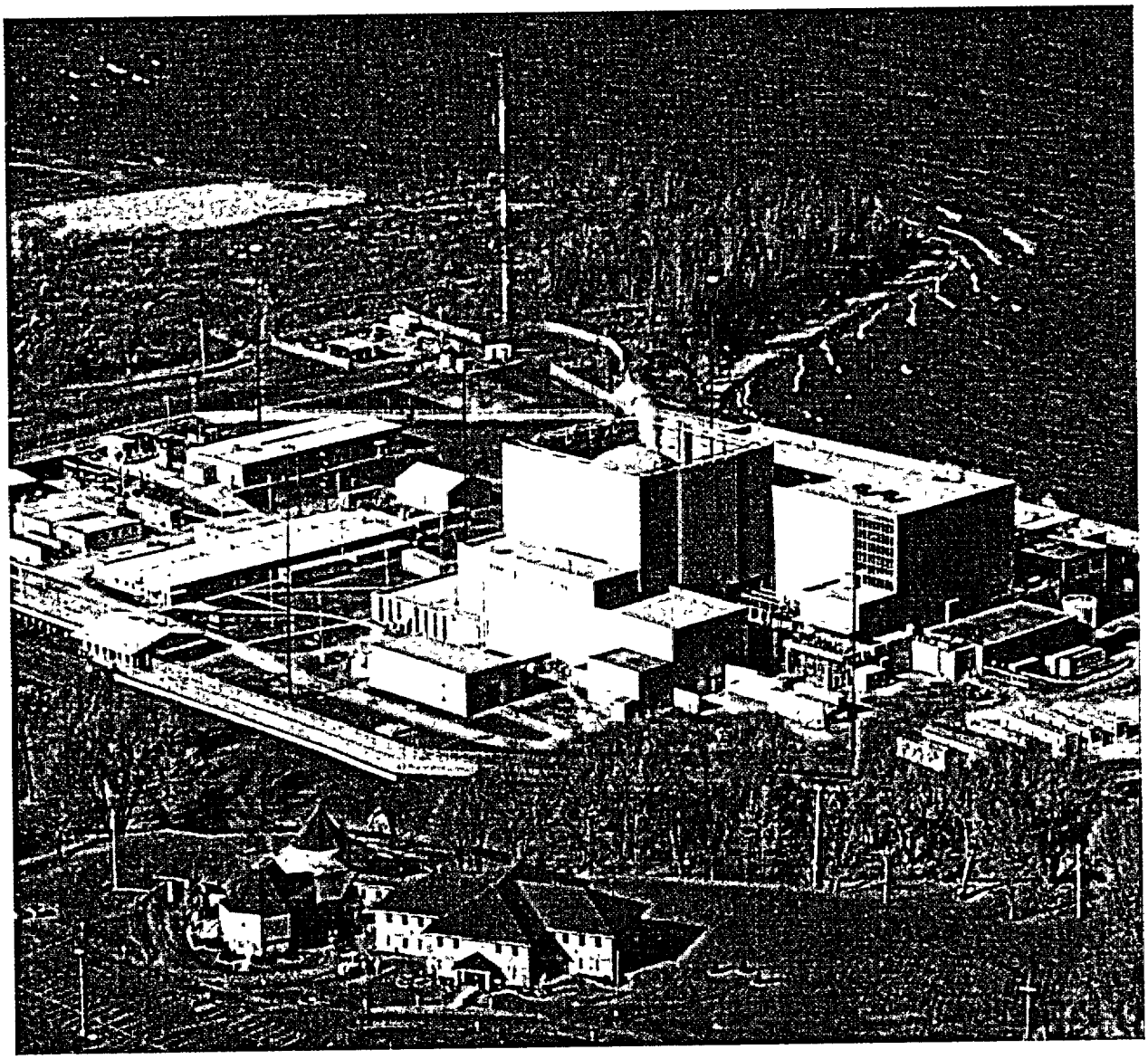
R. E. Ginna Nuclear Power Plant



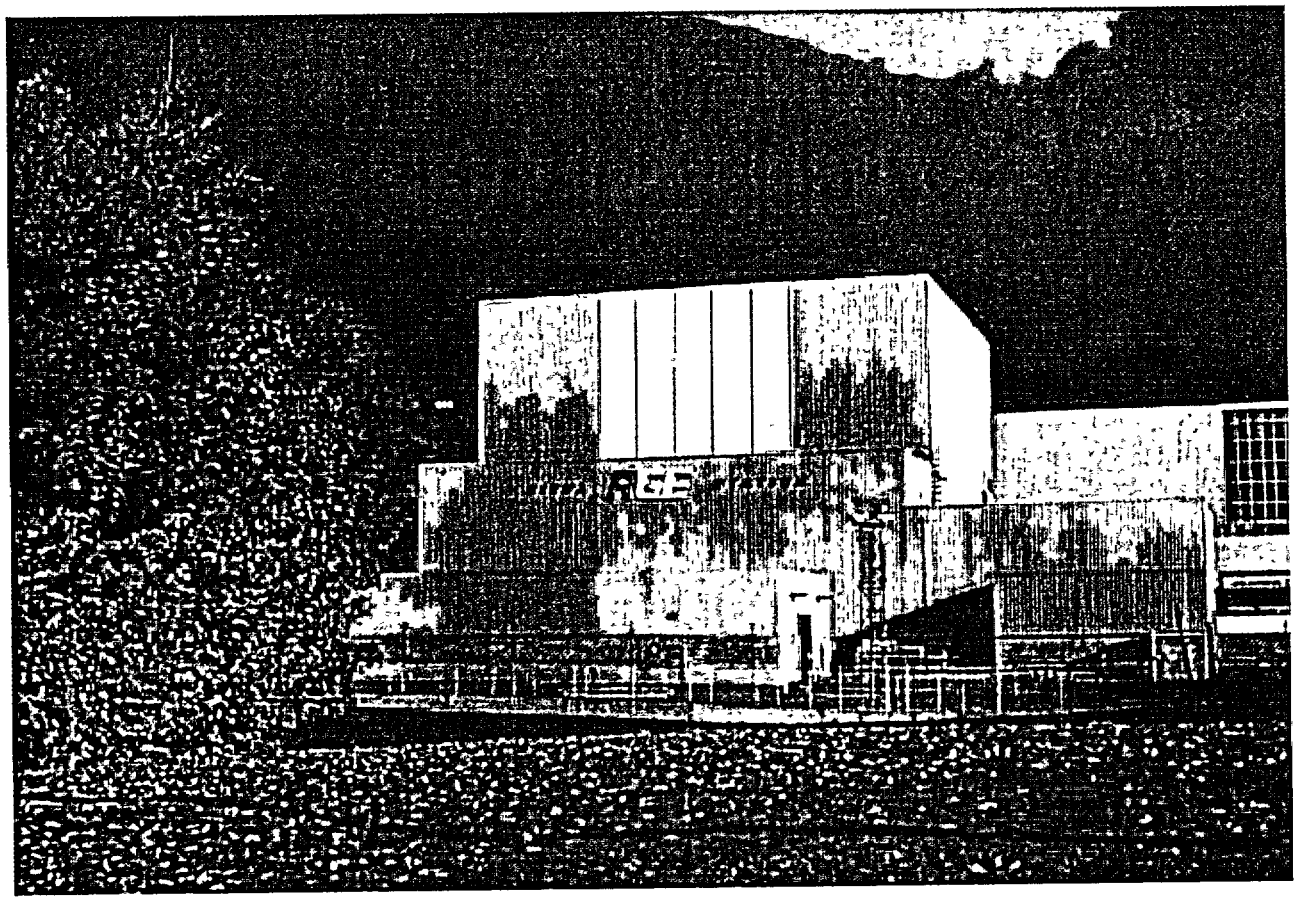
Application for Renewed Operating License

Volume 3

Appendix E – Environmental Report

RGE AND

APPLICATION FOR RENEWED OPERATING LICENSE



R. E. GINNA NUCLEAR POWER PLANT

APPENDIX E

(Provided as Linked Document)

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Acronyms and Abbreviations

%	percent
≤	less than or equal to
°F	degrees Fahrenheit
AC	alternating current
ACFB	atmospheric circulating fluidized bed
AEC	U.S. Atomic Energy Commission
AFW	auxiliary feedwater
AOCs	Areas of Concern
AOV	air-operated valve
AVT	all volatile treatment
BACT	best available control technology
Btu	British thermal unit(s)
Btu/hr	British thermal unit(s) per hour
CCW	component cooling water
CDF	core damage frequency
CEQ	Council on Environmental Quality
CFR	*Code of Federal Regulations*
CO	carbon monoxide
CO_2	carbon dioxide
CT	combustion turbine
CWA	Clean Water Act
DC	direct current
DG	diesel generator
DOE	U.S. Department of Energy
DSM	demand-side management
EPA	U.S. Environmental Protection Agency
ER	environmental report
ESCo	energy service company
FES	Final Environmental Statement
FR	*Federal Register*
FTR	failure to run
FTS	failure to start
F-V	Fussell-Vesely
FWS	U.S. Fish and Wildlife Service

Acronyms and Abbreviations (continued)

GEIS	*Generic Environmental Impact Statement for License Renewal of Nuclear Plants*
GLWQA	Great Lakes Water Quality Agreement
gpm	gallons per minute
GWh	gigawatt hour(s)
hp	horsepower
HRSG	heat recovery steam generator
IPE	Individual Plant Examination
ISLOCA	Interfacing System Loss-of-coolant Accident
JTU	Jackson Turbidity Unit(s)
kV	kilovolt(s)
kWh	kilowatt hour(s)
LAER	lowest achievable emission rate
lb/MMBtu	pound(s) per million British thermal units
LERF	large early release frequency
LOCA	loss-of-coolant accident
LOS	level of service
LSE	load-serving entity
m^2	square meter(s)
mA	milliampere(s)
MACCS	Melcor Accident Consequences Code System
MCWA	Monroe County Water Authority
mg/l	milligrams per liter
mgd	million gallons per day
MOV	motor-operated valve
msl	mean sea level
MW	megawatt(s)
MWC	Montezuma Wetlands Complex
MW(e)	megawatts (electric)
MW(t)	megawatts (thermal)
NA	not available; not applicable
NAAQS	national ambient air quality standards
NEPA	National Environmental Policy Act
NESC®	National Electric Safety Code®
NMFS	National Marine Fisheries Service

Acronyms and Abbreviations (continued)

No.	issue number
NO_2	nitrogen dioxide
NO_x	nitrogen oxide(s)
NOAA	National Oceanic & Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NSPS	new source performance standard(s)
NTU	Nephlometric Turbidity Unit(s)
NYCA	New York Control Area
NYISO	New York Independent System Operator
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSEG	New York State Electric and Gas
NYSEPB	New York State Energy Planning Board
NYSERDA	New York State Energy Research and Development Authority
NYSPSC	New York State Public Service Commission
NYSRC	New York State Reliability Council
OLER	Operating License Environmental Report
PM	particulate matter
PM_{10}	particulates less than 10 microns in diameter
PORV	power-operated relief valve
ppm	parts per million
PSA	probabilistic safety assessment
PSD	prevention of significant deterioration
psi	pounds per square inch
PWR	pressurized water reactor
RAW	Risk Achievement Worth
RCS	reactor coolant system
Ref.	Reference
RG&E	Rochester Gas and Electric Corporation
RGS	RGS Energy Group, Inc.
RHR	risidual heat removal
ROW	right(s)-of-way
RWST	refueling water storage tank

Acronyms and Abbreviations (continued)

SAFW	standby auxiliary feedwater pump (if this was deleted)
SAMA	severe accident mitigation alternative
SBC	system benefits charge
SBO	station blackout
scf	standard cubic foot/feet
SHPO	State Historic Preservation Officer
SI	safety injection
SIP	state implementation plan
SMITTR	surveillance, on-line monitoring, inspections, testing, trending, and recordkeeping
SO_2	sulfur dioxide
SPDES	State Pollution Discharge Elimination System
SW	service water
TDSA	Tribal Designated Statistical Area
UFSAR	Updated Final Safety Analysis Report
USACE	U.S. Army Corps of Engineers
V	volt
VCT	volume control tank
yr	year

1.0 INTRODUCTION

1.1 Purpose of and Need for Action

The U.S. Nuclear Regulatory Commission (NRC) licenses the operation of domestic nuclear power plants in accordance with the Atomic Energy Act of 1954, as amended, and NRC implementing regulations. Rochester Gas and Electric Corporation (RG&E) operates the R. E. Ginna Nuclear Power Plant (Ginna Station) pursuant to NRC Operating License DPR-18, which will expire September 18, 2009. Ginna Station received a provisional operating license on September 19, 1969, and a full-term operating license on December 10, 1984.

RG&E has prepared this environmental report for submittal in conjunction with its application to the NRC to renew the Ginna Station operating license, as provided by the following NRC regulations:

- Title 10, Energy, *Code of Federal Regulations* (CFR), Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," Section 54.23, "Contents of Application-Environmental Information" (10 CFR 54.23); and
- Title 10, Energy, CFR, Part 51, "Environmental Protection Requirements for Domestic Licensing and Related Regulatory Functions," Section 51.53, "Postconstruction Environmental Reports," Subsection 51.53(c), "Operating License Renewal Stage" [10 CFR 51.53(c)].

The NRC has defined the purpose and need for the proposed action, the renewal of the operating licenses for nuclear power plants such as Ginna Station, as follows:

> ...The purpose and need for the proposed action (renewal of an operating license) is to provide an option that allows for power generation capability beyond the term of a current nuclear power plant operating license to meet future system generating needs, as such needs may be determined by State, utility, and, where authorized, Federal (other than NRC) decision makers... (Ref. 1.1-1)

The renewed operating license would allow for an additional 20 years of plant operation beyond the current Ginna Station licensed operating period of 40 years.

1.2 Environmental Report Scope and Methodology

NRC regulation 10 CFR 51.53(c) requires that an applicant for license renewal submit with its application a separate document entitled, "Applicant's Environmental Report - Operating License Renewal Stage." This appendix to the Ginna Station license renewal application fulfills that requirement. In determining what information to include in the Ginna Station environmental report, RG&E has relied on NRC regulations and the following supporting documents that provide additional insight into the regulatory requirements:

- NRC supplemental information in the *Federal Register*: Vol. 61, pages 28467-28497 (Ref. 1.1-1); Vol. 61, pages 39555-39556 (Ref. 1.2-1); Vol. 61, pages 66537-66554 (Ref. 1.2-2); and Vol. 64, pages 48496-48507 (Ref. 1.2-3)
- *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) (Ref. 1.2-4; Ref. 1.2-5)
- *Regulatory Analysis for Amendments to Regulations for the Environmental Review for Renewal of Nuclear Power Plant Operating Licenses* (Ref. 1.2-6)
- *Public Comments on the Proposed 10 CFR Part 51 Rule for Renewal of Nuclear Power Plant Operating Licenses and Supporting Documents: Review of Concerns and NRC Staff Response* (Ref. 1.2-7)
- *Preparation of Supplemental Environmental Reports for Applications to Renew Nuclear Power Plant Operating Licenses* (Ref. 1.2-8)

RG&E has prepared Table 1.2-1 to verify conformance with regulatory requirements. Table 1.2-1 indicates where the environmental report responds to each requirement of 10 CFR 51.53(c). In addition, each responsive section in the report is prefaced by a boxed quote of the regulatory language and applicable supporting document language.

Table 1.2-1
Environmental Report Responses to License Renewal Environmental Regulatory Requirements

Regulatory Requirement	Responsive Environmental Report Section(s)	
10 CFR 51.53(c)(1)	Entire Document	
10 CFR 51.53(c)(2), Sentences 1 and 2	3.0	The Proposed Action
10 CFR 51.53(c)(2), Sentence 3	7.3	Environmental Impacts of Alternatives
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(1)	4.0	Environmental Consequences of the Proposed Action and Mitigating Actions
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(2)	6.3	Unavoidable Adverse Impacts
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(3)	7.0	Alternatives to the Proposed Action
	8.0	Comparison of Environmental Impact of License Renewal with the Alternatives
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(4)	6.5	Short-term Use Versus Long-term Productivity of the Environment
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(5)	6.4	Irreversible or Irretrievable Resource Commitments
10 CFR 51.53(c)(2) and 10 CFR 51.45(c)	4.0	Environmental Consequences of the Proposed Action and Mitigating Actions
	6.2	Mitigation
	7.3	Environmental Impacts of Alternatives
	8.0	Comparison of Environmental Impact of License Renewal with the Alternatives
10 CFR 51.53(c)(2) and 10 CFR 51.45(d)	9.0	Status of Compliance
10 CFR 51.53(c)(2) and 10 CFR 51.45(e)	4.0	Environmental Consequences of the Proposed Action and Mitigating Actions
	6.3	Unavoidable Adverse Impacts
10 CFR 51.53(c)(3)(ii)(A)	4.1	Introduction
10 CFR 51.53(c)(3)(ii)(B)	4.2	Intake System Impacts
	4.3	Heat Shock
10 CFR 51.53(c)(3)(ii)(C)	4.1	Introduction
10 CFR 51.53(c)(3)(ii)(D)	4.1	Introduction
10 CFR 51.53(c)(3)(ii)(E)	4.4	Impacts of Refurbishment on Terrestrial Resources
	4.5	Threatened or Endangered Species
10 CFR 51.53(c)(3)(ii)(F)	4.6	Air Quality During Refurbishment (Nonattainment Areas)
10 CFR 51.53(c)(3)(ii)(G)	4.15	Impact on Public Health of Microbiological Organisms
10 CFR 51.53(c)(3)(ii)(H)	4.7	Electric Shock from Transmission Line-induced Currents

Table 1.2-1 (continued)
Environmental Report Responses to License Renewal Environmental Regulatory Requirements

Regulatory Requirement	Responsive Environmental Report Section(s)	
10 CFR 51.53(c)(3)(ii)(I)	4.8	Housing Impacts
	4.9	Public Utilities: Public Water Supply Availability
	4.10	Education Impacts from Refurbishment
	4.11	Offsite Land Use
10 CFR 51.53(c)(3)(ii)(J)	4.12	Transportation
10 CFR 51.53(c)(3)(ii)(K)	4.13	Historic and Archaeological Resources
10 CFR 51.53(c)(3)(ii)(L)	4.14	Severe Accident Mitigation Alternatives
10 CFR 51.53(c)(3)(iii)	4.0	Environmental Consequences of the Proposed Action and Mitigating Actions
	6.2	Mitigation
10 CFR 51.53(c)(3)(iv)	5.0	Assessment of New and Significant Information
10 CFR 51, Appendix B, Table B-1, Footnote 6	2.7.3	Minority and Low-income Populations
	4.16	Environmental Justice

1.3 R.E. Ginna Nuclear Power Plant Licensee and Ownership

RG&E is currently the sole owner and licensed operator of Ginna Station. RG&E is a New York corporation engaged principally in the generation of electricity and the purchase, transmission, distribution, and sale of electric power and natural gas in western New York State. RG&E is a wholly owned subsidiary of Energy East, a super-regional energy services and delivery company with operations in New York, Connecticut, Massachusetts, Maine, and New Hampshire.

1.4 References

Ref. 1.1-1 U.S. Nuclear Regulatory Commission. "Environmental Review for Renewal of Nuclear Power Plant Operating Licenses." *Federal Register*. Vol. 61, No. 109. (June 5, 1996): 28467-97.

Ref. 1.2-1 U.S. Nuclear Regulatory Commission. "Environmental Review for Renewal of Nuclear Power Plant Operating Licenses; Correction." *Federal Register*. Vol. 61, No. 147. (July 30, 1996): 39555-6.

Ref. 1.2-2 U.S. Nuclear Regulatory Commission. "Environmental Review for Renewal of Nuclear Power Plant Operating Licenses." *Federal Register*. Vol. 61, No. 244. (December 18, 1996): 66537-54.

Ref. 1.2-3 U.S. Nuclear Regulatory Commission. "Changes to Requirements for Environmental Review for Renewal of Nuclear Power Plant Operating Licenses; Final Rules." *Federal Register*. Vol. 64, No. 171. (September 3, 1999): 48496-507.

Ref. 1.2-4 U.S. Nuclear Regulatory Commission. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG-1437. Office of Nuclear Regulatory Research. Washington, D.C. May 1996.

Ref. 1.2-5 U.S. Nuclear Regulatory Commission. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. Section 6.3, "Transportation," and Table 9-1, "Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants." NUREG-1437, Vol. 1, Addendum 1. Office of Nuclear Reactor Regulation. Washington, D.C. August 1999.

Ref. 1.2-6 U.S. Nuclear Regulatory Commission. *Regulatory Analysis for Amendments to Regulations for the Environmental Review for Renewal of Nuclear Power Plant Operating Licenses*. NUREG-1440. Office of Nuclear Regulatory Research. Washington, D.C. May 1996.

Ref. 1.2-7 U.S. Nuclear Regulatory Commission. *Public Comments on the Proposed 10 CFR Part 51 Rule for Renewal of Nuclear Power Plant Operating Licenses and Supporting Documents: Review of Concerns and NRC Staff Response*. NUREG-1529. Office of Nuclear Regulatory Research. Washington, D.C. May 1996.

Ref. 1.2-8 U.S. Nuclear Regulatory Commission. *Preparation of Supplemental Environmental Reports for Applications to Renew Nuclear Power Plant Operating Licenses*. Supplement 1 to Regulatory Guide 4.2. Office of Nuclear Regulatory Research. Washington, D.C. September 2000.

2.0 SITE AND ENVIRONMENTAL INTERFACES

2.1 Site Location and Environmental Setting

The R.E. Ginna Nuclear Power Plant (Ginna Station) site is in the town of Ontario, in the northwest corner of Wayne County, New York, on the south shore of Lake Ontario. The site is about 20 miles east of the center of the City of Rochester and 40 miles west-southwest of Oswego. Lake Road (County Route 101) provides road access to the plant and borders the site in an east-west direction approximately 1,700 feet south of the Station. Figures 2.1-1 and 2.1-2 show the site location and features within 50 and 6 miles, respectively. The surface of the land on the southern shore of Lake Ontario, at the site and east and west, is either flat or gently rolling. It increases in elevation to the south, from about 255 feet above mean sea level (msl) near the edge of the Lake; to 440 feet at Ridge Road [New York State (NYS) Route 104], 3.5 miles south of the Lake; and then to about 1,600 feet at the northern edge of the Appalachian Plateau, 30 to 40 miles to the south. Southward from NYS Route 104 the terrain progressively roughens, with a series of small abrupt hills commencing about 10 miles south of the site.

The site is owned by Rochester Gas and Electric Corporation (RG&E) and has increased from 338 acres at the time of preparation of the Ginna Station Operating License Environmental Report (OLER) (Ref. 2.1-1) to the current size of 488 acres. Correspondingly, the shoreline extent has increased from about one mile to 1.5 miles. Surface water features on site are limited to Mill Creek, which enters the site from the south, and Deer Creek, which enters the site from the west. These two creeks join southwest of the plant and empty into Lake Ontario just east of the plant. The general plant area is relatively well drained, with no topographic basins or swampy areas on the site. All drainage, both on surface and subsurface, ultimately proceeds toward the Lake. Figure 2.1-3 shows the site and its relationships to topographic features.

Approximately one half of the 488-acre site is leased and currently being used for agricultural production, primarily apple orchards and, to a lesser degree, corn and hay fields. Another 25 percent of the site has been left relatively undisturbed, having a combination of open fields, shrub brush, and trees. The remaining quarter of the site has been developed for the power station and ancillary facilities, with about 25 acres enclosed within the security fences. There are three occupied farm homes on the Ginna Station site, one of which has an occupied out-parcel. They are owned by RG&E and the occupants have leases that are renewable annually at the option of the Company. Two of the houses are located 4,100 feet and 2,900 feet, respectively, southwest of the plant, while the third, with its associated out-parcel, are about 2,300 feet and 1,900 feet southeast of the plant, respectively. All are located beyond the exclusion area boundary. Unoccupied buildings owned by RG&E include the Manor House (an employee meeting facility) and garage, about 900 feet east of the plant, horse barns (used for storage) about 1,500 feet south of the plant,

Figure 2.1-1
50-Mile Region

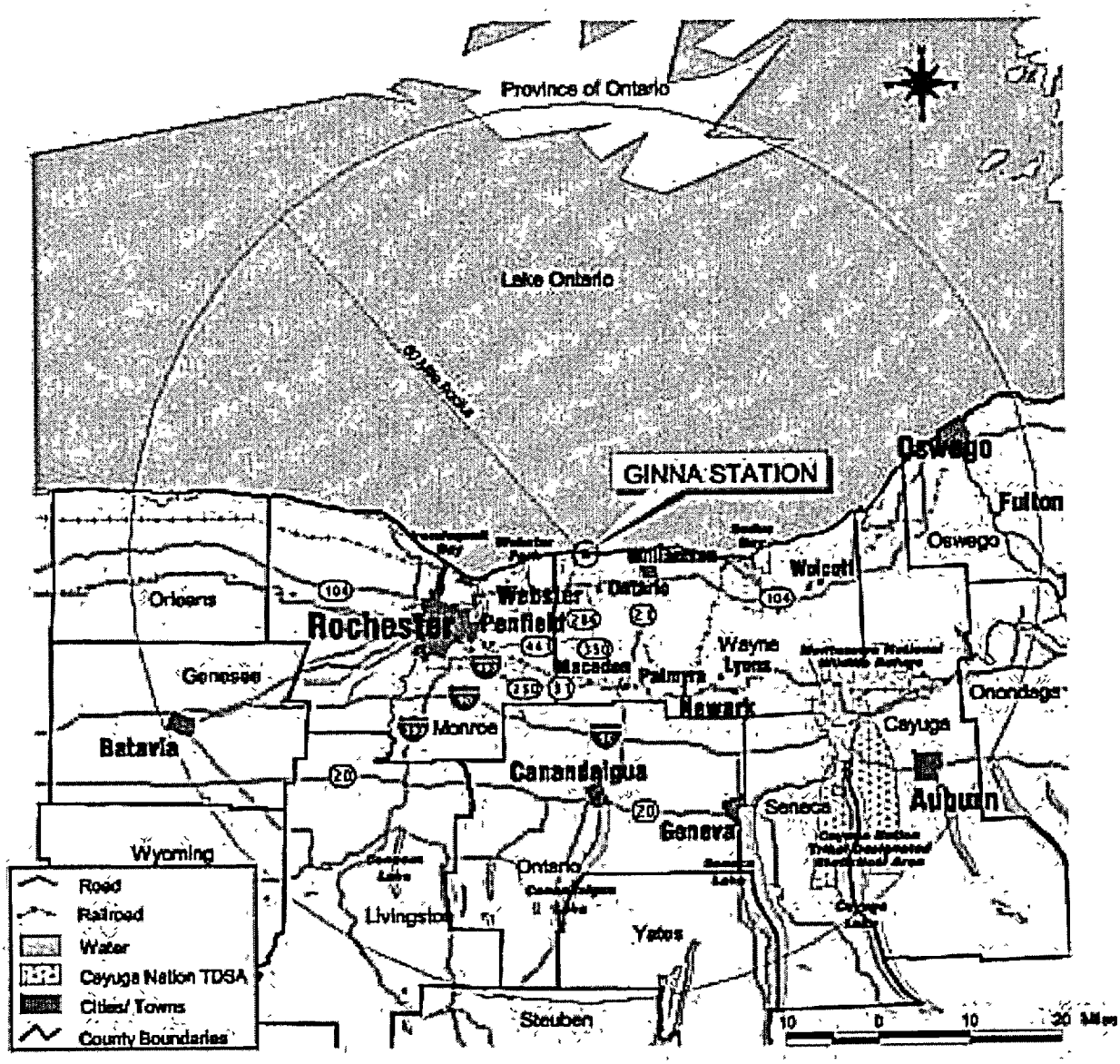


Figure 2.1-2
6-Mile Region

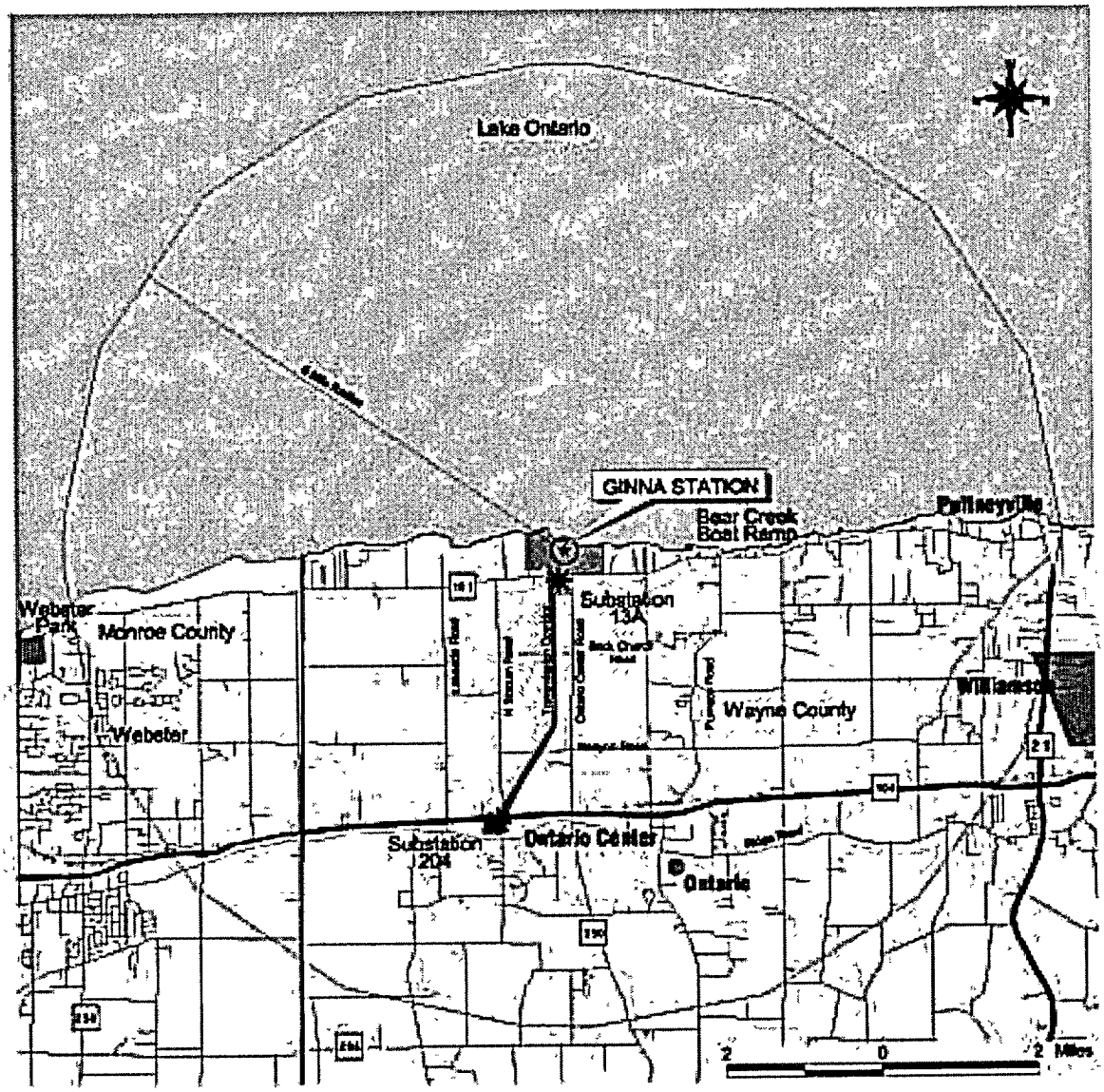
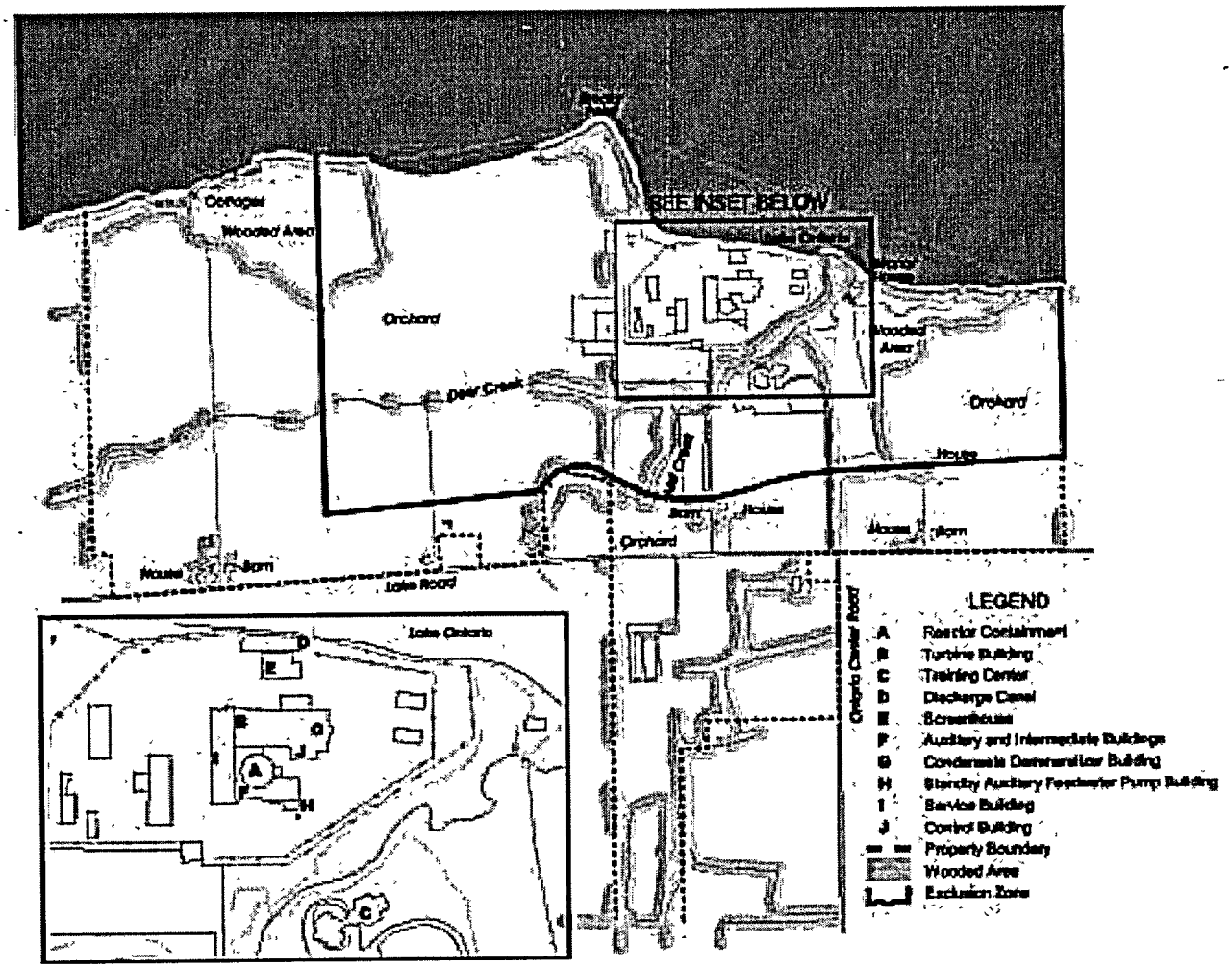


Figure 2.1-3
Site Map



and a house structure (used as a fitness for duty center) about 1,600 feet south of the plant.

