management, and transportation of wastes are maximized for both of the two fuel cycles ("uranium only recycle" and "no recycle"); that is, the identified environmental impacts are based on the cycle that results in the greater impact.

Because the U.S. does not currently reprocess spent fuel, only the "no recycle" option is considered here. Natural uranium is mined from either open-pit or underground mines or by an in-situ leach solution process. In-situ leach mining, the primary form used in the U.S. today, involves injecting a lixiviant solution into the uranium ore body to dissolve uranium and then pumping the solution to the surface for further processing. The in-situ leach solution containing uranium is transferred to mills where it is processed to produce uranium oxide (UO2) or "yellowcake". A conversion facility prepares the uranium oxide from the mills for enrichment by converting it to uranium hexafluoride, which is then processed to separate the non-fissile isotope uranium-238 from the fissile isotope uranium-235. At a fuel fabrication facility, the enriched uranium, which is approximately 4-5 percent uranium-235, is converted to UO2. The UO2 is pelletized, sintered, and inserted into tubes to form fuel assemblies. The fuel assemblies are placed in the reactor to heat water to steam which turns turbines which produce power. The nuclear reaction reduces the amount of uranium-235 in the fuel. When the uranium-235 content of the fuel reaches a point where the nuclear reaction becomes inefficient, the fuel assemblies are withdrawn from the reactor. After on-site storage for a time sufficient to allow the short-lived fission products to decay thus reducing the heat generation rate, the fuel assemblies would be available for transfer to a permanent waste disposal facility for internment. Disposal of spent fuel elements in a repository constitutes the final step in the "no recycle" option.

The following assessment of the environmental impacts of the fuel cycle for a U.S. EPR at the Nine Mile Point Nuclear Power Plant 3 (NMP3NPP) site is based on the values in NRC Table S-3 and the NRC's analysis of the radiological impacts from radon-222 and technetium-99 provided in NUREG-1437 (NRC, 1996). NUREG-1437 (NRC, 1996) and Supplement 1 to the Generic Environmental Impact Statement to NUREG-1437 (NRC, 1999a) provide a detailed analysis of the environmental impacts from the uranium fuel cycle. Although these references are specific to impacts related to license renewal, the information is relevant to this review because the U.S. EPR design uses the same type of fuel.

The fuel impacts in NRC Table S-3 are based on a reference 1,000 MWe LWR operating at an annual capacity factor of 80% for a net electric output of 800 MWe. As discussed in Chapter 1, NMP3NPP is being proposed to be located at the site of the existing two-unit NMPNS site in Oswego County, New York. The U.S. EPR standard configuration of 4,590 MWt with a gross electrical output of 1,710 MWe is used to evaluate uranium fuel cycle impacts relative to the reference reactor. In the following evaluation of the environmental impacts of the fuel cycle, a standard configuration and a capacity factor of 95% for a total gross electric output (i.e., 1,710 MWe) of approximately 1,625 MWe for the U.S. EPR is used. The U.S. EPR output is approximately twice the output used to estimate impact values in NRC Table S-3 (reproduced here as the first column of Table 5.7-1) for the reference reactor. Analyses presented here are scaled from the 1,000 MWe reference reactor impacts to reflect the output of a single U.S. EPR.

Recent changes in the fuel cycle may have some bearing on environmental impacts. As discussed below, the contemporary fuel cycle impacts are bounded by values in NRC Table S-3 even considering that the generating capacity of the U.S. EPR would be 100% higher than the NRC Table S-3 reference 1,000 MWe LWR.

The NRC calculated the values in NRC Table S-3 from industry averages for the performance of each type of facility or operation associated with the fuel cycle. The NRC chose assumptions so that the calculated values would not be under-estimated. This approach was intended to ensure that the actual values are less than the quantities shown in NRC Table S-3 for all LWR nuclear power plants within the widest range of operating conditions. Since NRC Table S-3 was promulgated, changes in the fuel cycle and reactor operations have occurred. For example, the estimate of the quantity of fuel required for a year's operation of a nuclear power plant can now reasonably be calculated assuming a 60 year lifetime (40 years of initial operation plus a 20 year license renewal term). This is described in NUREG-1437 (NRC, 1996), for both BWRs and PWRs, and the highest annual requirement, 35 MTU made into fuel for a BWR, was used as the basis for the reference reactor year.

However, Table 5.7-2 shows that the U.S. EPR requires slightly more than 35 MTU per year. It also shows the fuel cycle requirements assuming it is scaled to the net (i.e., 1,000 MWe with an 80% capacity factor) generating capacity of the reference 1,000 MWe LWR. The uranium requirements slightly exceed 35 MTU because the generating capacity is significantly greater than any of the reactor designs that were considered when NUREG-1437 (NRC, 1996) was issued. The U.S. EPR is sized for significantly higher generating capacity than its predecessors to achieve the benefit of the economy of scale offered by a larger plant. Nearly two of the reference 1,000 MWe LWRs would be required to provide the generating capacity of a single U.S. EPR.

Also, a number of fuel management improvements have been adopted by nuclear power plants to achieve higher performance and to reduce fuel and enrichment requirements, reducing annual fuel requirements. For example, the U.S. EPR is expected to employ such improvements as axial blankets to reduce axial neutron leakage which will reduce uranium-235 enrichment requirements, and consequently the quantity of uranium required for the U.S. EPR.

Therefore, NRC Table S-3 remains a reasonably conservative estimate of the environmental impacts of the fuel cycle fueling nuclear power reactors operating today.

Another change is the elimination of the restrictions in the U.S. on the importation of foreign uranium. The economic conditions of the uranium market now and in the foreseeable future favor full utilization of foreign uranium at the expense of the domestic uranium industry. These market conditions have forced the closing of most uranium mines and mills in the U.S., substantially reducing the environmental impacts from these activities although with the recent dramatic increase in the price of uranium, there is likely to be some recovery of the uranium mining industry. However, the NRC Table S-3 estimates have not been adjusted accordingly so as to ensure that these impacts, which have been experienced in the past and may be fully experienced in the future, are considered.

With the recent sharp increase in price of uranium it is likely there will be a reduction in the uranium enrichment tails assay. The uranium tails assay can best be described as the degree of depletion of uranium-235 in the depleted uranium waste that remains following the enrichment process. It is a parameter that can be adjusted to economical needs, depending on the cost of natural uranium and enrichment. As the price of uranium increases, it is generally more cost effective to remove more of the uranium-235 isotope from the natural uranium even though more separative work is required to do so. There is also some environmental gain to the extent that there are fewer uranium tails to dispose with the lower tails assay. Thus, with a lower tails assay less uranium is required reducing the effect of mining and milling operations on the environment. Although an increase in the amount of separative work is required, it is likely that the gaseous diffusion process will be replaced by centrifuge enrichment, and the overall impact on the environment will be less.

For the enrichment operation, the gaseous diffusion process is largely being replaced with the centrifuge process. NUREG-1437 (NRC, 1996) addresses this issue and notes that the centrifuge process uses 90% less energy than gaseous diffusion. Since the major environmental impacts for the entire fuel cycle are from the emissions from the fossil fueled plants needed to supply the energy demands of the gaseous diffusion plants, this reduction in energy requirements results in a fuel cycle with much less environmental impact. A transition to centrifuge enrichment will also result in a significant reduction in the cooling water discharges associated with the use of the fossil fuel plants as well as the large amount of cooling water required for the gaseous diffusion plant process equipment.

Factoring in changes to the fuel cycle suggests that the environmental impacts of mining and tail millings could drop to levels below those in NRC Table S-3. Section 6.2 of NUREG-1437 (NRC, 1996) discusses the sensitivity of these changes in the fuel cycle on the environmental impacts.

Finally, the "no recycle" option might not always be the only option for spent fuel disposition in this country. The Energy Policy Act of 2005 (PLN, 2005) directs the Department of Energy (DOE) to conduct an advanced fuel recycling technology research, development, and demonstration program to evaluate proliferation-resistant fuel recycling and transmutation technologies. DOE has reported to Congress on a plan to begin limited recycling of fuel with current reactors by

2025, and transitional recycling with current reactors by 2040 (DOE, 2005). Therefore, it is possible that recycling may be available during the 40 year initial term of the license to operate the U.S. EPR in the U.S. However, many actions will be required by the federal government before this research and development concept becomes a technological reality. For this reason, it has been has concluded that this option is too speculative to warrant further consideration for the U.S. EPR.

5.7.1 LAND USE

The total annual land requirements for the fuel cycle supporting a U.S. EPR (as scaled up from the reference reactor and provided in Table 5.7-1) is approximately 229 acres (93 hectares). Approximately 26 acres (11 hectares) is permanently committed land, and 203 acres (82 hectares) is temporarily committed. A "temporary" land commitment is a commitment for the life of the specific fuel cycle plant (e.g., a mill, enrichment plant, or succeeding plants). Following decommissioning, the land could be released for unrestricted use. "Permanent" commitments represent land that may not be released for use after decommissioning.

In comparison, a coal plant of 1,600 MWe (1,520 MWe net) capacity using strip-mined coal requires about 370 acres (150 hectares) per year for fuel alone. As a result, the impacts on land use for the U.S. EPR are deemed so minor as to not warrant mitigation.

5.7.2 WATER USE

Principal water use for the fuel cycle is that required to remove waste heat from the power stations supplying electricity to the enrichment process. Scaling from NRC Table S-3, Table 5.7-1 shows that of the total annual water use of 2.310 x 10^{10} gal (8.7 x 10^{10} L) for the U.S. EPR fuel cycle, about 2.252 x 10^{10} gal (8.5 x 10^{10} L) is required for the removal of waste heat. Evaporative losses from fuel cycle process cooling are approximately 3.2 x 10^8 gal (1.2 x 10^9 L) per year and mine drainage is approximately for 2.6 x 10^8 gal (9.8 x 10^8 L) per year.

Although the water use associated with the fuel cycle for the U.S. EPR would be greater than for the reference reactor, on a comparative basis obtained by scaling the reference reactor to the U.S. EPR, the Table S-3 data are applicable to the U.S. EPR.

NUREG-1437 (NRC, 1996) indicates that on a thermal-effluent basis, annual discharges from the nuclear fuel cycle are about 4% of those from the reference 1,000 MW(e) LWR using once-through cooling. The consumptive water use is about 2% of that from the model 1,000 MW(e) LWR using cooling towers. The maximum consumptive water use (assuming that all plants supplying electrical energy to the nuclear fuel cycle used cooling towers) would be about 6% of that of the model 1,000 MW(e) LWR using cooling towers. Under this condition, thermal effluents would be negligible, and as a result do not warrant mitigation.

Further, as noted earlier in this application, with the likelihood that centrifuge enrichment will be used for the U.S. EPR, water use will decline significantly because less than 10% of the energy used for the gaseous diffusion process will be required for the centrifuge enrichment.

5.7.3 FOSSIL FUEL IMPACTS

Electric energy and process heat are required during various phases of the fuel cycle process. The electric energy is usually produced by the combustion of fossil fuel at conventional power plants. Electric energy associated with the fuel cycle represents about 5% of the annual electric power production of the reference 1,000 MWe LWR. The original analysis (AEC, 1974) shows that the environmental impacts are almost totally from the electrical generation needed for the gaseous diffusion process. These impacts result from the emissions from the electrical generation that is assumed to be from coal plants, the water needed to cool the coal plants and the water needed to cool the gaseous diffusion plant equipment.

However, the process used for enrichment is undergoing a transition from gaseous diffusion to centrifuge enrichment. Centrifuge enrichment technology requires less than 10% of the energy needed for the gaseous diffusion process.

In the U.S., Louisiana Energy Services (LES), and the United States Enrichment Corporation (USEC) are in the process of constructing new centrifuge enrichment plants. LES broke ground for a new centrifuge enrichment plant at a site near Eunice, New Mexico in August 2006. The USEC centrifuge enrichment plant license was issued by the NRC in April 2007.

By the time enrichment services are required for the U.S. EPR, it is possible that the majority of U.S. supplied enrichment services will utilize centrifuge technology. As such, the environmental impacts associated with the electrical generation would be correspondingly less for the U.S. EPR.

Process heat is primarily generated by the combustion of natural gas. As concluded in NUREG-1437 (NRC, 1996), this gas consumption, if used to generate electricity, is less than 0.4% of the electrical output from the reference reactor. As a result, the direct and indirect consumption of electrical energy for fuel cycle operations are deemed to be minor relative to the power production of the U.S. EPR.

The natural gas consumption associated with the fuel cycle for the U.S. EPR will be greater than for the reference reactor since the U.S. EPR has a significantly higher generating capacity. However, if a comparative basis is established by scaling the reference reactor to the U.S. EPR, it is anticipated that this figure will remain at less than 0.4% of the U.S. EPR output.

5.7.4 CHEMICAL EFFLUENTS

The quantities of liquid, gaseous and particulate discharges associated with the fuel cycle processes are given in NRC Table S-3 (Table 5.7-1) for the reference 1,000 MWe LWR. The quantities of effluents for a U.S. EPR is approximately twice those in NRC Table S-3 (Table 5.7-1). The principal effluents are SOx, NOx, and particulates. Based on the Environmental Protection Agency Latest Findings on National Air Quality, 2002 Status and Trends (EPA, 2003), the U.S. EPR emissions constitute a very small fraction of the national sulfur and nitrogen oxide annual emissions.

Liquid chemical effluents produced in the fuel cycle processes are related to fuel enrichment and fabrication and may be released to receiving waters. All liquid discharges into navigable waters of the U.S. from facilities associated with fuel cycle operations are subject to requirements and limitations set by a National Pollutant Discharge Elimination System (NPDES) regulatory discharge permit, thus assuring minimum impact. For NMP3NPP, NPDES permit requirements will be implmented through a New York State Pollutant Discharge Elimination System (SPDES) permit

As concluded in NUREG-1555 (NRC, 1999b) tailing solutions and solids are generated during the milling process, but are not released in quantities sufficient to have a significant impact on the environment.

Impacts from the above listed chemical effluents for the U.S. EPR, therefore, are minor and will not warrant mitigation.

5.7.5 RADIOACTIVE EFFLUENTS

Radioactive gaseous effluents estimated to be released to the environment from waste management activities and certain other phases of the fuel cycle are set forth in NRC Table S-3 as shown in Table 5.7-1. From these data the 100 year environmental dose commitment to the population in the U.S. is calculated for one year of the fuel cycle for the U.S. EPR (excluding reactor releases and dose commitments due to radon-222 and technetium-99). The dose commitment to the population is approximately 800 person-rem (8 person-Sv) per year of operation of the U.S. EPR based on scaling up the referenced 1,000 MWe LWR.

The additional whole body dose commitment to the population from radioactive liquid wastes effluents due to all fuel cycle operations other than reactor operation is approximately 400 person-rem (4 person-Sv) per year of operation. Thus, the estimated 100 year environmental dose commitment to the population from the fuel cycle for radioactive gaseous and liquid effluents is approximately 1,200 person-rem (12 person-Sv) to the whole body per reactor-year for the U.S. EPR.

The radiological impacts of radon-222 and technetium-99 releases are not included in NRC Table S-3. However, Section 6.2 of NUREG-1437 (NRC, 1996), estimates radon-222 releases from mining and milling operations, and from mill tailings for a year of operation of the reference 1,000 MWe LWR. The estimated releases of radon-222 for one U.S. EPR reactor year are 11,500 Ci (4.3×10^5 GBq). Of this total, about 78% is from mining, 15% from milling, and 7% from inactive tails before stabilization. Radon releases from stabilized tailings were estimated to be 2.0 Ci (74 GBq) per year for the U.S. EPR. This is twice the NUREG-1437 (NRC, 1996) estimate for the reference reactor year. The major risks from radon-222 are from exposure to the bone and lung, although there is a small risk from exposure to the whole body. The organ-specific dose weighting factors from 10 CFR 20 (CFR, 2007b) were applied to the bone and lung doses to estimate the 100 year dose commitment from radon-222 to the whole body.

NUREG-1437 (NRC, 1996) considers the potential health effects associated with the releases of technetium-99. The estimated release for the U.S. EPR is 0.015 Ci (0.55 GBq) from chemical processing of recycled uranium hexafluoride before it enters the isotope enrichment cascade or centrifuge plant and 0.011 Ci (0.39 GBq) into groundwater from a high level waste repository. The major risks from technetium are from exposure of the gastrointestinal tract and kidneys, and a small risk from whole-body exposure. The total-body 100 year dose commitment from technetium-99 is estimated to be 222 person-rem (2.22 person-Sv) for the U.S. EPR.

Although radiation can cause cancer at high doses and high dose rates, no data unequivocally establish a relationship between cancer and low doses or low dose rates, below about 10,000 mrem (100 mSv). However, to be conservative, radiation protection experts assume that any amount of radiation may pose some risk of cancer, or a severe hereditary effect, and that higher radiation exposures create higher risks. Therefore, a linear, no-threshold dose response relationship is used to describe the relationship between radiation dose and detrimental effects. Based on this model, risk to the public from radiation exposure can be estimated using the nominal probability coefficient (730 fatal cancers, non-fatal cancers or severe hereditary effects per 1,000,000 person-rem (10,000 person-Sv)) provided in the International Commission of Radiological Protection Publication 60 (ICRP, 1991). This coefficient, multiplied by the sum of the estimated whole-body population doses of approximately 3,500 person-rem/yr (35 person-Sv per year) provided above for the U.S. EPR, estimates that the population in the U.S. could incur a total of approximately 2.6 fatal cancers, non-fatal cancers or severe hereditary effects from the annual fuel cycle for the U.S. EPR.

This risk is small compared to the number of fatal cancers, non-fatal cancers and severe hereditary effects that are estimated to occur in the population annually from exposure to natural sources of radiation using the same risk estimation methods.

Based on these analyses, the environmental impacts of radioactive effluents from the fuel cycle for the U.S. EPR are deemed to be minor and, therefore, will not warrant mitigation.

