February 10, 2006

Mr. David B. Edwards, Plant Manager
Honeywell Specialty Chemicals
P.O. Box 430
Metropolis, IL 62960

SUBJECT: LICENSEE REVIEW OF DRAFT ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED LICENSE RENEWAL OF HONEYWELL'S METROPOLIS WORKS FACILITY, METROPOLIS, ILLINOIS

Dear Mr. Edwards:

By letter dated May 27, 2005, Honeywell International, Inc. (Honeywell) submitted a license renewal application to the U.S. Nuclear Regulatory Commission (NRC) to continue uranium conversion operations at the Metropolis Works (MTW) facility. The NRC staff has completed the draft environmental assessment regarding the proposed renewal of NRC Source Materials License SUB-526 for an additional 10 years. We have attached a copy of this draft environmental assessment to give you the opportunity to comment on the document's technical accuracy. To ensure a timely completion of the final environmental assessment, we request that you complete your review and return your comments to me within 30 days of receipt of this letter.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

If you have any questions, please contact Mr. Neil Haggerty of my staff by telephone at (301) 415-5196, or by e-mail at nxh3@nrc.gov. Written response can be provided to:

B. Jennifer Davis, c/o Document Control Desk, U.S. Nuclear Regulatory Commission, Mailstop T-7J08, Washington DC, 20555-0001. Thank you for your assistance.

Sincerely,

/RA/

B. Jennifer Davis, Chief
Environmental Review Section
Division of Waste Management
and Environmental Protection
Office of Nuclear Material Safety
and Safeguards

Docket No.: 40-3392
License No.: SUB-526

Attachment: As Stated

B. Jennifer Davis, c/o Document Control Desk, U.S. Nuclear Regulatory Commission, Mailstop T-7J08, Washington DC, 20555-0001. Thank you for your assistance.

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Docket No.: 40-3392
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Attachment: As Stated

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OFFICE:	DWMEP:PM	DWMEP:SC
NAME:	N. Haggerty	B.J. Davis
DATE:	02/09/06	02/10/06

Environmental Assessment for Renewal of NRC License No. SUB-526 for the Honeywell Specialty Materials, Inc. Metropolis Works (MTW) Facility

Draft Report

U.S. Nuclear Regulatory Commission
Office of Nuclear Material Safety and Safeguards
Division of Waste Management and Environmental Protection

Docket No. 40-3392

February 2006

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ACRONYMS/ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AEC	Atomic Energy Commission
ALARA	As Low As Reasonably Achievable
BOD	Biological Oxygen Demand
CEDE	Committed Effective Dose Equivalent
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
dpm	disintegrations per minute
EA	Environmental Assessment
EDE	Effective Dose Equivalent
EPF	Environmental Protection Facility
ft^3/s	cubic feet per second
IEPA	Illinois Environmental Protection Agency
ISGS	Illinois State Geological Service
kph	kilometers per hours
µCi/ml	microcuries per milliliter
m^3/s	cubic meters per second
MGD	million gallons per day
mgm^3	milligrams per cubic meter
mph	miles per hour
mrem	millirem
mSv	milliSieverts
MTW	Metropolis Works
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
pCi/L	picocuries per liter
PM10	**inhalable particulate matter with aerodynamic diameters less than 10 microns**
PM2.5	**inhalable particulate matter with aerodynamic diameters less than 2.5 microns**
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
SEI/ASCE	Structural Engineering Institute / American Society of Civil Engineers
SU	standard units
TEDE	Total Effective Dose Equivalent
TLD	thermoluminescense dosimeter
TSS	total soluble solids
TVA	Tennessee Valley Agency
USDA	U.S. Department of Agriculture
USDOI	U.S. Department of the Interior
USEC	United States Enrichment Company
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WSO	Weather Service Office