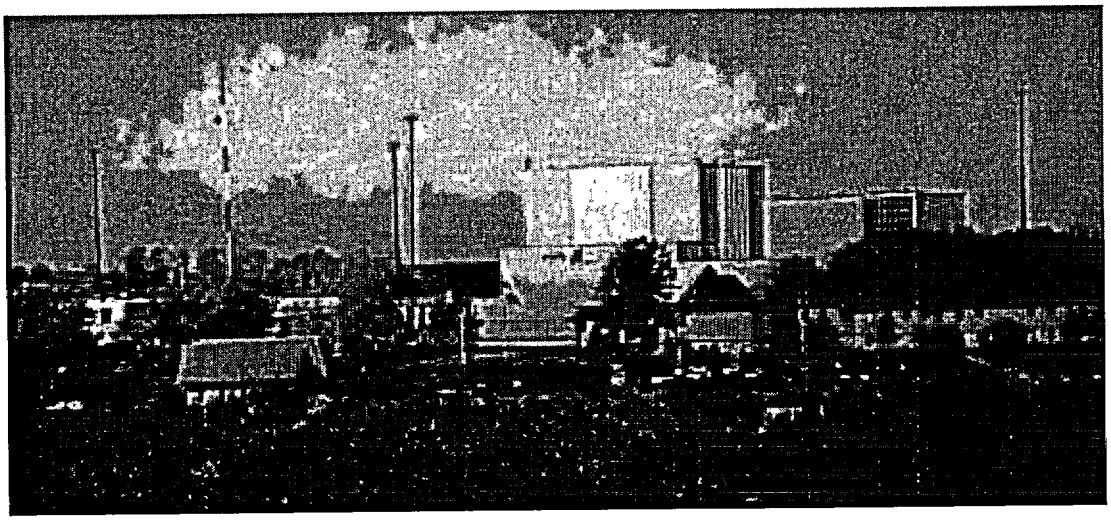
While there are currently no plans for further development on the site, additional security features are being added at this time, primarily along the perimeter of the plant area. The addition of these security features are unrelated to and independent license renewal.

The following excerpt from the Ginna OLER in 1972 (Ref. 2.1-1) describes the conscious effort put forth to minimize the aesthetic impacts of the plant upon this rural setting:

> ...careful planning ... went into the design and construction of this plant in order to make the most discreet use of the site and its natural resources. Meetings were held, as early as four years prior to the plant's construction, with town officials, members of the local school board and land owners adjacent to the site. Many people were apprised of RG&E's intentions and assured that every effort would be made to preserve the natural beauty of the site. Several revisions were made in the plant's initial plans to preserve the orchards, grazing lands, and farm buildings which were part of the area's pastural heritage.
>
> To the casual passerby the visible structures do not appear to be a power plant. Ginna Station is the first of several stackless nuclear plants. The dome of the reactor building, which dominates many such facilities, is concealed by a facade blended into the architectural design of the structure. The color scheme of the outside of all buildings is a blend of green and blue to tie in with nature's own green terrain and the blue of the lake. ... Thus, the aesthetic impact of the Ginna plant is kept to a bare minimum. Maximum concern was focused by RG&E on preserving as much as possible of the original agricultural characteristic of this site. When originally acquired in 1958 the property contained three farm houses and two barns which have been preserved in their original locations by the Company. Several acres of mature forest trees dominate the area and most of the site. These trees are maintained by the Company in their original condition.

The following photograph shows the plant and site as they are today. From this photo it is evident that RG&E has continued to preserve the aesthetics of the site, as described in the 1972 environmental report.

The immediate area around the site is rural. There are no substantial population centers, industrial complexes, airports, transportation arteries, or parks within a 3-mile radius of the Ginna Station site, and the only recreational facility within this radius is the Bear Creek boat launch (about 1.5 miles from the site). The largest community within 10 miles of the site is Webster, located in Monroe County approximately 7 miles west-southwest, with a town population of 37,926 and a village population of 5,216 (Ref. 2.1-2). The largest metropolitan area within 50 miles is Rochester, approximately 17.5 miles west of the site, with a population of 219,773 (Ref. 2.1-2).



Webster Park, a 550-acre Monroe County park on the south shore of Lake Ontario, is approximately six miles west of the site. Facilities include a fishing pier, campground, day use shelters, lodges and cabins, picnic areas, tennis courts, baseball and soccer fields, hiking, and cross-country ski trails (Ref. 2.1-3). Approximately 35 miles from the Ginna property, in southeastern Wayne County along the border with Cayuga and Seneca Counties, is the Montezuma Wetlands Complex (MWC). The 36,000-acre complex includes the federally owned Montezuma National Wildlife Refuge, state-owned Northern Montezuma Wildlife Management Area, lands owned by conservation groups, and private property (Ref. 2.1-4). The area contains marshes and impoundments, forested wetlands, old fields, meadows, farm fields, and woodlands (Ref. 2.1-4).

There are two major federal projects planned in the area. In November 2001, the U.S. Congress approved spending for the Port of Rochester Harbor and Ferry Terminal project. The Port of Rochester is located approximately 15 miles west of the site. According to Congresswoman Louise Slaughter, who secured the funding in the U.S. House of Representatives, the monies will be spent for harbor and port construction and to pay for a portion of the terminal services for the ferry service and cruise and excursion services (Ref. 2.1-5). Congress also approved spending money on the planned Center of Excellence in Photonics and Optoelectronics Rochester. The Center will be located in the City of Rochester. The Center will combine federal, state, and private monies and will focus on developing technology transfer and pilot fabrication facilities for imaging and communications devices that can be shared between Center partners (including Kodak, Xerox, Corning, University of Rochester, and Rochester Institute of Technology) (Ref. 2.1-6).

2.2 Aquatic and Riparian Communities

The Ginna Station site comprises 488 acres located on the southern shore of Lake Ontario, including about 1.5 miles of shoreline. The surface of the land, at the site and east and west of it, is either flat or gently rolling and slopes towards the Lake. Mill Creek (Wayne County) enters the site from the south and Deer Creek enters the site from the west. These two creeks merge at a point southwest of the plant, then turn east, passing south of the plant and north of the Ginna Station Training Center, and empty into the Lake near the northeastern corner of the site. Mill Creek drains an area of approximately 15 square miles and flows almost directly north for nine miles to its confluence with Deer Creek (see Figure 2.1-2). Mill Creek has a continuous yield. At a culvert on Lake Road, 0.8 miles above its mouth, measured recorded flow was 0.04 cubic feet per second. The base flow consisted of discharge entering the stream channel from groundwater or other delayed sources. Deer Creek is a wet-weather stream that dries up during the summer months west of the site (Ref. 2.1-1, Section 2.5).

Lake Ontario is the smallest of the Great Lakes and measures approximately 190 miles long by 50 miles wide. It has a surface area of 7,340 square miles. The maximum depth is 802 feet. Its mean depth, 283 feet, is greater than that of the other Great Lakes, except Superior, and it is the eleventh largest lake in the world in volume. The mean surface elevation of Lake Ontario is about 246 feet above sea level. Depths of 40 to 100 feet occur within one to two miles off the United States shoreline in the site area. The major source of water, approximately 86 percent, to Lake Ontario is the outflow from Lake Erie via the Niagara River, located about 90 miles to the west of Ginna Station. The outflow from Lake Ontario is via the St. Lawrence River, about 60 miles east of Ginna Station, to the Atlantic Ocean. The predominant surface currents along Lake Ontario's southern shoreline are from west to east, and they tend to swing toward the south shore. This water movement would be expected due to the effect of prevailing winds and the Earth's rotation (Ref. 2.1-1).

The lake bottom off the Ginna Station is characterized by the presence of exposed bedrock in the form of a series of shelves with the long axis lying east-west. While this lake bottom has an overall fairly even slope of about 1:100, numerous irregularities are found scattered throughout this area, such as hollows three to four feet in depth, or areas of mixed boulder and cobble. These irregularities provide potential areas of inhabitation and refuge for fish and invertebrates.

In the near shore area, the overburden is predominantly smaller cobble and rubble, with the size of the material gradually increasing with depth into boulder-sized rocks. Further lakeward there is a general tendency for the flat bedrock to be exposed. Frequently, a thin layer of fine sediment will cover the bottom substrates.

Stable beds of cobble or boulders, and areas of exposed bedrock, are substrates that provide good habitat for the growth of *Cladophora*, which is the principal periphyton of the Lake and grows profusely in the area. Historically, *Cladophora* growth was generally limited to lake bottom depths of 20 feet or less, due to poor

water clarity and associated light limitations. With increased water clarity in recent years, however, *Cladophora* growth at depths up to 30 feet have been reported (Ref. 2.2-6).

To the west of the plant, Smoky Point juts out into the Lake for about 1,000 feet. The strong long-shore current carries suspended material around the tip of Smoky Point, where it gradually settles out as a long, tongue-shaped area extending eastward for almost 5,000 feet. This area of deposition lies at a depth of between 10 to 15 feet and curves shoreward beginning about 1,000 feet east of the point and then stretches eastward.

The shoreline of Lake Ontario, within the Ginna Station protected area, is covered by a revetment composed of large stones. The revetment was originally designed to provide surge flooding protection. The revetment has not been extended beyond the existing surge flood protection zone due primarily to a lack of need and the great expense associated with the installation of this type of large stone protection. RG&E notes that erosion is occurring both east and west of the protected area. Some shore erosion occurs east and west of the revetment, but does not affect the surge flood protection.

The water quality of Lake Ontario has changed dramatically since the Ginna Station OLER was submitted in 1972 (Ref. 2.1-1, Section 2.5). After years of environmental stresses such as overfishing, cultural eutrophication, and contaminant discharges resulting in degradation of water quality, loss of habitat, and depreciation of fish communities, two significant environmental legislative actions took place that reversed the downward water quality trends in Lake Ontario and throughout the Great Lakes in general.

The first was the Federal Water Pollution Control Act of 1972, and its 1977 amendments, known as the Clean Water Act (CWA). This legislation established the National Pollution Discharge Elimination System (NPDES) permitting program, and its subsequent implementation by New York State as the State Pollution Discharge Elimination System (SPDES) permitting program. This was the first comprehensive federal action to manage point-source pollution and the water quality of the Nation's waterbodies by authorizing water discharge permits, including numerical limits on pollutants of concern. Ginna Station's first SPDES Permit was issued in 1975, and has been subsequently renewed, per SPDES regulations, up to the current permit, which expires February 2003.

Second, under the auspices of the International Joint Commission, the Great Lakes Water Quality Agreement (GLWQA) was first signed by the U.S. and Canada in 1972, as a commitment by each country to restore and maintain the chemical, physical, and biological integrity of the Great Lakes Basin ecosystem. The GLWQA includes a number of objectives and guidelines to achieve numeric water quality goals for the Great Lakes. A recent review of the Specific Objectives within Annex 1 of the GLWQA has indicated that many of the goals for organic persistent toxics are currently being met (Ref. 2.2-2). Data from the Rochester area (Ref. 2.2-3) show

that the Specific Objectives for inorganic persistent toxic substances (i.e., metals) are also being met.

To control critical pollutants, the GLWQA further included the development and implementation of localized remedial action plans for Areas of Concern (AOCs) and lakewide management plans. The identification of AOCs initiated a shift towards localized pollutant problem areas, recognizing improvements in lakewide water quality. Three AOCs are located on the New York side of Lake Ontario, with the two nearest to Ginna Station being the Rochester Embayment (about 20 miles to the west) and Oswego River and Harbor (about 40 miles to the east).

These water quality initiatives have been very successful in reducing the input and lowering Lake concentrations of such important parameters as nutrients (primarily phosphorus) and persistent toxic chemicals. The phosphorus levels in mid-lake were at 16.7 milligrams/liter (mg/l) in 1969, and were found to be below 10 mg/l in 1993 (Ref. 2.2-4). In 2001, representative Lake Ontario phosphorus levels were considered to be 4.79 mg/l (Ref. 2.2-2). Similarly, very substantial reductions in organic persistent toxins within Lake Ontario fish have been reported by the New York State Department of Environmental Conservation (NYSDEC) (Ref. 2.2-5). Concurrent with these improvements in water quality, there has also been a profound increase in water clarity as well from 1988 to 1993 (Ref. 2.2-4).

Table 2.2-1 provides certain water quality information from the time of the Ginna Station OLER (Ref. 2.1-1, Section 2.5), and recent data collected near Rochester at RG&E's Russell Station and the Monroe County Water Authority's intake, both of which are 20 miles west of Ginna Station on Lake Ontario. This table clearly shows the reduction in phosphorus levels discussed above. In addition, substantial reductions in turbidity are also evident, supporting the general consensus that water clarity has improved dramatically. While the turbidity values were reported in different units in 1971 and 2000, Nephlometric Turbidity Units (NTU, 2000) and Jackson Turbidity Units (JTU, 1971) are roughly equivalent. The eutrophic conditions of the Lake near Ginna Station at the time of initial operation were apparent, as described in the OLER (Ref. 2.1-1, Section 2.7.1), by the emphasis placed on the algae *Cladophora*, both in terms of the heavy *Cladophora* growth that was found in benthic surveys and the decomposing masses that would collect along the shoreline. Most telling, however, are the references to the fact that such algae growth was limited to water depths of 20 feet or less due to high Lake turbidity at that time (Ref. 2.1-1, Appendix E, page D2-1). While no recent benthic surveys have been conducted in the Ginna Station area, and masses of algae still occasionally wash ashore, it is known that in Lake Ontario the lake bottom can now be seen through 30-foot-deep water (Ref. 2.2-6). This increased water clarity allows *Cladophora* growth to now extend out to water depths of 30 feet or more.

Changes in the water quality (i.e., nutrient levels) of Lake Ontario are a prime contributor to significant changes in the biological communities of the Lake as well,

Table 2.2-1
Comparison of Lake Ontario Water Quality 2000 and 1971[a]

	MCWA[b] 2000	Ginna Station[c] 1971	Russell Station[d] 1971
Alkalinity	83	88	91
Total Hardness	125	134	129
pH (units)	7.6	8.3	8.2
Total Dissolved Solids	160	311	201
Nitrates	0.34	0.30	0.46
Phosphorus	0.00479[d]	0.42	0.03
Turbidity	0.09 (NTU)	5 (JTU)	9 (JTU)
Sulfates	28	11	10.3
Chlorides	22	30	33
Calcium	36	43	37.6
Copper	Not Detectable	0.011	0.013
Iron	Not Detectable	0.040	0.120
Magnesium	8.8	6	9
Sodium	12	14	13

a. All values milligrams per liter unless otherwise noted.
b. Ref. 2.2-3 (unless otherwise noted).
c. Ref. 2.1-1, Table 2.5-1.
d. Ref. 2.2-2.
JTU = Jackson Turbidity Units
MCWA = Monroe County Water Authority
NTU = Nephlometric Turbidity Units

since nutrient supply is the basis for overall productivity (Ref. 2.2-1). The Great Lakes Fishery Commission stated, "... the overall productivity of the Great Lakes appeared to be declining due to reduced inputs of nutrients. Reduced productivity translated to reduced catches" (Ref. 2.2-7). However, a number of other factors—such as the salmonid stocking program, the introduction of non-native invasive aquatic species, on-going anthropogenic impacts, and natural climatic variabilities—have also been major contributors to substantially altering the water quality and ecological communities within Lake Ontario over the past 25 to 30 years. The synergy of these factors has caused the state of relatively reduced productivity that currently exists in the Lake. This is supported by researchers who have suggested that Lake Ontario ecosystem management over the past three decades has resulted in oligotrophication of the Lake, i.e., the reverse of euthrophication (Ref. 2.2-8).

The Lake Ontario fish community existing at the time of initial Ginna Station operation, in the early-1970s, reflected the tumultuous changes to the fishery over the previous 150 years. Between the mid-1800s and the early-1970s, populations of top predatory species such as lake sturgeon (*Acipenser fulvescens*), atlantic salmon (*Salmon salar*), lake trout (*Salvelinus namaycush*), lake herring (*Coregonus artedii*), burbot (*Lota lota*), and deepwater ciscoes (*Coregonus johannae*) had all collapsed. This is attributed to such factors as overfishing, invasion of sea lamprey (*Petromyzon marinus*), habitat loss, and degraded water quality or eutrophication. The open lake fish community in 1970 was dominated by planktivores such as alewife (*Alosa pseudoharengus*) and smelt (*Osmerus mordax*) due to the lack of large predatory species. Annual alewife die-offs were common at that time, which contributed to the impaired conditions of the Lake and shoreline. In addition, the productive conditions near shore supported large numbers of warmwater gamefish and their prey. In the mid-1970s New York State and the Province of Ontario instituted a salmonid stocking program, of up to 8 million fish per year, aimed at utilizing the extensive forage base of alewife and smelt. For the next 20 years this program was very successful by both developing a world-class sport fishery on Lake Ontario as well as controlling the forage base population.

By the early 1990s, a number of factors came together to again drastically shift this ecosystem. The alewife population, facing strong ecological pressures, showed increased signs of stress and possible collapse. Paramount to this stress was the heavy predatory pressure exerted by the ever-increasing salmonid stocking program, to the point that concerns were raised that predatory demand was higher than could be supported by available prey (Ref. 2.2-4). In response to this concern, Canadian and U.S. fisheries managers proposed to reduce salmonid stocking by nearly 50 percent. As water quality improved and nutrients decreased, less phytoplankton were produced, resulting in reduced zooplankton populations, and thus reduced food supply for alewives. Another problem for alewives exists in their susceptibility to harsh weather conditions, in that they historically have die-offs following colder winters. This susceptibility becomes even more acute as food supplies dwindle, resulting in deteriorating condition factors (such as weight) and overall health.

Beginning in 1993, salmonid stocking was reduced substantially (Ref. 2.2-4) and in recent years has been at a level of 6 million fish (Ref. 2.2-9; Ref. 2.2-10). Concurrently, the alewife population has maintained itself, albeit at all-time low levels, since the reduced salmonid stocking was initiated and, in fact, the alewife population has increased in number in recent years (Ref. 2.2-11).

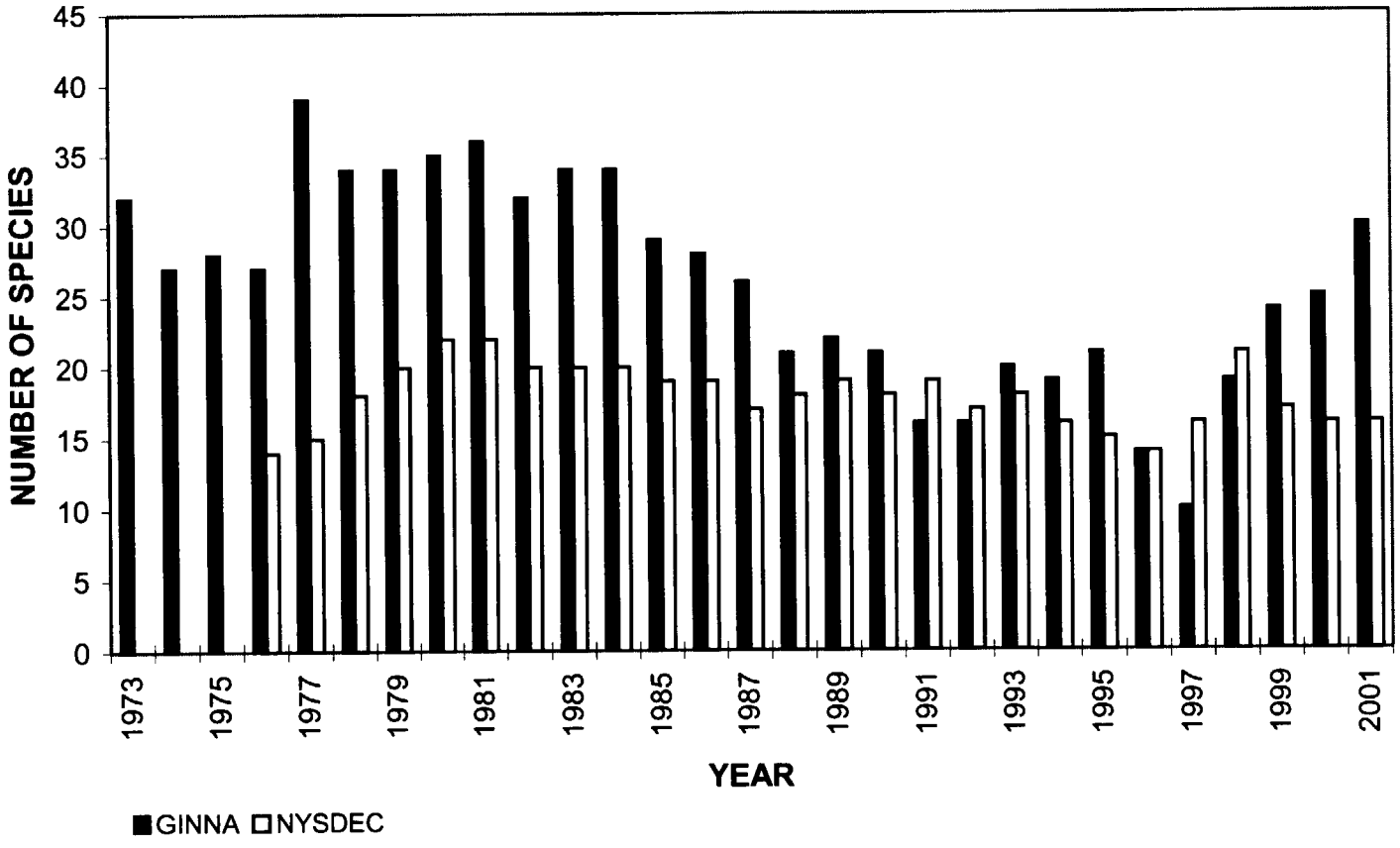
While the combination of extreme predatory pressure from salmonids, reduced food supply, and susceptibility to cold winters put the alewife population at risk, the invasion of the exotic species *Driessena spp.* (zebra and quagga mussels) contributed further impacts upon the ecosystem. As efficient filter feeders, driessenids reduced already impacted phytoplankton populations and removed other particles from the water column as well. Gaining nourishment from the algae and coagulating and depositing other water-borne detrital material on the lake bottom in the form of pseudofeces, driessenids have been credited with increasing the water clarity, or at least speeding up the results of reduced phytoplankton numbers. With driessenid numbers of greater than 20,000 per square meter often found on the bottom throughout the Lake, and filtering rates of 1 to 2 liters per day per mussel, the impact of these species has to be significant. Obvious ecological changes include the removal of organic material from the water column and deposition on the lake bottom, thus transferring production from the pelagic to the benthic communities. Driessenid impacts on benthic communities, however, are not yet understood (Ref. 2.2-12). Other exotic species have recently invaded Lake Ontario as well, although to date, none are credited with having impacts comparable to driessenids. These include the relatively large zooplankters *Cercopagis pengoi* and *Bythrotrephes cederstroemi*, commonly called the fish hook water flea and spiny water flea, respectively. While their ecological impacts may not be currently defined, the fish hook water flea has gained a reputation as a nuisance due to its tendency to clump and foul fishing lines. At Ginna Station, it has occasionally been found within various strainers of the cooling water system, but has not posed any particular operational problems. At the fishery level, while the round goby (*Neogobius melonostomus*) has been reported on occasion within Lake Ontario (Ref. 2.2-13), it is not yet routinely found, and has not been collected in the Ginna Station impingement sampling.

While the alewife and salmonid fisheries routinely dominate the Lake fishery status, trends in other species have been affected as well. One of the primary data sets available to provide insight on this is that of the Ginna Station Impingement Program (Ref. 2.2-14; Ref. 2.2-15). The Ginna Station Impingement Program has been conducted at regular intervals throughout each year since its inception in 1973. While the primary purpose of this program is to assess impingement impacts, especially upon alewife and smelt Lake populations, it also provides a valuable monitoring tool of the fishery community in the area of the Lake near Ginna Station. The Ginna Station Impingement Program's nearly 30-year monitoring data record is one of the longest consistent fishery databases on the Great Lakes. Another data set available is the warm water fishery assessment conducted by the NYSDEC in the eastern basin of Lake Ontario (Ref. 2.2-16). These two data sets were reviewed with respect to two biological indices regarding the overall status of the Lake Ontario

fishery: number of species and abundance (see Figures 2.2-1 and 2.2-2). With respect to number of species, the Ginna Station data show 30-35 species per year during the mid-1970s to mid-1980s, followed by a decline into the teens over the next ten- to twelve-year period [with the minimum number (10 species) found during 1997], and then an apparent rebound since 1997, up to 30 species in 2001 (Ref. 2.2-14; Ref. 2.2-15). The NYSDEC data, although not as dramatic, also show peak number of species to be found in the early-1980s, followed by a decrease in numbers during the mid-1990s and into recent years (Ref. 2.2-16). Concerning abundance, the Ginna Station data show relatively high numbers impinged during the mid-1970s (reflecting the large populations of alewives and smelt in the Lake at that time) followed by an overall continual decline in numbers over the years to the present (Ref. 2.2-15). Again, while not as extreme, the NYSDEC data show the continual decline in fish numbers from 1976 through 2001 (Ref. 2.2-16). These two data sets, used to gain an overview perspective of the Lake ecosystem, clearly demonstrate that productivity in Lake Ontario has decreased since the mid-1970s.