5.7.6 RADIOACTIVE WASTES

For low level waste (LLW) disposal at land burial facilities, Table S-3 (NRC, 1976) indicates that there will be no significant radioactive releases to the environment. The basis for this conclusion is that only shallow land burial is considered. The U.S. EPR operates at a cleaner level than the reference LWR discussed in NUREG-0116 (NRC, 1976) as evidenced by lower volumes of low level radioactive waste discussed in Section 3.5. Improvements in fuel integrity and differences in fuel form are responsible for contributing to both a lower level of waste generated during operation and less overall contamination to be managed during the decontamination and decommissioning process. The plants with higher thermal efficiency would produce less heavy metal waste. The main radionuclides identified for low level waste are Co-60 and Fe-55 with half-lives of 5.26 years and 2.73 years, respectively. Based on these half-lives, after about 20 years, the activity would be less than the reference LWR.

Federal Law requires that high level and transuranic wastes are to be buried at a repository and no release to the environment is expected to be associated with such disposal because it has been assumed that all of the gaseous and volatile radionuclides contained in the spent fuel are no longer present at the time of disposal of the waste. In NUREG-0116 (NRC, 1976), which provides background and context for the high level and transuranic Table S-3 values, the NRC indicated that these high level and transuranic wastes will be buried and will not be released to the environment.

Onsite storage of LLW will be provided in accordance with NRC regulations and guidance, such that doses will be maintained as low as resasonable achievable (ALARA), and waste management will be handled in accordance with approved procedures. The collection, storage, and treatment of solid radioactive wastes is described in Section 3.5.4.

The NRC has already concluded that for applicants seeking an Early Site Permit (ESP), these impacts are acceptable, and would not be sufficiently large to require a NEPA conclusion that the construction and operation of a new nuclear unit at the sites should be denied.

5.7.7 OCCUPATIONAL DOSE

The annual occupational dose for the Reference 1,000 MW(e) reactor attributable to all phases of the fuel cycle is about 600 person-rem (NRC, 1996). Since the fuel cycle for the U.S. EPR is similar to the fuel cycle of the Reference Reactor, the annual occupational dose for all phases of the fuel cycle can be determined by normalizing the rated power of the U.S. EPR to the Reference Reactor. Doing this the annual occupational dose for all phases of the fuel cycle is approximately 1,220 person-rem or approximately a factor of 2 larger than the reference reactor S-3 value. However, on a per MWe basis, the dose would be the same. The environmental impact from this occupational dose is considered minor compared to the dose of 0.05 Sv/yr (5 rem/yr) to any individual worker permitted under 10 CFR Part 20 (CFR, 2007b).

5.7.8 TRANSPORTATION

The transportation dose to workers and the public totals about 0.025 person-Sv (2.5 person-rem) annually for the Reference 1,000 MW(e) LWR per Table S-3. Scaling the data for the

U.S. EPR, this corresponds to a dose of approximately 0.051 person-Sv (5.1 person-rem). For comparative purposes, the estimated collective dose from natural background radiation to the U.S. population is 900,000 person-Sv/yr (90 million person-rem/yr (NCRP, 1987). On the basis of this comparison, environmental impacts of transportation will be negligible.

5.7.9 FUEL CYCLE

As previously, only the "no recycle" option is considered here because the U.S. does not currently reprocess spent fuel. The data provided in Table S-3, however, include maximum recycle option impact for each element of the fuel cycle (NRC, 1999b). As a result, the analysis of the uranium fuel cycle performed and the environmental impacts described, as compared to Table S-3 impacts, are not affected by whether a specific fuel cycle is selected ("no recycle" or "uranium only recycle").

5.7.10 REFERENCES

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CFR, 2007a. Title 10, Code of Federal Regulations, Part 51, Environmental Protection Regulations For Domestic Licensing And Related Regulatory Functions, January 2007.

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EPA, 2003. Latest Findings on National Air Quality, 2002 Status and Trends, EPA 454/K-03-001, U.S. Environmental Protection Agency, August 2003.

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NRC, 1996. Generic Environmental Impact Statement for License Renewal of Nuclear Plants, NUREG-1437, Nuclear Regulatory Commission, May 1996.

NRC, 1999a. Generic Environmental Impact Statement for License Renewal of Nuclear Plants, NUREG-1437, NUREG-1437, Supplement 1 Regarding the Calvert Cliffs Nuclear Power Plant, Nuclear Regulatory Commission, October 1999.

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PLN, 2005. Pubic Law No. 109-58, Energy Policy Act of 2005, August 2005.

Table 5.7-1—NRC Table S-3 of Uranium Fuel Cycle Environmental Data (a) Compared to the U.S. EPR Configuration (Normalized to Model LWR Annual Fuel Requirement [WASH-1248] or Reference Reactor Year [NUREG-0116])

(Page 1 of 2)

	Reference Reactor	U.S. EPR
MWe	1,000	1,710
Capacity Factor	0.8	0.95
MWe (Net)	800	1624.5
Environmental Considerations		
NATURAL RESOURCE USE		
Land (acres)(hectares)		
Temporarily committed[b]	100 (40)	203 (82)
Undisturbed area	79 (32)	160 (65)
Disturbed area	22 (9)	45 (18)
Permanently committed	13 (5)	26 (11)
Overburden moved (millions of MT)(millions of tons)	2.8 (3.1)	5.7 (6.3)
Water (millions of gallons)(millions of liters)		
Discharged to air	160 (606)	320 (1,211)
Discharged to water bodies	11,090 (41,980)	22,520 (85,247)
Discharged to ground	127 (481)	258 (977)
Total	11,377 (43,067)	23,102 (87,450)
Fossil fuel		
Electrical energy (thousands of MW-hour)	323	656
Equivalent coal (thousands of MT (thousands of tons))	118 (130)	240 (265)
Natural gas (millions of scf)(millions of cubic meters)	135 (3.82)	274 (7.76)
EFFLUENTS-CHEMICALS (MT)(tons)		
Gases (including entrainment) c		
SO_X	4,400 (4,849)	8,935 (9,849)
NO_X[d]	1,190 (1,311)	2,416 (2,663)
Hydrocarbons	14 (15.4)	28 (31)
CO	29.6 (32.6)	60 (66)
Particulates	1,154 (1,272)	2,343 (2,583)
Other gases		
F	0.67 (0.74)	1.36 (1.50)
HCl	0.014 (0.015)	0.028 (0.031)
Liquids		
SO_4	9.9 (10.9)	20.1 (22.2)
NO_3	25.8 (28.4)	52.4 (57.8)
Fluoride	12.9 (14.2)	26.2 (28.9)
Ca^{++}	5.4 (5.95)	11 (12.1)
Cl^-	8.5 (9.4)	17.3 (19.1)
Na^+	12.1 (13.3)	24.6 (27.1)
NH_3	10.0 (11.0)	20.3 (22.4)
Fe	0.4 (0.4)	0.8 (0.9)
Tailings solutions (thousands of MT (thousands of tons))	240 (264)	487.4 (537.3)
Solids	91,000 (100,282)	185,000(203,928)

Table 5.7-1—NRC Table S-3 of Uranium Fuel Cycle Environmental Data (a) Compared to the U.S. EPR Configuration (Normalized to Model LWR Annual Fuel Requirement [WASH-1248] or Reference Reactor Year [NUREG-0116])

(Page 2 of 2)

	Reference Reactor	U.S. EPR
EFFLUENTS-RADIOLOGICAL (CURIES)(GBq)		
Gases		
Rn-222[e]	Note e	
Ra^{226}	0.02 (0.74)	0.04 (1.48)
Th^{230}	0.02 (0.74)	0.04 (1.48)
Uranium	0.034 (1.258)	0.069 (2.553)
Tritium (thousands)	18.1 (669.7)	36.8 (1,361.6)
C^{14}	24 (888)	48.7 (1,801.9)
Kr^{85} (thousands)	400 (14,800)	812.3 (30,055.1)
Ru-106	0.14 (5.18)	0.28 (10.36)
I-129	1.3 (48.1)	2.6 (96.2)
I-131	0.83 (30.71)	1.69 (62.53)
Tc-99[e]	Note (e)	
Fission products and TRU[f]	0.203 (7.511)	0.412 (15.244)
Liquids		
Uranium and daughters	2.1 (77.7)	4.3 (159.1)
Ra-226	0.0034 (0.1258)	0.0069 (0.2553)
Th-230	0.0015 (0.0555)	0.003 (0.111)
Th-234	0.01 (0.37)	0.02 (0.74)
Fission and activation products	5.9E-06 (2.18E-04)	1.20E-05 (4.44E-04)
Solids		
Other than HLW[f] (shallow)	11,300 (418,100)	22,900 (848,750)
TRUf and HLW[f] (deep)	1.1E+07 (4.07E+08)	2.2E+07 (8.26E+08)
Effluents - thermal (billions of Btu (billions of Joules))	4,063 (4,286,465)	8,250 (8,701,600)
Transportation (person rem)(Sv)	12.1(0.121)	24.6 (0.246)
Exposure of workers and the general public	2.5 (0.025)	5.1 (0.051)
Occupational exposure	22.6 (0.226)	45.9 (0.459)

Notes:

a. In some cases where no entry appears in NRC Table S-3 it is clear from the background documents that the matter was addressed and that, in effect, the table should be read as if a specific zero entry had been made. However, there are other areas that are not addressed at all in the table. NRC Table S-3 does not include health effects from the effluents described in the table, or estimates of releases of radon-222 from the uranium fuel cycle or estimates of technetium-99 released from waste management or reprocessing activities. Radiological impacts of these two radionuclides are addressed in NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," dated May 1996, and it was concluded that the health effects from these two radionuclides posed a small significance.
Data supporting NRC Table S-3 are addressed in WASH-1248, "Environmental Survey of the Uranium Fuel Cycle," dated April 1974; NUREG-0116, "Supplement 1 to WASH-1248, Environmental Survey of Reprocessing and Waste Management Portions of the LWR Fuel Cycle," dated October, 1976; NUREG-0216 "Supplement 2 to WASH-1248, Public Comments and Task Force Responses Regarding the Environmental Survey of the Reprocessing and Waste Management Portions of the LWR Fuel Cycle," dated March 1977; and in the record of final rule making pertaining to "Uranium Fuel Cycle Impacts from Spent Fuel Reprocessing and Radioactive Waste Management, Docket RM-50-3." The contributions from reprocessing, waste management and transportation of wastes are maximized for either of the two fuel cycles (uranium only recycle and no recycle). The contribution from transportation excluded transportation of cold fuel to a reactor and of irradiated fuel and radioactive wastes from a reactor which are considered in NRC Table S-4 of 10 CFR 51.20(g). The contributions from the other steps of the fuel cycle are given in Columns A through E of NRC Table S-3A of WASH-1248.

b. The contributions to temporarily committed land from reprocessing are not prorated over 30 years, since the complete temporary impact accrues regardless of whether the plant services one reactor for one year or 57 reactors for 30 years.
c. Estimated effluents based upon combustion of coal for equivalent power generation.
d. 1.2% from natural gas use and processes.
e. Radiological impacts of radon-222 and technetium-99 are addressed in NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," dated May 1996. The Generic Environmental Impact Statement concluded that the health effects from these two radionuclides pose a small risk.
f. TRU means transuranic; HLW means high level waste.

Table 5.7-2—Average Nominal Annual Fuel Cycle Requirements (U.S. EPR Scaled to the 1,000 MWe Reference LWR)

	U_3O_8 kg (lbs)	Natural UF_6 kg U (lbs U)	SWUs	Enriched UF_6 kg U (lbs U)
U.S. EPR	393,000 (867,000)	332,000 (732,100)	201,000	35,800 (78,900)
Scaled to the Reference Reactor	194,000 (427,000)	163,000 (360,000)	99,000	17,600 (39,000)

NOTES:

a. U.S. EPR 1,710 MWe; capacity factor 95% = 1,624.5 Net MWe
b. Reference Reactor 1,000 MWe; capacity factor 80% = 800 Net MWe
c. Adjustment factor 1,000 x 800/1,624.5 = 0.492
d. U.S. EPR tails assay is assumed to be 0.3%
e. U.S. EPR average enrichment is 4.3% uranium-235

5.8 SOCIOECOMONIC IMPACTS

5.8.1 PHYSICAL IMPACTS OF STATION OPERATION

This section addresses the direct physical impacts of plant operation on the surrounding community. The impacts evaluated include the effects from noise, odors, exhausts, thermal emissions, and visual intrusion. The discussion evaluates how these impacts should be treated and whether mitigation is needed. As a result of regulatory permits and controls and the remoteness of the site, direct physical impacts from plant operation on the surrounding community are expected to be SMALL.

5.8.1.1 Plant Layout

Potential physical impacts would be controlled through compliance with applicable regulations and plant siting. As described in Sections 2.2, the area in the vicinity of the proposed facility is largely agricultural, forest, rangeland, and includes Lake Ontario. The NMP3NPP site is characterized by developed (37.6%), forest (15.9%), rangeland (27.7%), wetlands (6.5%), and agricultural (12.1%) lands. The site is located in the town of Scriba, New York, a rural area, relatively remote from population and community centers.. The site is approximately 5 mi (8 km) north-northeast of the nearest boundary of Oswego, New York, and is 36 mi (58 km) north-northwest of Syracuse, New York.

The plant layout is provided in Figure 3.1-1 and its structures are described in ER Section 3.1. The NMP3NPP would occupy approximately 900 acres (364 ha) of the NMPNS owned lands. The NMP Unit 1 and NMP 2 are also located on the NMPNS site, and the proposed NMP3NPP site is located approximately 3,000 ft (914 m) and 3,600 ft (1,097 m), west southwest of NMP Unit 1 and Unit 2, respectively.

As described in ER Section 4.1, the NMPNS site acreage was purchased for the purpose of generating electricity. The proposed action of operation of an additional power unit would not alter the site's general use.

5.8.1.2 Distribution of Community Population, Buildings, Roads and Recreational Facilities

The total residential population within 1 mi (1.6 km) is an estimated 90 persons based on the 2000 U.S. Census (Table 2.5-6). The number of residents within the 4 mile (6.4 km) Low Population Zone was estimated to be 3,453 persons. No residential properties are located within the NMPNS site boundary. Furthermore, there are no nursing homes, hospitals, prisons, or schools within the Low Population Zone (LPZ).

Table 2.5.1-6 presents population distributions, by residential population and transient population in 2000, within each of the sixteen geographic directional sectors at radii of 0 to 1 mi (0 to 2 km), 1 to 2 mi (2 to 3 km), 2 to 3 mi (3 to 5 km), 3 to 4 mi (5 to 6 km), 4 to 5 mi (6 to 8 km), and 5 to 10 mi (8 to 16 km) from the NMP3NPP.

Besides the residential or farm buildings to the west and south, the Town of Scriba located southwest of the NMP3NPP site has commercial buildings in the town center. Figure 2.2-5 shows roads/highways that are in the vicinity of the NMP3NPP site.

As described inSection 2.2.1, there are no Native Americans on lands within the site or within 6 mi (10 km) of the NMPNS site. There are also no Federal Lands. The state owned lands owned by Oswego County are primarily Wildlife management Areas and State Forests. The closest in proximity to the NMP3NPP site are the Selkirk Shores State Park, Battle Island State Park, and

Mexico Point State Park. All of these areas are outside the 6 mi (10km) radius to the NMP3NPP site. The Fort Ontario Historic Site in downtown Oswego is within the vicinity of the NMP3NPP site. There are no state-managed parks with the 6 mi (10 km) radius of the NMP3NPP site. There are lands owned by Oswego County that are comprised of nature parks, youth camps, and recreational areas. There are no National Parks, Forests, or Monuments within close proximity of the NMP3NPP site and t is not anticipated that operation of the NMP3NPP will prevent the continuation of any of these areas from ongoing recreational activities.

5.8.1.3 Noise

The principal noise sources associated with operation of the new plant are the switchyard, transformers, and cooling towers. As noted in Section 2.7.7, a recent baseline ambient noise survey documents that, with the exception of one site (out of 6 measurement locations) where a low-level "humming" was observed, there were no observed, off-site, audible noise from the existing NMP Unit 1 and Unit 2 plants, day or night. Studies were conducted over a 13-day test period encompassing leaf-off conditions. For one site, where a sound was audible, it is likely that a nearby facility or non-NMPNS plant source was the cause of the noise. Similar results would be expected for NMP3NPP, as it relates to general plant noise, including the switchyard and transformers.

The estimated noise generated from the NMP3NPP cooling tower operation has been modeled to assess impacts to the nearby community. Figure 5.8-1 and Figure 5.8-2 show the estimated sound contours from the anticipated cooling tower noise during the leaf-off season and leaf-on season and Table 5.8-1 lists the tabular results. Modeled noise contours beyond the NMP3NPP site boundary, regardless of the season show Leq sound levels less than the HUD Ldn guideline value of 65 dBA (HAI, 2008).

Power plants generally do not result in off-site noise levels greater than 10 dBA above background and noise at levels between 60 and 65 dBA was generally considered of small significance (NRC,1999). While the modeled results are below 65 dBA, NYSDEC policy dictates that further evaluation of the cooling tower sound pressure levels may be required for incremental sound levels above 6 dBA. The NYSDEC policy states that an increase of 10 dBA deserves consideration of avoidance and mitigation measures in most cases (NYSDEC, 2001).

Final design of the cooling tower has yet to be completed. However, during final design, equipment alternatives will be evaluated to mitigate the impact of noise. Sound attenuation through the use of baffles and louvers at air inlets and discharge emission areas will be evaluated. NYSDEC also recommends substituting quieter equipment to reduce noise levels and modifying machinery using flexible noise control covers and dampening plates and pads (NYSDEC, 2001). Low noise fans and premium efficiency motors represent quieter equipment. Enclosures for pumps, fans and motors will also be evaluated for effectiveness in reducing noise levels. There are also environmental options to be considered, primarily erecting sound barriers such as screens or berms around either the noise generating equipment or the receptor. The nearer the barrier is to either the source or the receptor the more effectively it will perform to reduce noise. Thus, the impact of noise from operation of NMP3NPP to nearby residences and recreational areas is anticipated to be SMALL.

Noise generated from traffic would increase due to a larger plant workforce and from more NMP3NPP site deliveries and off-site shipments. The traffic noise, however, would be limited to normal weekday business hours. In addition, traffic control and administrative measures, such as staggered shift hours, would diminish traffic noise during the weekday business hours. Traffic noise during evenings and weekends would be substantially reduced because only a small fraction of the weekday workforce would be on-site. The potential noise impacts to the community, therefore, are expected to be temporary and manageable during shift changes. Thus, the noise impact from traffic due to operation of NMP3NPP to nearby residences and recreational areas is anticipated to be SMALL.

The noise levels would be controlled by compliance with regulatory criteria. For worker protection, the Occupational Safety and Health Administration (OSHA) noise-exposure limits identified in 29 CFR 1910.95 (CFR, 2007a) would be met. For residential areas, the EPA and HUD guidelines would be met, specifically, the acceptable outdoor decibel sound level of 55 dB(A) (USEPA, 1974; CFR, 2007e).

A study of traffic from the combined operations of NMP Unit 1, Unit 2 and NMP3NPP was performed to assess the potential impact on the Level of Service (LOS) provided by roads used by workers to commute to the NMPNS site. Results suggested that the existing road configurations would be adequate to maintain the current level of service (Section 4.4.1). However, a new access road for NMP Unit 1 and Unit 2 would be built in conjunction with an independent access road for NMP3NPP in order to minimize traffic congestion during shift changes.

5.8.1.4 Air and Thermal Emissions

The principal air emission sources associated with operation of NMP3NPP are standby diesel generators. NMP3NPP has four diesel generators (EDGs) and two Station Blackout (SBO) diesel generators as part of the Emergency Power Supply System. ER Section 3.6.3 quantifies the anticipated annual diesel generator air emissions, which include particulate matter (PM), sulfur oxides (SOx), carbon monoxide (CO), hydrocarbons (HC), and nitrogen oxides (NOx). Each EDG would be tested for approximately 4 hours every month, plus an additional 24 to 48 hours once every 2 years. Testing of the SBO diesels would occur for approximately 4 hours every quarter plus an additional 12 hours every year, and for an extended period of about 12 hours every 18 months.

Diesel generator air emissions would exhaust from a stack located on top of the diesel generator buildings at an elevation of 78 ft (24 m). When operational the exhaust would comply with Environmental Protection Agency Tier 4 requirements. Air emissions would also be controlled by compliance with the State of New York permit requirements and Federal Air Quality Standards 49 CFR 89.1000 (CFR, 2007c). The diesel generators would be required to meet the applicable emission limits in effect at the time of plant startup, with additional air pollution controls as required.

Air emissions sources would be administratively controlled to comply with Occupational Safety and Health Standards. In particular, 29 CFR 1910.1000 (CFR, 2007b) places limits on certain vapors, dusts, and other air contaminants. Dust suppression methods, such as watering areas that have been reseeded, would minimize dust emissions. Thus, the impact from air emissions to nearby residences and recreational areas is anticipated to be SMALL.

Thermal emission impacts are addressed separately in Section 5.3, Cooling System Impact. Potential impacts include the plume visibility, fogging, icing, and water deposition. Maximum solids deposition in the form of salts carried by plume water droplets is expected to be within NUREG-1555 criteria for protection of vegetation. Fogging or icing associated with the tower plumes is predicted to be less than twenty-two hours per year and five hours per year, respectively.

5.8.1.5 Visual Intrusion

As described in Section 3.1, due to heavily forested on-site areas, screening is provided by trees so that only the tops of the taller new structures may be visible from adjacent properties at ground-level from the south. Most new buildings would not be visible from the east because the taller structures of James A. Fitzpatrick NPP and because existing NMP Unit 1 and Unit 2 would mask the lower rise structures. Due to on-site elevation changes, topographical features (i.e., hills and valleys) would also help to screen and seclude new plant structures from surrounding properties even when foliage is seasonally absent. In addition, because the new plant would be located approximately 1,467 ft (447 m) from the nearest residential properties, distance would help to shield the new plant from view. The new Intake Structure and Pump House, and new discharge piping at the shoreline should also have a minimal visual impact considering that their proposed locations are consistent with the existing Intake Structures and would only be visible from the Lake.

Aesthetic principles and concepts expected in the design and layout of NMP3NPP are provided in Sections 3.1 and 4.4.1. Various measures are identified including preservation of existing woodlands, minimizing the impacts of construction related structures, continuity with NMP Unit 1 and Unit 2 structures, and reclamation of habitat where necessary. Thus, the visual impact to nearby residences and recreational areas from the NMP3NPP building structures and operation are expected to be SMALL.

The water vapor plume from the NMP3NPP CWS cooling tower would also be noticeable, given the heights to which the plume might rise, especially during the winter months, as discussed in Section 5.3.3.1. The frequency of the plume direction, its height, and its extent would vary, depending on the season and wind direction. The average length of the plume is expected to range from 2.6 mi (4.1 km) in the fall season to 3.8 mi (6.0 km) in the spring season. Annual average plume length is estimated to be approximately 2.3 mi (3.7 km). Average plume height would range from 2,003 ft (606 m) during the fall season to 3,016 ft (913 m) during spring. As a result, potential visual intrusion form the plume would vary according to viewpoint and season, yet would be consistent with existing site uses. Thus, the visual impact from the CWS cooling tower plume due to operation of NMP3NPP to nearby residences and recreational areas is anticipated to be SMALL.

Ground level fogging attributed to the cooling tower may also create a visible impact. Fogging is predicted to occur more frequently in the fall season. Maximum hours of fogging are predicted to range from 0.29 hours in the northwest direction during the spring season to 0.74 hours in the south-southwest direction during the fall season. The maximum hour for annual fogging is predicted to be 1.1 hours in the south-southwest direction. This represents a very small percentage (0.01%) of the total hours per year.

Rime icing (white or milky opaque granular deposit of ice that occurs when supercooled water drops below freezing) is also predicted to occur from operation of the CWS tower but at a lower frequency. The maximum hour for rime icing is predicted to be 0.2 hour in the south-southwest direction during the winter season. This represents a very small percentage of the total hours per year (0.002%). Rime icing is not predicted to occur during the spring, summer, or fall seasons.

Since fogging and icing would occur for only a percentage of the time and would occur most frequently on-site, the visible impacts are expected to be small.

5.8.1.6 Standards for Noise and Gaseous Pollutants

The noise levels will be controlled by compliance with regulatory requirements. For worker protection, the Occupational Safety and Health Administration (OSHA) noise-exposure limits identified in 29 CFR 1910.95 (CFR, 2007b) will be met. For residential areas, the noise levels would be controlled by compliance with regulatory requirements. New York State guidelines and the EPA and HUD guidelines will also be met. For worker protection, the Occupational Safety and Health Administration (OSHA) noise-exposure limits identified in 29 CFR 1910.95 (CFR, 2007a; CFR, 2007e; USEPA, 1974) would be met.

In addition, there were no local or county noise ordinances found for the site area. The New York State Department of Environmental Conservation published a guideline for evaluating potential community impacts from any new noise source based on the perceptibility of the new source above the existing ambient sound level (NYSDEC 2001). The guideline states that "Increases from 3-6 dBA may have potential for adverse noise impact only in cases where the most sensitive receptors are present." Cumulative increases of between 3 and 5 dBA are generally regarded as negligible or hardly audible. Thus a cumulative increase in the total ambient sound level of 6 dBA or less is unlikely to constitute an adverse community impact.

Air emission sources will also be administratively controlled to comply with Occupational Safety and Health Standards. In particular, 29 CFR 1910.1000 (CFR, 2007a) places limits on certain vapors, dusts and other air contaminants

5.8.1.7 Proposed Methods to Reduce Visual, Noise and Other Pollutant Impacts

The traffic study discussed in ER section 4.4.1 showed that an adequate LOS would be provided by existing roads during the operation phase of the NMP3NPP. New site access roads are planned to allow independent access to NMP Unit 1 and Unit 2 and to NMP3NPP.

As discussed in Section 5.8.1.3 through 5.8.1.6, the impacts due to noise, air pollutants, and visual impacts are expected to be SMALL. Outdoor noise levels would comply with EPA and HUD guidelines, NYSDEC policy, and OSHA noise exposure limits for workers outside of the buildings. Excessive noise inside the buildings would require protective equipment to be worn by workers. Thus, the impact from noise to plant workers from operation of NMP3NPP is anticipated to be MODERATE inside the buildings, requiring hearing protection, and SMALL outside of the buildings and inside other buildings that do not require hearing protection.

Air emissions would comply with the state and federal requirements through administration of applicable permits. The diesel generators would be required to meet the applicable emission limits at the time of plant startup, with additional air pollution controls as required. OSHA standards would be adhered to for on-site exposure to vapors, dusts, and other air contaminants for workers. Thus, the impact from air emissions to plant workers from operation of NMP3NPP is anticipated to be MODERATE inside the buildings, requiring the use of breathing apparatus, and SMALL outside of the buildings and inside other buildings that do not require a breathing apparatus.

Thermal emissions would be controlled through the State Pollutant Discharge Elimination System (SPDES) permit process for plant discharges to surface waters including Lake Ontario. Thus, the effect from thermal effects from operation of NMP3NPP on Lake Ontario is anticipated to be SMALL. The NMP3NPP intake and discharge structures would be visible from Lake Ontario given that their location is adjacent to the Lake. The NMP3NPP containment building and CWS cooling tower would be visible from certain locations within the view shed but would be consistent with that of NMP Unit 1 and Unit 2. The cooling tower plume would be visible from these same vantage points. The impact of these visual intrusions, however are expected to be SMALL because the NMP3NPP is already aesthetically altered by the presence of the existing NMP Unit 1 and Unit 2 structures and NMP Unit 2 natural draft cooling tower. As a result, no mitigation is required.

As discussed in Section 5.2, environmental impacts on water quality during operation would be minimal. Groundwater would not be used for NMP3NPP operation and surface water runoff and sedimentation effects would be minimized by the implementation of site safety and spill prevention and stormwater pollution prevention plans. Effluent from the planned wastewater treatment plant would meet all applicable health standards, regulations, and water quality criteria as set by the New York State department of Environmental Conservation and the U.S. EPA. Cooling tower blowdown and wastewater plant effluent are expected to be collected by a retention basin. Effluent would be discharged to Lake Ontario but would be within the SPDES permit limits.

5.8.1.8 References

CFR, 2007a. Title 29, Code of Federal Regulations, Part 1910.95, Occupational Noise Exposure, 2007.

CFR, 2007b. Title 29, Code of Federal Regulations, Part 1910.1000, Air Contaminants, 2007.

CFR, 2007c. Title 40, Code of Federal Regulations, Part 89.1000, Oxides of Nitrogen, Carbon Monoxide, Hydrocarbon, and Particulate Matter Exhaust Emission Standards, 2007.

CFR, 2007d. Title 40, Code of Federal Regulations, Part 80,524, What Sulfur Content Standard Applies to Motor Vehicle Diesel Fuel Downstream of the Refinery or Importer? 2007.

CFR, 2007e. Title 24, Code of Federal Regulations, Part 51, Subpart B Noise Abatement and Control, 2007.

NYSDEC, 2001. "Assessing and Mitigating Noise Impact: Program Policy." New York State Department of Environmental Conservation, Revised February 2, 2001.

USEPA, 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, PB 550/9-74-004.

5.8.2 SOCIAL AND ECONOMIC

This section describes the potential demographic, housing, employment and income, tax revenue generation, land value, and public facilities and services impacts of station operations. The comparative geographic area, for the evaluation of socioeconomic impacts extends in a 50 mi (80 km) radius from the proposed NMP3NPP. Oswego County and Onondaga County have been defined as the region of influence (ROI), because 94.9% of the existing NMPNS operational workforce resides there, and it is assumed that the operational workforce for NMP3NPP would also primarily reside in and impact this geographic area.

As shown in Table 5.8-2, it is estimated that a total of 363 employees would be added to the on-site workforce to operate NMP3NPP. An estimated 344 workers (94.9%) and their families (i.e., households) would likely reside in the ROI. In addition, an estimated 284 of the 586 indirect jobs located in the ROI that would be created by the NMP3NPP operation would be filled by the spouses of the direct workforce. A total of 1,420 people would migrate into the ROI as a result of the operation of NMP3NPP, representing a 0.2% increase in the total of 580,713 people in the two counties in 2000 (USCB, 2000a and b). It is concluded that the impacts to population levels in the ROI would be SMALL, and would not require mitigation

5.8.2.1 Demography

5.8.2.1.1 50 Mile (80 km) Comparative Geographic Area

The operational workforce would likely be hired from throughout the northeast United States, and include major population centers in the vicinity of the study area such as the Syracuse, Rochester, and the New York City metropolitan areas. Some of the operational workforce is likely to be drawn from the construction workforce, and would therefore permanently move to the ROI. Due to the relatively small size of the NMP3NPP operational workforce, and the estimated very minor population decrease in the ROI from 580,713 in 2000 (USCB, 2000a and b) to 579,854 in 2006 (859 or 0.2%; USCB, 2006a and b), the changes in population within the 50 mi (80 km) comparative geographic area would be SMALL, and would not require mitigation.

5.8.2.1.2 Two-County Region of Influence

As stated earlier, because 94.9% of the existing NMPNS operational workforce resides in Oswego County (73.3%) and Onondaga County (21.6%), it is assumed that the direct and indirect operational workforce for NMP3NPP would reflect the existing NMPNS employee demographic pattern and be permanent in-migrants primarily residing in and impacting this geographic area.

An additional workforce of up to 1,000 workers may be required for a 15-day period, once every 18 months, to support planned plant outages during refueling and other specialized tasks. This group would represent only temporary visitors to the area and would either commute on a weekly basis or for the duration of the tasks, and would reside in area hotels and motels. The scheduled outage for NMP3NPP would be planned around similar schedules for NMP Unit 1 and Unit 2, so that they do not overlap.

Due to the relatively small size of the NMP3NPP operational workforce, the changes in population within the ROI would be SMALL, and would not require mitigation.

5.8.2.2 Housing

The construction workforce would be significantly larger than the operational workforce (see Section 4.4.2). Construction would be of sufficient duration that the housing and support services required during NMP3NPP operation would already be in place so that any incremental NMP3NPP operational impacts would be SMALL. Thus, the operational workforce would either rent or purchase existing homes in the ROI, or would purchase acreage on which to build new homes. Of the estimated 646 direct and indirect households migrating into the ROI as a result of operating NMP3NPP, it is estimated that 499 households (77%) would reside in Oswego County and 147 (23%) would reside in Columbia County. The total number of housing units needed within the ROI would represent 2.8% of the total 22,789 vacant units (USCB, 2000a and b) located in the ROI in 2000.

In addition, scheduling planned outages for NMP3NPP at times other than when they would occur for NMP Unit 1 and Unit 2 should minimize the impacts of the availability and cost for hotel/motel rooms and other short-term accommodations.

Thus, the overall ROI, and each county within it, have enough housing units available to meet the needs of the direct and indirect operational workforces. The in-migrating workforces alone should not result in an increase in housing prices or rental rates because significantly more units are available than would be needed,. Thus, it is concluded that the impacts to area housing would be SMALL, and would not require mitigation.

5.8.2.3 Employment and Income

As stated earlier, it is estimated that a total of 363 direct employees would be added to the on-site workforce to operate NMP3NPP, and a maximum of 586 indirect job opportunities would be created in the ROI. Of this total, as stated above, an estimated 344 direct workers (94.9%) and 586 indirect workers would reside within the two county ROI. The 930 direct and indirect ROI jobs would result in a noticeable, but SMALL, impact to the area economy, representing a 0.3% increase in the 59,778 total labor force in Oswego County in 2000 (USCB, 2000c) and the 228,431 total labor force in Onondaga County (USCB, 2000d).

It is estimated that Nine Mile Point 3 Nuclear Project, LLC and UniStar Nuclear Operating Services would spend $28 million annually on salaries (in 2005 dollars, an average of $77,135/year/worker for direct labor, excluding benefits). The NMP3NPP estimated average annual salary is significantly greater (almost 54% more) than the $50,209 mean earnings in Oswego County in 2006 (USCB, 2006c) and 25% more than the $61,782 mean earnings in Onondaga County (USCB, 2006d). If income is distributed similar to the direct workforce in-migration pattern, Oswego County would experience an estimated $20.5 million increase in annual income and Onondaga County would receive an estimated $6.0 million annually.

Assuming that the indirect workforce would have annual salaries of $50,209 (based on the 2006 mean earnings in Oswego County (SCB, 2006c)), the 452 indirect workforce migrating into Oswego County would generate over $22.7 million in income and the 133 indirect workforce migrating into Onondaga County would generate $6.7 million in household income. This income would result in additional expenditures and economic activity in the ROI. However, it would represent a small percentage of overall total income in the ROI. Thus, it is concluded that the impacts to employment and income would be SMALL, and would not require mitigation.

5.8.2.4 Tax Revenue Generation

5.8.2.4.1 50 Mile (80 km) Comparative Geographic Area

Additional state income taxes would be generated by the in-migrating residents, although the amount cannot be estimated because of the variability of investment income, retirement that the 50 mi (80 km) radius and the state would experience a $26.6 million increase in annual wages from the direct workforce and $29.4 million in indirect workforce wages ($50,209 annual salary multiplied by 586 total indirect jobs in New York), for a total of $56.0 million. Relative to the existing total wages for the state and 50 mi (80 km) radius area, it is concluded that the potential increase in state income taxes represent a SMALL economic benefit.

Additional sales taxes also would be generated by the power plant and the in-migrating residents. It is estimated that approximately $9 million would be spent annually (in 2005 dollars) on materials, equipment, and outside services (excluding costs for planned outages), which would generate additional state sales and income taxes. The amount of increased sales tax revenues generated by the in-migrating residents would depend upon their retail purchasing patterns, but would only represent a SMALL benefit to this revenue stream for the state and the 50 mi (80 km) radius area.

Overall, all tax revenues generated by the NMP3NPP and the related workforce would be substantial in absolute dollars as described above. However, they would be relatively small compared to the overall tax base in 50 mi (80 km) area and the state of New York. Thus, it is concluded that the overall beneficial impacts to state tax revenues would be SMALL.