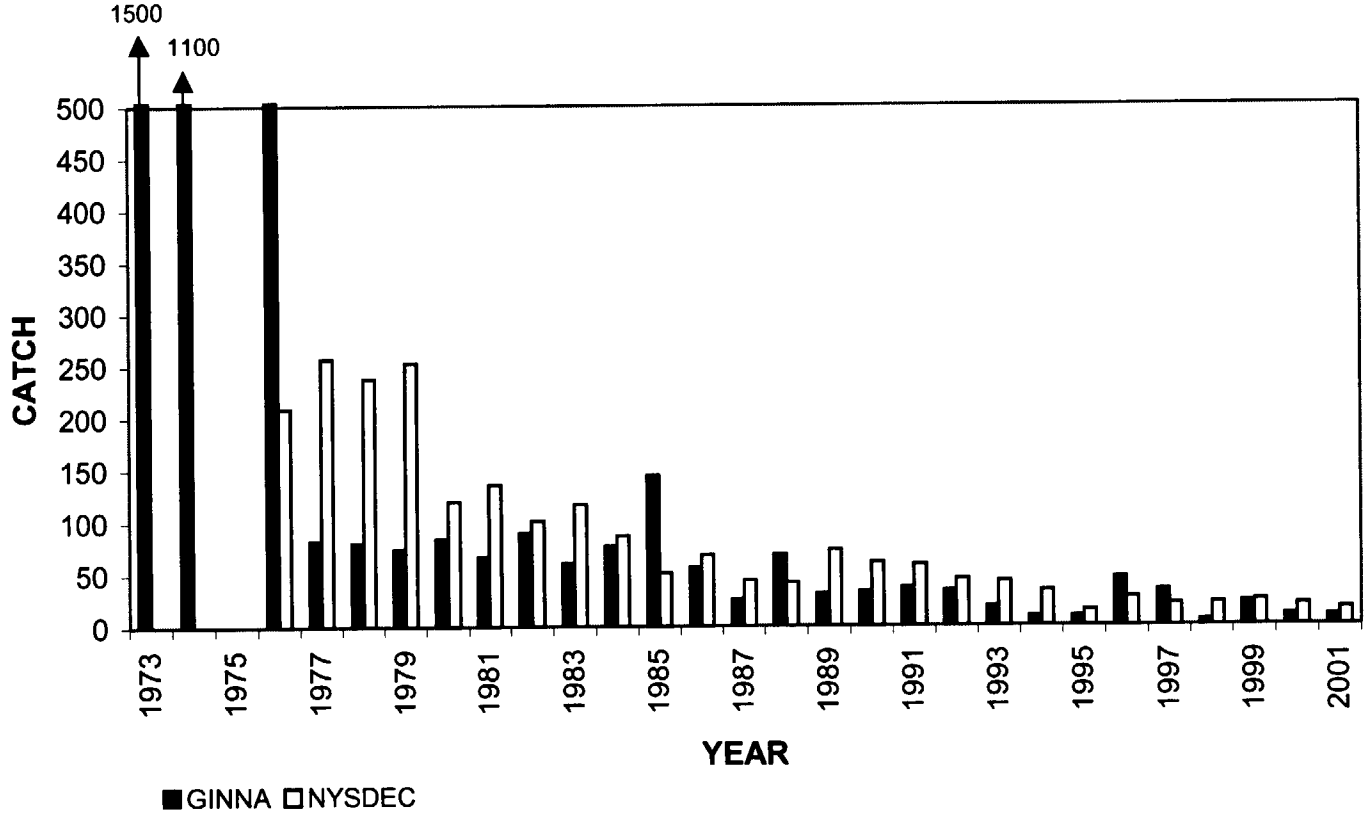
Ichthyoplankton (fish eggs and larvae) studies, conducted at the Ginna Station site in 1977 and 1978, characterize the site with respect to utilization of the Lake Ontario shoreline adjacent to the Ginna Station site for fish spawning and as a nursery area (Ref. 2.2-17; Ref. 2.2-18). More than 90 percent of the fish larvae found during both years were alewives. Also found both years, in the 1 percent to 5 percent range, were carp/goldfish (*Cyprinus carpio/Carrassius aurtus*), smelt, and johnny darters (*Etheostoma nigrum*). All of these species are common components of the local fish community, and typical of the fish communities found along the nearshore areas of Lake Ontario's southern shoreline. Conversely, there were no indications that the Ginna Station site area was unique to, or preferred by, any species with respect to spawning or nursery areas or both. Likewise, no threatened or endangered species were found in these studies. Ginna Station is not adjacent to any significant bays or other habitat features that may provide unique or important spawning or nursery areas. Studies conducted within Lake Ontario near Chaumont, Sodus, and Irondequoit Bays, during 1997 and 1998, show that alewife continues to dominate the ichthyoplankton population (Ref. 2.2-19), and that alewives' spawning locations are ubiquitous. Of particular interest given the dramatic reduction in productivity within the Lake is the fact that alewife larval densities found in both the late-1970s and the late-1990s were within the same order of magnitude. Further, these recent studies found similar species to those collected at Ginna Station in the 1970s, and generally support the previously stated conclusions concerning the spawning, nursery, and habitat conditions of the Ginna Station site.

Figure 2.2-1
Species Diversity Per Year, 1973–2001



Source: Ref. 2.2-14, Ref. 2.2-15, Ref. 2.2-16.

Figure 2.2-2
Fish Abundance Per Year, 1973–2001



Source: Ref. 2.2-14, Ref. 2.2-15, Ref. 2.2-16.

2.3 Groundwater Resources

Ginna Station does not use groundwater as a resource for any plant operations or as potable water resource. The water table at the Ginna Station site generally occurs in the overburden soils over most of the site, but lies beneath the rock surface in part of the southeastern sector where the bedrock surface rises. The mean low water elevation of the surface of Lake Ontario is approximately 244 feet above msl according to U.S Geological Survey data. Borings previously advanced at the site show that the water table rises to approximately 247 feet in the general plant area and that it continues to rise towards the south, gently towards the southwest and more steeply towards the southeast (Ref. 2.3-1).

Data collected previously also indicates that the rock elevation underlying the site rises towards the south. With the exception of the top few feet of rock (which is weathered and fractured in nature), the rock underlying the site has been described to have virtually no measurable vertical permeability. Any movement of water through the rock appears to occur in joints and fractures in the top few feet, and flows in a north to northwest direction towards Lake Ontario. This would be expected from normal hydrologic action in an area where the slightly fractured upper zone of rock follows the rock contours, and the rock contours rise southward from the lakefront. Local depressions in the bedrock surface may hold water because of the very low permeability of the rock, but ultimate drainage should be in the direction of the Lake (Ref. 2.1-1).

Finally, the rock has been described as being practically impermeable to depths sufficient to prevent relief of stresses and consequent open joints. Inspection of the reactor excavation and the relatively dry condition of the intake tunnel below Lake Ontario, both noted during construction, confirm this assessment (Ref. 2.1-1).

Surface water runoff in the vicinity of the plant area may proceed southward along normal surface contours, but the channels of Deer and Mill Creeks intercept this path and divert any flow to the Lake. Any percolating surface water that reaches the saturated zone of groundwater will ultimately flow in the direction of the Lake (Ref. 2.3-1).

Based on available information, the closest groundwater wells used as a drinking water source are located at distance greater than 1/2 mile from the Ginna Station site along Lake Road east and west of the Ginna Station site, with a few on Ontario Center Road, which runs south from Lake Road. The nearest known groundwater drinking well is approximately 1/2 mile southwest of the reactor building (Ref. 2.1-1). However, as discussed above, groundwater flow in proximity of Ginna Station is northward; thus, any wells in the area surrounding Ginna Station would not be affected by any effluent or inadvertent releases from the plant site.

2.4 Meteorology and Air Quality

Rochester's weather is influenced by its proximity to Lake Ontario. Weather systems coming from Canada across the Lake tend to pick up moisture and deposit it within 15-20 miles of the shoreline. The average high temperature in July is 80 degrees Fahrenheit (°F) with an average low of 59°F. During January, the region experiences an average high of 30°F and an average low of 16°F. Snowfall, as recorded at the Greater Rochester International Airport, averages approximately 93 inches per year, though communities closer to Lake Ontario tend to experience many "lake-effect" snow showers. According to the Northeast Regional Climate Center, Rochester's average precipitation is 31.96 inches (Ref. 2.4-1). Prevailing winds are from the west-southwest (away from Rochester) (Ref. 2.4-2).

Ginna Station is not located in an area designated by the National Ambient Air Quality Standards as a maintenance area or an area of nonattainment. The nearest area of nonattainment is Niagara County, which is classified as marginal for ozone (Ref. 2.4-3). According to data from the U.S. Environmental Protection Agency (EPA), between 1991 and 2000, the number of days when the air quality index was greater than 100 for ozone in the Rochester Metropolitan Statistical Area ranged from a high of 16 in 1991, to a low of 0 in 1993 and 1996. In 2000, the EPA reports one day when the air quality index for ozone was higher than 100 for this area (Ref. 2.4-4).[1]

1. The air quality index is a uniform index that provides general information to the public about air quality.

2.5 Critical and Important Terrestrial Habitats

The Ginna Station and the associated transmission line corridor are surrounded by a variety of very typical habitat types found in Central and Western New York State. These consist of mature woodlands, meadows, and early- and late-stage old fields. In addition, significant acreage is farmed for grains or is in use as apple orchards. The Station property and transmission line corridor that are farmed are leased to local residents. The other "natural" areas are left to go through natural succession and are not actively managed by RG&E.

The wildlife species that occur at the Ginna Station site and transmission line corridor are also very typical of those found in similar habitats throughout Central and Western New York State. Whitetail deer (*Odocileus virginianus*), woodchuck (*Marmota monax*), gray squirrel (*Sciurus carolinensis*), cottontail rabbit (*Sylvilagus floridanus*), raccoon (*Procyon lotor*), grey (*Urocyon cinereoargenteus*) and red (*Vulpes vulpes*) fox, Eastern chipmunk (*Tamias striatus*), and meadow vole (*Microtus pennsylvanicus*) are commonly found mammals. Numerous bird species, including the ring-necked pheasant (*Phasianus colchicus*), American kestrel (*Falco sparverius*), screech owl (*Otus asio*), blue jay (*Cyanocitta cristata*), bluebird (*Sialia sialis*), American goldfinch (*Carduelis tristis*), and crow (*Corvus brachyrhynchos*) are common. Amphibians common to the site include American toad (*Bufo americanus*), leopard frog (*Rana pipiens*), green frog (*Rana clamitans*), and wood frog (*Rana sylvatica*). Reptiles include the Eastern garter snake (*Thamnophis sirtalis sirtalis*) and ribbon snake (*Thamnophis sauritus*) (Ref. 2.5-1).

Although endangered species such as the peregrine falcon (*Falco peregrinus*) and bald eagle (*Haliaeetus leucocephalus*) use the shoreline during spring migration, as does the threatened species northern harrier (*Circus cyaneus*), there is no habitat at the Ginna Station site or along the transmission line corridor that is considered to be critical habitat for these three species (Ref. 2.5-1).

There are no state regulated wetlands found either at the Ginna Station site or on the transmission line corridor. Contacts with environmental regulatory agencies also indicate no critical habitat type or species is found in either location (Ref. 2.5-2; Ref. 2.5-3).

Although there are no critical habitat areas either at the Ginna Station site or on the transmission line corridor, RG&E promotes environmental stewardship on all appropriate properties to enhance the opportunities for wildlife to exist. In an effort to enhance the Ginna Station property for wildlife and to educate the employees about the value of wildlife and habitat, various bird nesting boxes, including six boxes for kestrels and screech owls, have been erected on the property. Along with the nest boxes, a hiking trail system with benches is located primarily on the area known as the Manor House property. Built entirely by volunteer efforts, the Manor House property is an area available to employees to enjoy the natural beauty of the Ginna Station property.

2.6 Threatened or Endangered Species

A review of the federally threatened and endangered species listed for New York State revealed no species known to be resident on the Ginna Station site or transmission line corridor. One species, the bald eagle, which is federally listed as threatened, has been sighted in the vicinity of the Ginna Station during migratory periods (Ref. 2.5-3).

According to the Montezuma National Wildlife Refuge, no species on the Federal Endangered Species list is a resident at the MWC. Two species on the New York State Endangered Species List have been seen in the MWC area (35 miles from Ginna Station): the black tern (*Chlidonias niger*) and the peregrine falcon. Four species on the New York State Threatened Species list are present in the MWC area: the pied-bill grebe (*Podilymbus podiceps*), the least bittern (*Ixobrychus exilis*), the common tern (*Sterna hirundo*), and the sedge wren (*Cistothorus platensis*) (Ref. 2.6-1).

A review of the New York State Natural Heritage Program's databank indicated no records of rare species of flora or fauna on or within a mile of the Ginna Station site. A review of the New York State Breeding Bird Atlas produced a record of a New York State threatened species, the northern harrier (*Circus cyaneus*), that was "observed in possible breeding habitat, but no other indication of breeding noted." This sighting occurred over 15 years ago and no confirmed nest sites have ever been found on the Ginna Station property. A nesting colony of golden-winged warblers, a New York State species of special concern, was found in the transmission corridor south of the site in a recent survey (Ref. 2.6-2). Also, the southern shoreline of Lake Ontario is a traditional migratory pathway for numerous species of passerine birds and raptors. Bald eagles and peregrine falcons are occasionally seen during migratory periods, however, these sightings are transitory and none of these birds nests or resides within the Ginna Station property (Ref. 2.5-3).

The lake sturgeon, a threatened species in New York State, might be found in Lake Ontario near Ginna Station. One sturgeon was netted several years ago by the NYSDEC at Pultneyville, a village approximately 6 miles east of the Ginna Station (Ref. 2.5-2). No sturgeon has ever been reported at the Ginna Station site.

Though the range of the bog turtle (*Clemmys muhlenberoi*), a State-listed endangered species, includes the region along the southern shore of Lake Ontario, none has been seen or reported on the Ginna Station site and bog turtles would not be expected to occur there (Ref. 2.6-3).

Based upon the above information, RG&E concludes that there are no known Federal or State threatened or endangered species either on the Ginna Station site, on its associated transmission line corridor, or in close proximity to the site.

2.7 Demography

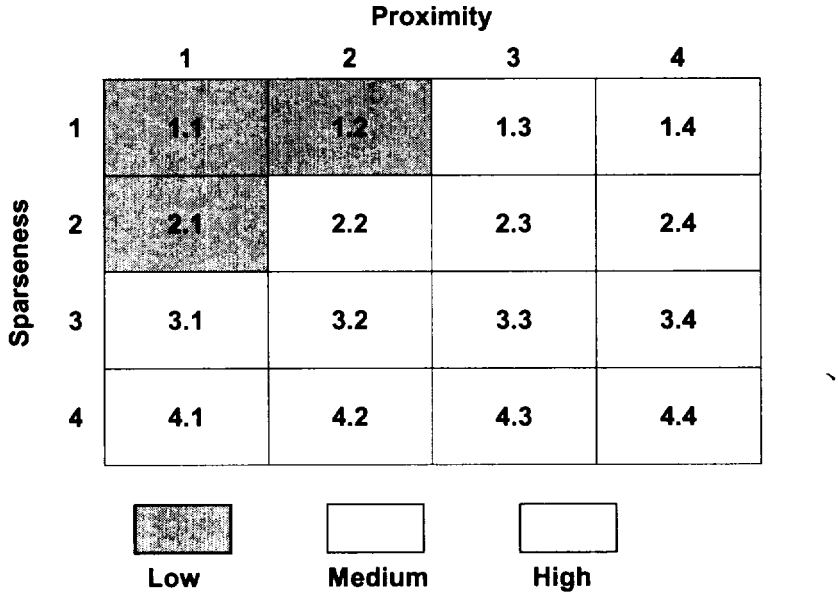
2.7.1 Regional Demography

The U.S. Nuclear Regulatory Commission's (NRC's) *Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants* (GEIS) presents a population characterization method that is based on two factors: "sparseness" and "proximity" (Ref. 2.7-1, Section C.1.4). "Sparseness" measures population density and city size within 20 miles of a site, while "proximity" measures population density and city size within 50 miles. The NRC uses the factors defined below to characterize the remoteness of the site.

Category		
		Sparseness
Most sparse	1	Less than 40 persons per square mile and no community with 25,000 or more persons within 20 miles
	2	40 to 60 persons per square mile and no community with 25,000 or more persons within 20 miles
	3	60 to 120 persons per square mile or less than 60 persons per square mile with at least one community with 25,000 or more persons within 20 miles
Least sparse	4	Greater than or equal to 120 persons per square mile within 20 miles
		Proximity
Not in close proximity	1	No city with 100,000 or more persons and less than 50 persons per square mile within 50 miles
	2	No city with 100,000 or more persons and between 50 and 190 persons per square mile within 50 miles
	3	One or more cities with 100,000 or more persons and less than 190 persons per square mile within 50 miles
In close proximity	4	Greater than 190 persons per square mile within 50 miles

Source: Ref. 2.7-1.

The GEIS then uses the following matrix to rank the population category as low, medium, or high.



Source: Ref. 2.7-1, page C-6.

RG&E used Year 2000 U.S. Census data (Ref. 2.7-2) and geographic information system software (Arcview®) to determine demographic characteristics in the Ginna Station vicinity at the block group level.

The population within 20 miles of the Ginna facility is approximately 564,000, which equals a population density of 449 people per square mile (Ref. 2.7-2). Applying the GEIS sparseness classification, the Ginna Station falls into Category 4 (greater than or equal to 120 persons per square mile within 20 miles).

As estimated from Year 2000 U.S. Census information, approximately 1.25 million people live within 50 miles of Ginna Station (Ref. 2.7-2). This equates to a population density of 165 persons per square mile within a 50-mile radius. Applying the GEIS proximity measure, Ginna Station falls into Category 3 (having one or more cities with 100,000 or more persons, and less than 190 persons per square mile within 50 miles). According to the GEIS sparseness and proximity matrix, Ginna Station's sparseness Category 4 and proximity Category 3 result in the conclusion that the plant is located in a high population area.

The City of Rochester, in Monroe County, with a population of 219,773 (Ref. 2.1-2), is the largest city within 50 miles of the Ginna Station facility. The next largest city is Auburn, in Cayuga County, with a population of 28,574; followed by Oswego, Oswego County (17,954); Geneva, Ontario County (13,617); Fulton, Oswego County (11,855); and Canandaigua, Ontario County (11,264) (Ref. 2.1-2). The largest eight

towns within 50 miles of Ginna Station are all suburbs of Rochester and are also located within Monroe County's borders.

As shown on Figure 2.1-1, all or parts of 13 counties are located within 50 miles of Ginna Station. Monroe (population 735,343), Ontario (100,224), and Wayne Counties (93,765) are wholly contained within this region. The remaining counties and the number of county residents within a 50-mile radius of the plant are: Cayuga (69,624), Livingston (54,655), Genesee (46,409), Onondaga (28,132), Orleans (30,641), Oswego (77,081), Seneca (30,254), Steuben (5,658), Yates (21,139), and Wyoming (6,110) (Ref. 2.7-2).

There are no Native American reservations within 50 miles of the facility. However, there is a Tribal Designated Statistical Area (TDSA) for the Cayuga Nation located within 50 miles of the facility. A TDSA is a geographical entity identified and delineated for the U.S. Census Bureau by federally recognized American Indian tribes that do not currently have a federally recognized land base (i.e., a territory that contains a Native American population over which a Federally recognized tribe has jurisdiction, or a territory in which a State-recognized tribe provides benefits and services to its members) (Ref. 2.7-3).

In 2000, the State of New York reported a state population count of almost 19 million, or 6.7 percent of the Nation's population (Ref. 2.7-4; Ref. 2.7-5). From 1990 to 2000, New York had a compound average annual growth rate of approximately 0.5 percent (Ref. 2.7-5). Wayne County's average for the same period was also 0.5 percent (Ref. 2.7-6; Ref. 2.7-7). Wayne County's total population, according to the 2000 Census, was 93,765 (Ref. 2.7-7). In order to provide the broadest perspective when presenting population growth information, the United States data have been included in this analysis. The United States reported a U.S. 2000 population total exceeding 280 million (281,421,906) (Ref. 2.7-8) with a compound average annual growth rate of 1.2 percent from 1990 to 2000 (Ref. 2.7-8). Wayne County's average growth rate is relatively slow when compared with the United States growth rate; however, it is roughly equivalent to the State growth rate.

The median age of Wayne County residents is 36.9 (Ref. 2.7-7). The average household in Wayne County has 2.64 individuals and the average family comprises 3.08 people (Ref. 2.7-9). Monroe County is home to approximately 735,000 people according to the latest U.S. Census figures, and the median age is 36.1 (Ref. 2.7-7). The average household in Monroe County contains 2.47 people and the average family size is 3.08 members (Ref. 2.7-9).

The 1973 Final Environmental Statement for Ginna Station forecasted that population within a 50-mile radius of the Ginna facility would be 2,327,329 in 2010 (Ref. 2.7-10). Currently, the population within this range is 1.3 million. The reason for the significantly slower pace of population growth in the region is based on the economics of the area. In 1973, Rochester was dominated by a number of large manufacturing companies. Eastman Kodak, Xerox, Gannett, and Bausch & Lomb

headquartered and had large manufacturing facilities in Monroe County. In addition, other manufacturing companies such as General Dynamics had large operations in Rochester.

During the intervening 29 years, many things have changed. General Dynamics has pulled its large operations out of the region; Xerox has relocated its headquarters out of state, even though it maintains large manufacturing and research and development facilities in Monroe County; Gannett has moved its headquarters out of state and shut down one of its two daily newspapers. Kodak's employment peaked in 1982, and the company continues to face challenges from domestic and international competitors. Bausch & Lomb, although still headquartered in Rochester, maintains a much smaller presence with only minimal manufacturing (Ref. 2.7-11).

Gaining in size has been Rochester's service sector. Companies such as Paychex have entered into markets that did not exist in 1973, and have been very successful. Drawing from their experiences working for a non-Bell telephone company, a number of former Rochester Telephone employees have branched out, starting their own telecommunications companies. This would not have been allowed in 1973, when all telecommunications markets were regulated and there was no choice in local or long distance phone service. Rochester also capitalizes on its intellectual capital from its colleges and universities. Home to the University of Rochester and Rochester Institute of Technology, Rochester produces many highly skilled college graduates each year. In addition, the research conducted at the University of Rochester and, especially, the University of Rochester Medical Center has resulted in numerous startup companies that remain in the Rochester area (Ref. 2.7-11).

The loss of tens of thousands of manufacturing jobs has been more than replaced by gains in services. However, employment growth has been slow by National standards, especially as job growth tends to remain strong in the South. The slow growth in jobs has led to below average population growth as a result (Ref. 2.7-11).

2.7.1.1 Population Projections

By the year 2020, New York State's population is projected to be 19.4 million, an increase of 2.1 percent from 2000 (Ref. 2.7-12). By the same year, Wayne County's population is projected to be 98,454, an increase of 5 percent over 20 years (Ref. 2.7-13). The United States population is expected to grow by 15.4 percent between 2000 and 2020, to a total population of 325 million (Ref. 2.7-14).

Decennial population numbers from 1980 to 2000 and projections out to the year 2040 for Wayne and Monroe Counties, New York State, and the United States are presented in Table 2.7-1.

2.7.2 Transient Populations

There is a summertime increase of about 500 people in the lakeside population within a 5-mile radius of the plant site, and a summertime increase of 4,000 to 5,000 people in the lakeside population within a 20-mile radius of the plant site. The

Table 2.7-1
Population Levels, 1980–2040

	Actual			Projected			
	1980	1990	2000	2010	2020	2030	2040
United States	226,542,199[a]	248,709,873[a]	281,421,906[b]	299,862,000[c]	324,927,000[c]	351,070,000[c]	377,350,000[c]
New York State	17,558,072[a]	17,990,455[a]	18,976,457[d]	NA	19,373,000[e]	NA	NA
Monroe County	702,238[a]	713,968[a]	735,343[d]	735,708[f]	742,150[f]	747,612[f]	751,350[g]
Wayne County	84,581[a]	89,123[a]	93,765[d]	96,931[f]	98,454[f]	99,744[f]	100,741[g]

NA = Not Available

a. Ref. 2.7-15
b. Ref. 2.7-8
c. Ref. 2.7-14
d. Ref. 2.7-7
e. Ref. 2.7-12
f. Ref. 2.7-13
g. Ref. 2.7-16

nearest group of houses are summer cottages, 0.8 miles west. Other groups are located at Bear Creek, 1.5 miles east, and at Ontario-on-the-Lake, a development located approximately 2 miles west (Ref. 2.4-2). Other than the summertime residents of the area, there are no large groups of transients within 5 miles of the Ginna Station site. The only parks near the site are Webster Beach Park in Monroe County, approximately 6 miles west of the plant site, and B. Forman Park in Wayne County, approximately 8 miles east of the plant site. There are no federal recreational facilities in the area. There are no state parks or special use areas within 10 miles of the plant site.

Wayne County does have a migrant labor population during the June-October season, primarily for apple picking. Approximately 115 farm-worker camps of five or more persons are scattered throughout Wayne County, with a total population of about 4,400 migrants. Information from Rural New York Farmworker Opportunities shows that there are only 12 camps, with about 130 migrants, located in the vicinity of the Ginna Station site (Ref. 2.4-2).

2.7.3 Minority and Low-income Populations

The NRC "Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues" defines a "minority" population as: American Indian or Alaskan Native, Asian, Native Hawaiian or other Pacific Islander, or Black races, or Hispanic ethnicity, other, multi-racial, and the aggregate of all minority races (Ref. 2.7-17). The guidance indicates that a minority population exists if:

Exceeds 50 Percent – the minority population percentage of the environmental impact site exceeds 50 percent, or

More than 20 Percent Greater – the minority population percentage of the environmental impact site is significantly greater (typically at least 20 percentage points) than the minority population percentage in the geographic area chosen for comparative analysis.

Where the environmental impact area falls entirely within the border of a state, the NRC has used a 50-mile radius as the environmental impact site and the state as the geographic area for comparative analysis. RG&E has adopted this approach for the Ginna Station environmental justice analysis. The NRC guidance calls for use of the most recent U.S. Census Bureau decennial census data.

RG&E used year 2000 U.S. Census data in determining the percentage of the total population within New York State for each minority category, and in identifying minority populations within 50 miles of Ginna Station. The U.S. Census Bureau provides updated annual population projections in addition to decennial data for selected portions of its demographic information; however, neither an updated projection based on the year 1990 census data nor year 2000 Census data was available at the block-group level for low-income populations at the time of this analysis. Therefore, RG&E used 1990 U.S. Census Bureau data (Ref. 2.7-18) to identify low-income populations within 50 miles of Ginna Station. RG&E divided U.S. Census Bureau population numbers for each racial/ethnic group within each Census block group by the total population for that Census block group to obtain the percentage of the block group's population represented by each minority (Ref. 2.7-2). For each of the 1,032 block groups within 50 miles of Ginna Station, RG&E calculated the percentage of the population in each minority category and compared the result to New York State's minority percentages to determine whether disproportionate minority populations exist in an area. U.S. Census Bureau data for New York State characterize 0.4 percent as American Indian or Alaskan Native, 5.5 percent Asian, 0.05 percent Native Hawaiian or other Pacific Islander, 15.9 percent Black races, 7.1 percent all other single race minorities, 3.1 percent multi-racial, 32.1 percent aggregate of minority races, and 15.1 percent Hispanic ethnicity (Ref. 2.7-2). Table 2.7-2 indicates how many census tracts within each county exceed the threshold for determining the presence of a low-income or minority population.

Based on the "more than 20 percentage points" criterion, Black minority populations exist in 122 block groups, out of the 1,032 examined (see Table 2.7-2). The vast majority (120) are in Monroe County, with one each in Cayuga and Wyoming Counties. Figure 2.7-1 displays the location of these Black minority block groups. Hispanic ethnicity minority populations exist in 10 block groups with all in Monroe County (see Table 2.7-2). Figure 2.7-2 displays the location of these Hispanic ethnicity minority block groups.

Aggregate minority populations exist in 127 block groups (see Table 2.7-2), Monroe County accounts for 125 block groups and Cayuga and Wyoming each have one

Table 2.7-2
Minority and Low-income Population Census Block Groups

County	Total 2000 Block Groups	Black	American Indian or Alaskan Native	Asian	Native Hawaiian or Other Pacific Islander	All Other Single Race Minorities	Multi-Racial Minorities	Aggregate of Minority Races	Hispanic Ethnicity	Total 1990 Block Groups	1990 Block Groups Low-Income
Cayuga	68	1	0	0	0	0	0	1	0	68	2
Genesee	44	0	0	0	0	0	0	0	0	58	0
Livingston	32	0	0	0	0	0	0	0	0	33	1
Monroe	601	120	0	1	0	3	0	125	10	670	94
Onondaga	23	0	0	0	0	0	0	0	0	22	0
Ontario	82	0	0	0	0	0	0	0	0	86	2
Orleans	17	0	0	0	0	0	0	0	0	16	0
Oswego	44	0	0	0	0	0	0	0	0	44	3
Seneca	33	0	0	0	0	0	0	0	0	35	0
Steuben	6	0	0	0	0	0	0	0	0	6	0
Wayne	57	0	0	0	0	0	0	0	0	60	1
Wyoming	5	1	0	0	0	0	0	1	0	5	0
Yates	20	0	0	0	0	0	0	0	0	25	0
Total	1032	122	0	1	0	3	0	127	10	1128	103
State Averages											
New York		15.9%	0.4%	5.5%	0.05%	7.1%	3.1%	32.1%	15.1%	NA	13.0%

Figure 2.7-1
Black Minority Population

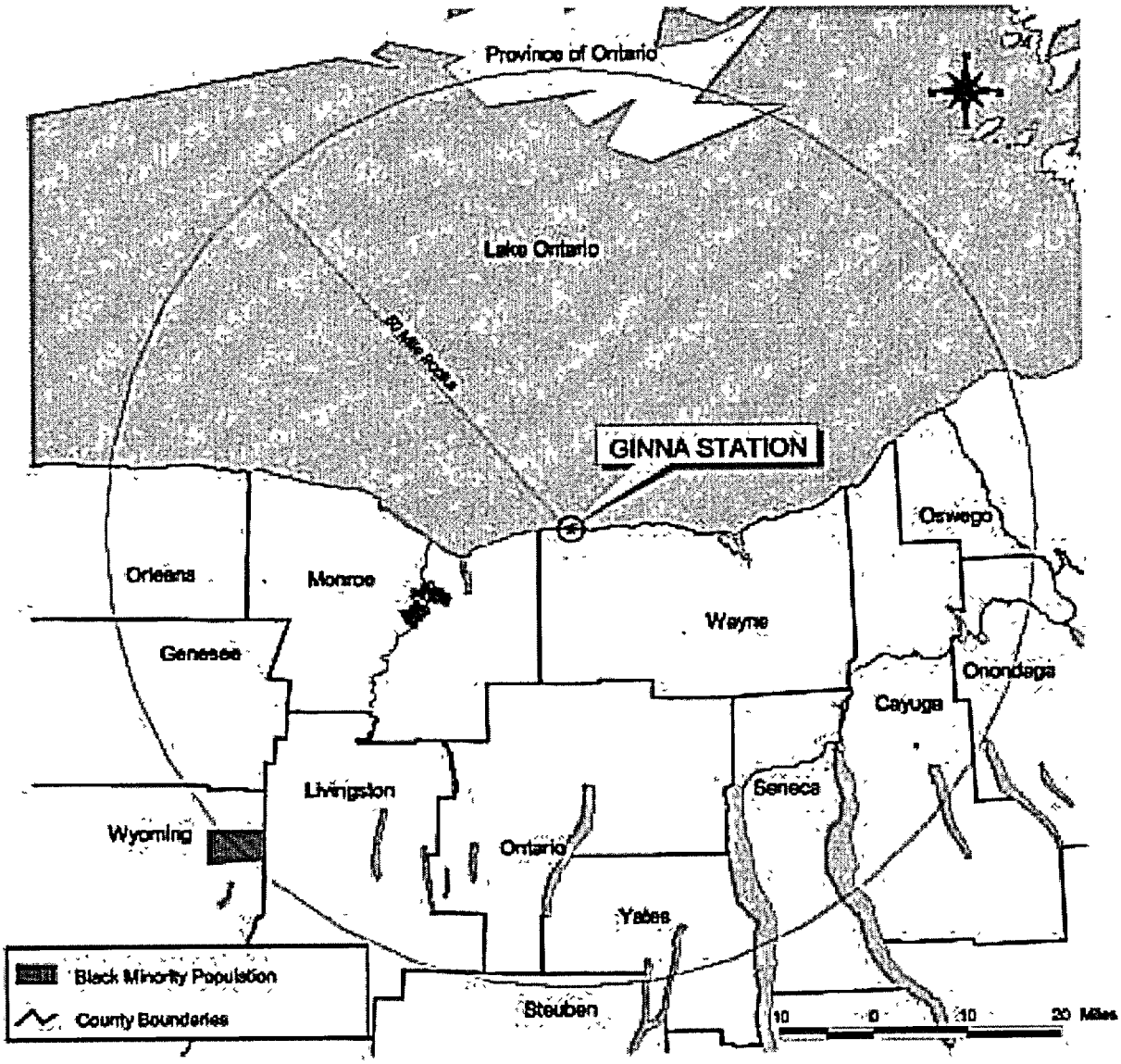
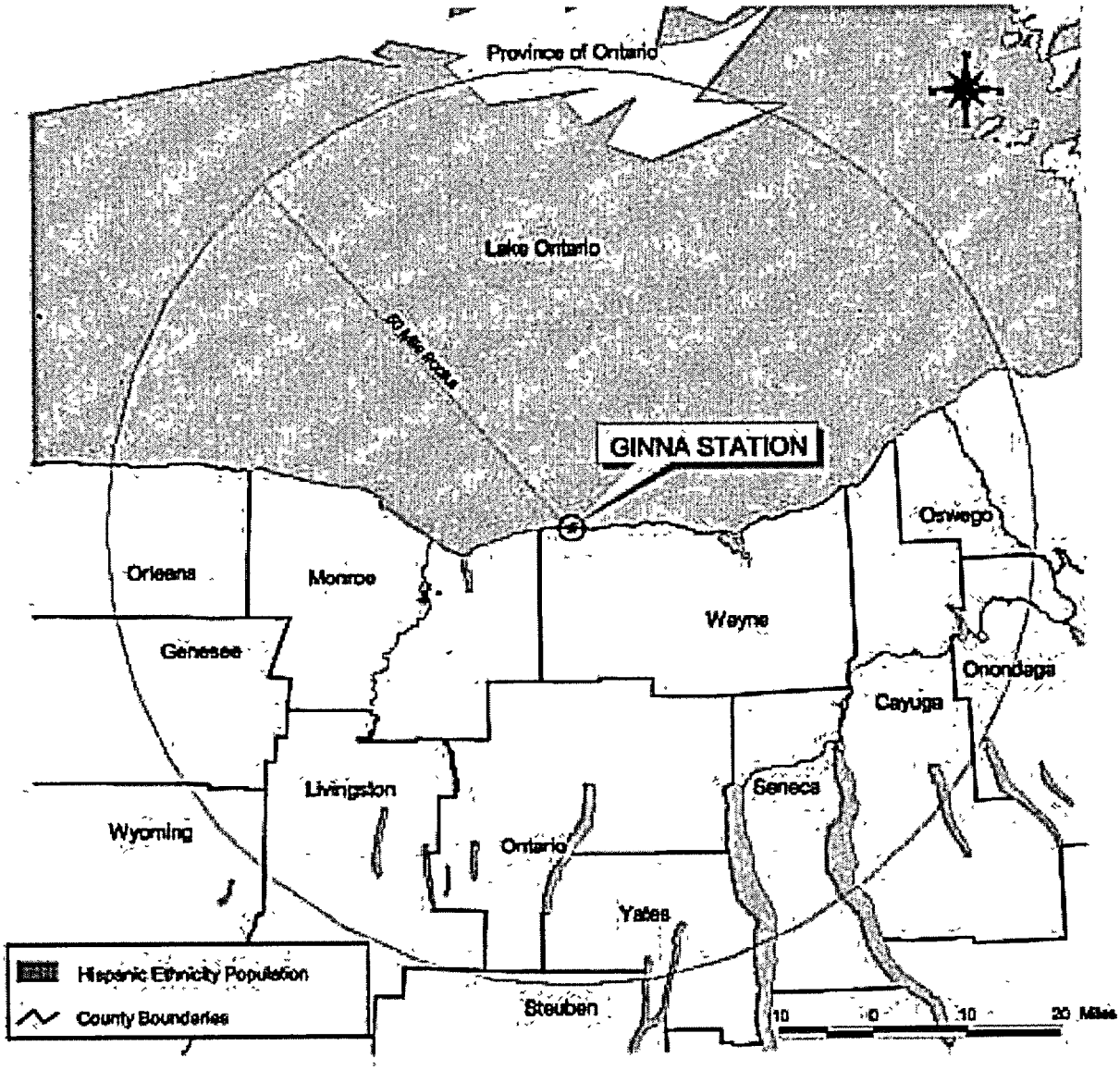


Figure 2.7-2
Hispanic Ethnicity Population



block group. Figure 2.7-3 displays the location of the aggregate minority block groups.

Other single race minority populations exist in 3 block groups (see Table 2.7-2), all of which are located in Monroe County. Figure 2.7-4 displays the location of these other single race minority block groups.

Asian minority populations exist in 1 block group located in Monroe County (see Table 2.7-2). Figure 2.7-5 displays the location of Asian minority block groups.

No block groups contain Native Hawaiian or other Pacific Islander minority populations, American Indian or Alaskan Native populations or multi-racial minority populations (see Table 2.7-2).

In conclusion, there are minority populations of Blacks, Asians, aggregate minority, and other single race categories and the Hispanic ethnicity category within a 50-mile radius of Ginna Station. They tend to be concentrated within the City of Rochester, with a small number of block groups in other counties.

2.7.3.1 Low-income Populations

NRC guidance defines "low-income" using U.S. Census Bureau statistical poverty thresholds (Ref. 2.7-17). RG&E divided the number of low-income individuals in each census block group by the total number of individuals residing in each block group to obtain the percentage of low-income persons per block group. U.S. Census data characterized 13.0 percent of New York State persons as low-income in 1990 (Ref. 2.7-20). The guidance indicates a low-income population is considered to be present if the percentage of households below the poverty level in an environmental impact area is significantly greater (typically at least 20 percentage points) than the low-income population percentage in the geographic area chosen for comparative analysis (New York State).

Based on the "more than 20 percent" criterion, 103 of the 1,128 (1990) block groups contain a low-income population (see Table 2.7-2). The number of block groups in a defined geographic area changes with every decennial census. Monroe County contains 94 of these block groups, with Oswego County home to 3, and Cayuga and Ontario County each home to 2. Livingston and Wayne Counties each have one block group with a low-income population. Figure 2.7-6 shows the location of low-income block groups.

Figure 2.7-3
Aggregate Minority Population

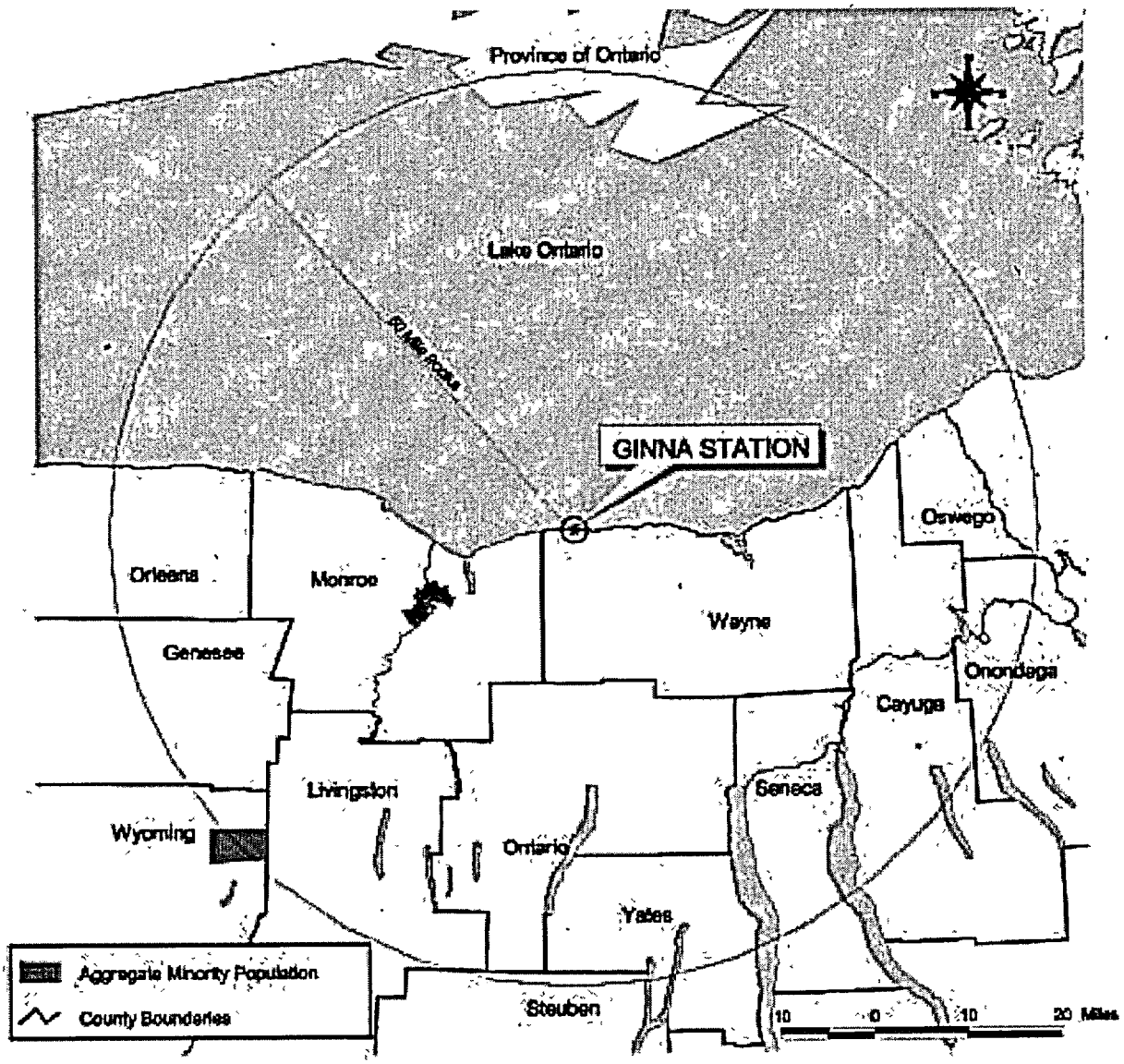


Figure 2.7-4
Other Single Race Minority Population

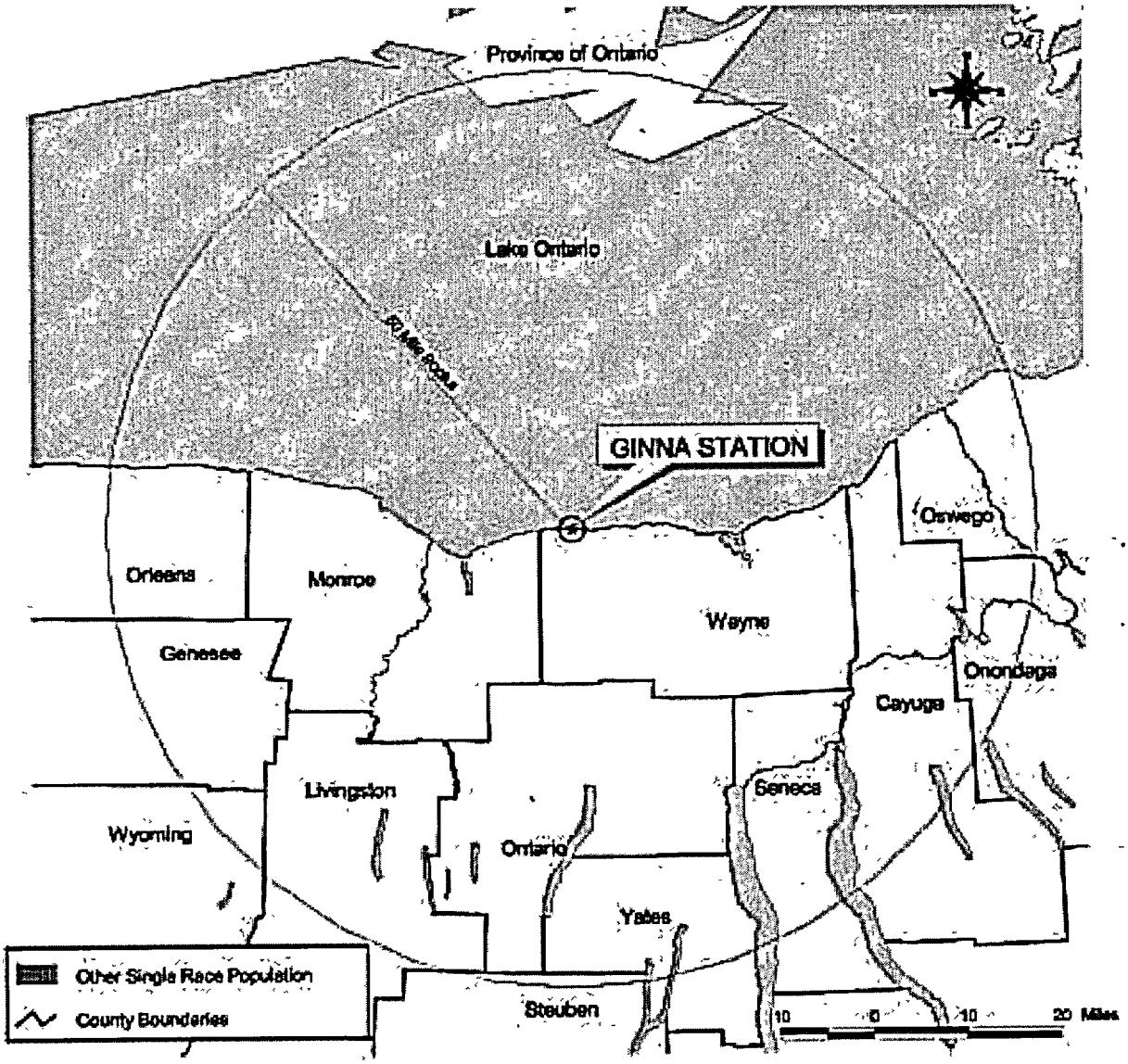


Figure 2.7-5
Asian Minority Population

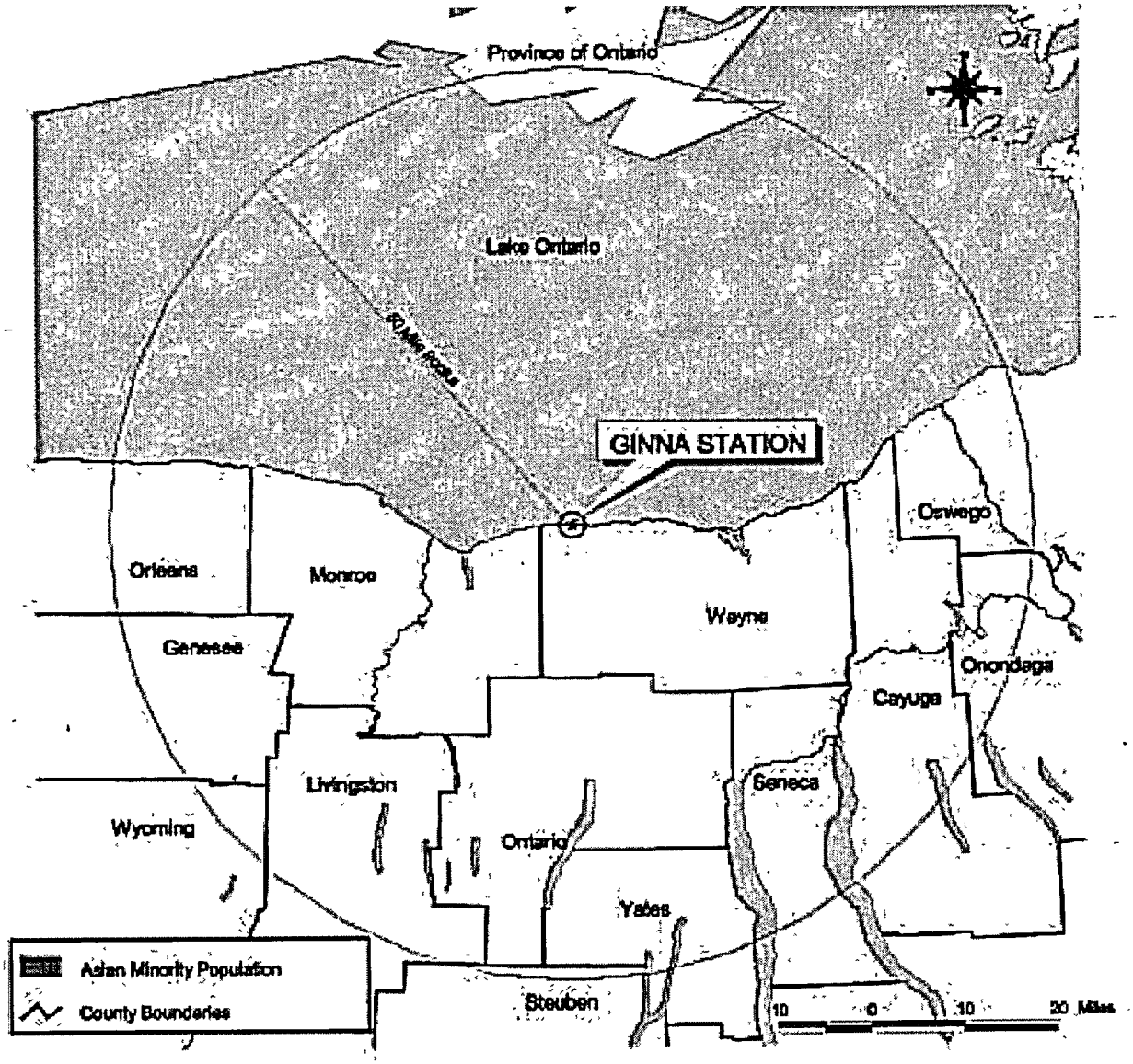
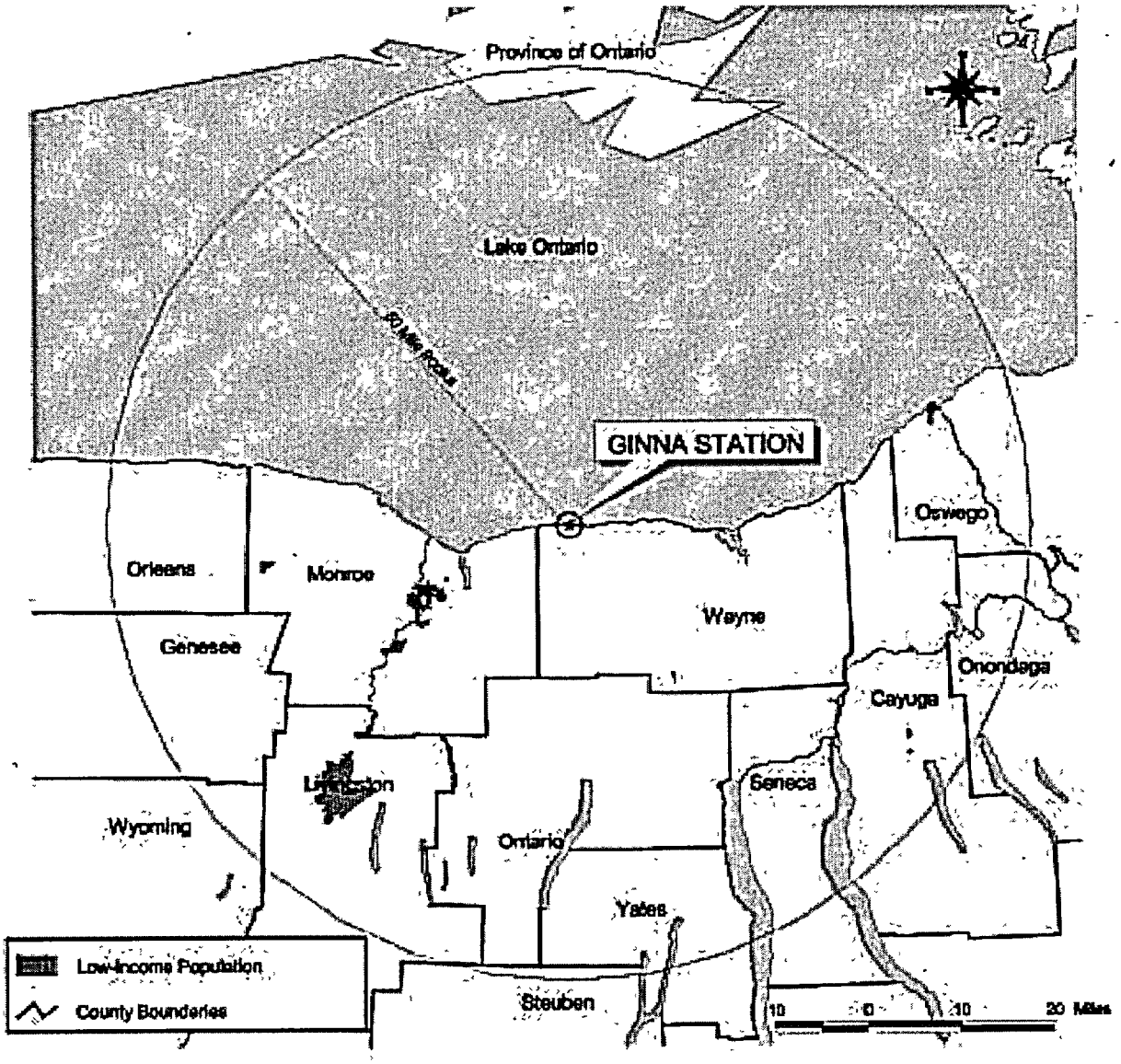


Figure 2.7-6
Low-income Population



2.8 Economic Base

Wayne County, in which the Ginna Station site is located, is primarily of a rural nature and sparsely populated.

Monroe County, located adjacent to and west of Wayne County, is the heart of the Rochester metropolitan area. Home to a number of large, well-known manufacturing companies, Monroe County's labor force remains more heavily concentrated in manufacturing than the Nation's even after significant job cuts at some of these companies.

In 2000, Wayne County's workforce was concentrated in services, which accounted for 31 percent of total employment according to the New York State Department of Labor. Manufacturing and trade each accounted for approximately 15 percent, with agriculture accounting for 3.6 percent and the rest in other sectors (Ref. 2.8-1). On average, 5.2 percent of Wayne County's labor force of 49,300 workers was unemployed during 2001 (Ref. 2.8-2).

According to the New York State Department of Labor, manufacturing employment in Monroe County during 2000 was 21.5 percent of total employment, while services led all categories at 40 percent, retail employment represented 16 percent, and agriculture accounted for less than 1 percent (Ref. 2.8-1). Monroe County's unemployment rate remained below the state and national averages during 2001, averaging just 4.3 percent out of a labor force of 377,400 (Ref. 2.8-2).

The construction industry plays a much smaller role in Wayne County, given its more agrarian nature, employing just 1,023 people, on average, during 2000. Monroe County's construction industry employed, on average, 13,442 during 2000 according to the New York State Department of Labor (Ref. 2.8-1).

Between 1990 and 2000, employment growth in Monroe and Wayne Counties averaged 0.5 percent per year. The manufacturing sector, which accounted for 27 percent of all jobs in 1990, retreated steadily during the past decade as major manufacturers reacted to changing market conditions. Average annual job losses of 1.2 percent during this time left manufacturing jobs accounting for 22 percent of all employment in 2000. Meanwhile, services employment continued to expand, from 34 percent of total employment in 1990 to 40 percent in 2000 (Ref. 2.8-1).

Monroe County is home to many well-known manufacturers, like Eastman Kodak and Bausch & Lomb. In addition, Xerox, founded in Rochester, retains a large manufacturing and marketing base in Monroe County. Photonics, biotechnology, computer and data services, telecommunications, and precision manufacturing each play an important role in the local economy (Ref. 2.7-11).

The future is expected to continue the current trends. Manufacturing concerns will continue to downsize while services, including computer software and business services, will grow. The region's higher education sector, anchored by the University of Rochester and Rochester Institute of Technology, produces many highly skilled

graduates. Many of these graduates stay in the area and start their own companies and this is likely to continue into the future (Ref. 2.7-11).

A number of public-works projects are either underway or in the planning stages in Wayne and Monroe Counties. Eight projects, ranging from $220,000 to over $3 million, are under consideration or have broken ground in Wayne County. The closest to the Ginna Station is a brownfields environmental restoration project in Sodus (Ref. 2.8-3). Monroe County, given its population base, has many more projects under consideration than does Wayne County. Included in these is an $850,000 project to improve Webster Park, currently planned for 2004 (Ref. 2.8-4).

The region's transportation network includes major highways, a train network, and an international airport. Rochester International Airport is located approximately 20 miles southwest of Ginna Station.

2.9 Housing

Wayne County had 38,767 housing units in 2000, with a vacancy rate less than 10 percent. Seasonal/recreational housing accounts for 44.7 percent of the vacant units. With a larger population base and a stronger employment market, Monroe County's housing market is a bit stronger. In Monroe County only 5.8 percent of 304,388 housing units is vacant (Ref. 2.9-1). Annual sales of existing homes in the Rochester metropolitan area totaled 10,754 during 2001 (Ref. 2.9-2). The number of housing permits in the Rochester metropolitan area has remained stable during the past 8 years (Ref. 2.9-3).

2.10 Regional Tax Structure

Property taxes are used to fund schools, police and fire protection, roads maintenance, and other municipal services. Property taxes may be levied by counties, cities, towns, villages, school districts, and special districts (Ref. 2.10-1).

According to the New York State Office of Real Property Services:

> The amount of a particular property's tax bill is determined by two things: the property's taxable assessment and the tax rates of the taxing jurisdictions in which the property is located. The tax rate is determined by the amount of the tax levy to be raised from all, or part, of an assessing unit, and the unit's taxable assessed value. The assessment is determined by the assessor and is based on the value of the property less any applicable property tax exemptions.

Ginna Station is located in the Town of Ontario, Wayne County, and the Wayne Central School District. RG&E tax payments for Ginna Station to these jurisdictions, are detailed in Table 2.10-1. Tax payments for Ginna Station averaged 13.2 percent of the total budget and 37.2 percent of total property taxes for the Town of Ontario for the period from 1995 to 2001. The Ginna Station site accounted for a smaller proportion of the Wayne County budget, only 2.0 percent of the total budget and 6.4 percent of total property taxes for the same period. The Ginna Station site accounted for 12.4 percent of the total budget for the period 1995 through 1999 for the Wayne Central School District.

It is evident from Table 2.10-1 that over time RG&E property tax payments for Ginna Station constitute a decreasing percentage of each taxing entity's total budget. RG&E expects this trend to continue into the future, and with respect to the Town of Ontario and Wayne County School District, this trend is approaching a level that is ten percent or less of the taxing jurisdiction's total budget. In an agreement with the three taxing jurisdictions, the assessed value of the facility is reduced by $13 million per year, through 2009 (Ref. 2.10-5). While this reduction does not directly translate to a percentage reduction in taxes, it does suggest that these levels will continue to go down, as is shown in Table 2.10-1.

Table 2.10-1
Property Tax Paid by Ginna Station; Property Tax Revenues and Total Budgets of Wayne County, Town of Ontario, and Wayne Central School District; 1995 - 2001

Year	Total Property Tax Revenues ($)	Property Tax Paid for Ginna Station ($)	Percent of Total Property Taxes (%)	Total Budget ($)	Percent of Total Budget (%)
		Wayne County			
1995	25,637,215[a]	1,977,607	7.7	79,315,166[a]	2.5
1996	26,040,581[a]	1,767,004	6.8	80,650,726[a]	2.2
1997	26,012,141[a]	1,661,234	6.4	82,669,765[a]	2.0
1998	25,923,815[a]	1,599,601	6.2	84,526,663[a]	1.9
1999	25,504,000[a]	1,597,823	6.3	85,934,651[a]	1.9
2000	26,911,005[a]	1,634,372	6.1	88,697,549[a]	1.8
2001	27,198,909[a]	1,489,193	5.5	92,486,009[a]	1.6
		Town of Ontario			
1995	1,486,983[b]	720,503	48.5	4,868,418[b]	14.8
1996	1,772,832[b]	683,209	38 5	5,105,070[b]	13.4
1997	1,984,839[b]	731,959	36.9	5,413,726[b]	13.5
1998	2,119,847[b]	765,647	36.1	5,552,530[b]	13.8
1999	2,174,857[b]	764,523	35.2	5,923,504[b]	12.9
2000	2,224,925[b]	749,000	33.7	5,889,192[b]	12.7
2001	2,225,607[b]	704,898	31.7	6,182,603[b]	11.4
		Wayne Central School District			
1995	NA	3,270,099	NA	23,865,546[c]	13.7
1996	NA	3,172,118	NA	23,635,950[c]	13.4
1997	NA	3,183,220	NA	24,964,558[c]	12.8
1998	NA	3,165,620	NA	27,248,584[c]	11.6
1999	NA	3,105,391	NA	28,927,432[c]	10.7
2000	NA	3,170,478	NA	NA	NA
2001	NA	3,182,172	NA	NA	NA

a. Ref. 2.10-2
b. Ref. 2.10-3
c. Ref. 2.10-4

2.11 Land Use

Wayne County is rich in agricultural history and terrain. The County's growth began in agriculture in the 1790s, and agriculture continues to play an important role in the County's economy. Wayne County had a 2000 population of 93,765, and is composed of 15 towns, each with an elected Town Supervisor (Ref. 2.11-1).

Wayne County's land use characteristics included 840 farms in 1997, the most recent year for which data are available, compared to 1,064 farms in 1987. The acreage used in farming has dropped from 191,309 acres to 167,190 over the same time period. Primary crops include corn (358 farms), hay and other grains (342 farms), orchards (apples, pears, peaches, etc.) (255 farms), beef and milk cows (223 farms), oats, potatoes, and vegetables. The county ranks 43rd nationwide in the number of acres dedicated to orchards (Ref. 2.11-2).

The land within a radius of 5 miles of the Ginna Station site is used for agricultural purposes, principally for growing apples, cherries, grapes, and field crops. There are three dairy farms within a 5-mile radius of the plant, with 50 to 75 milk cows per farm (Ref. 2.4-2, Section 2.1.1).

Monroe County is home to Rochester, the third largest city in New York State. The County is the dominant center of the Genesee Valley region. Monroe County comprises 19 towns, 10 villages, and the City of Rochester, with a combined population of approximately 750,000 residents and a land area of 663.21 square miles (Ref. 2.11-3). Monroe County is more industrialized than Wayne County (Ref. 2.4-2, Section 2.1.1).

The New York Constitution grants all cities, towns, and villages the right of "home-rule" power. County level land-use planning is therefore very limited in the State of New York. Rather, local governments in New York State have primary control over land use within their boundaries. While the Comprehensive Plan sets municipal development objectives, zoning ordinances are most commonly used to regulate land uses (Ref. 2.11-4).

In New York State, the three types of local laws that impact land-use control are: (1) Comprehensive Plans, which may follow General City Law, Town Law, or Village Law; (2) Zoning Ordinances, which must follow General City Law, Town Law, or Village Law; and (3) Subdivision Ordinances, which must follow General City Law, Town Law, or Village Law. Local government right to "home rule" means that local governments may adopt or amend local laws that relate to their "property, affairs, or government" as long as the local laws are not inconsistent with the Constitution or general laws (Ref. 2.11-4).

According to the Monroe County Planning Department (Ref. 2.11-5), Monroe County last passed a Comprehensive Plan in 1979. The document did not have any land-use authority, since land-use planning in New York State is done at the local level. The County sees its role as very minimal in land-use planning, and does not have any unusual restrictions to growth. The County did recently provide $2 million from

tobacco settlement dollars to leverage other local and state funding for the purpose of open space preservation. Suburban towns must initiate the open space actions. A town may approach the County and ask for up to 25 percent of the cost of acquiring the development rights to a piece of property targeted in the town's Comprehensive Plan for open space preservation. The remaining 75 percent of the cost must come from non-County sources. Such parcels are generally quite small, and do not exceed 70 acres.

The City of Rochester is essentially a "built-out" community. The City has declined in population over the last two decades, due to declining household size and movement to the suburbs. The City has made a concerted effort to remove obsolete housing units left in disrepair. In addition to the focus on removal of obsolete units, the City is also focused on infilling strategies with the objective of stabilizing the population. For example, some parcels that were traditionally non-residential have been converted to residential use and re-furbished to meet the demand for new, high-end residential units. No restrictions on growth are in place (Ref. 2.11-6).