5.8.2.4.2 Two-County Region of Influence

NMP3NPP would pay property taxes in Oswego County. It is estimated that annual property tax payments would be approximately [ ] million beginning in 2017. These payments would represent a [ ] increase in property tax revenues for Oswego County when compared to property tax revenues for 2006, which were [ ], and a [ ] increase in total revenues for Oswego County, which in 2006 were $163.1 million (see Table 2.5-28). These increased real estate tax revenues would either provide additional revenues for existing public facility and service needs or for new needs generated by the power plant and associated workforce. The increased revenues also could help to maintain or reduce future taxes paid by existing non-project related businesses and residents, to the extent that project-related payments provide tax revenues that exceed the public facility and service needs created by NMP3NPP. It is concluded that these increased power plant real estate tax revenues would be a LARGE economic benefit to Oswego County.

Additional county income taxes would be generated by the in-migrating residents, although the amount cannot be estimated because of the variability of investment income, retirement contributions, tax deductions taken, applicable tax brackets, and other factors. It is estimated that annual wages in the two-county region for direct workforce will increase by $26.6 million, and annual wages due to indirect workforce will increase by $29.4 million, for a increase in annual wages of $56.0 million. Oswego County would experience a $20.6 million increase in annual wages from the direct workforce and $22.7 million increase in indirect workforce wages, for a total of $43.2 million. Onondaga County would experience an estimated annual increase of $6.0 million from the direct workforce and $6.7 million in indirect workforce wages, for a total of $12.7 million. Relative to the existing total wages for the ROI, it is concluded that the potential increase in state income taxes represent a SMALL economic benefit to the jurisdictions.

As indicated above, additional sales taxes also would be generated by the power plant and the in-migrating residents. The amount of increased sales tax revenues generated by the in migrating residents would depend upon their retail purchasing patterns, but would only represent a SMALL benefit to this revenue stream for Oswego County and Onondaga County. Overall, although all tax revenues generated by the NMP3NPP and the related workforce would be substantial in absolute dollar terms as described above, they would be relatively small compared to the overall tax base in the ROI. Thus, it is concluded that the overall beneficial impacts to tax revenues would be SMALL.

5.8.2.5 Land Values

Studies have found varying impacts to residential and commercial land values for facilities that are visible and have greater perceived risks, such as nuclear power plant sites; potentially less visible, but also greater perceived risks of contaminated and brownfield sites; highly visible but lower perceived risk sites such as transmission lines; and for highly visible, but low perceived human risk sites, such as windfarm energy facilities.

Other studies of potential impacts to property values have had varied results, depending on the type of facility being studied, including facilities that are more visible and could have greater risks such as nuclear power plants; facilities that are potentially less visible, but also have greater risks, such as landfills and hazardous waste sites; and highly visible facilities, but with potentially less perceived risk, such as electrical transmission lines and windfarm facilities. For instance, a Maryland Department of Natural Resources (MDNR, 2006) study of the effects of large industrial facilities showed that residential property values were not adversely affected by their proximity to the Calvert Cliffs Nuclear Power Plant site. Overall, Maryland power plants have not been observed to have negative impacts on surrounding property values. Similarly, studies of the property value impacts of the Three Mile Island nuclear power plant accident showed that nearby residences were not significantly affected by the accident (Gamble, 1982; as cited by RESI, 2004).

However, studies of the impacts to residential property values from low-level radioactive waste landfills in Ohio (Smolen et al., 1992), from leaks at a nuclear facility in Ohio (Miller,1992; as cited by Reichert, 1997), and along potential nuclear shipment routes in Nevada (Urban Environmental Research, 2002) show that these facilities and activities have a negative impact on housing values within a limited distance from the facility, typically within 3 miles. Even within this limited distance, the impacts on property values decrease rather quickly as one gets farther from the facility.

Evaluations of potentially less visible, but also perceived greater risk facilities, such as hazardous waste and Superfund sites (e.g., underground storage tanks, existing and former manufacturing facilities, and so forth) generally show similar results. A study of underground storage tanks in Ohio showed that proximity to non-leaking or unregistered leaking tanks did not affect property values, but registered leaking tanks affected property values within 300 feet of the sites (Simons, 1997). Studies of Superfund sites in Ohio (Reichert, 1997), Texas (Kohlhase, 1991; as cited by Reichert, 1997) (Dale, 1997) (McCluskey, 1999), Pennsylvania (Erickson, 2001), and the southeastern United States (Ho, 2004) showed that property values were negatively affected by the facilities. The negative impacts were particularly noticeable during periods with significant media coverage and public concern, with the properties close to the facilities most affected. As indicated earlier, the greater the distance from the facilities, the less the impacts on property values. Also, once there was a reduction in media attention and public concern, or after site cleanup, property values sometimes recovered from their losses. Similar results were found for landfills in Ohio (Hite, 2001; as cited by Ho, 2004) and Maryland (Thayer, 1992).

Electrical transmission lines and windfarm facilities can be highly visible but might have a smaller perceived risk to area residents than nuclear and hazardous waste facilities. Although three early studies (Blinder, 1979) (Brown, 1976) (Kinnar., 1984; as cited by Delaney, 1992) found that tall electrical transmission lines did not affect nearby residential or agricultural property values, later studies (Colwell, 1979; as cited by Delaney, 1992) showed that they did have a negative effect on property values. The most common reason given by one study was the visual impact of the transmission line, followed by the perceived health risk (Delaney, 1992). One study (Colwell, 1990) showed that over time the negative impacts to property values decreased, indicating a reduced concern about the facilities.

Studies of potential impacts to property values from windfarm facilities have had mixed results. A study of an existing windfarm in New York (Hoen, 2006) and a potential windfarm facility in Illinois (Poletti, 2007) showed that there was no impact to nearby residential property values. However, another study (Sterzinger, 2003) of impacts at existing facilities showed that property values increased faster near the facilities than in control areas, likely because of the perception that they represented "green" benefits to the environment.

Overall, these studies show that the impacts of various types of facilities can have a negative impact on residential property values, typically within 1 to 3 miles of a facility. However, they also show that the impacts might be less where other facilities already exist, and over time these negative impacts could decrease. The estimated 12 full-time leased residences at the Ontario Bible Camp, the nearest of which are located 1,467 feet (447 m) from the proposed NMP3NPP facility, would likely see reduced property values. These residents have expressed concern about the potential impacts of NMP3NPP on their property values. Because there are three existing nuclear power plant units east and southeast of the NMP3NPP site and they have been there for a number of years, the overall impacts to land values likely would be SMALL and would not require mitigation.

5.8.2.6 Public Facilities

As discussed in Section 4.4.2, the size of the construction workforce, the excess capacity of housing and public facilities in the ROI, and actions taken to meet unforeseen needs would result in enough public facility capacity to meet the smaller direct operational workforce needs. As discussed above, there is a sufficient quantity of vacant housing units in Oswego County and Onondaga County to meet the housing needs of the in-migrating direct and indirect operational workforces for NMP3NPP, so no new housing units would likely be required. Thus, water and sewage services would not be affected and would continue to be adequate to meet the needs of the workforces. Although an increase in the population would likely place additional demands on area transportation and recreational facilities, the facilities appear to have enough capacity to accommodate the increased demand and impacts would likely be SMALL. Area highways and roads would have increased traffic levels, particularly during shift changes at the NMP3NPP, resulting in a SMALL traffic impact. A representative of the Oswego County Planning Department suggested that the area is well-prepared to handle any additional increases in population and service demands due to its prior experiences with the existing facilities.

5.8.2.6.1 Transportation

As indicated during the construction phase of NMP3NPP, any replacement heavy equipment and reactor components could be taken by railroad during plant operation and maintenance activities, thereby reducing potential regional highway/road impacts. These materials then would be transported from the railroad, on the NMP3NPP access road, to the site (see ER Section 4.1.1).

Table 5.8-3 shows the projected levels of service (LOS) for selected intersections accessing the NMP3NPP site under the future build and no-build scenarios. That analysis projected that there would be no changes in LOS levels between these two scenarios for the four signalized intersections, or for the New York 104/New York 104B unsignalized intersection. For the unsignalized Lake View/Lake Road intersection the pm peak would improve from a LOS of "C" to "B" because it would be reconfigured under the build scenario. However, for the unsignalized County Road 1/County Road 1A intersection the am peak would drop from "A" to "B" and the unsignalized County Road 29/New York Highway 104 would decrease from "B" to "C" during the am peak and from "C" to "D" during the pm peak. These changes represent acceptable levels of service and, thus, the additional commuting patterns of the NMP3NPP operational workforce would only have minor impacts. Therefore, it is concluded that the impacts to transportation would be SMALL, and would not require mitigation.

5.8.2.6.2 Area-Wide and Recreational Aesthetics

The NMP3NPP site is currently partly forested and partly cleared land. The NMP3NPP would be located in a cleared area where many of the facilities, and particularly the tallest structures (e.g., the Reactor Building, vent stack, and the Cooling Tower) would be visible from the Ontario Bible Camp property located about 1,467 feet (447 m) to the northwest, and from Lake Ontario located about 600 ft (183 m) to the north. The tallest structures associated with construction of NMP3NPP include the Reactor Building that would rise about 230 ft (70 m) above grade, the vent stack that would rise 203 ft (62 m), and the Circulating Water System's Cooling Tower that would rise 177 ft (54 m) above grade. Although these NMP3NPP structures would be aesthetically consistent with the existing nuclear power plants to the east and southeast, they would be located closer to Lakeview Road and County Road 1A and would be more visible. Thus, the visual impacts of these structures to surrounding residents and transportation facilities (e.g., Lake Street/County Road 1A) would be MODERATE, but only to the extent that those off-site facilities are used (Section 2.5.3).

NMP Unit 2 has a cooling tower, so a visible steam plume is currently created. The steam plume generated by the NMP3NPP cooling tower also would be visible to area residents, recreational users in the surrounding area, and travelers along Lake Street/County Road 1A. It is estimated that the average plume length would range from 2.6 mi (4.1 km) in the fall season to 3.8 mi (6.1 km) in the spring season, and its average height would range from 2,003 ft (606 m) in the fall season to 3,016 ft (913 m) in the spring. Thus, the plume would not introduce a new element to the visual landscape, so the additional visual impacts from NMP3NPP would be SMALL.

Because only existing off-site transmission corridors, or proposed transmission corridors that are unrelated to the project's construction, would be used to accommodate the increased generation from NMP3NPP, no new off-site transmission lines would be built to service the plant and only new, short on-site interconnections or line relocations would be required.

Because no new housing units or developments would likely be built to meet NMP3NPP operational workforce needs, there would be no visual impacts to existing residents or users in the ROI from these facilities.

Because of the minimal visual impacts of the access roads, water intake, outfall, transmission lines, and the steam plume, but the MODERATE impact of the NMP3NPP structures, it is concluded that the impacts to area-wide and recreational aesthetics would be MODERATE, and could require mitigation.

5.8.2.7 Public Services

An increase in population levels from the NMP3NPP operational workforces would not likely place additional demands on area doctors and hospitals, police services, fire suppression and EMS services, and schools because the area has experienced a 0.2% population decline from

2000 to 2006. Thus, these services should have enough capacity to accommodate the increased demand and impacts would likely be SMALL.

5.8.2.7.1 Police, EMS, and Fire Suppression Services

A representative of the Oswego County Sheriff's Department has indicated that they have a current need to update the computer systems in their correctional facilities, and also to upgrade their overall radio/communications systems. Although the department currently does not anticipate that the NMP3NPP operational needs and associated workforce would place additional demands on their department, they stated that if there were a significantly greater number of calls for service in the future it might require them to request additional staff, vehicles, and equipment.

A representative of the City of Fulton Police Department has indicated that they currently have some budget constraints and the need to upgrade their communications equipment, computers, and weapons. However, similar to other departments, the department currently did not foresee additional departmental demands with operation of the NMP3NPP project or its associated workforce. However, they did state that if there were significant increases in traffic, the department might need additional traffic enforcement officers and associated traffic enforcement vehicles and supplies.

A representative of the Onondaga County Sheriff's Department has identified current capital needs for a new headquarters building, heliport, and jail facilities. In addition, this department did not anticipate any additional demands for the operation of the NMP3NPP, however, they did state that additional specialized response personnel and equipment could be needed sometime in the future, depending upon the needs of the power plant. Even though some law enforcement departments in the area of the proposed NMP3NPP project have some current needs, none of those spoken with anticipated that operation of the project would place significant additional demands on their departments. As a result, potential impacts to law enforcement departments would likely be SMALL, and would not require mitigation.

As described in Sections 2.5.2 and 4.4.2, Oswego County and Onondaga County have large, primarily volunteer, fire departments that are meeting the needs of their respective residents. A representative of the Oswego County Emergency Management Office stated that their Emergency Operations Center (EOC) was aging; that they need additional radiological equipment, supplies, and portable monitors; but that operation of the NMP3NPP project likely would not place greater demands on their department. This is a small department that substantially serves in a coordination role for other emergency departments, including being responsible for emergency medical technicians (EMTs) and radiological training, emergency management planning with local schools and hospitals, and disaster preparedness.

The Oswego City Fire Department also has emergency medical services. However, a representative suggested that the current ambulance fleet is not capable of handling additional calls associated with the operation of a new unit. The existing needs for more storage space, new hires, especially with paramedic training, and upgrades to equipment would need to be accommodated in order to handle calls that could result from the unit.

A representative of the City of Fulton Fire Department stated that the department currently has a general need for increased funding for its paid firefighters/EMTs, a need to add two to three personnel to each of their two fire stations, and to replace aging fire trucks. Although the representative was uncertain about the potential effects that operation of the NMP3NPP project could have on their department, a potential general increase in calls to meet the new workforce needs, responses to potential increases in motor vehicle accidents, responses to incidents potentially involving new hazardous materials transported through the area, and a potential increase in mutual aid calls were a concern for them.

The fire and emergency response departments would be supplemented by a NMP3NPP on-site emergency response team, which would include a fire brigade. The NMP3NPP staff would also include an on-site emergency response team and EMT responders. An emergency management plan would be developed for NMP3NPP, similar to that which already exists for NMP Unit 1 and Unit 2. The plan would address UniStar Nuclear Operating Services and agency responsibilities, reporting procedures, actions to be taken, and other items should an emergency occur at NMP3NPP. Because additional needs would be met during the construction phase of the power plant, no additional EMS or fire suppression services would likely be required for the operational phase, the impact would be SMALL, and no mitigation would be required.

A representative of Oswego Hospital stated that they currently are applying for funding to enlarge the emergency room from 11 to 19 beds and updating the associated facilities, and they have a 3 to 5-year strategic plan to expand or improve other facilities and services. With the implementation of these plans, the representative felt that they would be able to meet any additional needs related to the operation of NMP3NPP and the associated workforce.

For additional unforeseen service needs that might arise, as described in Section 5.8.2.4 above, the significant new tax revenues generated in Oswego County by operation of NMP3NPP would provide additional funding to expand or improve services and equipment to meet the additional daily demands created by the plant. Onondaga County also would experience increased revenues from operation of the power plant, but to a much lesser extent. However, some departments still might not have enough staff and equipment to respond to an emergency situation, including off-site evacuation. Detailed discussions about non-radiological accidents can be found in Section 5.12.2 and radiological impacts are discussed in Sections 5.4 and 7.0. Thus, it is concluded that there would be a SMALL impact on some fire and law enforcement departments, and no mitigation would be required.

5.8.2.7.2 Educational System

A representative of the Oswego City School District stated that their district is operating at or near capacity at this time, with funding reduced during the past two budgeting processes and a capital spending plan identifying high-priority needs for high school expansion/renovation. The representative stated if the previous funding levels were restored, the operation of the NMP3NPP project might require the purchase of additional supplies for the associated increase in students but that no other needs were anticipated at this time.

A representative of the City of Fulton School District stated that their district also is operating at or near capacity at this time and have budgeted to add five high school classrooms starting in 2009. They felt that if a significant increase in students were to occur from the NMP3NPP operational workforce, it would require hiring additional staff, an increase in building capacity and parking, expansion of the school lunch program, and purchase of more consumable supplies for the students.

As described above, an estimated 499 new households would migrate into Oswego County as a result of the operation of NMP3NPP. These households would include an estimated 304 children (assuming a total of 0.61 children per household, not all of which would be school-aged). These additional students would represent an increase of 1.3% to the 23,569 students enrolled in the county in the 2005-2006 school year. The estimated $78.3 million in increased property taxes that would be paid to Oswego County annually by UniStar for

NMP3NPP, which include levies for the Oswego County Public School System, would provide additional funds to meet the educational needs of children for the in-migrating operational workforce. Thus, it is concluded that the impacts to the Oswego County Public School System would be SMALL, and would not require mitigation.

The in-migration of an estimated 147 new households into Onondaga County as a result of the operation of the NMP3NPP would similarly place greater demands on the County educational system. These households would include an estimated 90 children (again assuming a total of 0.61 children per household, not all of which would be school-aged). These additional students would represent an increase of 0.1% to the 76,074 students enrolled in the county in the 2005-2006 school year.

Although the school district could receive some additional funding from property taxes generated by these new households (likely to be minimal because adequate housing units are already available in the county and those units are already being taxed), it would not receive additional funding directly from the power plant because NMP3NPP does not pay property taxes to Onondaga County. Because the number of in-migrating operational households is small and the educational system already would likely have been expanded to meet the in-migrating construction workforce needs, the impacts of the power plant on the Onondaga County School District would likely be SMALL, and would not require mitigation.

5.8.2.8 References

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5.8.3 ENVIRONMENTAL JUSTICE IMPACTS

This section describes the potential disproportionate adverse socioeconomic, cultural, environmental, and other impacts that operation of NMP3NPP could have on low-income and minority populations within two geographic areas. The first geographic area is a 50 mi (80 km) radius, where there is a potential for disproportionate employment, income, and radiological impacts, compared to the general population (NRC, 1999). This analysis also evaluates potential impacts within the region of influence (ROI), most of which is encompassed within a 20 mi (32 km) radius of the power plant site, where more localized potential additional impacts could occur to housing, employment, aesthetics, recreation, and other resources, compared to the general population. It also highlights the degree to which each of these populations would disproportionately benefit from operation of the proposed power plant, again compared to the entire population.