The Town of Webster, in the northeast portion of Monroe County and the Monroe County town closest to the Ginna Station site, has a Comprehensive Plan passed in 1998. The Town has a functioning Planning Board and a Zoning Board of Appeals, but no Conservation Board. Site plan reviews are required for zoning/development changes or actions. Planned unit development and signage provisions are mandatory provisions in the Zoning Ordinance, Subdivision Ordinance, and Land Use Regulations of the Town. The Town encourages vegetation retention using trees. For erosion and sedimentation control purposes, the Town has placed restrictions on grading, filling, and excavation. The Town mandates mitigation measures for drainage and stormwater management practices, encourages development restrictions in flood-prone areas, and encourages addressing Federal Emergency Management Agency guidelines. Because the Town of Webster is on Lake Ontario, a substantial section of land is shoreline and can be subject to erosion; hence the focus on erosion and sedimentation control, flood-prone areas, etc. However, the Town does not have any development restrictions in environmentally sensitive areas, does not have dedication of open space, and has no open space easements or any open space conservation. Therefore, there is no reason to believe that any restrictions or growth control measures exist (Ref. 2.11-4).

According to the Wayne County Department of Development, the Wayne County towns abutting Lake Ontario do not have any overly restrictive ordinances placed on growth. There is no reason to suspect that a limit on building permits will occur in the vicinity of the Ginna Station site in the foreseeable future (Ref. 2.11-7).

2.12 Public Services

2.12.1 Public Utilities

The Ginna Station uses public utilities for potable water. Most of the water used in the generation of electricity is drawn from Lake Ontario and is, therefore, not from the public utility. As discussed in Section 3.1.3.1, the Ginna Station purchases its potable water from the Ontario Water District, Town of Ontario.

The Monroe County Water Authority (MCWA) has a capacity for 145 million gallons per day (mgd) with peak usage of 122 mgd. The MCWA has 23 mgd of excess capacity in its water system. At the present time, the MCWA has enough supply to handle an additional 9,200 households. The Authority estimates that the average household uses 250 gallons per day. Monroe County has two surface water sources: Lake Ontario water, which is treated at the Shoremont Plant and the Brockport Plant; and Hemlock Lake water, which is purchased from the City of Rochester and treated at the City's plant in Hemlock (Ref. 2.12-1).

The City of Rochester has its own water system that draws water from Hemlock and Canadice Lakes located to the south of Rochester. The City of Rochester owns over 7,000 acres of land in the watershed around these two Lakes. The City is permitted to draw, on average, 37 mgd from the two Lakes with a maximum daily usage of 48 mgd. If the City needs to supplement its water supply, it purchases water from the MCWA (Ref. 2.12-2).

While Monroe County's water system is organized at a county level, Wayne County's is organized mainly at a town level. The County purchases most of its water from area towns and villages, plus Monroe County (Ref. 2.12-3). Wayne County produces a small amount of water, with a capacity of 70,000 gallons per day and peak usage of 30,000 gallons per day (Ref. 2.12-3). Wayne County draws its water from the Third Creek basin (Ref. 2.12-3). The Wayne County Water and Sewer Authority estimates that the average residential customer uses 150-200 gallons of water per day (Ref. 2.12-3). There is no credible estimate on the percentage of households serviced by wells in Wayne County.

The Town of Ontario's water system has a 3.5 mgd capacity, with average daily usage of approximately 1.9 mgd. Of that usage, 51 percent of the volume is sold outside of the Town. The Town of Ontario's water system currently maintains 16 inch intake pipes. Plans are to increase the size of these pipes, by summer 2002, to double their intake capacity. While plans are not to immediately increase the water intake volume, the ability to do so will be available once the project is complete (Ref. 2.12-4). The Town of Ontario estimated that the number of its residents on private wells would be no more than a dozen, but indicated that they do not track that information. The Town of Williamson has a capacity of 4 mgd and peak usage of 2 mgd (Ref. 2.12-5); Newark has a capacity of 3.5 mgd and peak usage of 2.14 mgd (Ref. 2.12-6); Wolcott's capacity is 544,000 gallons per day with peak usage of approximately 330,000 gallons per day (Ref. 2.12-7); and Lyons Village has a capacity of 800,000 gallons per day and peak usage of 550,000 gallons per day

(Ref. 2.12-8). The Towns of Ontario, Williamson, and Wolcott draw their water from Lake Ontario. Newark draws its water from Canandaigua Lake, and Lyons Village buys water from Junius Ponds in Seneca County and produces its own via two wells. The groundwater source for the wells is the Fairport/Lyons Glacial Stream Channel (Ref. 2.12-8).

2.12.2 Transportation

The region's transportation network includes an international airport, a train network, and major highways. Rochester International Airport is located approximately 20 miles southwest of Ginna Station. A primary passenger railway, operated by Amtrak, runs east-west approximately 13.5 miles south of Ginna Station. In addition, the Ontario Midland Railroad is a local "shortline" that feeds into the CSX Transportation lines. Ontario Midland, a privately owned company, operates 47 miles of a T-shaped track in Wayne County. The tracks are used to transport both passengers and freight. The east-west portion of the "T" runs approximately 3 miles south of Ginna Station, from Webster to Wolcott. The north-south portion of the track runs from Sodus to Newark, 16 miles east of Ginna Station (Ref. 2.12-9; Ref. 2.12-10). The east-west portion of the "T" does not currently have direct access to Ginna Station. However, RG&E owns a corridor of property from the track to Ginna Station, and a 3-mile track could be laid to provide direct access to the plant if necessary. Ontario-Midland has delivered transformers to Ginna Station in the past (as close as possible given lack of direct access). The land under the east-west portion of the line is owned by RG&E (Ref. 2.12-11).

The transportation routes and road conditions in the vicinity of Ginna Station are described in the following paragraphs. The main east-west transportation routes that provide access to Ginna Station are County Route 101 (Lake Road) and NYS Route 104. Lake Road runs east-west and provides direct access to Ginna Station along much of the site's southern border. NYS Route 104 is the predominant east-west corridor in the area and runs parallel to Lake Road, approximately 3.5 miles south of Ginna Station. Town road Ontario Center Road runs north and south, connecting NYS Route 104 to Lake Road immediately south of Ginna Station. Several other secondary roads run north-south providing access to Lake Road from NYS Route 104. Lake Road and NYS Route 104, along with a number of north-south secondary roads linking the two, provide a number of routes for employees to access Ginna Station.

Employees commuting from Monroe County (and other points west) are likely to use east-west corridors, namely NYS Route 104, NYS Route 441, or NYS Route 286, to access Lake Road via north-south corridors NYS Route 250 or Ontario Center Road/NYS Route 350. Employees commuting from the south and east are likely to use north-south corridors NYS Routes 21 and 350 to reach NYS Route 104, and then use Ontario Center Road to Lake Road.

Lake Road is a two-lane road with a daily traffic count of approximately 2,150 vehicles (Ref. 2.12-12). Ontario Center Road is also a two-lane road, but

neither Wayne County nor the Town of Ontario has recent data on the daily traffic volume. A traffic count is planned for 2003 (Ref. 2.12-12).

State roads carry a "volume/capacity ratio," which indicates whether the road is being actively used over capacity (value greater than 1.0), at capacity (value of 1.0), or under capacity (value less than 1.0) (Ref. 2.12-13). State roads also carry "surface score ratings" ranging from a low of "1," or impassable, to a high of "10," which indicates new construction (Ref. 2.12-14 and 2.12-15). The volume/capacity ratios and surface score ratings for the roads cited as primary routes of commuting patterns to Ginna Station are described below.

The portion of NYS Route 104 between the Monroe County border and Furnace Road in the Town of Ontario is four lanes and has a surface rating of 6, classifying it as "fair." The most recent year in which work was done on this 4.75-mile stretch of road is 1991. This section of NYS Route 104 experiences heavy traffic, carrying just fewer than 20,000 vehicles per day, but has a volume/capacity ratio of 0.3, indicating that use is well under its volume/capacity. Between Furnace Road and NYS Route 21 in Williamson, the rating improves to 8, classifying this 4.83-mile stretch of road as "high good." This portion of the road is two lanes and has a volume/capacity ratio between 0.7 and 0.9, depending on the section of road.

Volume on NYS Route 104 picks up significantly in Monroe County. Between the Wayne County line and NYS Route 250, where the road is four lanes, volume ranges between 24,300 and 40,000 vehicles daily. This reflects those people working at Xerox in Webster and those commuting into Rochester. The road conditions deteriorate over this 2.85-mile portion of road with a rating dropping to 5, classifying the road as "high poor." The volume/capacity ratio for NYS Route 104 between Route 250 in Monroe County and the Wayne County border ranges between 0.3 and 0.57, indicating that volume on this portion of the road is not over capacity.

NYS Route 250 runs north-south and is likely to be used by Ginna Station employees living in the southeast portion of Monroe County. It is primarily a two-lane road, with a short four-lane portion where it crosses NYS Route 104. Commuters may take Route 250 north all the way to Lake Road, or to NYS Route 104 east in the Village of Webster, and continue to the Ginna Station site as described above. From its northernmost point at County Route 101, running south through the Village of Webster, Route 250 has a surface score between 8 and 9. North of the Village of Webster, the volume/capacity ratio is between 0.1 and 0.4, well below capacity. A small portion of Route 250 in the Village of Webster has a volume/capacity ratio of between 0.5 and 0.8, indicating it is under capacity. As it runs south through the Village, the ratio is between 0.4 and 0.7, and the surface rating is between 8 and 9. As Route 250 runs south out of the Village of Webster and through the Town of Penfield, it has a volume/capacity ratio of 0.5, indicating that the road is used at one-half of its capacity, and it has a surface score of between 7 and 9.

NYS Route 441 runs east and west, and may be used by commuters in eastern Monroe or western Wayne County to connect with either Route 250 or Route 350, both of which run north to NYS Route 104. From Route 250 into Wayne County, the

road is two lanes. In Monroe County the volume/capacity ratio of NYS Route 441 from Route 250 to the Wayne County line ranges from 0.7 to 1.0, indicating this stretch is below or at capacity. The same section has a surface rating between 5 and 6. The volume/capacity ratio is 0.2 along its entire length in Wayne County, indicating that it is running at one-fifth of its capacity. The surface score is 7 in Wayne County.

NYS Route 286 is a two-lane road running east and west just north of Route 441, and may also be used to reach Route 250 or Route 350, both of which run north to Lake Road. Route 286 has a volume/capacity ratio of 0.2 from Route 250 in Monroe County, to its end at Route 350 in Wayne County, indicating that it is running at one-fifth of its capacity. Its surface score along this length is 7.

NYS Route 21 is a two-lane road running north and south through the western portion of Wayne County. It may be used by commuters who reside in some portions of western Wayne County to drive north to NYS Route 104 west, then travel on to Ginna Station as described earlier. Route 21 has a volume/capacity ratio of between 0.2 and 0.3 running south from NYS Route 104, through the Village of Palmyra, approximately 12.5 miles south of Ginna Station. This indicates the road is running at between one-third and one-fifth of its capacity. The surface score along this length ranges from 8 to 9.

NYS Route 350 is a two-lane, north-south roadway directly south of Ginna Station, that begins at NYS Route 104 in Ontario Center, and runs south through Wayne County to the Village of Macedon. The volume/capacity ratios along the length of Route 350 indicate that it could handle substantially more traffic. The ratio on the entire length of Route 350 ranges from 0.2 to 0.4, indicating it is at 20 percent to 40 percent of its total capacity. The surface ratings near Ginna Station are between 5 and 6, with the most recent road work done in 1991 and 1992. Daily traffic volume is approximately 4,650 vehicles near Ginna Station. As Route 350 runs south, the volume/capacity ratio remains between 0.2 and 0.4 until it reaches the Village of Macedon. The surface score improves to between 7 and 8 from Route 441 south to the Village of Macedon. The daily traffic count drops to 4,400 vehicles as the road heads south from Route 441 to Route 31, and increases to 5,370 as the road leads into Macedon. Ontario Center Road extends NYS Route 350 north of NYS Route 104 to Lake Road; however, no data are available for this road.

2.13 Historic and Archaeological Resources

Both Monroe and Wayne Counties have a history of Native American inhabitation. Lake Ontario, Irondequoit Bay, and Sodus Bay provided vibrant trading routes for the Iroquois Indian Nations during the 15th and 16th centuries. The arrival of European settlers and the wars fought between the English and the Native Americans and between the Colonists and the British caused the Native American populations to fall dramatically. While some Native American history remains in the area, no significant Native American villages or other artifacts have been found or identified on or in close proximity to the Ginna Station site.

Four sites listed on the National and State Registers of Historic Places are located within the six-mile radius of the Ginna Station site. Two of these are in Pultneyville, six miles east of Ginna Station: Gates Hall and Pultneyville Public Square, and Pultneyville Historic District. The other two are Brick Church Corners (also known as Heritage Square) and the First Presbyterian Church, located one mile south-southwest and three miles south from the Ginna Station site, respectively (Ref. 2.13-1).

No archeological sites are known to exist in the vicinity of either the Ginna Station site or the electric transmission line corridor (Ref. 2.7-10).

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3.0 THE PROPOSED ACTION

NRC

"The report must contain a description of the proposed action, including the applicant's plans to modify the facility or its administrative control procedures... . This report must describe in detail the modifications directly affecting the environment or affecting plant effluents that affect the environment...." 10 CFR 51.53(c)(2)

Rochester Gas and Electric Corporation (RG&E) proposes that the U.S. Nuclear Regulatory Commission (NRC) renew the R.E. Ginna Nuclear Power Plant (Ginna Station) operating license for an additional 20-year period, through September 18, 2029. Renewal would provide RG&E and the State of New York the option of relying on Ginna Station to meet the State's future needs for electricity generation. Section 3.1 provides a general description of plant design and operating features. Sections 3.2 through 3.4 address changes in aging management activities that will be required to support operations during the operating license renewal period.

3.1 General Plant Information

Ginna Station is owned and operated by RG&E whose principal offices are located in Rochester, New York. Ginna Station provides about 40 percent of the electrical load in the RG&E service territory, located primarily in upstate western New York, centered on the Rochester metropolitan area. The plant is located on the south shore of Lake Ontario (approximately 20 miles east of Rochester) and the site consists of 488 acres, including about one and one-half miles of shoreline.

General information about design and operational features of Ginna Station that are of interest from an environmental impact standpoint is available in several documents. Among the most comprehensive sources are the Final Environmental Statement (FES) prepared by the NRC's predecessor agency, the U.S. Atomic Energy Commission (AEC), and the Updated Final Safety Analysis Report (UFSAR), prepared and maintained by RG&E. The AEC issued an FES, in 1973, that addressed operation of Ginna Station (Ref. 3.1-1). RG&E maintains a UFSAR that provides current design information for the plant (Ref. 3.1-2). The NRC's *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) presents that agency's requirements regarding general plant information relevant to license renewal (Ref. 3.1-3). RG&E used these documents and other sources as a basis for the plant descriptive information presented in the remainder of Section 3.1.

3.1.1 Major Facilities

The arrangement of Ginna Station's major structures, including the reactor containment, auxiliary building, intermediate building, control building, turbine building, screenhouse, all-volatile-treatment (AVT) or condensate demineralizer building, standby auxiliary feedwater pump building, and the service building

containing offices, shops, and laboratories is shown in Figure 2.1-3. Additionally, the old steam generator storage facility is located northwest of the plant.

The screenhouse, located 115 feet north of the turbine building and 80 feet south of the Lake shore, contains the traveling screens, circulating water pumps, service water pumps, fire water pumps, plant heating boiler, the chlorination system, and some safety-related equipment.

Ginna Station has a nuclear reactor of a pressurized water type (i.e., a pressurized water reactor, or PWR) and has the capability to produce 490 net megawatts of electric power. The reactor containment is a vertical, cylindrical reinforced-concrete type with pre-stressed tendons in the vertical wall, a reinforced-concrete ring anchored to the bedrock, and a reinforced hemispherical dome. The major components of the reactor coolant system are located within the containment structure. The containment structure provides a physical barrier to protect the equipment from natural disasters and shielding to protect personnel from radiation emitted from the reactor core while at power. The reactor vessel is located in the center of the containment structure below ground level.

3.1.2 Nuclear Steam Supply System

The Ginna Station nuclear steam supply system consists of a PWR and its associated coolant system supplied by Westinghouse (Ref. 3.1-2, Section 5.1.1). The system is designed as two identical heat-transfer closed loops, each of which includes a reactor coolant pump and a steam generator connected to the reactor vessel. The system also includes a pressurizer, pressurizer relief tank, connecting piping, and instrumentation needed for operational control. Highly purified water, to which chemicals are added to control corrosion and to moderate the nuclear reaction, circulates under high pressure through the reactor and the tube side of the steam generators in these closed loops, called the primary system. Heat from the reactor is transferred to highly purified, treated water in the shell side of the steam generators to produce high-pressure saturated (less than 0.1 percent quality) steam that is routed through the steam turbines, condensed back to water in the main condensers, and pumped back to the steam generators, thus making up a secondary cooling loop isolated from the primary system.

The reactor was initially licensed to operate at a maximum power level of 1,300 megawatts-thermal. On the basis of additional safety and environmental evaluations, however, the AEC issued a license amendment (Amendment No. 2), March 1, 1972, to allow operation at the system's full-rated power level of 1,520 megawatts-thermal (Ref. 3.1-2, Section 1.1).

The Ginna Station reactor is licensed to use uranium-dioxide fuel that has a maximum enrichment of 5.0 percent by weight uranium-235 (Ref. 3.1-2, Section 9.1.2.1.2). Typical average enrichment is 4.20 percent by weight uranium-235.

The reactor core is composed of fuel rods fabricated with cylindrical, uranium-dioxide ceramic pellets enclosed in 144-inch-long cylindrical, zircaloy or ZIRLO tubes with welded end plugs. The 179 fuel rods are fabricated into 14 x 14 array fuel

assemblies with end fittings and grids to support and limit motion of the tubes. There are 121 of these fuel assemblies in the reactor core. The core also contains absorber rods made of silver-indium-cadmium, arranged in 29 control-element assemblies, to control the nuclear reaction.

RG&E regularly replaces about one-third (44) of the fuel assemblies in the reactor core at approximately 18-month intervals. The approximate maximum average burn-up for a fuel sub-batch discharged from the reactor core is less than 55,000 megawatt-days per metric ton uranium.

3.1.3 Cooling and Auxiliary Water Systems

3.1.3.1 Water Use Overview

Lake Ontario is the source for cooling and most auxiliary water systems. Ginna Station utilizes a once-through condenser cooling system with a submerged offshore intake and a surface shoreline discharge. The total nominal flow of circulating water through the turbine condenser and service water systems is about 354,600 gallons per minute (gpm). A flow of approximately 340,000 gpm is used in the turbine condenser system and the rest is available for use in the service cooling supply and fire protection systems. The water from these two systems is combined and is released to the discharge canal, which discharges into Lake Ontario. The circulating water system (condenser cooling system) is a completely separate system from the closed secondary system. The circulating water system also contains a condensate cooler that is used to cool condensate to the hydrogen coolers and air ejectors. In addition, domestic-quality water, at a flow of about 100,000 gallons per day, is purchased from the Ontario Water District, Town of Ontario, for drinking, sanitary purposes, auxiliary boiler feed, and condensate makeup and polishing. Sanitary waste from Ginna Station is discharged into the Town of Ontario New York's waste water treatment system.

3.1.3.2 Circulating Water System

The function of the circulating water system is to provide a reliable supply of water to condense the steam exhausted from the low-pressure turbines. The water source and heat sink for the circulating water system is Lake Ontario. The circulating water system functions to remove heat from the steam cycle via the main condensers and is designed to do so regardless of weather or Lake conditions. The system consists of an offshore intake structure designed specifically to minimize the possibility of clogging, an inlet tunnel, four traveling screens, two circulating water pumps, and shoreline discharge via a short discharge canal.

The intake structure is located 3,100 feet out from shore at a depth of about 33 feet of water at mean lake level, 244.7 feet, and is completely submerged below the surface of the Lake. Even an occurrence of historical low water level will result in no less than 15 feet of water covering the intake structure. The intake itself is an octagonal-shaped structure, 50.8 feet across, containing electrically heated screen racks in each of the eight 17.3-foot-wide by 10-foot-high ports. Heavy screen racks with bars spaced 10-14 inches apart, center to center, prevent large objects from

entering the system. At conditions of full flow (354,600 gpm) the velocity at the intake screen racks is 0.8 feet per second. Water enters the intake from all sides in a circle, protecting against stoppage by a single, large piece of material. The low velocity plus the submergence provide assurance that floating ice will not plug the intake. The only phenomenon that might contribute to the plugging would be the accumulation of frazil ice on the screen racks. Frazil ice is a type of spiny, crystallized ice that forms on objects in a turbulent stream of supercooled water. To minimize such a formation, the bars have been separated 10 inches to 14 inches on center, making it unlikely that frazil ice could support itself over a span of this distance. The electric heaters keep the metal bars above 32 degrees Fahrenheit (°F), thus minimizing the adhesive characteristics of frazil ice to metal surfaces.

To meet the high reliability requirements, the intake system is completely submerged below the surface of the Lake. A 10-foot diameter, reinforced-concrete-lined tunnel driven through bedrock extends 3,100 feet in a northern direction from the shoreline. From the intake, the tunnel slopes downward over its 3,100-foot length for a total elevation decrease of 10 feet. From underneath the screenhouse, the tunnel rises vertically and connects to a reinforced-concrete inlet plenum, or forebay, in the screenhouse. Warm water recirculation is provided in the screenhouse inlet forebay to temper the inlet water temperature and melt any ice that might reach or form at this point.

Before the cooling water reaches the two circulating water pumps that send it through the condensers, the water passes through one of four parallel traveling screens. The four originally installed traveling screens were fitted with steel wire mesh, having 3/8-inch openings, and are similar in concept to vertical conveyor belts. In an effort to enhance performance and durability, the original mesh has been replaced with 3/16-inch by 1-inch rectangular, stainless steel crimped-fit mesh on two of the four traveling screens. The mesh on the remaining screens is scheduled to be replaced with the new mesh by the end of 2003. The screens, which remove fish and debris from the cooling water system, are operated sequentially, each being washed for 15-20 minutes. There is at least one traveling screen in operation at all times when at least one of the circulating cooling water pumps is operating. The screens can operate at two speeds, slow and fast, and in two modes, automatic and manual. Service water is used to flush the debris off the screens into a 1.3-foot wide and up to 2.0-foot deep concrete trough, or screen washwater discharge fish/debris sluice. It runs from the four traveling screens to the discharge canal and has four turns, all greater than 145° and more than 17 feet apart. Currently, water travels through the sluice at a flow rate of 40 gpm while the screens are in operation. All fish and debris, excluding collections during the impingement studies, are returned to Lake Ontario via this sluice.

Water leaves the condensers and discharges into two condenser discharge tunnels, which are each 8-feet wide and 7-feet high and are rectangular in shape. They run west 95 feet and then north towards the discharge canal. Six feet north of the turbine building the two tunnels direct flow into two 96-inch pre-stressed, reinforced-concrete pipes. These two pipes run 160 feet and enter the discharge canal at the

bottom of a seal well. The purpose of a seal well is to provide a water seal and prevent air from entering the condensers via the discharge lines. The floor rises gradually from the seal well (231.5 feet) to an elevation of 238 feet. This elevation is maintained throughout the rest of the canal. The discharge canal is on the north side of the screen house and is 40-feet wide. The canal is rectangular and is constructed of reinforced concrete. At a lake elevation of 246 feet, the discharge canal has an average water depth of 8 feet and the discharge flow velocity is 2.34 feet per second. The canal has a recirculation weir that can direct warm discharge water into the screenhouse inlet forebay, as previously discussed. The canal then turns north and extends another 35 feet, where it enters Lake Ontario at the shoreline. This last 35 feet is lined with armour stones. The discharge canal is protected from large debris by a submarine net placed inside the canal near the shoreline.

The thermal discharge from the Ginna Station once-through cooling water system is directed into Lake Ontario from the shoreline discharge canal onto the surface of the Lake. Normal temperature increase over ambient water at the point of discharge is about 20°F, and the size of the thermal plume is normally about 175 acres. A complete description of the thermal discharge and related environmental impacts is contained in the Ginna Station Section 316(a) demonstration (Ref. 3.1-4).

3.1.3.3 Service Water System

The service water system consists of four service water pumps located in the screen house. They are two-stage, vertical turbine pumps (original specified rating of 5,300 gpm). Between 1995 and 1997, all four original 300-horsepower (hp) motors were replaced with 350-hp motors that have anti-reverse-rotation devices. The service water system circulates Lake Ontario water from the screenhouse to various heat exchangers and systems inside the containment and the auxiliary, intermediate, turbine, and diesel generator buildings. The service water system supplies cooling water to various turbine, as well as auxiliary reactor, plant loads. It provides multiple water source flow paths to ensure the availability of the ultimate heat sink. All portions of the service water distribution system serving safeguards equipment are designated as Seismic Category I. All other portions of the service water system serving non-safety loads are designated as non-seismic and are capable of being isolated from the Seismic Category I portion of the system through the use of redundant motor-operated isolation valves.

The preferred service water discharge flow path is to the discharge canal, then Lake Ontario. An alternate service water discharge flow path exists via a discharge structure to Deer Creek. This path is used very infrequently, primarily during surveillance testing or when maintenance work is required in the preferred service water discharge path. When in use, flows are documented in the monthly Discharge Monitoring Report submitted to the New York State Department of Environmental Conservation (NYSDEC). The only special limitation imposed on use of the alternate discharge flow path is that chlorine injection is not allowed, since this would be an unmonitored release point.

3.1.3.4 Treated Water System

The treated water system comprises the following secondary plant subsystems: demineralized water production; domestic (potable) water; secondary water chemical treatment; and non-radioactive liquid waste disposal (floor drains, secondary sample effluents, etc.). The treated water subsystems are non-safety related auxiliary systems that support the functionality of other process systems.

The principal components of the treated water system are pumps, tanks, ion exchange vessels, and the essential piping, hoses, and valves necessary for the subsystems to function. The primary water treatment system or mobile demineralizer trucks process domestic water to provide demineralized water to the reactor makeup water tank, the component cooling water surge tank, the condensate storage tanks, and various local locations throughout the plant via a piping distribution network. The AVT chemistry system uses chemical addition and ion exchange to treat condensate water in order to reduce the corrosion of equipment in the secondary system and minimize the fouling of heat transfer surfaces. The AVT regeneration wastes are collected in neutralization tanks and sampled to determine disposition methods. The catalytic oxygen removal system reduces condensate-dissolved oxygen by mixing hydrogen with the condensate and reducing the free oxygen to water by exposing the mixture to a metal catalyst surface. The secondary plant equipment and floor drains serve to route leakage from equipment and compartments in order to provide proper control of leakage, prevent uncontrolled communication between areas as necessary, and to allow monitoring of leakage prior to disposition. Where drains from safety-related areas are tied into drains from areas that contain a large quantity of flammable liquid, backflow protection is provided to prevent possible spread of a liquid fire via the drain system. An underground retention tank is the collection point for the various building floor and equipment drains, and provides retention of these effluents for sampling and treatment prior to discharging into the circulating water discharge.

3.1.3.5 Groundwater Monitoring Program

Ginna Station does not use groundwater in any of its water systems. There are no production wells on the site. However, RG&E has established a groundwater monitoring program. In the early 1990s, the presence of trace amounts of boric acid and radionuclides was discovered in the groundwater in the immediate vicinity of Ginna Station. The levels detected were consistent with the water content of the spent fuel pool and transfer canal.

RG&E initiated a program to (1) assess the leakage source, (2) determine the most probable groundwater flow direction, (3) initiate a monitoring program for tracking any potential offsite releases, and (4) evaluate the potential impact on plant equipment.

It was determined that the leakage of about 0.1 gpm emanated from welds in the transfer canal. Leakage occurs only when the transfer canal is filled with water, which occurs only during a small portion of each refueling outage. A sampling and

monitoring plan was initiated in 1996, and groundwater sampling was proceduralized. Data collected indicate groundwater flow is toward the Lake and that a conservative estimate of the total tritium released from the site into groundwater discharged to Lake Ontario is 0.002 curies. This value represents approximately 0.001 percent of the total average annual tritium (160 curies) released from Ginna Station. The tritium levels measured in the onsite groundwater wells are below the drinking water limits specified in 40 CFR 190.

Because of the negligible impact of this leakage, RG&E considers it acceptable to retain this arrangement and to continue the monitoring program to ensure continued regulatory compliance by monitoring these small release levels (Ref. 3.1-5).

3.1.4 Power Transmission Systems

Ginna Station generates electricity at 19 kilovolts (kV). This voltage is stepped up to 115kV at Ginna Station and is transmitted 0.6 miles, by four 115kV underground cables, to Substation 13A. Substation 13A is located south of the Ginna Station site on the south side of Lake Road. As shown on Figure 2.1-2 four 115kV overhead transmission lines (Circuits 908, 911, 912, and 913) emanate from Substation 13A and run approximately 3-1/2 miles in a southerly direction to connect to the transmission grid at Substation 204 (Fruitland), which is on the south side of New York State Route 104. These lines are supported on wooden structures with two lines per structure—Circuits 908 and 913 are on one set of structures and Circuits 911 and 912 are on the second set of structures. Only Circuits 908, 911, 912, and 913 were built as a direct result of Ginna Station construction, startup, and operation. There is a fifth 115kV line (Circuit 909) emanating from Substation 13A that serves as a distribution line and is located on its own structure on the east side of the transmission corridor. RG&E has not made any modifications to either the transmission corridor or the transmission lines since original installation.

The 500-foot-wide transmission corridor from Ginna Station to Substation 204 is entirely owned by RG&E. The portion of the corridor between Substation 13A and Substation 204 is in the Town of Ontario, Wayne County, and has road crossings at Brick Church Road, Kenyon Road, Slocum Road, and NYS Route 104. Locked gates limit corridor access at roadways. Land use in this area is predominantly agricultural with only a few homes adjacent to the transmission corridor.

The transmission corridor is characterized by low grasses with trees at the edge of the transmission corridor. RG&E has a New York State Public Service Commission-approved long-range vegetation management plan. This plan embodies the use of selected management techniques to foster the goal of maintaining a low-growing vegetative community.

Inspection of the 115kV lines from Substation 13A to Substation 204 occurs on a regular basis. Ongoing transmission corridor surveillance and maintenance of the facilities ensure continued conformance to design standards. RG&E performs semi-annual high-speed helicopter inspections and annual comprehensive low-speed helicopter inspections. RG&E also performs a comprehensive ground-level inspection of the 115kV circuits and the transmission corridor every 5 years. When

defects or deficiencies are found, critical defects are addressed as soon as possible with arrangements made through the Energy Control Center and Ginna Station. The Energy Control Center is responsible for the integrity of the electric transmission system while Ginna Station Operations is responsible for the integrity of Ginna Station. Any corrections as a result of critical defects have to be made with the appropriate holding authority keeping in mind the integrity of the electric transmission system and the Ginna Station. Non-critical maintenance issues are addressed during Ginna Station refueling and maintenance outages. These helicopter patrols and ground-level inspections confirm that there are no corridor encroachments and ensure that such encroachments are dealt with in an appropriate and timely manner.

Within the next few years, RG&E plans to extend Circuit 909 to Substation 121 (Quaker Road). This project will address current energy delivery issues (increased load growth in western Wayne County and eastern Monroe County) and is not related to the license renewal and continued operation of Ginna Station.

3.2 Refurbishment Activities

NRC

"The report must contain a description of...the applicant's plans to modify the facility or its administrative control procedures.... This report must describe in detail the modifications directly affecting the environment or affecting plant effluents that affect the environment...." 10 CFR 51.53(c)(2)

"The incremental aging management activities carried out to allow operation of a nuclear power plant beyond the original 40-year license term will be from one of two broad categories: (1) SMITTR actions, most of which are repeated at regular intervals, and (2) major refurbishment or replacement actions, which usually occur fairly infrequently and possibly only once in the life of the plant for any given item...." (Ref. 3.1-3, Section 2.6.3.1, page 2-41.) ["SMITTR" defined at GEIS Section 2.4, page 2-30, as surveillance, on-line monitoring, inspections, testing, trending, and recordkeeping]

In the GEIS (Ref. 3.1-3, Section 3.1 and Appendix B, Table B.2), the NRC identifies refurbishment activities that utilities might perform for license renewal. Performing such major refurbishment activities would necessitate changing administrative control procedures and modifying the facility. The GEIS analysis assumed that an applicant would begin any major refurbishment work shortly after the NRC granted a renewed license and would complete the activities during five outages, including one major outage at the end of the 40th year of operation. The GEIS refers to this as the refurbishment period.

GEIS Table B.2 lists license renewal refurbishment activities that the NRC anticipated utilities might undertake. In identifying these activities, the GEIS intended to encompass actions that typically take place only once in the life of a nuclear power plant, if at all. The GEIS analysis assumed that a utility would undertake these activities solely for the purpose of extending plant operations beyond 40 years and would undertake them during the refurbishment period. The GEIS indicates that many plants will have undertaken various major refurbishment activities to support the current license period but that some plants might undertake such tasks only to support extended plant operations.

RG&E has performed some major construction activities at Ginna Station (e.g., steam generator replacement, seismic piping upgrade). However, the Ginna Station Integrated Plant Assessment that RG&E has conducted under 10 CFR Part 54 and submits as part of this application has not identified the need to undertake any major refurbishment or replacement actions to maintain the functionality of important systems, structures, or components during the Ginna Station license renewal period or any other modifications related to license renewal. Therefore, no refurbishments or modifications have been identified that would directly affect the environment or plant effluents.

3.3 Programs and Activities for Managing the Effects of Aging

NRC

"The report must contain a description of...the applicant's plans to modify the facility or its administrative control procedures....This report must describe in detail the modifications directly affecting the environment or affecting plant effluents that affect the environment...." 10 CFR 51.53(c)(2)

"The incremental aging management activities carried out to allow operation of a nuclear power plant beyond the original 40-year license term will be from one of two broad categories: (1) SMITTR actions, most of which are repeated at regular intervals, and (2) major refurbishment or replacement actions, which usually occur fairly infrequently and possibly only once in the life of the plant for any given item...." (Ref. 3.1-3, Section 2.6.3.1, page 2-41.) ["SMITTR" defined at GEIS Section 2.4, page 2-30, as surveillance, on-line monitoring, inspections, testing, trending, and recordkeeping]

Appendix A of this Ginna License Renewal Application contains RG&E's proposed license renewal-related amendments to the UFSAR. In accordance with NRC requirements [10 CFR 54.21(d)], the proposed amendments contain a description of the programs and activities for managing the effects of aging at Ginna Station. In addition to describing existing programs, the proposed amendments describe proposed modifications (enhancements) to existing programs and proposed new programs and activities.

3.4 Employment

3.4.1 Current Workforce

The Ginna Station facility currently employs approximately 500 people on a full-time basis, augmented by an additional 700-person workforce during outages. More than 80 percent of the normal operating workforce is composed of RG&E employees. Approximately 48 percent of the full-time employees lives in Wayne County and 44 percent in Monroe County. The remaining 8 percent is distributed among 10 counties, with 2.5 percent in Ontario County, 1.6 percent in Livingston County, and 1 percent or less in each of the other counties (Ref. 3.1-6).

RG&E refuels Ginna Station on an 18-month schedule. During refueling outages, site employment increases by as many as 700 workers for temporary (30 to 40 days) duty. These numbers are within the GEIS range of 200 to 900 additional workers per reactor outage.

3.4.2 License Renewal Increment

Performing the license renewal surveillance, on-line monitoring, inspections, testing, trending, and recordkeeping (SMITTR) activities referred to in Section 3.3 could necessitate increasing Ginna Station staff workload by some increment. The size of this small increment would be a function of the schedule within which RG&E must accomplish the work and the amount of work involved.

In the GEIS, the NRC assumes that each nuclear power plant license renewal would be for a 20-year period plus the remaining duration of the current license and that the NRC would issue the renewal approximately 10 years prior to current license expiration. In other words, the renewed license would be effective for 30 years. The NRC determined that the utility would initiate SMITTR activities at the time of issuance and would conduct license renewal SMITTR activities throughout the remaining 30-year life of the plant, sometimes during full-power operation (Ref. 3.1-3, Section B.3.1.3) but mostly during normal refueling, and during 5-year and 10-year in-service inspections during refueling outages (Ref. 3.1-3, Table B.4).

RG&E has determined that the NRC's scheduling assumptions in the GEIS are reasonably representative of the Ginna Station incremental license renewal workload scheduling. Many Ginna-specific license renewal SMITTR activities would have to be performed during outages. Although some Ginna Station license renewal SMITTR activities would be one-time efforts, others would be recurring, periodic activities that would continue for the life of the plant.

The NRC estimates in the GEIS that no more than 60 additional personnel would be needed to perform license renewal SMITTR activities during the three-month duration of a 10-year in-service inspection refueling outage. Having established this upper value for what would be a single event in 20 years, the NRC uses this number as the expected number of additional permanent workers needed per unit attributable to license renewal. In GEIS Section C.3.1.2, the NRC uses this

approach in order to, "...provide a realistic upper bound to potential population-driven impacts..."(Ref. 3.1-3).

RG&E expects that existing capabilities for routine activities such as outages will enable plant staff to perform the increased SMITTR workload without adding Ginna Station personnel. However, for the purpose of performing its own bounding analyses in this environmental report, RG&E is adopting the NRC's GEIS approach and is assuming that Ginna Station would require no more than a total of 60 additional permanent workers to perform license renewal SMITTR activities.

Adding full-time employees to the plant workforce for continued operation during the license renewal period would have the indirect effect of creating additional jobs and related population growth in the community. Using 1999 data, RG&E calculated a regional employment multiplier appropriate for the electric services sector in the combined-county area of Monroe and Wayne Counties with IMPLAN 2.0. RG&E has used the calculated multiplier, 1.668, to estimate the number of direct and indirect jobs supported by additional Ginna Station employees that might be needed during the license renewal period. Applying the multiplier, a total of 100 (60 × 1.668) new jobs would be created in the Monroe and Wayne combined-county area, where total employment in 2000 was slightly over 426,700 persons. These 100 new direct and indirect jobs represent 0.01 percent of current total employment in the two counties (Ref. 3.1-7). In summary, RG&E is assuming that 60 additional permanent direct workers during the license renewal period would create an additional 40 indirect jobs in the community.

These 100 new jobs (60 direct and 40 indirect) could result in a population increase of 308 in the area [100 jobs multiplied by 3.08 average number of persons per household in the Wayne and Monroe combined-county area (Ref. 3.1-8)]. This increase represents less than 0.05 percent of the population in 2000 (829,108 persons) for the combined-county area.

3.5 References

Ref. 3.1-1 U.S. Atomic Energy Commission. *Rochester Gas & Electric Corporation. Docket No. 50-244. Final Environmental Statement Related to the Operation of R.E. Ginna Nuclear Power Plant Unit 1.* Washington, D.C. 1973.

Ref. 3.1-2 Rochester Gas and Electric Corporation. *R.E. Ginna Nuclear Power Plant, Updated Final Safety Analysis Report.* Rev. 16. April 2001.

Ref. 3.1-3 U.S. Nuclear Regulatory Commission. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants.* NUREG-1437. Office of Nuclear Regulatory Research. Washington, D.C. May 1996.

Ref. 3.1-4 Rochester Gas and Electric Corporation. Ginna Nuclear Power Plant, 316(a) Demonstration Supplement, NPDES Permit No. 0070 0X2 2 000079 (NY 0000493). RG&E Report No. BP-13-043. Rochester, NY. March 1977.

Ref. 3.1-5 Rochester Gas and Electric Corporation. *Spent Fuel Pool Leakage Release Path Assessment.* SEV-1123. Rochester, NY, Rev. 00. April 1999.

Ref. 3.1-6 Rochester Gas and Electric Corporation. Numbers of employees at Ginna Station. Personal communication with P. Sawyko. June 2002.

Ref. 3.1-7 Rumage, W. New York State Department of Labor, Division of Research and Statistics. Covered Employment and Wages. Personal communication with C. Milligan. December 20, 2001, and January 24, 2002.

Ref. 3.1-8 U.S. Census Bureau. "GCT-P7, Households and Families: 2000;" Geographic Area: New York -- County. http://factfindercensus.gov/bf/_lang=en_vt_name=DEC_2000_SF1_U_GCTP7_ST2_geo_id=04000US36.html. Accessed January 28, 2002.

4.0 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND MITIGATING ACTIONS

NRC

The environmental report shall discuss the "...impact of the proposed action on the environment. Impacts shall be discussed in proportion to their significance[.]" 10 CFR 51.45(b)(1) as adopted by §51.53(c)(2)

4.1 Introduction

Chapter 4 presents an assessment of the environmental consequences and potential mitigating actions associated with the renewal of the R.E. Ginna Nuclear Power Plant (Ginna Station) operating license. The U.S. Nuclear Regulatory Commission (NRC) has identified and analyzed 92 environmental issues that it considers associated with nuclear power plant license renewal and has designated the issues as Category 1, Category 2, or Not Applicable (NA). The NRC has designated the issues as "Category 1" if, after analysis, the following criteria were met:

- The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristic; and
- A single significance level (i.e., small, moderate, or large) has been assigned to the impacts (except for collective offsite radiological impacts from the fuel cycle and from high-level-radioactive waste and spent-fuel disposal); and
- Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

If the NRC analysis concluded that one or more of the Category 1 criteria could not be met, the NRC designated the issue as Category 2. The NRC requires plant-specific analyses for Category 2 issues. The NRC designated two issues as "NA," signifying that the categorization and impact definitions do not apply to these issues. NRC rules do not require analyses of Category 1 issues that the NRC has resolved using generic findings (10 CFR 51, Subpart A, Appendix B, Table B-1) based on its *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) (Ref. 4.1-1). An applicant may reference the generic findings or GEIS analyses for Category 1 issues.

Appendix A of this Ginna Station environmental report lists the 92 issues with their NRC-assigned categorizations, and identifies the environmental report and GEIS sections that address each issue. For those issues not applicable to Ginna Station, a notation gives the basis for that designation. The issues are numbered in the same order in which they are listed in Table B-1 of Appendix B to Subpart A of 10 CFR 51, for ease of reference.

4.1.1 CATEGORY 1 LICENSE RENEWAL ISSUES

NRC

"The environmental report for the operating license renewal stage is not required to contain analyses of the environmental impacts of the license renewal issues identified as Category 1 issues in Appendix B to subpart A of this part." 10 CFR 51.53(c)(3)(i)

"...[A]bsent new and significant information, the analysis for certain impacts codified by this rulemaking need only be incorporated by reference in an applicant's environmental report for license renewal...." (61 *Federal Register*, page 28483).

Rochester Gas and Electric Corporation (RG&E) has determined that of the 69 Category 1 issues, 12 do not apply to Ginna Station because they apply to design, operational, or location features that do not exist at the facility. These features include cooling water discharges in coastal areas, use of cooling towers, and use of cooling ponds. In addition, because RG&E does not plan to conduct any major refurbishment activities, the NRC findings for the seven Category 1 issues that apply only to refurbishment clearly overestimate Ginna Station refurbishment impacts and do not apply. RG&E has reviewed the NRC findings and has identified no new and significant information, or become aware of any such information that would make the NRC findings inapplicable to Ginna Station. Therefore, RG&E adopts by reference the NRC findings for the 50 Category 1 issues that RG&E determined to be applicable to Ginna Station.

4.1.2 CATEGORY 2 LICENSE RENEWAL ISSUES

NRC

"The environmental report must contain analyses of the environmental impacts of the proposed action, including the impacts of refurbishment activities, if any, associated with license renewal and the impacts of operation during the renewal term, for those issues identified as Category 2 issues in Appendix B to subpart A of this part...." 10 CFR 51.53(c)(3)(ii)

"The report must contain a consideration of alternatives for reducing adverse impacts, as required by § 51.45(c), for all Category 2 license renewal issues...." 10 CFR 51.53(c)(3)(iii)

The NRC designated 21 issues as Category 2. As in the case of Category 1 issues, some Category 2 issues (five) do not apply to design, operational, or location features that exist at Ginna Station. These issues and their bases for exclusion are presented in the following table.

Issue	Basis for Exclusion
13. Water use conflicts (plants with cooling ponds or cooling towers using makeup water from a small river with low flow)	Not applicable because Ginna Station is not equipped with cooling ponds or cooling towers.
33. Groundwater use conflicts (potable, service, and dewatering; plants that use greater than 100 gallons per minute)	Not applicable because Ginna Station does not use groundwater (no dewatering; potable and service water are from municipal supply that draws from surface water sources).
34. Groundwater use conflicts (plants using cooling towers withdrawing makeup water from a small river)	Not applicable because Ginna Station is not equipped with cooling towers.
35. Groundwater use conflicts (Ranney wells)	Not applicable because Ginna Station does not use Ranney wells.
39. Groundwater quality degradation (cooling ponds at inland sites)	Not applicable because Ginna Station is not equipped with cooling ponds.

Sections 4.2 through 4.15 of this environmental report address the Category 2 issues applicable to Ginna Station and the issues that apply to refurbishment activities. Each section begins with a statement of the issue, and explains why the NRC was not able to generically resolve the issue. If the issue does not warrant detailed analysis, the section explains the basis for this conclusion.

If the subject Category 2 issue has been determined by RG&E to be applicable to Ginna Station, the section provides both details on the issue and the required detailed analysis. These analyses include conclusions regarding the significance of the impacts relative to renewal of the operating license for Ginna Station and discuss potential mitigative alternatives when applicable and to the extent required. RG&E has determined that 16 Category 2 issues warrant this detailed discussion. For each, RG&E has identified the significance of the impacts associated with the issue as either small, moderate, or large, consistent with the criteria that the NRC established at 10 CFR 51, Subpart A, Appendix B, Table B-1, Footnote 3, as follows:

Small – Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, the NRC has concluded that those impacts that do not exceed permissible levels in the NRC's regulations are considered small.

Moderate – Environmental effects are sufficient to alter noticeably but not to destabilize any important attribute of the resource.

Large – Environmental effects are clearly noticeable and are sufficient to destabilize any important attributes of the resource.

In accordance with National Environmental Policy Act (NEPA) practice, RG&E considered ongoing and potential additional mitigation in proportion to the

significance of the impact to be addressed (i.e., impacts that are small receive less mitigative consideration than do impacts that are large).

4.1.3 "NA" License Renewal Issues

The NRC determined that its categorization and impact finding definitions did not apply to two issues. RG&E included these issues in Appendix A to this environmental report. The NRC noted that applicants currently do not need to submit information on chronic effects from electromagnetic fields (10 CFR 51, Subpart A, Appendix B, Table B-1, Footnote 5). For the other NA issue, environmental justice, the NRC does not require information from applicants but noted that it will be addressed in individual license renewal reviews (10 CFR 51, Subpart A, Appendix B, Table B-1, Footnote 6). RG&E has included an environmental justice analysis in Section 4.16, along with supporting demographic information in Section 2.7.3.

4.2 Intake System Impacts

4.2.1 Entrainment of Fish and Shellfish in Early Life Stages

NRC

"If the applicant's plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of current Clean Water Act 316(b) determinations...or equivalent State permits and supporting documentation. If the applicant can not provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from...entrainment." 10 CFR 51.53(c)(3)(ii)(B)

"The impacts of entrainment are small at many plants but may be moderate or even large at a few plants with once-through and cooling-pond cooling systems. Further, ongoing efforts in the vicinity of these plants to restore fish populations may increase the numbers of fish susceptible to intake effects during the license renewal period, such that entrainment studies conducted in support of the original license may no longer be valid...." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 25

The NRC made impacts on fish and shellfish resources resulting from entrainment a Category 2 issue because it could not assign a single significance level (small, moderate, or large) to the issue; the impacts of entrainment are small at many plants, but they may be moderate or large impacts at some plants. Also, ongoing restoration efforts may increase the number of fish susceptible to intake effects during the license renewal period (Ref. 4.1-1, Section 4.2.2.1.2). Information to be ascertained includes: (1) type of cooling system (whether once-through or cooling pond); and (2) current Clean Water Act Section 316(b) determination or equivalent state documentation.

The SPDES permit and related correspondence, provided in Appendix B to this report, constitute State permits and documentation equivalent to a Clean Water Act 316(b) determination. Items 1 through 5 of the Additional Requirements in the SPDES permit address the 316(b) determination and approve RG&E's request pursuant to section 316(b) for the duration of the permit.

Entrainment sampling of Ginna Station intake waters for ichthyoplankton (fish eggs and larvae) was done during the years 1976 through 1981. The results of this sampling were used to develop annual entrainment number projections by species and lifestage. During this six-year period, fish egg entrainment projections averaged 89,000,000 per year, with a range of 14,000,000 to 168,000,000. Corresponding fish larvae numbers averaged 17,000,000, with a range of 7,000,000 to 37,000,000. Alewives (*Alosa pseudoharengus*), smelt (*Osmerus mordax*), and darters (*Etheostoma spp.*) were consistently found to be the principal larval species entrained, with alewives always strongly predominant.

As discussed in Section 2.2, RG&E conducted studies of ichthyoplankton in Lake Ontario during 1977 and 1978, and focused on characterizing the Lake ichthyoplankton population near the Ginna Station site as well as Ginna Station entrainment/Lake population interactions (Ref. 4.2-1 and 4.2-2). More recently, Lake

Ontario ichthyoplankton studies, conducted in 1997 and 1998 by Cornell University (Ref. 4.2-3), found the Lake ichthyoplankton population to be similar to that identified in RG&E's 1977 and 1978 surveys.

Fish species identified in the 1977 and 1978 entrainment studies generally corresponded to the species found in the Lake ichthyoplankton studies conducted during those same years. In both years alewives numerically dominated the ichthyoplankton and entrainment findings. Smelt and johnny darters (*Etheostoma nigrum*) were the next two most numerous species entrained, while carp/goldfish (*Cyprinus carpio/Carassius auratus*) were entrained in much reduced numbers relative to their rank in the ichthyoplankton studies.

The 1977 and 1978 studies confirmed that the entrainment situation at Ginna Station reflects the site ichthyoplankton community. The 1997 and 1998 studies showed that the Lake ichthyoplankton population is similar in community structure to that found at Ginna Station in 1977 and 1978, and is relatively similar along the entire Lake Ontario southern shoreline. Based upon these facts, RG&E concludes that the entrainment impacts of Ginna Station operations during the license renewal period will not be substantially different from those previously evaluated and approved within the State Pollution Discharge Elimination System (SPDES) permit process. As part of the current SPDES permit program, the New York State Department of Environmental Conservation (NYSDEC) has regularly reviewed the impacts of the Ginna Station intake system and has determined that further mitigative efforts are not warranted at this time. This is supported by Additional Requirement 1 of the current Ginna Station SPDES Permit and the September 1999 correspondence from NYSDEC, as provided in Appendix B.

As part of RG&E's communication with regulatory agencies and interested parties concerning this Ginna Station License Renewal environmental report, NYSDEC provided comments concerning entrainment at Ginna Station. RG&E believes that these comments will be appropriately addressed within the current Ginna Station SPDES permit process (see Section 9.1.5).

4.2.2 Impingement of Fish and Shellfish

NRC

"If the applicant's plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of current Clean Water Act 316(b) determinations...or equivalent State permits and supporting documentation. If the applicant can not provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from...impingement...."10 CFR 51.53(c)(3)(ii)(B)

"The impacts of impingement are small at many plants but may be moderate or even large at a few plants with once-through and cooling-pond cooling systems...." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 26

The NRC made impacts on fish and shellfish resources resulting from impingement a Category 2 issue because it could not assign a single significance level to the issue;

impingement impacts are small at many plants, but might be moderate or large at a few plants. Information to be ascertained includes: (1) type of cooling system (whether once-through or cooling pond); and (2) current Clean Water Act Section 316(b) determination or equivalent state documentation.

The SPDES permit and related correspondence, provided in Appendix B to this report, constitute State permits and documentation equivalent to a Clean Water Act 316(b) determination. Items 1 through 5 of the Additional Requirements in the SPDES permit address the 316(b) determination and approve RG&E's request pursuant to section 316(b) for the duration of the permit.

Impingement has been extensively monitored and impingement impacts evaluated at Ginna Station each year since 1973. The Ginna Station SPDES Permit has always included a requirement for impingement monitoring and the submittal of annual reports detailing the subject year's program and assessing the results.

Impingement impact assessments for Ginna Station have developed over the years in consultation with NYSDEC. Since 1982, one of two assessment types is conducted depending upon species and population information available. For alewife and smelt, the total annual projected number impinged is compared to the Lake Ontario (New York waters) population for that species and year as reported by NYSDEC and the U.S. Fish and Wildlife Service (FWS). RG&E then calculates the percentage of the Lake population impinged and makes a determination of impact, which is reported to NYSDEC. Since Lake population information is not available for other species, a qualitative approach must be used, primarily utilizing Lake information provided by NYSDEC. This is the same information used to describe the current status of the Lake fishery in Section 2.2.

The annual percentages of the Lake Ontario alewife and smelt populations impinged by Ginna Station each year, for the period 1982 through 2001, are presented in Table 4.2-1. The 19-year average percentages impinged for alewives and smelt are 0.00100 and 0.00084, respectively. The maximum percentages for both species were about 0.00330, occurring in 1984. Using the maximum values, these findings show that only about three alewives for every 100,000 in the New York waters of Lake Ontario, and three smelt for every 100,000 in the New York waters of Lake Ontario would be impinged. The most recent RG&E Impingement Program Report (Ref. 4.2-4) states:

> ... RG&E concludes that impingement of alewives at Ginna Station should not impact the alewife population in Lake Ontario. This is based upon the fact that the impingement impact, i.e., the percentage of alewives impinged versus the total lake population, per year, is very low and must be considered negligible.

This conclusion is repeated with respect to smelt.

As previously stated, the impact determinations regarding impingement upon other species are limited to qualitative evaluations since there are no estimates of their populations within Lake Ontario. Section 2.2 discusses the overall lakewide

Table 4.2-1
Annual Percentages of Lake Ontario Alewife and Smelt Populations Impinged at Ginna Station

Year	Alewife (%)	Smelt (%)
1983	0.00108	0.00080
1984	0.00326	0.00330
1985	0.00246	0.00220
1986	0.00077	0.00248
1987	0.00070	0.00031
1988	0.00004	0.00016
1989	0.00016	0.00008
1990	0.00243	0.00035
1991	0.00022	0.00017
1992	0.00262	0.00057
1993	0.00046	0.00008
1994	0.00054	0.00027
1995	0.00014	0.00013
1996	0.00163	0.00127
1997	0.00172	0.00038
1998	0.00032	0.00023
1999	0.00026	0.00018
2000	0.00014	0.00280
2001	0.00003	0.00012
MIN	0.00003	0.00008
AVG	0.00100	0.00084
MAX	0.00326	0.00330

Source: Ref. 4.2-5.

reductions in fish populations as reported by NYSDEC through their annual assessments within the Eastern Basin of Lake Ontario (see Figures 2.2-1 and 2.2-2). Correspondingly, Ginna Station impingement numbers have declined substantially throughout the past 29 years (see Figure 2.2-2). The alewife and smelt impingement data indicate that the percentage of the Lake population impinged is fairly constant and reflective of the number available in the Lake. Given that no site-specific population data exist for other species impinged, it is reasonable to conclude that impingement of species other than alewife and smelt would also be some constant proportion of the fish available in the area. This is consistent with the impingement data, which show generally decreasing numbers, similar to what is being reported for the Lake over all.

In 1999, RG&E received correspondence from NYSDEC (see Appendix B) regarding the Department's review of the 1998 Ginna Station Impingement Program Report. In the September 22, 1999, letter NYSDEC states: "In light of this recent work and the degree of impact revealed through the monitoring program, the Department does not consider it necessary to pursue additional mitigative actions at the Ginna or Russell Power Stations at this time." Given this statement by NYSDEC and the continued Ginna Station impingement monitoring, RG&E concludes that the impingement impacts of Ginna Station operations will not be substantially different from those previously evaluated and approved within the SPDES process.

Impingement studies have consistently demonstrated that Ginna Station intake system operations have an extremely limited and minimal impact upon alewife and smelt populations. Likewise, impingement of other species has been consistent with lakewide trends and indicates no localized impacts. Based upon these facts, RG&E concludes that impingement impacts from Ginna Station operations during the license renewal period will not be substantially different from those previously evaluated and approved within the SPDES permit process. As part of the current SPDES permit program, NYSDEC has regularly reviewed the impacts of the Ginna Station intake system and has determined that further mitigative efforts are not warranted at this time. This is supported by Additional Requirement 1 of the current Ginna Station SPDES Permit and the September 1999 correspondence from NYSDEC, as provided in Appendix B.

As part of RG&E's communication with regulatory agencies and interested parties concerning the Ginna Station License Renewal environmental report, NYSDEC has provided additional comments concerning impingement at Ginna Station that further support the 1999 determinations. RG&E believes that these comments will be appropriately addressed within the current Ginna Station SPDES permit process. Further discussion is provided in Section 9.1.5.

4.2.3 Summary of Entrainment and Impingement Impacts

RG&E's SPDES permit for Ginna Station constitutes the State's equivalent Clean Water Act 316(b) determination. The findings of the Ginna Station Entrainment and Impingement Programs, along with corresponding site surveys of the adjacent area of Lake Ontario, all describe the fish communities that interact with the Ginna Station

intake system and, hence, may be impacted by its operation. The extensive impingement monitoring conducted by RG&E over the past 29 years provides a pertinent method of tracking the local populations over time, as well as allowing comparisons to concurrent changes in the Lake Ontario ecosystem as documented by NYSDEC, FWS, and others.

These studies, in conjunction with other lakewide assessments, confirm that any impact of operational water withdrawal will be upon a typical Lake Ontario nearshore fish community, common to most areas along the Lake's southern shoreline. Considering all data, RG&E concludes that the limited area affected by the Ginna Station operations will have negligible impact upon the identified species.

This conclusion is based, in part, on quantitative analysis, such as in the case of alewife and smelt impingement, and in part on qualitative analyses evaluating entrainment/impingement numbers and trends in light of known Lake Ontario information and ecosystem knowledge. RG&E believes that this "negligible impact" can best be put into perspective by comparison with some clearly significant changes that have occurred within Lake Ontario over the past 25-30 years. These changes, described in Section 2.2 and summarized below, are both man-made and natural in origin, but regardless of origin all have had significant impacts upon Lake Ontario resulting in dramatic and measurable changes in the ecosystem that greatly overshadow any impacts caused by operation of the Ginna Station intake system:

1. The water quality initiatives of the Clean Water Act and the Great Lakes Water Quality Agreement have reduced the productivity of Lake Ontario dramatically. This action has resulted in phenomenal water clarity and substantially reduced numbers of organisms at all trophic levels.
2. The Lake Ontario Salmonid Stocking Program originally reduced excessive alewife and smelt populations, and then continued to put such pressure on these populations that this forage base was put in jeopardy of collapse. In response, the stocking program was extensively cut back in the early 1990s.
3. The invasion of exotic species, especially *Driessena spp.*, have further clarified the water, changed biological energy pathways from the water column to the lake bottom, and reportedly changed lake benthic communities.

These three examples have resulted in measurable, significant impacts to Lake Ontario and demonstrate a dominating influence upon the entire Lake Ontario ecosystem. In contrast, the minor, localized impacts associated with Ginna Station intake system operation are considered inconsequential in nature. RG&E also notes that power plant operations have never been identified in any of the assessments analyzing the above three impacts, indicating intake system impacts have made no significant contribution. Nevertheless, RG&E has historically attempted to minimize impacts of Ginna Station operations upon the Lake to the greatest extent possible, and will continue this approach into the future. RG&E further believes that such Lake Ontario management efforts and natural uncertainties will continue throughout the Ginna Station License Renewal term. Therefore, RG&E concludes that Ginna

Station intake system impacts [entrainment (Issue 25) and impingement (Issue 26)] from continued operation during the license renewal period will continue to have a negligible effect on the local and lakewide fish communities and are SMALL.

Based upon the evaluations and conclusions discussed above, RG&E concludes that the operation of the Ginna Station intake system during the period of license renewal will have negligible, acceptable impacts upon fish eggs, fish larvae, and the entire fish community in the Ginna Station area of Lake Ontario and in Lake Ontario over all.

4.3 Heat Shock

NRC

"If the applicant's plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of current Clean Water Act... 316(a) variance in accordance with 40 CFR part 125, or equivalent State permits and supporting documentation. If the applicant can not provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from heat shock ..." 10 CFR 51.53(c)(3)(ii)(B)

"Because of continuing concerns about heat shock and the possible need to modify thermal discharges in response to changing environmental conditions, the impacts may be of moderate or large significance at some plants..." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 27

The NRC made impacts on fish and shellfish resources resulting from heat shock a Category 2 issue because of continuing concerns about thermal discharge effects and the possible need to modify thermal discharges in the future in response to changing environmental conditions. Information to be ascertained includes: (1) type of cooling system (whether once-through or cooling pond); and (2) evidence of a Clean Water Act Section 316(a) variance or equivalent state documentation.

RG&E originally submitted information in support of a Section 316(a) variance for Ginna Station July 30, 1974, and August 23, 1974. This original information was prepared and submitted prior to formal regulatory guidance being available; however, RG&E believed that such a submittal was necessary in anticipation of statutory requirements. On April 1, 1977, RG&E submitted the Ginna Nuclear Power Plant, 316(a) Demonstration Supplement (Ref. 4.3-1), which was prepared in accordance with U.S. Environmental Protection Agency (EPA) guidelines and is generally referred to as the Ginna 316(a) Demonstration. Correspondence documenting agreements between EPA and RG&E concerning the content of the Ginna 316(a) Demonstration is contained within the Supplement.

The potential for heat shock to fish was thoroughly analyzed within the Ginna Station 316(a) Demonstration and was not found to be a potential problem. RG&E concluded that:

> This supplement demonstrates that the shoreline surface discharge of the Ginna Nuclear Power Plant assures the protection and propagation of a balanced indigenous aquatic community as exemplified by the Representative Important Species at the Ginna Site (Ref. 4.3-1, p. xiii).

Operational experience has supported this conclusion, in that no heat-shock-related environmental concerns have ever been associated with Ginna Station operations.

Approval of the Section 316(a) variance was first documented by NYSDEC within the Ginna SPDES Permit effective May 1985, and in each subsequent SPDES Permit issued to Ginna Station NYSDEC has re-affirmed its original approval. In the current SPDES Permit (see Appendix B), Additional Requirement 6 states:

> The thermal discharge from this facility shall ensure the protection and propagation of a balanced indigenous population of shellfish, fish and wildlife in and on Lake Ontario. In this regard the Department has approved the permittee's request for alternative effluent limitations pursuant to Section 316(a) of the Clean Water Act for the five year life of the permit. The effluent limitations in this permit reflect this approval. The water temperature at the surface of Lake Ontario shall not be raised more than three Fahrenheit degrees over the temperature that existed before the addition of heat of artificial origin except that in a mixing zone consisting of an area of 320 acres from the point of discharge, this temperature may be exceeded.