Section 2.5.1 provides details about the general population characteristics of the study area and Section 2.5.4 provides details about the number and locations of minority and low-income populations within a 50 mi (80 km) radius of the NMP3NPP site, and subsistence uses. Potential radiological impacts to the general public are described in Section 5.4 and Section 7.1.

5.8.3.1 50 Mile (80 km) Comparative Geographic Area

As stated in Sections 2.5.1 and 2.5.4, the greatest concentrations of minority populations within the comparative geographic area, but outside of the ROI, primarily reside toward the edges of the 50 mi (80 km) radius (see Section 2.5.4). These populations are located in Jefferson County, which is located northeast of the NMP3NPP site with seven aggregate minority census block groups, and Cayuga County, which is located southwest of the site with one aggregate group. Similarly, the greatest concentrations of low-income populations are located in Cayuga County with five census block groups, in Jefferson County with three census block groups, and Wayne County, which is located toward the edge of the 50 mi (80 km) radius southwest of the NMP3NPP site with one census block group (see Section 2.5.4). No unique minority or low-income populations within the comparative geographic impact area would likely be disproportionately adversely impacted by operation of the power plant because of the distances from the NMP3NPP site. These populations reside outside of the area where environmental impacts (e.g., noise, air quality, water quality, changes in habitat, aesthetic, etc.) would likely occur.

However, the proportion of low-income and minority operational workers from the comparative geographic area that are currently employed, but would be willing to move or commute to the power plant site, could benefit from increased income levels. These impacts are anticipated to be SMALL and would not require mitigation.because there would not be any disproportional direct physical impacts to minority and low-income populations, and because some might benefit from increased employment opportunities and income levels.

5.8.3.2 Two-County Region of Influence

5.8.3.2.1 Employment and Income

As described in Section 5.8.2, there would be an estimated 363-person workforce operating the NMP3NPP power plant from 2018 to 2058. An estimated 266 workers (73.3%) would reside in Oswego County and 78 workers (21.6%) would reside in Onondaga County. In addition, as described in ER Section 5.8.2, 586 indirect job opportunities (using a ROI-only multiplier of 1.6997 [BEA, 2008]) would be created in the ROI in support of the direct workforce. Minority and low-income residents of these census block groups might benefit from employment at NMP3NPP, to the extent that they are currently unemployed or underemployed, and to the extent that they have the skills required to fill the operational workforce positions. This beneficial impact is likely to be SMALL and would not be disproportionate compared to the general population and would not require mitigation.

As discussed in Section 5.8.2, it is estimated that Nine Mile Point 3 Nuclear Project, LLC and UniStar Nuclear Operating Services would spend $28 million annually in salaries (an average of $77,135/year/worker for direct labor, excluding benefits). The NMP3NPP estimated average annual salary was almost 54% greater than the mean earnings of $50,209 in Oswego County for 2006 (USCB, 2006a) and 25% more than the $61,782 mean earnings in Onondaga County for 2006 (USCB, 2006b). Again, minority and low-income residents might benefit from employment at NMP3NPP, to the extent that they can switch from lower paying to higher paying jobs. Given the small number of higher paying jobs created, the beneficial impacts for low-income and minority populations would be SMALL. This would not be disproportionate compared to the general population and would not require any mitigation.

5.8.3.2.2 Housing

As described in Sections 2.5.2 and 5.8.2, there are far more vacant housing units available in the ROI (a total of 27,034 or 11.8% in 2006, of which 21,925 or 8.6% are year-around units; USBC, 2006c and 2006d) than would be needed to house the direct and indirect operational workforces for NMP3NPP. Also, it is anticipated that there would be significantly more units available than would be needed, and the in-migrating direct and indirect workforces alone should not result in an increase in housing prices or rental rates.

In addition, scheduling planned outages with as many as 1,000 additional staff for NMP3NPP every two years at times other than when they would occur for NMP Unit 1 and Unit 2, should minimize the impacts of the availability and cost for hotel/motel rooms and other short-term accommodations (see Section 5.8.2). Again, as indicated in Section 2.5.2, there were 122 hotels, motels, and bed and breakfast facilities with over 1,600 units in Oswego County in 2008, 4 facilities in Onondaga County, and numerous other facilities were available outside of the ROI, but within a reasonable commuting distance. Thus, NMP3NPP should not affect the availability or cost of housing for low-income and minority populations. Due to the fact that the operational workforce would not require significant amounts of vacant housing or hotel/motel rooms and would not affect housing or rental prices, the power plant would have a SMALL impact on housing, would not be disproportionate compared to the general population, and again would not require mitigation.

5.8.3.2.3 Tax Revenues

NMP3NPP would pay an estimated [ ] annually in real estate taxes, starting on or before 2018 when power plant operation would begin (see Section 5.8.2). These payments would represent a [ ] increase in property tax revenues for Oswego County when compared to property tax revenues for 2006, which were [ ], and a [ ] increase in total revenues for Oswego County, which in 2006 were $163.1 million (see Table 2.5-28). It is estimated that approximately $9 million would be spent annually (in 2005 dollars) on materials, equipment, and outside services (excluding costs for planned outages), which would generate additional state sales and income taxes (see Section 5.8.2).

The NMP3NPP operational workforce would generate increased income tax, sales tax, and property tax revenues where they live and where they spend their incomes. low-income and minority populations might benefit somewhat from these increased tax revenues, either because they might help to avoid some future tax increases or they might fund improvements to, or the creation of, new public facilities or services. However, the benefits of these additional tax revenues, facilities, or services would be SMALL; would not be disproportionate compared to the general population; and, therefore, would not require mitigation.

5.8.3.2.4 Subsistence

Existing or traditional subsistence harvesting activities would not likely be affected by the operation of NMP3NPP, because these activities do not occur directly on the NMP3NPP site. Also, NMP3NPP would not likely affect the surrounding environment where subsistence and other harvesting activities might occur, and thus should not affect harvest rates. Therefore, impacts to subsistence uses would be SMALL, would not be disproportionate compared to the general population, and would not require mitigation.

5.8.3.2.5 Transportation

There is no indication that people in minority or low income census block groups lack personal vehicles or other modes of transportation. Thus, there would likely be a SMALL impact to minority and low income populations if transportation to outside of the ROI would be required, and no mitigation would be required.

5.8.3.3 References

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Table 5.8-1—Estimated Cooling Tower Sound in A-Weighted Levels at Five Community Receptors

Estimated Increase to Minimum Ambient Levels:						
SEASON	**LCO. 1 N/A**	**LCO. 2**	**LCO. 3**	**LCO. 4**	**LCO. 5**	**LCO. 6**
Leaf-on	55	50	46	37	35	35
Minimum LA50 Ambient		34	32	32	31	32
Increase to Min. Ambient		16	5	5	4	3

Table 5.8-2—Estimates of In-Migrating Operational Workforces in Oswego County and Onondaga County, from 2018 to 2058

	In-migration Characteristics	Oswego County	Onondaga County	Total ROI
Direct Workforce:				
	Maximum Direct Workforce			363
	Percent of Current NMP Unit 1 and Unit 2 Workforce Distribution	73.3%	21.6%	94.9%
	Estimated In-migrating Direct Workforce	266	78	344
	In-migrating Direct Workforce Population (@2.61 people/household)	**694**	**205**	**899**
Indirect Workforce:				
	Estimated Distribution of Peak Direct Workforce	266	78	344
	Peak Indirect Workforce (@1.6997 multiplier)	452	133	586
	Indirect Workforce Needs Met by Direct Workforce Spouses and Others (@51.2% working females 16 years old and older)	219	65	284
	Remaining, Unmet Indirect Workforce Need	233	69	302
	In-migrating Indirect Workforce Population (@2.61 people /household)	**402**	**118**	**521**
Total In-migrating Direct and Indirect Workforce Population:		**1,097**	**323**	**1,420**

Notes:

BEA (2008) estimated a 1.6997 direct/indirect employment multiplier for operation in the two-county ROI.
U.S. Census Bureau (2000e) census data indicates that the state of New York had 2.61 people per household.
U.S. Census Bureau (2000f) census data indicates that, within the state of New York, 51.2% of households had a working female 16 years old or older (assumed to be a spouse and others for this analysis).

Table 5.8-3— Intersection LOS: Projected Conditions During Operation

Intersection	Type of Intersection	Future No-Build		Future Build	
		AM	PM	AM	PM
Lakeview and Lake Road (CR1A)	Unsignalized	B	C	B	B*
CR1 and CR1A	Unsignalized	A	B	B	B
CR29 and NY104	Unsignalized	B	C	C	D
NY104 and NY104B	Unsignalized	A	B	A	B
NY104 and Route 481	Signalized	A	B	A	B
NY104 and Route 48	Signalized	B	C	B	C
Utica Street and Route 481	Signalized	A	C	A	C
Utica Street and Route 48	Signalized	B	C	B	C

Figure 5.8-1—Estimated Sound Contours from NMP3NPP Cooling Tower Noise During the Leaf-Off Season

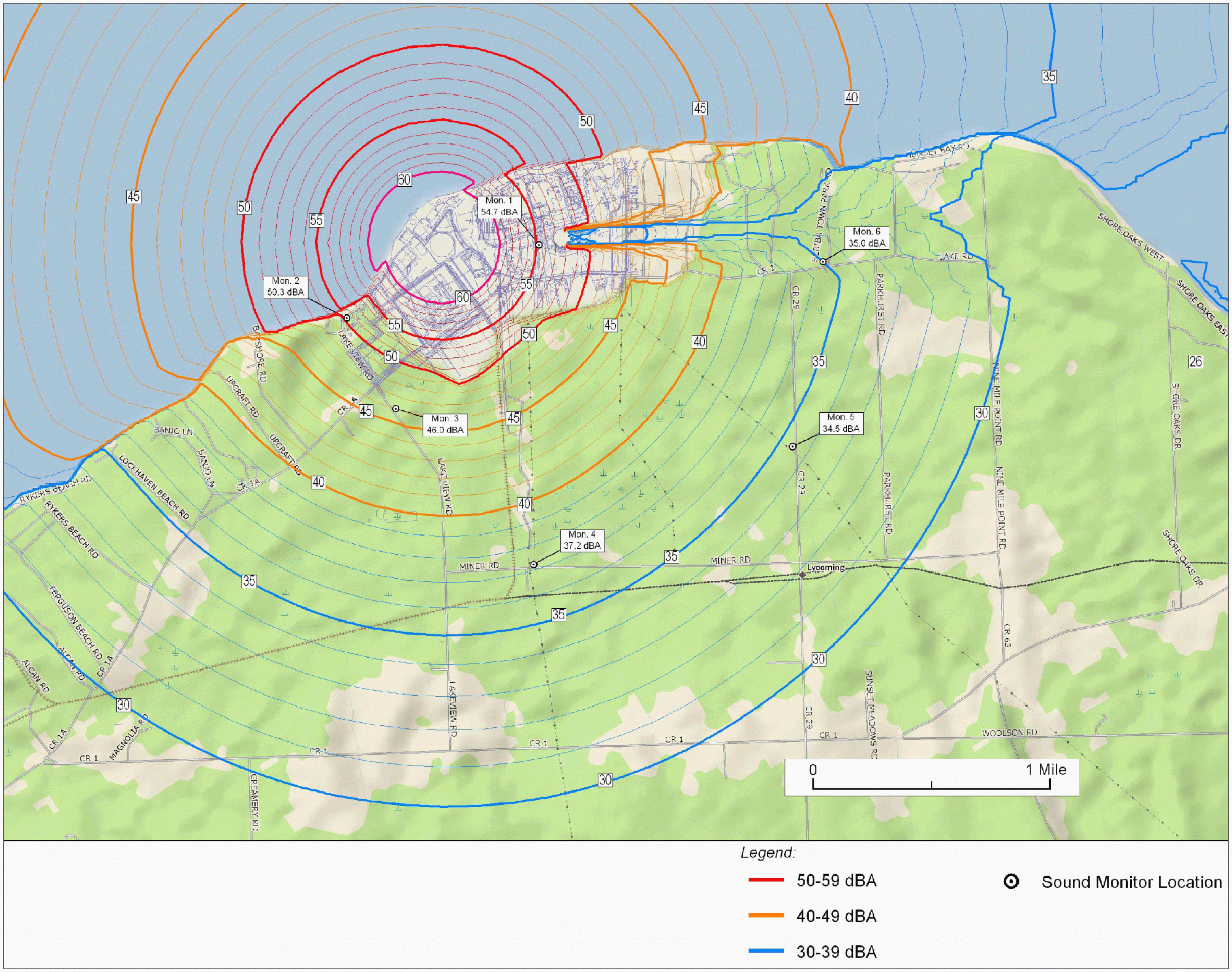
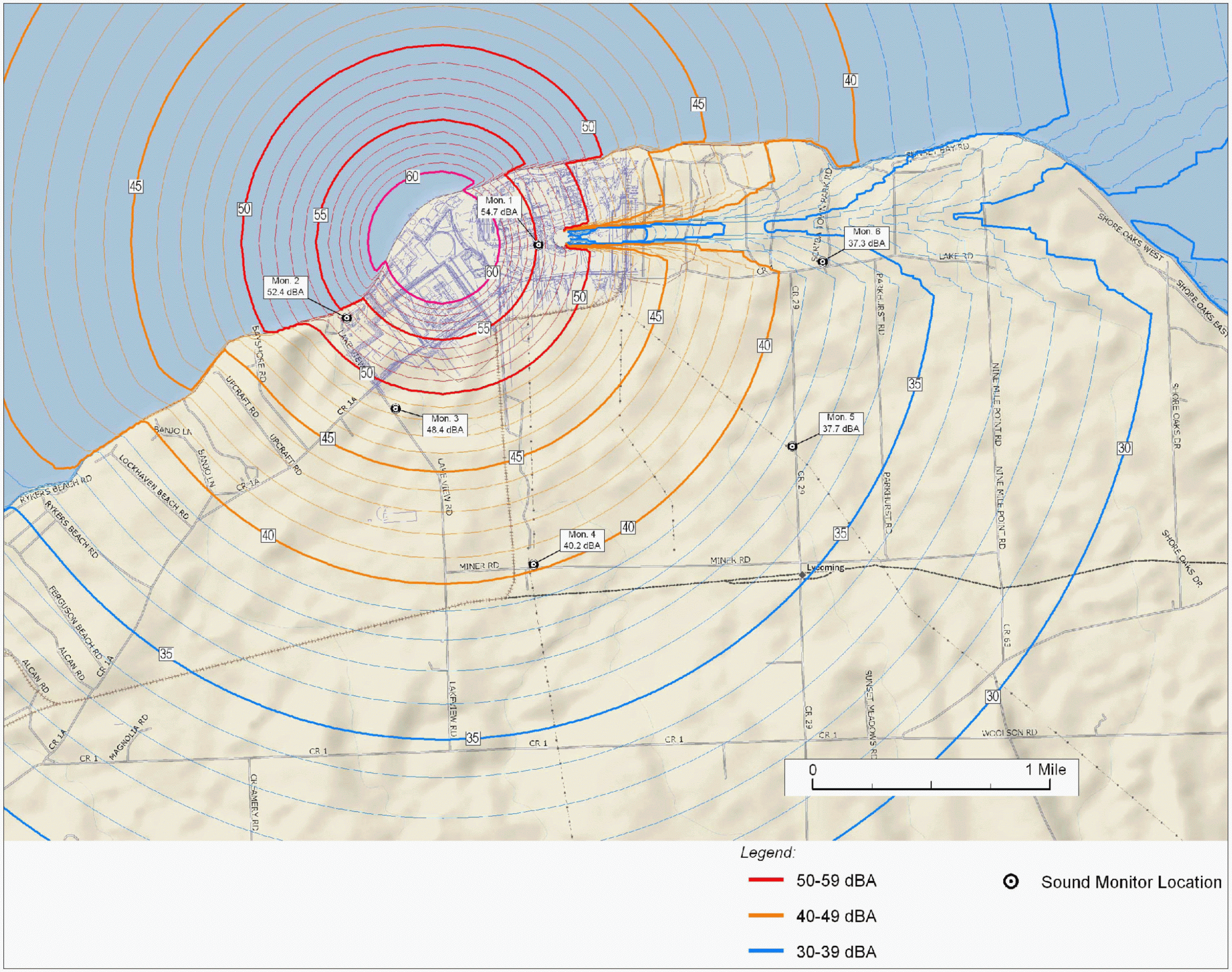


Figure 5.8-2—Estimated Sound Contours from NMP3NPP Cooling Tower Noise During the Leaf-On Season



5.9 DECOMMISSIONING

5.9.1 NRC GENERIC ENVIRONMENTAL IMPACT STATEMENT REGARDING DECOMMISSIONING

As indicated in Appendix A of Section 5.9 of NUREG-1555 (NRC, 2000), studies of social and environmental effects of decommissioning large commercial power generating units have not identified any significant impacts beyond those considered in the Final Generic Environmental Impact statement (GEIS) on Decommissioning (NRC, 2002). The GEIS evaluates the environmental impact of the following three decommissioning methods:

- DECON -The equipment, structures, and portions of the facility and site that contain radioactive contaminants are removed or decontaminated to a level that permits termination of the license shortly after cessation of operations.
- SAFSTOR - The facility is placed in a safe stable condition and maintained in that state until it is subsequently decontaminated and dismantled to levels that permit license termination. During SAFSTOR, a facility is left intact, but the fuel has been removed from the reactor vessel and radioactive liquids have been drained from systems and components and then processed. Radioactive decay occurs during the SAFSTOR period, thus reducing the quantity of contaminated and radioactive material that must be disposed of during the decontamination and dismantlement.
- ENTOMB - This alternative involves encasing radioactive structures, systems, and components in a structurally long-lived substance, such as concrete. The entombed structure is appropriately maintained, and continued surveillance is carried out until the radioactivity decays to a level that permits termination of the license.

NRC regulations do not require a COL applicant to select one of these decommissioning alternatives or to prepare definite plans for decommissioning. These plans are required by 10 CFR 50.82 (CFR, 2007a) after a decision has been made to cease operations. Therefore, general decommissioning environmental impacts are summarized in this section, since detailed plans or a selection of alternatives is not required for a COL applicant.

Decommissioning of a nuclear facility that has reached the end of its useful life has a positive environmental impact. The major environmental impact, regardless of the specific decommissioning option selected, is the commitment of small amounts of land for waste burial in exchange for the potential re-use of the land where the facility is located.

Radiological doses during decommissioning with appropriate work procedures, shielding, and other occupational dose control measures (e.g., remote controlled equipment) similar to those used during plant operation will be controlled. To date, experience with decommissioned power plants has shown that the occupational exposures during the decommissioning period are comparable to those associated with refueling and plant maintenance when it is operational. While each potential decommissioning alternative would have radiological impacts from the transport of materials to their disposal sites, the expected impact from this transportation activity would not be significantly different from normal operations.

5.9.2 DECOMMISSIONING COST ANALYSIS SUMMARY

While NRC regulations do not require the applicant to submit detailed decommissioning plans (e.g., no detailed analysis of decommissioning is necessary), COL applicants, in accordance with 10 CFR 52.77 (CFR, 2007b), must include as part of their application a report containing a certification that financial assurance for decommissioning will be provided in an amount that may be more, but not less, than the amount stated in the table in 10 CFR 50.75 (CFR, 2007c) paragraph (c)(1). Based on this decommissioning funding report, financial assurance, using parent guarantee(s) and/or letter(s) of credit, will be provided in the amount of $389 million (2007 $) consistent with the minimum funding amount established by 10 CFR 50.75 (CFR, 2007c) paragraph (c). This financial assurance will be provided via an acceptable instrument in accordance with 10 CFR 50.75 (CFR, 2007c) paragraph (e) and the guidance provided in Regulatory Guide 1.159 (NRC, 2003). The decommissioning funding report for NMP3NPP is provided in Part 1, "General Information" of this COL application.

5.9.3 REFERENCES

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5.10 MEASURES AND CONTROLS TO LIMIT ADVERSE IMPACTS DURING OPERATION

This section summarizes the measures and controls to be implemented during the operation of NMP3NPP to limit potential adverse impacts.

5.10.1 IMPACTS DURING OPERATION

In general, potential impacts will be minimized through compliance with applicable Federal, New York, and local laws and regulations enacted to prevent or minimize adverse environmental impacts that may be encountered such as air emissions, noise, storm water pollutants, and spills. Principal among these will be the SPDES Permit to protect water quality and compliance with 10 CFR Parts 50, Appendix I, (NRC, 2007a), 10 CFR 51.52(b) (NRC, 2007b) and 40 CFR Part 190 (NRC, 2007c) to minimize radiation. Also included will be required plans such as a Storm Water Pollution Prevention Plan (SWPPP) and associated Best Management Practices (BMPs) to minimize sediment erosion as well as administrative actions to protect air quality and a site Resource Management Plan. ER Section 1.3 lists the various applicable Federal, New York, and local laws, regulations, and permits.

Table 5.10-1 lists the potential impacts associated with the operation of NMP3NPP described in Sections 5.1 through 5.9 as well as Sections 5.11 and 5.12. The table identifies, from the categories listed below, which adverse impact may occur as a result of operation. Supplement 1 of NUREG-0586 (NRC, 2002) and Supplement 1 of NUREG-1437 (NRC, 1999) were also used to evaluate potential impacts. Table 5.10-1 also includes a brief description, by section, of each potential impact and the measures and controls to minimize the impact, if needed.

- Erosion and Sedimentation
- Air Quality (dust, air pollutants)
- Wastes (effluents, spills, material handling)
- Surface Water
- Groundwater
- Land Use
- Water Use and Quality
- Terrestrial Ecosystems
- Aquatic Ecosystems
- Socioeconomic
- Aesthetics
- Noise
- Traffic
- Radiation Exposure

- Other (site specific)

Based on existing site conditions and proposed measures and controls, the potential adverse impacts identified from the operation of NMP3NPP are anticipated to be SMALL for all categories evaluated.

5.10.2 REFERENCES

CFR, 2007a. Title 10, Code of Federal Regulations, Part 50 , Appendix I, Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion "As Low as is Reasonably Achievable" for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents, 2007.

CFR, 2007b. Title 10, Code of Federal Regulations, Part 51.52, Environmental Effects of Transportation of Fuel and Waste-Table S-4, 2007.

CFR 2007c. Title 40, Code of Federal Regulations, Part 190, Environmental Radiation Protection Standards for Nuclear Power Operations, 2007.

NRC, 1999. Generic Environmental Impact Statement for License Renewal of Nuclear Pants, Calvert Cliffs Nuclear Power Plant, NUREG-1437, Supplement 1, October, 1999.

NRC, 2002. Generic Environmental Impact Statement Decommissioning of Nuclear Facilities, NUREG-0586, Supplement 1, Vol. 1, November, 2002.

Table 5.10-1—Summary of Measures and Controls to Limit Adverse Impacts During Operation

(Page 1 of 11)

ER Section and Impact Summary	Erosion/Sediment (ES)	Air Quality (AQ)	Wastes (WS)	Surface Water (SW)	Groundwater (GW)	Land Use (L)	Water Use & Quality (W)	Terrestrial Ecosystems (TE)	Aquatic Ecosystems (AE)	Socioeconomic (S)	Aesthetics (A)	Noise (N)	Traffic (T)	Radiation Exposure (R)	Other (site specific) (O)	Potential Impact Category and Description	Proposed Measures and Controls or Mitigating Circumstances
5.1 Land Use Impacts																	
				S	S	S		S	S		S						
5.1.1 The Site and Vicinity																Presence of new permanent structures. (L) (TE) (AE) (O)	NMP3NPP footprint would be wholly contained on a dedicated nuclear power plant site; on-site land is not used for farmland nor is it considered prime or unique.
																Solids deposition from cooling tower drift. (TE) (AE)	Solids deposition (assumed as salt) rates below NUREG-1555 significance level, without drift eliminator in place.
																Regional land use increase due to settlement of new workforce in region. (L)	Regional impact expected to be small (see 5.8.2 below)
																Release of fuel, oils, or other chemicals. (SW) (GW)	Implement Spill Prevention, Control, and Countermeasures (SPCC) Plan.
5.1.2 Transmission Corridors and Off-site Areas																No new off-site transmission lines or rights-of-way disturbance (the existing transmission lines have sufficient capacity to carry the total output of existing NMP Unit 1 and Unit 2, as well as new NMP3NPP). (L)	Use existing transmission corridor maintenance policies and practices to protect terrestrial and aquatic ecosystems.
																New on-site transmission lines and facilities. (L) (TE)	Develop on-site transmission maintenance policies and practices and use site Resource Management Plan and Best Management Practices (BMPs) to protect and mitigate resources such as wetlands and surface water systems in vicinity.
5.1.3 Historic Properties and Cultural Resources																Disturbance of potentially eligible archaeological resources. (L)	Develop plan and procedures in consultation with the SHPO to manage historic/cultural resources.

Table 5.10-1—Summary of Measures and Controls to Limit Adverse Impacts During Operation

(Page 2 of 11)

Erosion/Sediment (ES)	Air Quality (AQ)	Wastes (WS)	Surface Water (SW)	Groundwater (GW)	Land Use (L)	Water Use & Quality (W)	Terrestrial Ecosystems (TE)	Aquatic Ecosystems (AE)	Socioeconomic (S)	Aesthetics (A)	Noise (N)	Traffic (T)	Radiation Exposure (R)	Other (site specific) (O)	Potential Impact Category and Description	Proposed Measures and Controls or Mitigating Circumstances
ER Section and Impact Summary																
5.2 Water-Related Impacts																
S			S	S		S		S								
5.2.1. Hydrologic Alterations and Plant Water Supply															Stormwater runoff from on-suite buildings, utilities and roads. (ES) (SW) (W) (AE)	Implement Stormwater Pollution Prevention Plan (SWPPP) including erosion and sediment plan as part of the NMP3NPP State Pollution Discharge Elimination System (SPDES) permit.
															Lake water withdrawal for closed-loop Circulating Water Supply System makeup, and Ultimate Heat Sink makeup. (SW) (W) (AE)	Install Best Available Technology (BAT) intake design. Will comply with Great Lakes Water Conservation and Management Act requirements.
															Impoundment and stream encroachment. (ES) (SW) (AE)	Develop new storm water impoundments and/or modify existing impoundments as part of plant construction.
5.2.2 Water Use Impacts.															Reduced navigational or recreational use. (W) (AE)	No effect on fisheries, navigation, or recreational use in the Lake is expected.
															Lake water withdrawal for closed-loop Circulating Water Supply System makeup and Ultimate Heat Sink makeup. (SW) (W)	Comply with Great Lakes Water Conservation and Management Act requirements.
															Reduction in available pervious (infiltration) areas. (SW) (GW)	Implement Spill Prevention, Control, and Countermeasures (SPCC) Plan.
															Impoundment and stream encroachment. (ES) (SW) (AE)	Develop new storm water impoundments and/or modify existing impoundments as part of plant construction.
															Release of fuel, oils, or other chemicals. (SW) (GW)	Implement Spill Prevention, Control, and Countermeasures (SPCC) Plan.
5.2.3 Water Quality Impacts															Effluent releases from plant Circulating Water Supply System, cooling tower, Wastewater Retention Basin and Wastewater Treatment Plant to Lake Ontario. (SW) (W) (AE)	Obtain NMP3NPP New York State Pollutant Discharge Elimination System (SPDES) permit and comply with effluent limitations.
															On-site erosion and sediment build up. (ES)	Implement Storm Water Pollution Prevention Plan (SWPPP), which includes sediment and erosion control.
															Release of fuel, oils, or other chemicals. (SW) (GW)	Implement Spill Prevention, Control, and Countermeasures (SPCC) Plan.

Table 5.10-1—Summary of Measures and Controls to Limit Adverse Impacts During Operation
(Page 3 of 11)

Erosion/Sediment (ES)	Air Quality (AQ)	Wastes (WS)	Surface Water (SW)	Groundwater (GW)	Land Use (L)	Water Use & Quality (W)	Terrestrial Ecosystems (TE)	Aquatic Ecosystems (AE)	Socioeconomic (S)	Aesthetics (A)	Noise (N)	Traffic (T)	Radiation Exposure (R)	Other (site specific) (O)
5.3 Cooling System Impacts														
	S			S			S	S		S				

ER Section and Impact Summary	Potential Impact Category and Description	Proposed Measures and Controls or Mitigating Circumstances
5.3.1 Intake System 5.3.1.1 Hydrodynamic Descriptions and Physical Impacts	Alteration of site hydrology. (GW)	Physical site characteristics such as rocky nature of bottom substrate and low intake velocities.
5.3.1 Intake System 5.3.1.2 Aquatic Ecosystems	Impingement increase. (AE)	Use BAT (Best Available Technology) intake design.
	Entrainment increase. (AE)	Use BAT (Best Available Technology) intake design.
5.3.2 Discharge System 5.3.2.1 Thermal Description and Physical Impacts	Ambient temperature increase. (AE)	Use closed-cycle system, incorporating a subsurface, multi-port diffuser.
5.3.2 Discharge System 5.3.2.2 Aquatic Ecosystems	Heat Shock. (AE)	Implement procedures that control rate of reduction of power for outages.
5.3.3 Heat-Discharge System 5.3.3.1 Heat Dissipation to the Atmosphere	Visible cooling tower plume. (AQ) (A)	Cooling tower modeling results show plumes occur in all directions, whose lengths and heights vary seasonally, but judged to have small impact and not require mitigation.
	Increase in ground-level fogging and icing. (AQ)	Cooling tower modeling results show that fogging and icing would occur for only a small percentage of the time and would occur most frequently on-site; no further controls warranted.
	Solids deposition from cooling tower drift. (TE) (A)	Cooling tower modeling results show solids deposition (assumed as salt) rates below NUREG-1555 significance level, without a drift eliminator in place; no further controls warranted.
	Plume (cloud) shadowing, humidity, and precipitation. (AQ) (A)	Cloud shadowing, humidity, and precipitation varies seasonally and is localized, having an anticipated small impact; no further controls warranted.

Table 5.10-1—Summary of Measures and Controls to Limit Adverse Impacts During Operation

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Erosion/Sediment (ES) Air Quality (AQ) Wastes (WS) Surface Water (SW) Groundwater (GW) Land Use (L) Water Use & Quality (W) Terrestrial Ecosystems (TE) Aquatic Ecosystems (AE) Socioeconomic (S) Aesthetics (A) Noise (N) Traffic (T) Radiation Exposure (R) Other (site specific) (O) **ER Section and Impact Summary**	**Potential Impact Category and Description**	**Proposed Measures and Controls or Mitigating Circumstances**
5.3.3 Heat-Discharge System 5.3.3.2 Terrestrial Ecosystem	Plant community (vegetation and trees) disturbance due to: fogging, high humidity, and icing, solids deposition (assumed as salt). (TE)	Natural vegetation is already adapted to frequent fogging, high humidity, and icing due to existing conditions, therefore, the new cooling tower has a small impact on the existing frequent fogging, high humidity, and icing. All vegetation exposed to deposition is at rates below NUREG 1555 significance level; no further controls warranted.
	Avian collisions with man-made structures. (TE) (A)	Lights on cooling towers expected to reduce the probability of collision by eagles or raptors.
5.3.4. Impacts to Members of the Public	Release of thermophilic bacteria from within the cooling system. (AE)	Appropriate biocide treatment of the Circulating Water System (CWS) will limit the propagation of thermophilic organisms.

Table 5.10-1—Summary of Measures and Controls to Limit Adverse Impacts During Operation
(Page 5 of 11)

ER Section and Impact Summary	Erosion/Sediment (ES)	Air Quality (AQ)	Wastes (WS)	Surface Water (SW)	Groundwater (GW)	Land Use (L)	Water Use & Quality (W)	Terrestrial Ecosystems (TE)	Aquatic Ecosystems (AE)	Socioeconomic (S)	Aesthetics (A)	Noise (N)	Traffic (T)	Radiation Exposure (R)	Other (site specific) (O)	Potential Impact Category and Description	Proposed Measures and Controls or Mitigating Circumstances
5.4 Radiological Impacts of Normal Operation		S						S	S					S			
5.4.1 Exposure Pathways																Liquid and gaseous pathway. (AQ) (TE) (AE) (R)	Comply with requirements and design to maintain dose ALARA. Implement radiological monitoring program, including groundwater.
																Direct radiation. (TE) (R)	Comply with requirements and design to maintain dose ALARA. Implement radiological monitoring program.
5.4.2 Radiation Doses to Members of the Public																Liquid and gaseous pathway. (AQ) (R)	Comply with requirements and design to maintain dose ALARA. Implement radiological monitoring program.
																Direct radiation. (R)	Comply with requirements and design to maintain dose ALARA. Implement radiological monitoring program.
5.4.3 Impacts to Members of the Public																Liquid and gaseous pathway. (AQ) (R)	Comply with requirements and design to maintain dose ALARA. Implement radiological monitoring program.
																Direct radiation. (R)	Comply with requirements and design to maintain dose ALARA. Implement radiological monitoring program.
5.4.4 Impacts to Biota Other than Members of the Public																Liquid and gaseous pathway. (TE) (AE) (R)	Comply with requirements and design to maintain dose ALARA. Implement radiological monitoring program.
																Direct radiation. (R)	Comply with requirements and design to maintain dose ALARA. Implement radiological monitoring program.

Table 5.10-1—Summary of Measures and Controls to Limit Adverse Impacts During Operation
(Page 6 of 11)

Erosion/Sediment (ES)	Air Quality (AQ)	Wastes (WS)	Surface Water (SW)	Groundwater (GW)	Land Use (L)	Water Use & Quality (W)	Terrestrial Ecosystems (TE)	Aquatic Ecosystems (AE)	Socioeconomic (S)	Aesthetics (A)	Noise (N)	Traffic (T)	Radiation Exposure (R)	Other (site specific) (O)	ER Section and Impact Summary	Potential Impact Category and Description	Proposed Measures and Controls or Mitigating Circumstances
															5.5 Environmental Impact of Waste		
	S	S	S			S		S									
															5.5.1 Nonradioactive Waste System Impacts	Solid waste generation, including hazardous waste and sewage sludge. (WS)	Reuse, recycle and reclaim solid waste and liquids as appropriate; otherwise, use approved transporters and off-site disposal facilities.
																Chemical and other pollutant discharges, including liquid and gaseous effluents. (WS) (AQ) (W) (AE)	Implement Chemical Control Program. Comply with applicable state and federal hazardous waste and air quality regulations. Comply with SPDES permit, including implementing a SWPPP and Best Management Practices (BMP)
															5.5.2 Mixed Waste Impacts	Chemical and radiation exposure. (WS) (SW) (W) (AE)	Implement Chemical Control Program. Implement storage, shipment and emergency response procedures.
																Accidental releases and cleanup. (SW) (W)	Implement Chemical Control Program. Implement storage, shipment and emergency response procedures.