As part of RG&E's communication with regulatory agencies and interested parties concerning the Ginna License Renewal environmental report, the NYSDEC provided comments concerning heat shock at Ginna Station. The NYSDEC comments pertain to the effect of exposing impinged fish to the elevated temperatures of the discharge canal and request a brief evaluation of this situation.

RG&E believes that two primary aspects need to be considered regarding the return of impinged fish to the discharge canal. One is the temperature rise to which the fish are subjected and the other is their residence time within the elevated temperatures of the discharge flow. The Ginna 316(a) Demonstration (Ref. 4.3-1) provides information that can assist in assessing both of these issues, namely, discharge flow rates and temperatures as well as fish thermal tolerance temperatures for selected species.

Discharge velocities range from two to five feet per second in the area of the discharge where impinged fish are returned. The fish return sluice enters the discharge canal near its centerline, about 100 feet from the discharge point of entry into the Lake. Therefore, fish would be subjected to an elevated temperature for approximately 20-50 seconds, at which time they could access cooler waters either within the discharge plume or return to ambient temperature water outside the boundaries of the plume. Upper lethal threshold temperatures for representative fish species and conditions were found to be within normal discharge temperature ranges (Ref. 4.3-1). Based upon this information, it is reasonable to conclude that a fish subjected to discharge temperatures for less than a minute would not be adversely affected. If a fish were disoriented upon entry into the discharge waters, it would be carried within the plume flow as it moves out into the Lake and incrementally cools with distance until ambient temperature is reached in the open Lake.

On the basis of these considerations, RG&E concludes that heat shock impacts (Issue 27) from continued operation of Ginna Station in the license renewal period would continue to be SMALL and, because the standard-setting process provides for minimizing environmental impact, further mitigation to support operation through the license renewal period would not be warranted.

4.4 Impacts of Refurbishment on Terrestrial Resources

NRC

The environmental report must contain an assessment of "...the impact of refurbishment and other license-renewal-related construction activities on important plant and animal habitats...." 10 CFR 51.53(c)(3)(ii)(E)

"...Refurbishment impacts are insignificant if no loss of important plant and animal habitat occurs. However, it cannot be known whether important plant and animal communities may be affected until the specific proposal is presented with the license renewal application...." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 40

"...If no important resources would be affected, the impacts would be considered minor and of small significance. If important resources could be affected by refurbishment activities, the impacts would be potentially significant...." (Ref. 4.1-1, Section 3.6, page 3-6)

The NRC made impacts of refurbishment on terrestrial resources a Category 2 issue because the significance of ecological impacts cannot be determined without considering site-specific and project-specific details (Ref. 4.1-1, Section 3.6). Aspects of the site and the project to be ascertained are (1) the identification of important ecological resources, (2) the nature of refurbishment activities, and (3) the extent of impacts to plant and animal habitat.

Detailed analyses are not required for this issue because, as Section 3.2 discusses, RG&E has no plans for major refurbishment or other license renewal-related construction activities at Ginna Station.

4.5 Threatened or Endangered Species

NRC

"All license renewal applicants shall assess the impact of refurbishment and other license-renewal-related construction activities on important plant and animal habitats. Additionally, the applicant shall assess the impact of the proposed action on threatened and endangered species in accordance with the Endangered Species Act." 10 CFR 51.53(c)(3)(ii)(E)

"Generally, plant refurbishment and continued operation are not expected to adversely affect threatened or endangered species. However, consultation with appropriate agencies would be needed at the time of license renewal to determine whether threatened or endangered species are present and whether they would be adversely affected." 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 49

The NRC made impacts to threatened and endangered species a Category 2 issue because the status of many species is being reviewed, and a site-specific assessment is required to determine whether any identified species could be affected by refurbishment activities or continued plant operations through the renewal period. In addition, compliance with the Endangered Species Act requires consultation with the appropriate Federal agency (Ref. 4.1-1, Sections 3.9 and 4.1).

Sections 2.2 and 2.5 describe aquatic and terrestrial habitats on and in the vicinity of the Ginna Station site and along the transmission line corridor of concern. Section 2.6 provides a discussion of those species listed as threatened or endangered at the federal level or the state level (in New York) that have the greatest likelihood of occurrence in the general vicinity of Ginna Station. This section presents an assessment of the environmental consequences to these species from future plant refurbishment activities and continued operation of the plant.

As discussed in Section 3.2, RG&E has no plans to conduct major refurbishment or construction activities at Ginna Station for continued operations during the license renewal period. Therefore, there would be no refurbishment-related or other license renewal construction-related impacts to protected species, and no further analysis of such impacts is required.

Section 2.6 presents information that indicates the potential for occurrence of any threatened or endangered aquatic species in the immediate vicinity of the site is very limited based on habitat and range considerations. No endangered or threatened species are known to inhabit or frequent the site or transmission corridor. Potential for impact from station operation on these species is reduced accordingly.

In addition to lack of suitable habitat in areas of concern, potential for adverse impact on threatened and endangered species from continued plant operation is highly unlikely on the basis of plant operational history. In particular, there has been no perceptible impact on the population of any threatened or endangered species during the 30-year operation of Ginna Station.

RG&E has initiated contacts with FWS and NYSDEC regarding Ginna Station license renewal and potential impacts to threatened and endangered species. Appendix C to this environmental report includes copies of the contact letters and agency responses. Based on the considerations presented above and the results of correspondence with these agencies, RG&E concludes that impact to threatened and endangered species from continued operation of Ginna Station in the license renewal period (Issue 49) would be SMALL, and mitigation would be unwarranted.

4.6 Air Quality During Refurbishment (Nonattainment Areas)

NRC

"If the applicant's plant is located in or near a nonattainment or maintenance area, an assessment of vehicle exhaust emissions anticipated at the time of peak refurbishment workforce must be provided in accordance with the Clean Air Act as amended...." 10 CFR 51.53(c)(3)(ii)(F)

"Air quality impacts from plant refurbishment associated with license renewal are expected to be small. However, vehicle exhaust emissions could be cause for concern at locations in or near nonattainment or maintenance areas. The significance of the potential impact cannot be determined without considering the compliance status of each site and the numbers of workers expected to be employed during the outage." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 50

The NRC made impacts to air quality during refurbishment a Category 2 issue because vehicle exhaust emissions from additional staff could be cause for some concern, and a general conclusion about the significance of the potential impact could not be drawn without considering the compliance status of each site and the number of workers expected to be employed during the refurbishment outage (Ref. 4.1-1, Section 3.3). Information needed would include (1) the attainment status of the plant-site area and (2) number of vehicles added as a result of refurbishment activities.

Ginna Station is not located in or near a nonattainment or maintenance area. Detailed analysis is not required for this issue because, as Section 3.2 discusses, RG&E has no plans for major refurbishment at Ginna Station.

4.7 Electric Shock from Transmission Line-induced Currents

NRC

"If the applicant's transmission lines that were constructed for the specific purpose of connecting the plant to the transmission system do not meet the recommendations of the National Electrical Safety Code for preventing electric shock from induced currents, an assessment of the impact of the proposed action on the potential shock hazard from the transmission lines must be provided." 10 CFR 51.53(c)(3)(ii)(H)

"Electrical shock resulting from direct access to energized conductors or from induced charges in metallic structures have not been found to be a problem at most operating plants and generally are not expected to be a problem during the license renewal term. However, site-specific review is required to determine the significance of the electric shock potential at the site." 10 CFR Part 51, Subpart A, Appendix B, and Table B-1, Issue 59

The NRC made the impact of electric shock from transmission lines a Category 2 issue because without a review of each plant's transmission line conformance with the National Electrical Safety Code® (NESC®) criteria, the NRC could not determine the significance of the electric shock potential. The regulation at 10 CFR 51.53(c)(3)(ii)(H) does not define the phrase "transmission line," but in the GEIS, the NRC indicates that transmission lines use voltages of about 115/138 kilovolts (kV) and higher, and that, in contrast, distribution lines use voltages below the 115/138kV level (Ref. 4.1-1, Sections 2.2.7 and 4.5.1). The GEIS also specifies that the transmission line of concern is located between the plant switchyard and the intertie to the transmission system. Information to be ascertained includes: (1) change in line use and voltage since last analysis; (2) conformance with NESC® (1991) standards; and (3) the potential change in land use along the transmission lines since the initial NEPA review.

The NESC® specifies minimum vertical clearances to the ground for electric lines. For electric lines operating at voltages exceeding 98kV alternating current (AC) to ground (Ref. 4.7-1), the clearance provided must limit the steady-state current[1] due to electrostatic effects to 5 milliamperes (mA) if the largest anticipated vehicle were short-circuited to ground. For this determination, the lines should be evaluated assuming final unloaded conductor sag at 120 degrees Fahrenheit (°F).

The transmission lines from the plant run underground to Substation 13A, which is located just south of Lake Road (County Route 101). Since these cables are grounded, there is no issue concerning shock from induced currents. The 115kV (phase to phase) transmission lines from Substation 13A and Substation 204 are above ground and are rated 66.4kV phase to ground. Given the phase-to-ground voltage is well below the NESC® provision, RG&E does not anticipate public health impacts from electric-field-induced shock.

1. The NESC® and the GEIS use the phrase "steady-state current," whereas 10 CFR 51.53(c)(3)(ii)(H) uses the phrase "induced current." The phrases have the same meaning here

To support this conclusion, RG&E performed field measurements to confirm compliance with the NESC® 5mA electric-field-induced current limit.

First, the RG&E field survey confirmed that there are no structures in or next to the transmission corridor that connects Ginna Station and Substation 204 (Ref. 4.7-2). Second, RG&E field measurements for electric-field-induced currents ranged from 0.015mA to 0.9mA, well below the 5mA limit established by the NESC®. These measurements were taken at a height of 18 feet 6 inches, which bounds the largest anticipated vehicular object to pass underneath the lines. The largest vehicle allowed on New York State highways by regulation is a tractor-trailer with a maximum height of 13 feet 6 inches.

As discussed previously, the transmission lines associated with the Ginna Station and within the scope of NRC license renewal environmental review are below the size of concern for induced shock, and field measurements demonstrate the electric-field-induced currents are well below the NESC® recommendations for preventing electric shock from induced currents. Therefore, RG&E concludes the impact of electric shock (Issue 59) is of SMALL significance. Due to the small significance of the issue, mitigation measures are not warranted.

4.8 Housing Impacts

NRC

The environmental report must contain "...An assessment of the impact of the proposed action on housing availability..." 10 CFR 51.53(c)(3)(ii)(I)

"Housing impacts are expected to be of small significance at plants located in a medium or high population area and not in an area where growth control measures that limit housing development are in effect. Moderate or large housing impacts of the workforce associated with refurbishment may be associated with plants located in sparsely populated areas or areas with growth control measures that limit housing development." 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 63

"...[S]mall impacts result when no discernible change in housing availability occurs, changes in rental rates and housing values are similar to those occurring statewide, and no housing construction or conversion occurs." (Ref. 4.1-1, Section 4.7.1.1)

The NRC made housing impacts a Category 2 issue because impact magnitude depends on local conditions that the NRC could not predict for all plants at the time of GEIS publication (Ref. 4.1-1, Section 3.7.2). Local conditions to be ascertained are: (1) population categorization as small, medium, or high; and (2) applicability of growth control measures.

4.8.1 Refurbishment

Refurbishment activities and continued operations could result in housing impacts due to increased staffing. As described in Section 3.2, RG&E does not plan to perform major refurbishment activities in association with Ginna Station license renewal. RG&E concludes that there would be no refurbishment-related impacts to area housing and, therefore, no analysis is required.

4.8.2 License Renewal Term

As described in Section 2.7, the Ginna Station site is located in a high population area. Wayne and Monroe Counties, as noted in Section 2.11, are not subject to growth control measures that limit housing development. At 10 CFR Part 51, Subpart A, Appendix B, Table B-1 (Issue 63), the NRC concludes that impacts to housing are expected to be of small significance at plants located in "high" population areas where growth control measures are not in effect. Therefore, RG&E concludes impacts to area housing would be small.

This conclusion is supported by the following site-specific housing analysis. The maximum impact to area housing is calculated using the following assumptions: (1) all direct and indirect jobs would be filled by in-migrating residents; (2) the residential distribution of new residents would be similar to current worker distribution; and (3) each new job created (direct and indirect) represents one housing unit. As described in Section 3.4, approximately 92 percent of the total number of Ginna employees resides in Wayne and Monroe Counties. Therefore, the focus of the housing impact analysis is on these two counties. As described in Section 3.4, RG&E's conservative estimate of 60 license renewal employees could generate the demand for 100

housing units (60 direct and 40 indirect jobs). If it is assumed that 92 percent of the 100 new workers would locate in the Wayne- and Monroe-County areas, consistent with current employee trends, a need for 92 new housing units would be created. In an area with a population of over 829,108 and vacancy rates of just under 10 percent in Wayne and 5.8 percent in Monroe, this additional housing demand would not create a discernible change in housing availability, change rental rates and housing values, or spur housing construction or conversion. Therefore, consistent with the NRC's conclusion in the GEIS, RG&E concludes that housing impacts from continued operations (Issue 63) would be SMALL. Given the magnitude of the impact, mitigative measures are not necessary.

4.9 Public Utilities: Public Water Supply Availability

NRC

The environmental report must contain "...an assessment of the impact of population increases attributable to the proposed project on the public water supply." 10 CFR 51.53(c)(3)(ii)(I)

"An increased problem with water shortages at some sites may lead to impacts of moderate significance on public water supply availability." 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 65

"Impacts on public utility services are considered small if little or no change occurs in the ability to respond to the level of demand and thus there is no need to add capital facilities. Impacts are considered moderate if overtaxing of facilities during peak demand periods occurs. Impacts are considered large if existing service levels (such as quality of water and sewage treatment) are substantially degraded and additional capacity is needed to meet ongoing demands for services." (Ref. 4.1-1, Section 3.7.4.5)

The NRC made public utility impacts a Category 2 issue because an increased problem with water availability may occur in conjunction with plant demand and plant-related population growth as a result of current water shortages in some areas (Ref. 4.1-1, Section 4.7.3.5). Local information needed would include: (1) a description of water shortages experienced in the area; and (2) an assessment of the public water supply system's available capacity.

The NRC's analysis of impacts to the public water supply system considered both plant demand and plant-related population growth demands on local water resources. As discussed in Section 3.2, RG&E plans no major refurbishment in association with license renewal, so plant demand would not be affected by major refurbishment activities.

The impact to the local water supply systems resulting from plant-related population growth can be determined by calculating the amount of water that would be required by these individuals. As described in Section 3.4, RG&E's conservative estimate of 60 license renewal employees could generate a total of 100 new jobs. This could result in an additional 100 new households or approximately 308 additional people in the area (based on the average household size). For this analysis, it is assumed half of the new households will be located in Monroe County and half will be in Wayne County.

The Monroe County Water Authority (MCWA) estimates that each household in its system uses approximately 250 gallons of water per day. Using this consumption rate, the plant-related population increase in Monroe County (50 households) would require approximately 12,500 gallons per day. The MCWA has an excess of 20 million gallons per day (Ref. 4.9-1).

The water supply system in Wayne County, comprising six municipal suppliers, has a combined capacity of 12.9 million gallons per day and a peak usage of 6.8 million gallons per day. The Wayne County Water and Sewer Authority estimates that the

average water usage by residential customers (i.e., individual families) is 150-200 gallons per day. Using this consumption rate, the plant-related population increase in Wayne County (50 households) would generate increased water demand of 10,000 gallons per day. The excess capacity in the systems in the County is 6.1 million gallons per day (Ref. 4.9-2). Both Monroe and Wayne Counties have sufficient excess capacity in their water systems to handle the 100 additional families.

Therefore, RG&E concludes that the impacts resulting from plant-related population growth to the public water supply (Issue 65) would be SMALL, and would not warrant mitigation.

4.10 Education Impacts from Refurbishment

NRC

The environmental report must contain, "An assessment of the impact of the proposed action on...public schools (impacts from refurbishment activities only) within the vicinity of the plant...." 10 CFR 51.53(c)(3)(ii)(l)

"Most sites would experience impacts of small significance but larger impacts are possible depending on site- and project-specific factors." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 66

"...[S]mall impacts are associated with project-related enrollment increases of 3 percent or less. Impacts are considered small if there is no change in the school systems' abilities to provide educational services and if no additional teaching staff or classroom space is needed. Moderate impacts generally are associated with 4 to 8 percent increases in enrollment...and... if a school system must increase its teaching staff or classroom space even slightly to preserve its pre-project level of service.... Large impacts are associated with project-related enrollment increases above 8 percent..." (Ref. 4.1-1, Section 3.7.4.1)

The NRC made impacts to education a Category 2 issue because site-specific and project-specific factors determine the significance of impacts (Ref. 4.1-1, Section 3.7.4.1). Local factors to be ascertained include: (1) project-related enrollment increases; and (2) status of the student/teacher ratio.

As described in Section 3.2, RG&E does not plan to perform major refurbishment activities at Ginna Station in association with license renewal. RG&E concludes that there would be no refurbishment-related impacts to education and, therefore, no analysis is required.

4.11 Offsite Land Use

4.11.1 Refurbishment

NRC

The environmental report must contain, "An assessment of the impact of the proposed action on...land-use... (impacts from refurbishment activities only) within the vicinity of the plant...." 10 CFR 51.53(c)(3)(ii)(l)

"Impacts may be of moderate significance at plants in low population areas." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 68

"...if plant-related population growth is less than 5 percent of the study area's total population, off-site land-use changes would be small, especially if the study area has established patterns of residential and commercial development, a population density of at least 60 persons per square mile...and at least one urban area with a population of 100,000 or more within...50 miles...." (Ref. 4.1-1, Section 3.7.5)

The NRC made impacts to offsite land use as a result of refurbishment activities a Category 2 issue because land-use changes could be considered beneficial by some community members and adverse by others. Local conditions to be ascertained include: (1) plant-related population growth; (2) patterns of residential and commercial development; and (3) proximity to an urban area of at least 100,000.

As described in Section 3.2, RG&E does not plan to perform major refurbishment activities at Ginna Station in association with license renewal. RG&E concludes that there would be no refurbishment-related impacts to offsite land use and, therefore, no analysis is required.

4.11.2 License Renewal Term

NRC

The environmental report must contain, "An assessment of the impact of the proposed action on ...land-use...within the vicinity of the plant..." 10 CFR 51.53(c)(3)(ii)(l)

"Significant changes in land use may be associated with population and tax revenue changes resulting from license renewal." 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 69

"...if plant-related population growth is less than five percent of the study area's total population, off-site land-use changes would be small..." (Ref. 4.1-1, Section 3.7.5)

"If the plant's tax payments are projected to be small relative to the community's total revenue, new tax-driven land-use changes during the plant's license renewal term would be small, especially where the community has pre-established patterns of development and has provided adequate public services to support and guide development." (Ref. 4.1-1, Section 4.7.4.1)

The NRC made impacts to offsite land use during the license renewal term a Category 2 issue because land-use changes may be perceived to be beneficial by some community members and adverse by others. Therefore, the NRC could not

assess the potential significance of site-specific offsite land-use impacts (Ref. 4.1-1, Section 4.7.4.1). In the GEIS, the NRC presents an analysis of offsite land use for the renewal term that is characterized by two components, population-driven and tax-driven impacts (Ref. 4.1-1, Section 4.7.4.1). Based on the GEIS case study analysis, the NRC concludes that all new population-driven land-use changes during the license renewal term at all nuclear power plants would be small. [Population growth caused by license renewal would represent a much smaller "percentage of the local area's" total population than the percentage represented by operations-related growth (Ref. 4.1-1, Section 4.7.4.2).] In Section 3.4.2, the assumed population growth associated with the license renewal term represents less than 0.05 percent of the 2000 population in the Wayne and Monroe County area. Based on GEIS case study analysis, the NRC concluded that if plant-related population growth is less than 5 percent of the study area's total population, off-site land-use changes would be small (Ref. 4.1-1, Section 3.7.5). RG&E agrees with this conclusion and, therefore, will only address potential tax-driven land-use impacts in this subsection.

Site-specific factors to consider in an assessment of new tax-driven land-use impacts include: (1) the size of plant-related population growth compared to the area's total population; (2) the size of the plant's tax payments relative to the community's total revenue; (3) the nature of the community's existing land-use pattern; and (4) the extent to which the community already has public services in place to support and guide development.

As described in Section 3.2, no major refurbishment or construction activities will be associated with Ginna Station license renewal. RG&E, therefore, does not anticipate any new tax payments that would influence offsite land use. As shown in Table 2.10-1, RG&E annual property tax payments to Wayne County for Ginna Station represented approximately 6.4 percent of the County's total annual property tax revenues for the period 1995 through 2001. For the same period, RG&E's payments to the County represented approximately 2.0 percent of Wayne County's annual total revenues. RG&E annual property tax payments to the Town of Ontario averaged 13.2 percent of the annual budget during the same period. Tax payments to the Wayne Central School District averaged 12.4 percent of total revenues for the period 1995 through 1999. Ginna tax payments have constituted a decreasing percentage of the three taxing jurisdictions' total revenues since 1995. RG&E expects this trend to continue into the future, with Ginna tax payments soon representing 10 percent or less of the taxing jurisdictions' total budgets.

The NRC has determined that the significance of tax payments is small if payments are less than 10 percent of a taxing jurisdiction's total revenues, moderate if payments are 10 percent to 20 percent of revenues, and large if payments represent greater than 20 percent of revenues (Ref. 4.1-1, Section 4.7.2.1). The NRC has further determined that if a plant's tax payments are projected to be small, license renewal tax-driven land-use changes would most likely be small with very little new development and minimal changes to the area's land-use patterns. If payments are projected to be moderate to large relative to the community's total revenue, new tax-

driven land-use charges would be moderate (Ref. 4.1-1, Section 4.7.4.1). Tax-driven land-use charges would most likely be small given that Wayne County and the Town of Ontario have established development patterns and are growing at relatively slow rates. RG&E concludes that tax-driven land-use impacts (Issue 69) would be SMALL and mitigative measures would not be warranted.

4.12 Transportation

NRC

The environmental report must contain an assessment of "...the impact of the proposed project on local transportation during periods of license renewal refurbishment activities..." 10 CFR 51.53(c)(3)(ii)(J)

"Transportation impacts are generally expected to be of small significance. However, the increase in traffic associated with the additional workers and the local road and traffic control conditions may lead to impacts of moderate or large significance at some sites." 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 70

Level of Service (LOS) "A and B are associated with small impacts because the operation of individual users is not substantially affected by the presence of other users." LOS A is characterized by "free flow at the traffic stream; users are unaffected by the presence of others." LOS B is characterized by "stable flow in which the freedom to maneuver is slightly diminished." (Ref. 4.1-1, Section 3.7.4.2)

The NRC made impacts to transportation a Category 2 issue because impact significance is determined primarily by road conditions existing at the time of the project, which the NRC could not forecast for all plants (Ref. 4.1-1, Section 3.7.4.2). Local road conditions to be ascertained are: (1) level of service (LOS) conditions; and (2) incremental increase in traffic associated with refurbishment activities and license renewal staff.

As described in Section 3.2, RG&E does not plan to perform major refurbishment activities at Ginna Station in association with license renewal. RG&E concludes that there would be no refurbishment-related impacts to local transportation and, therefore, no analysis is required.

As noted in Section 2.12.2, access to Ginna is via County Route 101 (Lake Road). New York State (NYS) Route 104 is an important east-west route for employees commuting to and from the site. Though LOS designation is not readily available for roads in New York State, the volume/capacity ratios can be used to associate current traffic conditions for the roads used by employees commuting to Ginna Station with the LOS designations. Table 4.12-1 presents the LOS definitions used by the NRC in the GEIS (Ref. 4.1-1) and presents a breakdown of the volume/capacity ratios used to approximate correlation of the available data for roads used to access the Ginna Station site to the LOS designations.

Correlating LOS designations with volume/capacity ratios, LOS ratings of A through D could be roughly related to ratios values less than 1.0. LOS ratings of E and F would roughly correlate to volume/capacity ratios of 1.0 and greater than 1.0, respectively. Using information presented in Section 2.12.2, Table 4.12-2 lists the sections of roadways that are most likely used by employees commuting to and from Ginna Station and for which data are available, the respective volume/capacity ratios, and the LOS rating equivalents.

Table 4.12-1
Level of Service Definitions

Level of Service[a]	Conditions[a]	Volume/ Capacity Ratios[b]
A	Free flow of the traffic stream; users are unaffected by the presence of others.	0 - 0.20
B	Stable flow in which the freedom to select speed is unaffected but the freedom to maneuver is slightly diminished.	0.21 - 0.4
C	Stable flow that marks the beginning of the range of flow in which the operation of individual users is significantly affected by interactions with the traffic stream.	0.41 - 0.6
D	High-density, stable flow in which speed and freedom to maneuver are severely restricted; small increases in traffic will generally cause operational problems.	0.61 - 0.8
E	Operating conditions at or near capacity level causing low but uniform speeds and extremely difficult maneuvering that is accomplished by forcing another vehicle to give way; small increases in flow or minor perturbations will cause breakdowns.	0.81 - 1.0
F	Defines forced or breakdown flow that occurs wherever the amount of traffic approaching a point exceeds the amount that can traverse the point. This situation causes the formation of queues characterized by stop-and-go waves and extreme instability.	greater than 1.0

a. Ref. 4.1-1, Section 3.7.4.2.

b. RG&E estimates the volume/capacity ratio range by LOS category by dividing the range evenly over the number of categories.

Table 4.12-2
Likely Commuter Routes

Road Section	Volume/Capacity Ratio	LOS Rating
NYS Route 104		
East of Ontario to NYS Route 21	0.7 to 0.9	D to E
West of Ontario to Monroe County border	0.3	B
Wayne County border to NYS Route 250	0.3 to 0.57	B to C
NYS Route 250		
County Road 101 to Webster	0.1 to 0.4	A to B
In Webster	0.4 to 0.8	B to D
South of Webster	0.5	C
NYS Route 350 from NYS Route 104 to Macedon	0.2 to 0.4	A to B
NYS Route 21 from NYS Route 104 to Palmyra	0.2 to 0.3	B

LOS = level of service
NYS = New York State

In GEIS Section 3.7.4.2, the NRC concluded that LOS designations of A and B are associated with small impacts, LOS designations of C and D are associated with moderate impacts, and LOS designations of E and F are associated with large impacts.

As noted in Section 2.12.2, NYS Route 104 serves as the primary east-west corridor in this area, as indicated by the volume of traffic. Traffic volume ranges from 20,000 to 40,000 with the higher volumes existing near the entrance to Monroe County. Much of NYS Route 104 in the vicinity of the Ginna Station operates well below capacity, while some of the two-lane portions east of the Town of Ontario are characterized as near capacity. However, traffic volumes drop off dramatically on north-south routes crossing NYS Route 104 that provide access to County Route 101 (Lake Road) and subsequently to Ginna Station. Volume capacity ratios available for these roads indicate that flow on these roads is much less than capacity.

The bounding scenario of 60 additional license renewal staff represents less than 3 percent of the traffic volume on Lake Road, and if it is assumed that all employees used Ontario Center Road to access the site from NYS Route 104, an increase of 60 additional cars represents less than 1 percent of the volume. The north-south routes for which capacity information is available indicate that these roads are well below capacity (less than 50 percent) and are roughly analogous to LOS designations of A/B. Therefore, under the bounding scenario, RG&E anticipates that an additional

60 employees during the period of extended operations would not significantly impact flow conditions on the roads providing direct access to the site, and concludes that impacts to transportation (Issue 70) would be SMALL. Given the magnitude of the impact, mitigation measures such as increased traffic controls would not be warranted.

4.13 Historic and Archaeological Resources

NRC

The environmental report must contain an assessment of "...whether any historic or archaeological properties will be affected by the proposed project." 10 CFR 51.53(c)(3)(ii)(K)

"Generally, plant refurbishment and continued operation are expected to have no more than small adverse impacts on historic and archaeological resources. However, the National Historic Preservation Act requires the Federal agency to consult with the State Historic Preservation Officer to determine whether there are properties present that require protection." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 71

"Sites are considered to have small impacts to historic and archaeological resources if (1) the State Historic Preservation Office (SHPO) identifies no significant resources on or near the site; or (2) the SHPO identifies (or has previously identified) significant historic resources but determines they would not be affected by plant refurbishment, transmission lines, and license-renewal term operations and there are no complaints from the affected public about the character; and (3) if the conditions associated with moderate impacts do not occur." (Ref. 4.1-1, Section 3.7.7)

The NRC made impacts to historic and archaeological resources a Category 2 issue because determinations of impacts to historic and archaeological resources are site-specific in nature, and the National Historic Preservation Act mandates that determination of impacts must be made through consultation with the State Historic Preservation Officer (SHPO) (Ref. 4.1-1, Section 4.7.7.3).

As described in Section 3.2, RG&E does not plan to perform refurbishment activities at Ginna Station in association with license renewal. Therefore, RG&E concludes that there would be no refurbishment-related impacts to historic and archaeological resources and, therefore, no analysis is required.

No archaeological or historic sites or artifacts of significance have been identified at or in close proximity to the Ginna Station. No known archaeological or historic sites of significance have been identified on the transmission line corridor. Therefore, continued use of transmission lines and the associated corridor are projected to cause little or no impact.

RG&E has initiated discussions with the SHPO regarding Ginna Station license renewal, and the SHPO has determined that it is unlikely that historical properties would be affected by this undertaking. Copies of the correspondence with the SHPO are provided in Appendix D of this environmental report.

RG&E notes that appropriate care will be taken to protect archaeological and historic resources should any land-clearing or ground-disturbing activities be undertaken in previously undisturbed areas during the period of continued operations. RG&E concludes that continued operation would have no adverse impacts to historic resources; hence, there would be no impacts to mitigate. Because the definition of

"small" includes impacts that are not detectable, the appropriate characterization of the impact on historic and archaeological resources (Issue 71) is SMALL.

4.14 Severe Accident Mitigation Alternatives

NRC

The environmental report must contain a consideration of alternatives to mitigate severe accidents "... [i]f the staff has not previously considered severe accident mitigation alternatives for the applicant's plant in an environmental impact statement or related supplement or in an environmental assessment ..."
10 CFR 51.53(c)(3)(ii)(L)

"The probability weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to ground water, and societal and economic impacts from severe accidents are small for all plants. However, alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives." 10 CFR Part 51, Subpart A, Appendix B, Table B-1 (Issue 76)

The term "accident" refers to any unintentional event (i.e., outside the normal or expected plant operational envelope) that results in the release or a potential for release of radioactive material to the environment. Generally, the NRC categorizes accidents as "design basis" or "severe." Design basis accidents are those for which the risk is great enough that an applicant is required to design and construct a plant to prevent unacceptable accident consequences. Severe accidents are those considered too unlikely to warrant design controls.

Historically, the NRC has not included in its environmental impact statements or environmental assessments any analysis of alternative ways to mitigate the environmental impacts of severe accidents. A 1989 court decision ruled that, in the absence of an NRC finding that severe accidents are remote and speculative, severe accident mitigation alternatives (SAMAs) should be considered in the NEPA analysis [Limerick Ecology Action v. NRC, 869 F.d 719 (3rd Cir. 1989)]. For most plants, including Ginna Station, license renewal is the first licensing action that would necessitate consideration of SAMAs.