Table 5.10-1—Summary of Measures and Controls to Limit Adverse Impacts During Operation
(Page 7 of 11)

ER Section and Impact Summary	Erosion/Sediment (ES)	Air Quality (AQ)	Wastes (WS)	Surface Water (SW)	Groundwater (GW)	Land Use (L)	Water Use & Quality (W)	Terrestrial Ecosystems (TE)	Aquatic Ecosystems (AE)	Socioeconomic (S)	Aesthetics (A)	Noise (N)	Traffic (T)	Radiation Exposure (R)	Other (site specific) (O)	Potential Impact Category and Description	Proposed Measures and Controls or Mitigating Circumstances
5.6 Transmission System Impacts								S			S	S			S		
5.6.1 Terrestrial Ecosystems																Effects from maintenance of off-site transmission lines and corridors. (TE) (O)	Existing off-site transmission lines and corridors will be used for the new unit; mitigation of potential impacts to off-site terrestrial ecosystems would be unchanged.
																Effects from maintenance of on-site transmission lines and corridors. (TE)	Implement on-site routine transmission system maintenance policy and procedures, including vegetation control, erosion control, and important species protection.
																Avian collisions with man-made structures. (TE) (A)	Lights on cooling towers expected to reduce the probability of collision by eagles or raptors.
5.6.2 Aquatic Ecosystems																Disturbance of on-site wetlands and streams in vicinity. (AE)	Use BMPs to protect resources, e.g., wetlands and streams.
																Disturbance to important aquatic species. (AE) (N)	Implement on-site routine transmission system maintenance policy and procedures, including vegetation control, erosion control, and important species protection.
																Effects from maintenance of on-site transmission lines and corridors. (AE)	Implement on-site routine transmission system maintenance policy and procedures, including vegetation control, erosion control, and important species protection.
5.6.3 Impacts to Members of the Public																Public exposure to noise, electric shock, and electric field gradients. (N)	On-site exposure expected to be similar or less than existing transmission system due to smaller on-site footprint and distance to public areas.

Table 5.10-1—Summary of Measures and Controls to Limit Adverse Impacts During Operation
(Page 8 of 11)

Erosion/Sediment (ES)	Air Quality (AQ)	Wastes (WS)	Surface Water (SW)	Groundwater (GW)	Land Use (L)	Water Use & Quality (W)	Terrestrial Ecosystems (TE)	Aquatic Ecosystems (AE)	Socioeconomic (S)	Aesthetics (A)	Noise (N)	Traffic (T)	Radiation Exposure (R)	Other (site specific) (O)	Potential Impact Category and Description	Proposed Measures and Controls or Mitigating Circumstances
ER Section and Impact Summary																
5.7 Uranium Fuel Cycle																
	S		S		S	S								S		
															Uranium mining and milling. (L) (R) (W) (AQ) (SW) Production of uranium conversion. (L) (R) (W) (AQ) (SW) Transportation of radioactive materials. (R) (O) Management of low- and high-level radioactive wastes. (R)	Note: Proposed Measures and Controls apply to all marked impact categories. Comparison of the U.S. EPR reactor, which was normalized for a reference 1,000 MWe LWR, to Table S-3 values, (Table 5.7-1) shows that the impacts evaluated (land use, water use, fossil fuels, chemical effluents, radioactive effluents and wastes, occupational exposure, and transportation), would all be minor and require no further controls. Possible use of centrifuge process in lieu of gaseous diffusion process, which significantly reduces energy use and resultant environmental effects.

Table 5.10-1—Summary of Measures and Controls to Limit Adverse Impacts During Operation

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Erosion/Sediment (ES)	Air Quality (AQ)	Wastes (WS)	Surface Water (SW)	Groundwater (GW)	Land Use (L)	Water Use & Quality (W)	Terrestrial Ecosystems (TE)	Aquatic Ecosystems (AE)	Socioeconomic (S)	Aesthetics (A)	Noise (N)	Traffic (T)	Radiation Exposure (R)	Other (site specific) (O)	Potential Impact Category and Description	Proposed Measures and Controls or Mitigating Circumstances
ER Section and Impact Summary																
5.8 Socioeconomic Impacts																
	S									S	S	S	S			
5.8.1 Physical Impacts															Noise increase due to: plant operation, including the switchyard, cooling tower operation, Local worker traffic and deliveries. (N) (S) (A) (T)	Minimal, if any, off-site audible operation noise is anticipated based on existing plant baseline noise survey results; no further controls warranted.
															Air emissions related to diesel generators. (AQ)	Compliance with applicable EPA and New York air quality regulations and permits
															Local traffic increase. (T) (N) (S)	Implement administrative traffic management procedures.
															Buildings visible, e.g., Intake and Discharge Structures, Containment, Cooling Tower, and related plume, (A) (AQ)	Limited visability of site from the east due to
5.8.2 Social and Economic Impacts															Operation work force increase. (S) (T) Public services need (housing, schools, EMS, land use) increase. (S) (T) Spending and tax revenue increase. (S)	Minor aggregate socioeconomic impacts inside Region of Influence anticipated (e.g., increase needs of schools, public services and facilities), but mitigation unnecessary due, in general, to sufficient capacity.
5.8.3 Environmental Justice Impacts															No disproportionate adverse impacts to minority or low-income populations. (S)	None necessary.

Table 5.10-1—Summary of Measures and Controls to Limit Adverse Impacts During Operation

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Erosion/Sediment (ES)	Air Quality (AQ)	Wastes (WS)	Surface Water (SW)	Groundwater (GW)	Land Use (L)	Water Use & Quality (W)	Terrestrial Ecosystems (TE)	Aquatic Ecosystems (AE)	Socioeconomic (S)	Aesthetics (A)	Noise (N)	Traffic (T)	Radiation Exposure (R)	Other (site specific) (O)		
ER Section and Impact Summary															**Potential Impact Category and Description**	**Proposed Measures and Controls or Mitigating Circumstances**
5.9 Decommissioning																
	S					S	S	S	S		S	S	S			
															Radiation exposure related to on-site decommissioning activities and transport of waste materials to disposal sites. (R) (T) (N)	Radiation exposure anticipated to be comparable or less than during operation per NUREG-0586. Maintain dose ALARA.
															Socioeconomic effects due to demands on and contributions to the community by workers. (S) (N)	Socioeconomic effects less than during plant construction or operation because level of activity and releases are expected to be smaller per NUREG-0586; no controls warranted.
															Environmental effects due to ecology, air quality, and water quality. (AQ) (W) (TE) (AE)	Environmental effects less than during operation because level of activity and releases are expected to be smaller per NUGREG-0586. Comply with the applicable regulatory requirements.

Table 5.10-1—Summary of Measures and Controls to Limit Adverse Impacts During Operation

(Page 11 of 11)

ER Section and Impact Summary	Erosion/Sediment (ES)	Air Quality (AQ)	Wastes (WS)	Surface Water (SW)	Groundwater (GW)	Land Use (L)	Water Use & Quality (W)	Terrestrial Ecosystems (TE)	Aquatic Ecosystems (AE)	Socioeconomic (S)	Aesthetics (A)	Noise (N)	Traffic (T)	Radiation Exposure (R)	Other (site specific) (O)	Potential Impact Category and Description	Proposed Measures and Controls or Mitigating Circumstances
5.11 Transportation of Radioactive Materials, Incident-Free														S			
																General public exposure to radiation during incident-free transport of fuel and wastes. (R) Worker exposure to radiation during incident-free transport of fuel and wastes. (R)	Performed detailed analysis in accordance with 10 CFR 51.52(b) (CFR, 2007b), yielding conservative results relative to the 3 mrem cumulative dose per reactor year for 1,100 public onlookers and transport workers. No further controls warranted.tive to the 4 mrem cumulative dose per reactor year for 200 transport workers.
5.12 Non-radiological Health Impacts		S										S			S		
																Public exposure to air emissions, dust, noise, pathogenic organisms, and electric shock. (O) (AQ) (N)	Comply with federal and state air quality requirements or permits.
																Occupational accidents or illnesses from exposures to noise, toxic chemicals or organisms. (AQ) (N) (O)	Implement site-wide Safety and Medical Program, including safety policies, safe work practices, as well as general and topic-specific training.

5.11 TRANSPORTATION OF RADIOACTIVE MATERIALS

The NRC evaluated the environmental effects of transportation of fuel and waste for light water reactors in the Environmental Survey of Transportation of Radioactive Materials to and from Nuclear Plants (AEC, 1972) and Environmental Survey of Transportation of Radioactive Materials to and from Nuclear Power Plants, Supplement 1 (NRC, 1975) and found the impacts to be small. These NRC analyses provided the basis for Table S-4 in 10 CFR 51.52 (CFR, 2007a) which summarizes the environmental impacts of transportation of fuel and radioactive wastes to and from a reference reactor.

The NRC regulations in 10 CFR 51.52 state that:

> Every environmental report prepared for a light-water-cooled nuclear power reactor shall contain a statement concerning transportation of fuel and radioactive wastes to and from the reactor. That statement shall indicate that the reactor and this transportation either meet all of the conditions in paragraph (a) of this section or all of the conditions in paragraph (b) of this section.

The U.S. EPR design varies from the conditions of 10 CFR 51.52(a). Specifically,

- The reactor has a core thermal power level exceeding 3,800 MWth,
- The reactor fuel has a uranium-235 enrichment that may exceed 4% by weight, and the uranium dioxide pellets are not encapsulated in zircaloy rods,
- The average level of irradiation of the irradiated fuel from the reactor will exceed 33,000 MWd/MTU.

Fuel cladding and heat are discussed in separate sections. Traffic density and dose are discussed in the same section since the calculation of dose is a function of traffic density.

The impact of shipment weight as described in Table S-4 is governed by other restrictions and is unaffected by the U.S. EPR variation from 10 CFR 51.52(a). Table 5.11-1 presents information from Table S-4 of 10 CFR 51.52 (CFR, 2007a).

5.11.1 FUEL CLADDING ENVIRONMENTAL IMPACT

10 CFR 51.52 describes the use of Zircaloy as fuel rod cladding material. More recently, the NRC has also specified, through rule-making, ZIRLO as an acceptable fuel cladding in 10 CFR 50.46 (CFR, 2007b). NMP3NPP will use AREVA's M5 Advanced Zirconium (M5) fuel rod cladding material.

Several NRC licensees have received approval to use M5 fuel rod cladding with a finding of "no significant impact." For example, NRC approved Davis-Besse Nuclear Power Station, Unit 1 use of M5 cladding, and concluded that the cladding presents no significant environmental impact during transportation (FR, 2000):

> With regard to the potential environmental impacts associated with the transportation of the M5 clad fuel assemblies, the advanced cladding has no impact on previous assessments determined in accordance with 10 CFR 51.52.

Further, in 2003, the NRC found M5 fuel rod cladding generally acceptable for use in license applications by compliance with the conditions specified in, and reference to AREVA's Topical Report (TR) (NRC 2003):

> The staff has completed its review of the subject TR and finds it is acceptable for referencing in licensing applications to the extent specified and under the limitations delineated in the report and in the associated safety evaluation (SE).

As described above, the use of M5 fuel cladding has been previously evaluated and determined to not result in significant transportation environmental impact at existing facilities. The use of M5 fuel cladding at NMP3NPP will be equivalent to the M5 fuel cladding previouNMP3NPPsly evaluated at the existing facilities. Therefore it is concluded that the use of M5 cladding at NMP3NPP will result in no environmental impact during transportation.

5.11.2 HEAT (IRRADIATED FUEL CASK IN TRANSIT) ENVIRONMENTAL IMPACT

This section addresses the decay heat generated in irradiated fuel casks during shipment to a repository.

An irradiated fuel cask has not yet been designed for U.S. EPR fuel; however in NUREG-1811, NUREG-1815, and NUREG-1817 the NRC described and addressed future irradiated fuel casks that may carry up to 1.8 MTU (4000 lbs U) (NRC, 2004; NRC, 2006a; and NRC, 2006b).

Each U.S. EPR fuel assembly contains up to 0.536 MTU (1200 lbs U). ORIGEN2.1 was used to calculate the decay heat from an U.S. EPR fuel assembly using the information provided in Table 5.11-7 (ORNL, 1991). Based on these calculations, an U.S. EPR irradiated fuel assembly will generate 5500 Btu/hr (1.6 kW) of decay heat following 5 years of on-site storage after removal from the reactor core (Table 5.11-2).

Therefore, an irradiated fuel cask designed consistent with that described in the referenced NUREGs could carry up to 3.36 irradiated assemblies (1.8 MTU / 0.536 MTU/assembly.) The total cask decay heat generation would then be 18,600 Btu/hr (5450 kW) (3.36 assemblies times 5500 Btu/hr per assembly.)

10 CFR 51.52(c), Table S-4 (CFR, 2007c) concludes that heat generation of up to 250,000 Btu/hr (73 kW) within a cask is an acceptable environmental impact. This is more than 13 times that which would be generated in a cask transferring the calculated quantity of U.S. EPR irradiated fuel.

An alternative analysis is to assess the maximum number of irradiated fuel assemblies per cask that could be shipped while complying with the 250,000 Btu/hr (73 kW) condition in Table S-4. This method addresses future potential cask designs that could be used to transport greater numbers of assemblies per cask.

The maximum number of U.S. EPR irradiated fuel assemblies based on this evaluation would be 45 assemblies (250,000 Btu/hr / 5500 Btu/hr per assembly). The largest postulated irradiated fuel transfer cask designs have capacities of about half this number and their use for transportation of irradiated U.S. EPR fuel would result in proportionally lower heat generation, well below the Table S-4 value (NRC, 2000b).

Therefore, the decay heat generated by the U.S. EPR fuel per irradiated fuel cask in transit is bounded by 10 CFR 51.52(c), Table S-4 and will not result in significant environmental effects during transportation under normal conditions.

5.11.3 INCIDENT-FREE DOSE AND TRAFFIC DENSITY IMPACT ANALYSIS

This section summarizes the incident-free transportation environmental impacts during normal operations for NMP3NPP. Transportation categories include;

- Transport of unirradiated fuel (new fuel) from fuel fabrication facilities to the site,
- Transport of irradiated fuel from the site to a monitored retrievable storage facility or permanent repository, and
- Transport of radioactive waste

TRAGIS (ORNL, 2003) and RADTRAN (SNL, 2006) computer codes were used to evaluate postulated incident-free dose. Code inputs for each category are presented in Table 5.11-3. The results are summarized in Table 5.11-5 and Table 5.11-6.

The results presented in Table 5.11-6 provide a comparison to the reference reactor using an analysis that is consistent with the methodology used previously in the Environmental Impact Statements NUREG-1811, NUREG-1815, and NUREG-1817 (NRC, 2004; NRC, 2006a; and NRC, 2006b).

5.11.3.1 Impact of Unirradiated Fuel (New Fuel)

The radiological dose for the environmental impacts of incident-free new fuel shipments to the reactor site was calculated from the farthest (most conservative) currently existing new fuel fabrication facility near Richland, WA to the NMPNS site.

RADTRAN 5.6 was used to model the NMP3NPP location specific environmental impact. The model used TRAGIS (ORNL, 2003) generated NMP3NPP location specific route data to yield dose per shipment. The postulated stop duration was 6.0 hours based on the TRAGIS calculated 2650 mi (4265 km) commercial highway route distance and the 0.0023 hr/mi (0.0014 hr/km), consistent with the stop model assumption used in NUREG-1811, NUREG-1815, and NUREG-1817 (NRC, 2004; NRC, 2006a; and NRC, 2006b).

The RADTRAN 5.6 model calculated radiological impact results per shipment are shown in Table 5.11-3.

The dose per shipment was multiplied by the average number of annual shipments to calculate the average dose per reactor year. New fuel shipments during the life of a reactor are expected to total 298 over the 40 year license period for an average of 7.5 shipments per reactor year. This is consistent with the condition described in Table S-4, which indicates that less than one shipment will occur per day.

At an average of 7.5 shipments per year, the average annual radiological impact from new fuel shipments will be as shown in Table 5.11-6.

5.11.3.2 Impact of Irradiated Fuel

The postulated radiological dose from the incident-free shipment of irradiated fuel from the reactor site to the proposed Yucca Mountain Repository located in Nevada was evaluated by multiplying conservative dose estimates per shipment by the average annual number of shipments.

A RADTRAN 5.6 model was developed using TRAGIS Highway Route Controlled Quantity distance and demographic data specific to the reactor site. Model conservatism is similar to that found in the irradiated fuel RADTRAN 5 models from NUREG-1811, NUREG-1815, and NUREG-1817 (NRC, 2004; NRC, 2006a; and NRC, 2006b). The bounding commercial route distance calculated with TRAGIS was approximately 2619 mi (4215 km) with stop duration of 5.0 hours.

The RADTRAN 5.6 model conservatively calculated radiological impact results per shipment are presented in Table 5.11-3.

Shipping cask capacity assumptions are approximations based on current shipping cask designs. The U.S. EPR will require an average of 21 shipments of irradiated fuel per year assuming an irradiated fuel cask capacity of 1.8 MTU (4000 lbs U) consistent with NUREG-1811, NUREG-1815, and NUREG-1817 (NRC, 2004; NRC, 2006a; and NRC, 2006b) and using the highest annual reload for the U.S. EPR of 37.5 MTU (83,000 lbs U), This is consistent with the condition described in Table S-4 of less than 1 shipment per day.

The postulated average annual radiological impact from an average of 21 irradiated fuel shipments per year to the proposed Yucca Mountain Repository is provided in Table 5.11-5.

5.11.3.3 Impact of Radioactive Waste (Radwaste)

The transportation dose of the incident-free radwaste shipments from the reactor site was calculated using the same RADTRAN 5.6 inputs and assumptions as described in 5.11.3.2 above including a bounding disposal location for the NMP3NPP site. TRAGIS was used to evaluate the highway route to the Hanford, WA commercial low level waste disposal repository. This site is currently not available to New York waste generators, but was used because it is bounding (farthest distance) compared to other existing disposal and processing sites. Other sites evaluated were Clive, UT; Beatty, NV; Barnwell, SC; and processors near Oak Ridge and Memphis, TN.

Using the same input parameters as the irradiated fuel model ensured a conservative model and is justified by the similar route demographics and conservatively chosen maximum package and vehicle surface dose rates.

The bounding commercial route distance calculated with TRAGIS was approximately (2661 mi (4283 km) with stop duration of 5.0 hours.

The RADTRAN 5.6 conservatively calculated radiological impact results per shipment are provided in Table 5.11-3.

The U.S. EPR average of 15 radwaste shipments per year was derived using current shipping container volume estimates of 55-gallon (0.21 m^3) drums and 90 ft3 (2.55 m^3) high integrity containers for process wastes and 1000 ft3 (28.32 m^3) SEALAND containers for dry active waste, similar to the analyses in NUREG-1811, NUREG-1815, and NUREG-1817 (NRC, 2004; NRC, 2006a; and NRC, 2006b). Commercially available containers were matched to the appropriate waste type to determine the total number of containers generated per year. The number of shipments was then determined by dividing the number of containers postulated to be generated by an assumed number of containers that can be transferred per shipment. Table 5.11-4 shows the U.S. EPR container generation rates, realistic container per shipment assumptions, and the subsequent annual number of shipments. The calculated 15 shipments per year is consistent with the condition in Table S-4 which describes less than one shipment per day.