The NRC concluded in its generic license renewal rulemaking that the unmitigated environmental impacts from severe accidents met the Category 1 criteria, but the NRC made consideration of mitigation alternatives a Category 2 issue because ongoing regulatory programs related to mitigation (i.e., Individual Plant Examination and Accident Management) have not been completed for all plants. Since these programs have identified plant programmatic and procedural improvements (and, in a few cases, minor modifications) as cost-effective in reducing severe accident and risk consequences, the NRC thought it premature to draw a generic conclusion as to whether severe accident mitigation would be required for license renewal.

Site-specific information to be presented in the environmental report includes: (1) potential SAMAs; (2) benefits, costs, and net value of implementing potential SAMAs; and (3) sensitivity of the analysis to changes to key underlying assumptions. This section of the environmental report is a synopsis of key site-specific SAMA information. Additional details, as called out in the following sections, are provided in Appendix E.

4.14.1 Methodology Overview

The methodology used to perform the Ginna Station SAMA cost-benefit analysis is based primarily on the handbook used by the NRC to analyze the benefits and costs of its regulatory activities, NUREG/BR-0184 (Ref. 4.14-1), subject to Ginna Station-specific considerations.

Environmental impact statements and environmental reports are prepared using a sliding scale in which impacts of greater concern and mitigative measures of greater potential value receive more detailed analysis than do impacts of less concern and mitigative measures of less potential value. Accordingly, RG&E used less detailed feasibility investigation and cost estimation techniques for SAMAs having disproportionately high costs and low benefits, and more detailed techniques for the most viable candidates.

The following is a brief outline of the approach taken in this SAMA analysis:

- Establish the Base Case – Use NUREG/BR-0184 and the current Ginna Station probabilistic safety assessment (PSA) model at the time of evaluation to evaluate the following severe accident impacts:

  - Offsite exposure costs – Monetary value of consequences (dose) to offsite population:

    Use the Ginna Station PSA model to determine the total accident frequency, which is a function of core damage and containment release frequencies. Use the Melcor Accident Consequences Code System (MACCS) to convert release input to public dose, and the methodology described in NUREG/BR-0184 to convert dose to present-worth dollars based on valuation of $2,000 per person-rem and present-worth discount factor.

  - Offsite economic costs – Monetary value of damage to offsite property:

    Use the Ginna Station PSA model to determine total accident frequency (core damage frequency and containment release frequency); MACCS to convert release input to offsite property damage; and the NRC's NUREG/BR-0184 methodology to convert offsite property damage estimate to present-worth dollars.

  - Onsite exposure costs – Monetary value of dose to workers:

    Use NUREG/BR-0184 best estimate occupational dose values for immediate and long-term dose, then apply the NUREG/BR-0184 methodology to convert dose to present-worth dollars based on valuation of $2,000 per person-rem and present-worth discount factor.

  - Onsite economic costs – Monetary value of damage to onsite property:

    Use NUREG/BR-0184 best estimate cleanup, decontamination, and replacement power costs; then apply the NUREG/BR-0184 methodology to convert onsite property damage estimate to present-worth dollars.

- SAMA Identification – Identify potential SAMAs from the following sources:

  Ginna Station PSA results and staff insights regarding the significant contributors to risk and plant design; SAMA analyses submitted in support of license renewal activities for other nuclear power plants; and NRC and industry documentation discussing potential plant improvements.

- Disposition of SAMAs – Eliminate candidates based on cost-benefit analysis:

  - SAMA impacts – Calculate impacts (i.e., onsite/offsite dose and damages) by using the plant model to simulate revised plant risk following implementation of each individual SAMA.

  - SAMA benefits – Calculate benefits for each SAMA in terms of averted consequences. Averted consequences are the arithmetic differences between the calculated impacts for the base case and the revised impacts following implementation of each individual SAMA.

  - Cost estimate – Estimate the cost of implementing each SAMA. The detail of the cost estimate must be commensurate with the benefit; if a benefit is low, it is not necessary to perform a detailed cost estimate to determine that the SAMA is not cost beneficial—engineering judgment can be applied.

- Sensitivity Analysis – Determine the effect that changing the discount rate would have on the cost-benefit calculation.
- Conclusions – Identify SAMAs that are cost beneficial, if any, and implementation plans or bases for not implementing.

The RG&E SAMA analysis for Ginna Station is presented in the following sections. These sections provide a detailed discussion of the process presented above.

4.14.2 Establishing the Base Case

The purpose of establishing the base case is to provide the baseline for determining the risk reductions (benefits) that would be attributable to the implementation of potential SAMAs. The primary source of data relating to the base case is the Ginna Station PSA model. Severe accident risk is calculated through use of the Ginna Station PSA model and the MACCS2 Level 3 model. The Ginna Station PSA model uses PSA techniques to:

- Develop an understanding of severe accident behavior;
- Understand the most likely severe accident consequences;
- Gain a quantitative understanding of the overall probabilities of core damage and fission product releases; and
- Evaluate hardware and procedure changes to assess the overall probabilities of core damage and fission product releases.

The Ginna Station PSA model includes internal events (e.g., loss of feedwater event, loss-of-coolant accident), external events (fires and flooding), and shutdown events. The model has been upgraded since completion of the Individual Plant Examination

and Individual Plant Examination for External Events (Ref. 4.14-2; Ref. 4.14-3; Ref. 4.14-4; Ref. 4.14-5), and it has been significantly modified to accommodate generic and plant-specific operating data, as well as risk-important plant design and procedural changes implemented since 1994 (e.g., relocation of service water piping to avoid battery room floods and steam generator replacement). Appendix Section E.1 provides additional information pertaining to the evolution of the Ginna Station PSA model, the current risk profile for the station, and risk-important modifications.

The Ginna Station PSA model describes the results of the first two levels of the Ginna Station probabilistic risk assessment for the plant. These levels are defined as follows: Level 1 determines core damage frequencies based on system analyses and human-factor evaluations; and Level 2 evaluates the impact of severe accident phenomena on radiological releases and quantifies the condition of the containment and the characteristics of the release of fission products to the environment.

Using the results of these analyses, the next step is to perform a Level 3 PSA analysis, which calculates the hypothetical impacts of severe accidents on the surrounding environment and members of the public. The MACCS2 computer code is used for determining the offsite impacts for the Level 3 analysis, whereas the magnitude of the onsite impacts (in terms of cleanup and decontamination costs and occupational dose) are based on information provided in NUREG/BR-0184. The principal phenomena analyzed are: atmospheric transport of radionuclides; mitigating actions (i.e., evacuation, condemnation of contaminated crops and milk) based on dose projection; dose accumulation by a number of pathways, including food and water ingestion; and economic costs. Input for the Level 3 analysis includes the reactor core radionuclide inventory, Ginna Station source terms (as applied to the Ginna Station PSA model), site meteorological data, projected population distribution (within a 50-mile radius) for the year 2030, emergency response evacuation modeling, and economic data. Appendix Section E.2 describes the MACCS2 input data, assumptions, and results.

4.14.2.1 Offsite Exposure Costs

The Level 3 base case analysis shows an annual offsite exposure risk of 4.09 person-rem. This calculated value is converted to a monetary equivalent (dollars) via application of the NRC's conversion factor of $2,000 per person-rem. This monetary equivalent is then discounted to present value using the NRC standard formula (Ref. 4.14-1):

$W_{pha} = C \times Z_{pha}$

where:

W_{pha} = monetary value of public health risk after discounting ($)

$C = [1 - \exp(-rt_f)]/r$

where:

t_f = years remaining until end of facility life (20 years)

r = real discount rate (as fraction) (0.07)

Z_{pha} = monetary value of public health (accident) risk per year before discounting ($/year)

Using a 20-year period for remaining plant life and a seven percent discount rate results in a value of approximately 10.76 for C. Therefore, calculating the discounted monetary equivalent of public health risk involves multiplying the dose (person-rem per year) by $2,000 and by the C value, approximately 10.76. The resulting monetary equivalent is $88,000.

4.14.2.2 Offsite Economic Costs

The Level 3 analysis shows that the offsite property loss factor multiplied by accident frequency yields an annual offsite economic risk of $24,100. Calculated values for offsite economic costs caused by severe accidents are also discounted to present value. Discounting is performed in the same manner as for the Offsite Exposure Costs discussed above. The resulting monetary equivalent is $259,000.

4.14.2.3 Onsite Exposure Costs

Values for occupational exposure associated with severe accidents are not derived from the Ginna Station PSA model, but instead are obtained from information published by the NRC. Occupational exposure consists of "immediate dose" and "long-term dose." The best-estimate value provided by the NRC for immediate occupational dose is 3,300 person-rem, and long-term occupational dose is 20,000 person-rem (over a ten-year cleanup period). The following equations are applied to these values to calculate monetary equivalents.

Immediate Dose

For a currently operating facility, the NRC, in NUREG/BR-0184, recommends calculating the immediate dose present value with the following equation:

Equation (1):

$$W_{IO} = \left(F_S D_{IO_S} - F_A D_{IO_A}\right) R \frac{1 - e^{-rt_f}}{r} \qquad (1)$$

where:

W_{IO} = monetary value of accident risk avoided due to immediate occupational dose, after discounting ($)

R = monetary equivalent of unit dose ($/person-rem)

F = accident frequency (events/year)

D_{IO} = immediate occupational dose (person-rem/event)

s = subscript denoting status quo (current conditions)

A = subscript denoting after implementation of proposed action

r = real discount rate
t_f = years remaining until end of facility life

The values used in the analysis are:

R = $2,000/person-rem
r = 0.07
D_{IO} = 3,300 person-rem/accident (best estimate)
t_f = 20 years

Assuming F_A is zero for the base case, the monetary value of the immediate dose associated with Ginna Station's accident risk is:

$$W_{IO} = (F_S D_{IO_S}) R \frac{1 - e^{-rt_f}}{r}$$

$$= 3300 * F * \$2000 * \frac{1 - e^{-.07*20}}{.07}$$

The core damage frequency (CDF) for the base case is 3.97E-05 per year; therefore,

W_{IO} = $3,000

Long-term Dose

For a currently operating facility, the NRC, in NUREG/BR-0184, recommends calculating the long-term dose present value with the following equation:

Equation (2):

$$W_{LTO} = (F_S D_{LTO_S} - F_A D_{LTO_A}) R * \frac{1 - e^{-rt_f}}{r} * \frac{1 - e^{-rm}}{rm} \quad (2)$$

where:

W_{LTO} = monetary value of accident risk-avoided long-term doses, after discounting ($)
F = accident frequency (events/year)
s = subscript denoting status quo (current conditions)
A = subscript denoting after implementation of proposed action
t_f = years remaining until end of facility life
r = real discount rate
R = monetary equivalent of unit dose ($/person-rem)
D_{LTO} = long-term occupational dose (person-rem/event)
m = years over which long-term doses accrue

The values used in the analysis are:

R = $2,000/person-rem
r = 0.07
D_{LTO} = 20,000 person-rem/accident (best estimate)
m = "as long as 10 years"
t_f = 20 years

Assuming F_A is zero for the base case, the monetary value of the long-term dose associated with the plant accident risk is:

$$W_{LTO} = (F_S D_{LTO_S}) R * \frac{1-e^{-rt_f}}{r} * \frac{1-e^{-rm}}{rm}$$

$$= (F_S \times 20000)\$2000 * \frac{1-e^{-.07*20}}{.07} * \frac{1-e^{-.07*10}}{.07*10}$$

The CDF (F) for the base case is 3.97E-05 per year; therefore,

W_{LTO} = \$12,000

Total Occupational Exposures

Combining Equations (1) and (2) above and using the above numerical values, the long-term accident related onsite (occupational) bounding dose (W_O) is equivalent to:

$W_O = W_{IO} + W_{LTO}$ = \$15,000

4.14.2.4 Onsite Economic Costs

Onsite economic costs are considered to include costs associated with cleanup/ decontamination, replacement power, and repair/refurbishment. Each of these factors is discussed in the following sections.

Cleanup and Decontamination

The total undiscounted cost estimate of cleanup and decontamination of a power facility subsequent to a severe accident is estimated by the NRC, in NUREG/BR-0184, at \$1.5E+09. Assuming the \$1.5E+09 estimate is spread evenly over a 10-year period for cleanup and applying a seven percent real discount rate, the cost translates into a net present value of \$1.1E+09 for a single event. This quantity is derived from the following equation:

$$PV_{CD} = \left(\frac{C_{CD}}{m}\right)\left(\frac{1-e^{-rm}}{r}\right)$$

where:

PV_{CD} = present value of the cost of cleanup/decontamination (\$)
C_{CD} = total cost of the cleanup/decontamination effort (\$1.5E+09)
m = cleanup period (10 years)
r = real discount rate (7 percent)

Therefore:

$$PV_{CD} = \left(\frac{\$1.5E+09}{10}\right)\left(\frac{1-e^{-.07*10}}{.07}\right)$$

$$PV_{CD} = \$1.079E+09$$

This cost is integrated over the license renewal period as follows:

$$U_{CD} = PV_{CD}\frac{1-e^{-rt_f}}{r}$$

where:

U_{CD} = net present value of cleanup/decontamination over the life of the plant ($)
t_f = years remaining until end of facility life

Based upon the values previously assumed:

$$U_{CD} = \$1.161E+10$$

Replacement Power

Replacement power costs, U_{RP}, are an additional contributor to onsite costs. These are calculated in accordance with NUREG/BR-0184, Sections 5.7.6.4 and 5.6.7.2. Since replacement power will be needed for the time period following a severe accident and for the remainder of the expected generating plant life, long-term replacement power calculations have been used. Values used in the calculations are based on the 910-megawatts (electric) [MW(e)] reference plant.

$$PV_{RP} = \left(\frac{\$1.2E+08}{r}\right)\left(1-e^{-rt_f}\right)^2$$

where:

PV_{RP} = present value of the cost of replacement power for a single event ($)
t_f = years remaining until end of facility life
r = real discount rate

This equation was developed per NUREG/BR-0184 for discount rates between 5 percent and 10 percent only. It was developed using the constant $1.2E+08, which has no intrinsic meaning, but is a substitute for a string of non-constant replacement power costs that occur over the lifetime of a "generic" reactor after an event.

To account for the entire lifetime of the facility, U_{RP} was then calculated from PV_{RP}, as follows:

$$U_{RP} = \frac{PV_{RP}}{r}\left(1-e^{-rt_f}\right)^2$$

where:

U_{RP} = present value of the cost of replacement power over the life of the facility ($)

Based upon values previously assumed:

U_{RP} = $7.89E+09

Applying the correction for a 490 MW(e) Ginna Station versus 910 MW(e) for the "generic" reactor, U_{RP} = $4.25E+09

Repair and Refurbishment

RG&E has no plans for major repair/refurbishment following a severe accident; therefore, there is no contribution to averted onsite costs from this source.

Total Onsite Economic Cost

The total onsite economic cost is the sum of the cleanup/decontamination cost (U_{CD}) and the replacement power cost (U_{RP}) multiplied by the CDF (3.97E-05/year). Therefore, the total onsite economic cost is $630,000.

4.14.2.5 Maximum Attainable Benefit

The present-dollar value equivalent for severe accidents at Ginna Station is the sum of the offsite exposure costs, offsite economic costs, onsite exposure costs, and onsite economic costs. Table 4.14-1 lists each of these values for the base case as calculated in the previous sections. As shown, the monetized value of severe accident risk is approximately $992,000.

The maximum theoretical benefit is based upon the elimination of all plant risk and equates to the base case severe accident risk described above. Therefore, the maximum attainable benefit is $992,000.

4.14.3 SAMA Identification

RG&E identified candidate modifications by focusing on station risk and design characteristics. RG&E considered insights into possible Ginna Station-specific improvements gained through the development and use of the Ginna Station PSA model over the past decade. RG&E focused on the dominant risk sequences identified by the model, as well as the results of other risk-importance studies to further focus the evaluation. Appendix Section E.1 provides details of the Ginna Station risk profile. Additional insights were gained from reviewing candidate modifications identified in previous license renewal SAMA evaluations submitted to the NRC by other licensees. As conceptual modifications were formulated, RG&E balanced the order-of-magnitude cost against the maximum attainable benefit. Those conceptual ideas whose cost would greatly exceed the maximum attainable benefit were not considered further.

4.14.4 Cost-Benefit Analysis

The cost-benefit analysis involved developing Ginna Station-specific SAMA descriptions and cost-benefit analyses for the viable candidate SAMAs. RG&E developed general descriptions as to how each potential SAMA would be implemented to provide a basis for bounding benefit and cost estimates. Each SAMA description provides the analysts with a detailed description that can be compared with the current plant configuration and processes. Appendix Section E.3 provides a description for each candidate SAMA.

Table 4.14-1
Estimated Present Dollar Value Equivalent for Severe Accidents at Ginna Station

Parameter	Present Dollar Value
Onsite Economic Costs	$630,000
Offsite Economic Costs	$259,000
Onsite Exposure Costs	$15,000
Offsite Exposure Costs	$88,000
Total	**$992,000**

RG&E then prepared site-specific cost estimates for implementing each candidate SAMA. Conservatively, the cost estimates included neither the cost of replacement power during extended outages required to implement the modifications, nor the contingency costs associated with unforeseen implementation obstacles. Estimates were presented in terms of dollar values at the time of implementation or estimation, and were not adjusted to present-day dollars.

Consistent with the methodology presented in Section 4.14.2, RG&E calculated the maximum benefit for each potential SAMA. The methodology for determining if a SAMA is beneficial consists of determining whether the benefit provided by implementation of the SAMA exceeds the expected cost of implementation. The benefit is defined as the sum of the reductions in the dollar equivalents for each severe accident impact (offsite exposure costs, offsite economic costs, occupational exposure costs, and onsite economic costs) resulting from the implementation of a SAMA.

The result of implementation of each SAMA would be a change in the Ginna Station severe accident risk (i.e., a change in frequency or consequence of severe accidents)[2]. The methodology for calculating the magnitude of these changes is straightforward. First, the Ginna Station severe accident risk after implementation of each SAMA was calculated using the same methodology as for the base case. A spreadsheet was then used to combine the results of the Level 2 model with the Level 3 model to calculate the post-SAMA risks. The results of the benefit analysis for each of the SAMAs are presented in Section 4.14.5.

As described above for the base case, values for avoided public and occupational health risk (benefits) were converted to a monetary equivalent (dollars) via application of the NRC's conversion factor of $2,000 per person-rem (Ref. 4.14-1)

[2] Frequency x consequence = risk.

and discounted to present value. Values for avoided offsite economic costs were also discounted to present value. The formula used for calculating net value for each SAMA is as follows:

Net value = ($APE + $AOC + $AOE + $AOSC) – COE

where:

$APE = monetized value of averted public exposure ($)
$AOC = monetized value of averted offsite costs ($)
$AOE = monetized value of averted occupational exposure ($)
$AOSC= monetized value of averted onsite costs ($)
COE = cost of enhancement ($)

If the net value of a SAMA is negative, the cost of implementing the SAMA is larger than the benefit associated with the SAMA, and the SAMA would not be considered cost-beneficial. The projected cost of each SAMA (COE) was derived by knowledgeable Ginna Station staff. RG&E staff prepared screening level plant-specific cost estimates that address the major cost considerations for implementing each SAMA. Additional detail for the candidate SAMA cost estimates is provided in Appendix Section E.3.

4.14.5 Results

RG&E used Revision 4.1 of the Ginna Station PSA model (dated May 2002) and developed a limited Level 3 model to conduct the SAMA analysis. Using these models, RG&E analyzed eight plant-specific alternatives for mitigating Ginna Station severe accident impacts. Table 4.14-2 presents the analysis results, including the percentage of CDF reduction, the estimated benefit, the estimated cost of the enhancement, and the net benefit for each of the candidate SAMAs evaluated. The cost-benefit evaluation indicates four candidate SAMAs are potentially cost beneficial for mitigating the consequences of a severe accident. These include:

- Obtaining a skid-mounted 480-volt (V) diesel generator (SAMA No. 1).
- Obtaining a third fire water source independent of the existing suction source for motor-driven and diesel-driven fire pumps (SAMA No. 2).
- Modifying procedures to allow charging pumps B and C to be manually aligned to Bus 14 (SAMA No. 4).
- Modifying air-operated valve (AOV) 112C to fail closed and AOV 112B to fail open on loss of instrument air (SAMA No. 7).

In NUREG/BR-0184, the NRC recommends using a seven percent real (i.e., inflation-adjusted) discount rate for value-impact analyses and notes that a three percent discount rate should be used for sensitivity analyses to indicate the sensitivity of the results to the choice of discount rate. This reduced discount rate takes into account the additional uncertainties (i.e., interest rate fluctuations) in

Table 4.14-2
Disposition of SAMAs Related to Ginna Station

SAMA No.	Potential Enhancement	CDF Reduction	Estimated Benefit	Estimated Cost of Enhancement	Screening Result and Discussion
1	Obtain a skid-mounted 480V diesel generator	14.8%	$813,000	$400,000	Positive net benefit of $413,000. Implementation would potentially mitigate all station blackout sequences. (Using a 3 percent discount rate, the net benefit is $739,000.)
2	Obtain a third fire water source independent of existing suction source for the motor- and diesel-driven fire pumps	5.5%	$303,000	$200,000	Positive net benefit of $103,000. Implementation would potentially mitigate the loss of all auxiliary feedwater due to failure of the service water suction source or a global failure of the screenhouse equipment due to fire or flooding. (Using a 3 percent discount rate, the net benefit is $224,000.)
3	Add a standby charging pump powered from a protected AC source	14.8%	$118,000	$1,100,000	Negative net benefit of $982,000. [Using a 3 percent discount rate, the net benefit is ($933,000).]
4	Modify procedures to allow charging pump B or C to be manually aligned to Bus 14	12.0%	$100,000	$20,000	Positive net benefit of $80,000. Implementation would potentially mitigate fires requiring entry into procedure "Alternative Shutdown for Control Complex Fire" or mitigate fires that would disable train B when the A charging pump fails to run. (Using a 3 percent discount rate, the net benefit is $122,000.)
5	Add redundant check valves in the two RHR injection lines to the RCS	3.3%	$844,000	$1,000,000	Negative net benefit of $156,000. (Using a 3 percent discount rate, the net benefit is $179,000.)

Table 4.14-2 (continued)
Disposition of SAMAs Related to Ginna Station

SAMA No.	Potential Enhancement	CDF Reduction	Estimated Benefit	Estimated Cost of Enhancement	Screening Result and Discussion
6	Modify motor-driven AFW pump cooling system to be independent of SW	5.8%	$40,000	$200,000	Negative net benefit of $160,000. [Using a 3 percent discount rate, the net benefit is ($143,000).]
7	Modify AOV 112C to fail closed and AOV 112B to fail open on loss of instrument air	6.3%	$63,000	$50,000	Positive net benefit of $13,000. Implementation would eliminate the need for manual operator actions on low VCT levels. (Using a 3 percent discount rate, the net benefit is $39,000.)
8	Reconfigure the PORVs so they transfer automatically from instrument air to N2 on low pressure and convert N2 supply line AOV to DC powered motor-operated valve	0.9%	$7,000	$400,000	Negative net benefit of $393,000. [Using a 3 percent discount rate, the net benefit is ($390,000).]

AC = alternating current
AFW = auxiliary feedwater
AOV = air-operated valve
CDF = core damage frequency
DC = direct current
ISLOCA = Interfacing System Loss-of-Coolant Accident
PORV = power-operated relief valve
RCS = reactor coolant system
RHR = residual heat removal
SW = service water
V = volt
VCT = volume control tank

predicting costs for activities that would take place several years in the future. Using a three percent discount rate, the magnitude of the net benefit increases for each of the candidate SAMAs, and one additional SAMA candidate (SAMA No. 5) was determined to be potentially cost beneficial.

It is important to note that an industry peer review of the Ginna Station PSA model (Revision 4.1) was conducted in May 2002. The results of this review will be incorporated into future updates of the model. RG&E will evaluate the extent to which the SAMA analysis will be affected by these model refinements. For the purposes of this submittal, RG&E, where possible, conducted a bounding analysis to account for potential model changes and recognizes that some of the benefits may be overestimated. RG&E considers this an appropriate approach for a screening-level analysis.

In the GEIS, the NRC concluded that the probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts of severe accidents are of small significance for all plants. RG&E concurs with that conclusion and addressed site-specific measures to mitigate severe accidents in this analysis. RG&E determined the potentially cost-beneficial SAMAs identified do not relate to adequately managing the effects of aging and, therefore, would not be required to be implemented pursuant to 10 CFR 54.

However, RG&E has historically identified and implemented various plant improvements at Ginna Station in order to reduce the CDF and the consequences of postulated accidents. Accordingly, RG&E will continue to refine the evaluation and consider implementation of these potentially cost-beneficial modifications through the current plant change process.

4.15 Impact on Public Health of Microbiological Organisms

NRC

"If the applicant's plant uses a cooling pond, lake, or canal or discharges into a river having an annual average flow rate of less than 3.15 × 1012ft3/year (9 × 1010m3/year), an assessment of the impact of the proposed action on public health from thermophilic organisms in the affected water must be provided." 10 CFR 51.53(c)(3)(ii)(G)

"These organisms are not expected to be a problem at most operating plants except possibly at plants using cooling ponds, lakes, or canals that discharge to small rivers. Without site-specific data, it is not possible to predict the effects generically." 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 57

The NRC designated impacts to public health from thermophilic organisms a Category 2 issue, requiring plant-specific analysis, because the magnitude of the potential public health impacts associated with thermal enhancement of such organisms, particularly *Naegleria fowleri,* could not be determined generically. The NRC noted in the GEIS that impacts of nuclear power plant cooling towers and thermal discharges are considered to be of small significance if they do not enhance the presence of microorganisms that are detrimental to water quality and public health (Ref. 4.1-1, Section 4.3.6). The NRC requires [10 CFR 51.53(c)(3)(ii)(G)] an assessment of the potential impact on public health of thermophilic organisms in receiving waters for nuclear power plants that use cooling ponds, lakes, canals, or small rivers. Information to be ascertained includes: (1) thermal conditions for the enhancement of *Naegleria fowleri*; (2) thermal characteristics of the receiving water body; (3) thermal discharge temperature; and (4) impacts to public health.

Based on current security measures required by the NRC, recreational access within the immediate discharge area for Ginna Station is prohibited, thus the general public cannot be exposed to waters within the immediate discharge area. However, employee access for environmental sampling from discharge canal waters or within the immediate discharge area in the Lake is permitted, creating some potential for human exposure.

Thermophilic bacteria generally occur at temperatures of 77°F to 178°F, with maximum growth at 122°F to 140°F. Bacteria pathogenic to humans typically have optimum temperatures of approximately 99°F (Ref. 4.8-1). Populations of the pathogenic amoeba *Naegleria fowleri* can be enhanced in thermally altered water bodies at temperatures ranging from 95°F to 106°F or higher, but this organism is rarely found in water cooler than 95°F based on studies reviewed and coordinated by Tyndall et al. (Ref. 4.8-2).

As described in Section 2.2, Lake Ontario is approximately 190 miles long by 50 miles wide, and it is the eleventh largest lake in the world in volume. The Ginna Station 316(a) Demonstration Supplement (Ref. 4.3-1) provides expected and extreme Lake Ontario and Ginna Station discharge temperatures to the 95 percent confidence level. This means that temperatures above these values could occur

5 percent of the time. Expected ambient Lake Ontario water temperature in the summer was determined to be 65.8°F, and maximum temperature was 74.6°F. Therefore, ambient Lake Ontario conditions would not support the thermophilic organisms of concern.

Thermophilic organisms occurring in the water column, if any, that might be of concern are expected to be limited to those entrained in the condenser cooling water. These organisms would be subjected to a rapid temperature rise through the condenser followed by relatively rapid cooling as the discharge plume mixes with the ambient lake water. The normal summer discharge temperature of the Ginna Station discharge was determined to be 85.8°F, while the maximum temperature was 94.6°F. Again, these temperatures may be exceeded 5 percent of the time, however, the maximum discharge temperature would not go above the SPDES permit limitation of 102°F. For the few periods of time that discharge temperatures may be above 95°F, residence time in the plume would be short because of mixing in the plume as it rapidly (3-45 feet per second) moves into the Lake and reduces in temperature. The ensuing decline in temperature would create an adverse environment for thermophilic microbes. Based on the average temperatures of the discharge and receiving waters, species such as *Naegleria fowleri* and *Legionella spp.* would not be expected to proliferate in the vicinity of Ginna Station.

Given these poor conditions for supporting populations of thermophilic organisms, such organisms in the Ginna Station discharge do not constitute a significant public health issue. In addition, no pathway for significant human exposure exists because environmental sampling within these waters is infrequent, there is no mechanism for inhalation exposure from aerosol production (such as spray nozzles), and recreational uses in the immediate vicinity of the discharge are prohibited, precluding both direct contact and ingestion routes.

Based on the evaluation presented above, RG&E concludes that impacts on public health from thermophilic microbiological organisms are not likely to occur as a result of license renewal, and there would be no impacts to mitigate. Because the definition of "small" includes impacts that are not detectable, the appropriate characterization of the impact on public health of microbiological organisms from continued operation of Ginna Station during the license renewal period is SMALL, and further mitigation is unwarranted.

4.16 Environmental Justice

NRC

"The need for and the content of an analysis of environmental justice will be addressed in plant-specific reviews." 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 92

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations" (Ref. 4.16-1), requires Executive agencies to identify and address, as appropriate, "disproportionately high and adverse human health or environmental effects" from their programs, policies, and activities on minority and low-income populations. The Presidential Memorandum that accompanied Executive Order 12898 emphasized the importance of using existing laws, including the NEPA, to identify and address environmental justice concerns, "including human health, economic, and social effects, of Federal actions."

Although the NRC is not subject to Executive Order 12898, it has voluntarily committed to conduct environmental justice reviews of actions under its jurisdiction and has issued procedural guidance (Ref. 4.16-2, Attachment 4). The guidance does not provide a standard approach or formula for identifying and addressing environmental justice issues. Instead, it offers general principles for conducting an environmental justice analysis under the NEPA. The NRC guidance makes clear that if no significant impacts are anticipated from the proposed action, then "...no member of the public will be substantially affected" and, as a consequence, "...there can be no disproportionate high and adverse effects or impacts on any member of the public including minority or low income populations."

RG&E has reviewed and adopted by reference NRC findings for Category 1 issues that RG&E determined are applicable to Ginna Station license renewal (see Section 4.1). The NRC has concluded that environmental impacts for each of these issues would be SMALL. RG&E has addressed each Category 2 issue and has performed required analyses for those that RG&E determined are applicable to Ginna Station license renewal (see Sections 4.2 through 4.15 and Appendix A of this environmental report).

For applicable Category 2 issues requiring analysis, RG&E has concluded that the environmental impacts would be SMALL for the following:

- Entrainment, impingement, and heat shock;
- Threatened or endangered species;
- Electric shock from transmission line-induced currents;
- Housing, public water supply, offsite land use, and transportation;
- Historic and archaeological resources;
- Severe accident mitigation alternatives; and
- Public health impacts from microbiological organisms.

Based on the RG&E review, Ginna Station license renewal and continued operations would result in no significant impact. No member of the public would be substantially affected and, as a consequence, there would be no disproportionately high and adverse impacts on any member of the public, including minority and low-income populations. In such instances, a qualitative review of potential environmental justice impacts is adequate and no mitigation measures need be described.

4.17 References

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