At this average of 15 shipments per year, the average annual radiological impact from radwaste shipments to the bounding disposal site is shown in Table 5.11-5.

5.11.3.4 Comparison with Table S-4 and Conclusion

Table 5.11-6 summarizes the incident-free transportation environmental impacts per reactor year. The table included consideration of:

- Transport of unirradiated fuel (new fuel) from fuel fabrication facilities to the reactor site,
- Transport of irradiated fuel from the reactor site to a monitored retrievable storage facility or permanent repository, and
- Transport of radioactive waste (radwaste) from the reactor site to off-site disposal facilities

The cumulative doses shown in Table 5.11-5 were calculated based on the product of thousands of potentially exposed individuals and the very low doses that each of the could receive.

Although radiation may cause cancers at high doses and high dose rates, currently there are no data that unequivocally establish the occurrence of cancer following exposure to low doses below about 10 rem (100 mSv) or at low dose rates. The individual doses and dose rates calculated to occur during normal transportation are many orders of magnitude less than either of these.

Radiation protection experts conservatively assume that any amount of radiation exposure may pose some risk of causing cancer or a severe hereditary effect and that the risk is higher for higher radiation exposures. I.e., linear, no-threshold dose response model is used to describe the relationship between radiation dose and detriments such as cancer induction. This model has been accepted as a conservative model for estimating health risks from radiation exposure, recognizing that the model probably over-estimates those risks.

The NRC staff estimates the risk to the public from radiation exposure using the nominal probability coefficient for total detriment of 730 fatal cancers, nonfatal cancers, and severe hereditary effects per 1,000,000 person-rem (10,000 person-Sv) from ICRP Publication 60 (ICRP, 1991).

All the population doses presented in Table 5.11-5 are less than 100 person-rem/yr (one person-Sv/yr); therefore, the total detriment estimates associated with these postulated doses would all be less than 0.1 fatal cancers, nonfatal cancers, and severe hereditary effects per year.

These risks are very small compared to the fatal cancers, nonfatal cancers, and severe hereditary effects that would occur annually in the same population from exposure to natural sources of radiation.

Based on this the environmental impacts during normal transportation environmental do not represent a significant environmental impact.

5.11.4 SUMMARY AND CONCLUSION

The use of M5 cladding has been previously evaluated and determined not to result in significant environmental impact during normal conditions of transportation.

A conservative and detailed analysis of the environmental impacts for the transportation of unirradiated fuel, irradiated fuel, and radioactive waste to and from NMP3NPP has been performed in accordance with 10 CFR 51.52(b) (CFR, 2007c). The use of M5 cladding has been previously evaluated and determined not to result in significant environmental impact during normal conditions of transportation. The decay heat generated by U.S. EPR fuel in transit is bounded by 10 CFR 51.52(c), Table S-4 (CFR, 2007c) and will not result in significant environmental effects during transportation under normal conditions. The dose and traffic impact analysis of the incident free transportation of U.S. EPR fuel and radioactive waste generated at the new facility will not result in significant environmental effects during transportation under normal conditions.

Based on this, the U.S. EPR design variation from the conditions of 10 CFR 51.52(a) will not result in significant environmental effects during transportation activities associated with the operation of NMP3NPP. As a result, the impacts would be SMALL.

5.11.5 REFERENCES

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CFR, 2007b. Title 10, Code of Federal Regulations, Part 50.46, Acceptance Criteria for Emergency Core Cooling Systems for Light-Water Nuclear Power Reactors, 2007.

CFR, 2007c. Title 10, Code of Federal Regulations, Part 51.52, Environmental Effects of Transportation of Fuel and Waste - Table S-4, 2007.

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SNL, 2006. RADCAT 2.3 User Guide. SAND2006-6315, Sandia National Laboratories, R. Weiner, D. Osborn, G. Mills, D. Hinojosa, T. Heames, and D. Orcutt, 2006.

Table 5.11-1—Summary of Environmental Impacts of Transportation of Fuel and Waste to and from One Light Water Reactor, taken from 10 CFR 51.52 Table S-4

Normal Conditions of Transport			
		Environmental Impact	
Heat (per irradiated fuel cask in transit)		250,000 Btu/hr (73 kW)	
Weight (governed by Federal or State Restrictions)		73,000 lbs. (33,000 kg) per truck; 100 tons (91 MT) per cask per rail car	
Traffic Density			
Truck		Less than 1 per day	
Rail		Less than 3 per month	
Exposed Population	Estimated Number of Persons Exposed	Range of Doses to Exposed Individuals (per reactor year)	Cumulative Dose to Exposed Population (per reactor year)
Transportation Workers	200	0.01 to 300 mrem (1e-4 to 3 mSv)	4 person rem (40 mSv)
General Public			
Onlookers	1,100	0.003 to 1.3 mrem (0.03 to 13 µSv)	3 person rem (30 mSv)
Along Route	600,000	1E-4 to 6E-2 mrem (1E-3 to 0.6 µSv)	No number provided in 10 CFR 51.52 Table S-4

Table 5.11-2—Decay Heat for EPR Irradiated Fuel Assembly

Decay Time (year)	Decay Heat per Assembly (Btu/hr)			
	GWd/MTU 62(1)	GWd/MTU 52(2)	GWd/MTU 40(1)	GWd/MTU 10(1)
4.75	7.32E+03		4.01E+03	9.17E+02
5.00	7.09E+03	5.52E+03	3.88E+03	8.83E+02
6.34	5.89E+03		3.17E+03	6.95E+02

Notes:

1: Linear regression used to determine 5 year decay heat at 62, 40, 10 (GWd/MTU).
2: Polynomial Regression used to determine 52 GWd/MTU decay heat at 5 years:
(5.52E+03 = 0.896*(52)^2+54.96*(52)+243)

Table 5.11-3—RADTRAN & TRAGIS Model Input Parameters

Parameter	New Fuel	Spent Fuel	Radwaste
TRAGIS Input:			
Route Mode	Commercial	HRCQ	Commercial
Route Origin	Richland, WA	NMP	NMP
Route Destination	NMP	Yucca Mt, NV	Hanford, WA
RADTRAN Input from TRAGIS:			
Total Shipping Distance, km (mi)	4264.7 (2650.0)	4215.0 (2619.1)	4282.8 (2661.2)
Travel Distance - Rural, km (mi)	3276.3 (2035.8)	3232.6 (2008.6)	3274.3 (2034.6)
Travel Distance - Suburban, km (mi)	877.1 (545.0)	874.8 (543.6)	879.0 (546.2)
Travel Distance - Urban, km (mi)	111.6 (69.3)	107.9 (67.0)	129.9 (80.7)
Population Density - Rural, person/km^2 (person/mi^2)	11.7 (30.3)	11.4 (29.5)	11.6 (30.0)
Population Density – Suburban, person/km^2 (person/mi^2)	308.5 (799.0)	311.1 (805.7)	322.8 (836.0)
Population Density - Urban, person/km^2 (person/mi^2)	2417.1 (6260.3)	2349.2 (6084.4)	2427.9 (6288.2)
Stop Time, hr/trip	6.0 [(b)]	5.0 [(c)]	5.0 [(d)]
RADTRAN Input from NRC Models [(a)]			
Vehicle Speed, km/hr (mi/hr)	88.49 (55.0)	88.49 (55.0)	88.49 (55.0)
Traffic Count - Rural, vehicles/hr	530	530	530
Traffic Count - Suburban, vehicles/hr	760	760	760
Traffic Count - Urban, vehicles/hr	2400	2400	2400
Dose Rate at 1-m from Vehicle, mSv/hr (mRem/hr)	0.001 (0.1)	0.14 (14)	0.14 (14)
Packaging Length, m (ft)	7.3 (23.9)	5.2 (17.1) [(e)]	5.2 (17.1)
Number of Truck Crew	2	2	2
Population Density at Stops (radii: 1-10m (3.3-32.8ft)), person/km^2 (person/mi^2)	64300 (166536)	30000 (77699.6)	30000 (77699.6)
Population Density at Stops (radii: 10-800m (32.8-2624ft)), person/km^2 (person/mi^2)	NA	340 (880.6)	340 (880.6)
Shielding Factor at Stops (radii: 1-10m (3.3--32.8ft))	1	1	1
Shielding Factor at Stops (radii: 10-800m (32.8-2624ft))	NA	0.2	0.2

Notes:

(a) Fron NUREG 1815
(b) Based on 0.0014 - hour / km,
(c) Based on TRAGIS output: 10 stops at 30 minutes each.
(d) Based on TRAGIS output: 10 stops at 30 minutes each.
(e) Cylinder of 1-m (3.3-ft) diameter

Table 5.11-4—Annual EPR Solid Radioactive Waste

Waste Type	Annual Max Quantity ft^3 (m^3)	Container Internal Volume ft^3 (m^3)	Maximum Number of Containers	Containers per Shipment[(d)]	Number of Shipments[(d)]
Evaporator Concentrates	140 (4.0)	7.3[(a)] (0.21)	19.2	40	1
Spent Resins (other)	90 (2.5)	90[(b)] (2.55)	1.0	1	1
Spent Resins (Rad Waste Demineralizer System)	140 (4.0)	90[(b)] (2.55)	1.6	1	2
Wet Waste from Demineralizers	8 (0.2)	90[(b)] (2.55)	0.1	1	1
Waste Drum for Solids Collection from Centrifuge System	8 (0.2)	7.3[(a)] (0.21)	1.1	40	1
Filters (quantity)	120 (3.4)	90[(b)] (2.55)	1.3	1	2
Sludge	35 (1.0)	90[(b)] (2.55)	0.4	1	1
Mixed Waste	2 (0.1)	7.3[(a)] (0.21)	0.3	40	1
Non-Compressible Dry Active Waste (DAW)	70 (2.0)	1000[(c)] (28.32)	0.1	1	1
Compressible DAW	1415 (40.1)	1000[(c)] (28.32)	1.4	2	1
Combustible DAW	5300 (150.1)	1000[(c)] (28.32)	5.3	2	3
Overall Totals	**7328 (208)**				**15**

Notes:

First two columns from Section 3.5, Table 3.5-10
(a) 7.3 ft^3, 55 gallon drum.
(b) 90 ft^3, medium size container such as an 8 to 120 HIC.
(c) 1000 ft^3, 20 ft. SEALAND container.
(d) Assumed based on container volumes and max number of caontainers that can be transferred per shipment,

Table 5.11-5—Evaluated Transportation Dose per Shipment Under Normal Conditions

New Fuel Shipment		
Exposed Population	**Dose per Shipment**	
Transportation Workers[a]	2.27E-05 person-Sv	2.27E-03 person-rem
General Public:		
Onlookers[b]	8.85E-05 person-Sv	8.85E-03 person-rem
Along Route[c]	2.06E-06 person-Sv	2.06E-04 person-rem
Irradiated Fuel		
Exposed Population	**Dose per Shipment**	
Transportation Workers	1.02E-03 person-Sv	1.02E-01 person-rem
General Public:		
Onlookers	3.51E-03 person-Sv	3.51E-01 person-rem
Along Route	9.47E-05 person-Sv	9.47E-03 person-rem
Radwaste		
Exposed Population	**Dose per Shipment**	
Transportation Workers	1.03E-03 person-Sv	1.03E-01 person-rem
General Public:		
Onlookers	3.52E-03 person-Sv	3.52E-01 person-rem
Along Route	9.89E-05 person-Sv	9.89E-03 person-rem

Notes:

(a) Crew dose
(b) On link plus Stop dose
(c) off link dose

Table 5.11-6—Summary of Annual Transportation Radiological Dose Impact for the EPR

		New Fuel	Irradiated Fuel	Radwaste	Total	S-4
Worker Dose	person-Sv (person-rem)	1.7E-04 (1.7E-02)	2.1E-02 (2.1E+00)	1.6E-02 (1.6E+00)	3.7E-02 (3.7E+00)	4.0E-02 (4.0E+00)
Public, Onlooker Dose	person-Sv (person-rem)	6.6E-04 (6.6E-02)	7.4E-02 (7.4E+00)	5.3E-02 (5.3E+00)	1.3E-01 (1.3E+01)	3.0E-02 (3.0E+00)
Public, Along Route Dose	person-Sv (person-rem)	1.6E-05 (1.6E-03)	2.0E-03 (2.0E-01)	1.5E-03 (1.5E-01)	3.5E-03 (3.5E-01)	3.0E-02 (3.0E+00)

Table 5.11-7—ORIGEN2.1 Decay Heat Input Parameters for EPR Irradiated Fuel

PARAMETER		VALUE
US EPR core thermal power for design-basis applications	Nominal	4590 MWt
	Measurement Uncertainty	22 MWt (0.48%)
	Total (design-basis)	4612 MWt
Number of fuel assemblies in core		241
Fuel enrichment		5 $^{w}/_{o}$ U-235
Mass of U metal in fuel assembly		535.917 kg
Total mass of U metal in core		1.2916E+05 kg
Fuel isotopic composition (based on ORNL/TM-12294/V4)	U-234	4.423E-02 $^{w}/_{o}$
	U-235	5.000E+00 $^{w}/_{o}$
	U-236	2.300E-02 $^{w}/_{o}$
	U-238	9.493E+01 $^{w}/_{o}$
	Total	1.00E+02 $^{w}/_{o}$
Irradiation time interval	5 GWd/MTU	140.026 days
Irradiation times to yield the selected burnups	10 GWd/MTU	280.05 days
	40 GWd/MTU	1120.21 days
	62 GWd/MTU	1736.32 days
Decay time array		0 to 1.0E+09 sec (31.69 yrs)
Computer code and cross-section libraries (RSIC CCC-371, and ORNL/TM-11018)		ORIGEN-2.1 PWRUE

5.12 NONRADIOLOGICAL HEALTH IMPACTS

5.12.1 PUBLIC HEALTH

Nonradiological health impacts and risks to members of the public due to operation of the new power plant and associated new transmission lines are those previously identified.

The impacts to the public from pathogenic organisms in the heated effluent from the plant are addressed in Section 5.3.4, "Impacts to Members of the Public (Cooling System Impacts)".

The impacts to the public from operation of the transmission system due to induced currents in metal fences and vehicles beneath transmission lines are addressed in Section 5.6.3, "Impacts to Members of the Public (Transmission System Impacts).

The impacts and risks due to the transport of nonradiological air emissions and dust and noise propagation off-site through the atmosphere to nearby residences and businesses are addressed in Section 5.8.1 "Physical Impacts of Station Operations".

5.12.2 OCCUPATIONAL HEALTH

Personnel at an operational power generation unit could be susceptible to industrial accidents (e.g., falls, electric shock, burns), or occupational illnesses due to noise exposure, exposure to toxic or oxygen replacing gases, exposure to thermophilic organisms in the condenser bays, and other caustic agents.

During the operations phase of NMP3NPP a safety and medical program with associated personnel to promote safe work practices and respond to occupational injuries and illnesses will be provided. The safety and medical program will utilize an industrial safety manual providing a set of work practices with the objective of preventing accidents due to unsafe conditions and unsafe acts. These safe work practices address hearing protection, confined space entry, personal protective equipment, respiratory protection, heat stress, electrical safety, excavation and trenching, scaffolds and ladders, fall protection, chemical handling, storage, and use, and other industrial hazards. The safety and medical program provides for employee training on safety procedures. Site safety and medical personnel are provided to handle industrial accidents and occupational illnesses.

The Bureau of Labor Statistics maintains records of a statistic known as total recordable cases (TRC), which are a measure of work-related injuries or illnesses that include death, days away from work, restricted work activity, medical treatment beyond first aid, and other criteria. The incidence rate of recordable cases at NMPNS for its workforce (excluding outage on-site workers) for 2005 through 2007, as calculated from OSHA documentation, averaged 0.16 cases per 100 workers or 0.16%. This compares favorably to the nationwide TRC rate for electrical power generation workers of 3.1% nationwide (BLS, 2008A) and to the State of New York for electrical power generation, transmission, and distribution workers of 3.4% (BLS, 2008B). It is estimated that 363 on-site employees would be added for NMP3NPP. An additional workforce of up to 1000 workers is estimated during a 15-day period once every 18 months to support plant outages.

The number of total recordable cases per year for NMP3NPP can be estimated as the number of workers times the TRC rate. The estimated TRC incidences would be:

Number of Workers	TRC Incidence at US Rate	TRC Incidence at NY Rate	TRC Incidence at NMPNS Rate
363 (normal)	11	12	2
1000 (outage)	1 (per outage event)	1 (per outage event)	NA

The estimated total recordable cases for the operations workforce based on the rate for NMP Unit 1 and Unit 2 shown in Table 5.12-1 is well under the U.S. and State of New York rates, showing that NMPNS's safety program is effective. This same program would be used to guide safe operations at the proposed unit to ensure that employees work in a safe manner and recordable cases are prevented as much as possible.

5.12.3 REFERENCES

BLS 2008a. Table 1, Incidence rates of nonfatal occupational injuries and illnesses by industry and case types, 2006, Bureau of Labor Statistics, Website: http://www.bls.gov/iif/oshwc/osh/os/ostb1765.pdf, Date accessed: March 25, 2008.

BLS 2008b. Table 6, Incidence rates of nonfatal occupational injuries and illnesses by industry and case types, 2006, New York, Bureau of Labor Statistics, http://www.bls.gov/iif/oshwc/osh/os/pr066ny.pdf, Date accessed: March 25, 2008.

Table 5.12-1—NMP Unit 1 and Unit 2 OSHA 300 Data

Year	Annual Average Employees	Total Hours Worked	Recordable Injuries	Incidence Rate
2007	950	2,312,367	4	0.346
2006	1,064	2,346,887	0	0
2005	1,100	2,642,574	2	0.151
Total	3,114	7,301,828	6	0.164