CHEMICAL IONS AND COMPOUNDS

CaF_2	calcium fluoride
CF	carbon monofluoride
CO	carbon monoxide
F_2	fluorine
H_2	hydrogen
H_2SO_4	sulfuric acid
HF	hydrogen fluoride or hydrofluoride
IF_5	iodine pentafluoride
KOH	potassium hydroxide
NaOH	sodium hydroxide
NH_3	ammonia
$(NH_4)_2SO_4$	ammonium sulfate
NO_2	nitrogen dioxide
NO_x	nitrous oxides
O_3	ozone
Pb	lead
Ra	radium
SbF_5	antimony pentafluoride
SF_6	sulfer hexafluoride
SO_2	sulfer dioxide
Th	thorium
U-234	uranium-234
U-235	uranium-235
U-238	uranium-238
U_3O_8	triuranium octoxide
UF_4	uranium tetrafluoride
UF_6	uranium hexafluoride
UO_2	uranium oxide

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ENVIRONMENTAL ASSESSMENT
RELATED TO THE RENEWAL OF NRC LICENSE NO. SUB-526
FOR THE HONEYWELL SPECIALTY MATERIALS, INC.
METROPOLIS WORKS (MTW) FACILITY

1.0 PURPOSE AND NEED FOR PROPOSED ACTION

1.1 Introduction

By letter dated May 27, 2005 (Honeywell, 2005a), Honeywell International, Inc. (Honeywell) submitted an application to renew the Source Material License, SUB-526, for the Metropolis Works (MTW) uranium hexafluoride (UF_6) facility near Metropolis, Illinois, for a period of 10 years. At the MTW facility, uranium conversion services have been performed for the commercial nuclear power industry since it was originally licensed by the U.S. Atomic Energy Commission (AEC) in 1958. The current license was issued by the U.S. Nuclear Regulatory Commission (NRC) in June 1995 for a 10-year period. (NRC, 1995a) The licensee at the time of the last renewal, AlliedSignal, Inc., has since merged with Honeywell, and the facility's license has been transferred to Honeywell.

The NRC staff has prepared this environmental assessment (EA) pursuant to Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508), NRC regulations (10 CFR Part 51), which implement the requirements of the National Environmental Policy Act (NEPA) of 1969, and applicable guidance from NUREG-1748, Environmental Review Guidance for Licensing Actions Associated with Nuclear Material Safety and Safeguards Programs (NRC, 2003). The purpose of this EA is to assess the environmental impacts (radiological and non-radiological) of the proposed license renewal for this facility. The format and methodology employed for this EA are consistent with those for the EA that assessed the last license renewal for this facility in 1995 (NRC, 1995b); this assessment reflects regulatory changes and operational and environmental experience obtained during the most recent 10 years of facility operation.

Documents evaluated in preparing this EA include the Honeywell Metropolis Works Application for Renewal of USNRC Source Material License SUB-526, Docket 40-3392 (Honeywell, 2005a), including the supporting Environmental Report (Honeywell, 2005b) and Safety Demonstration Report (Honeywell, 2005c); Honeywell responses to NRC requests for additional information (Honeywell, 2005d and 2005e); and the Environmental Assessment for Renewal of Source Material License SUB-526, Docket 40-3392, Allied Signal, Inc., Metropolis, Illinois (NRC, 1995b). Additional references are listed in Section 8.0 of this EA.

1.2 Background

The MTW site is located in Massac County, Illinois, on the Ohio River, approximately 1.6 kilometers (one mile) northwest of the Metropolis, Illinois city limits (Figure 1.1). The MTW facility is a multi-product chemical manufacturing facility producing sulfur hexafluoride (SF_6), iodine and antimony pentafluorides (IF_5, SbF_5), liquid fluorine (F_2), carbon monofluoride (CF), and UF_6. The production of UF_6 is the only operation at the plant licensed by NRC, as required under 10 CFR Part 40. The licensed facility is designed to produce about **14,000 metric tons (15,430 tons) per year** of uranium as UF_6 from uranium ore concentrates. The plant feed is uranium ore concentrates about 75 weight percent uranium and the primary product is high purity UF_6. The UF_6 product is first shipped to the U.S. Enrichment Corporation (USEC).

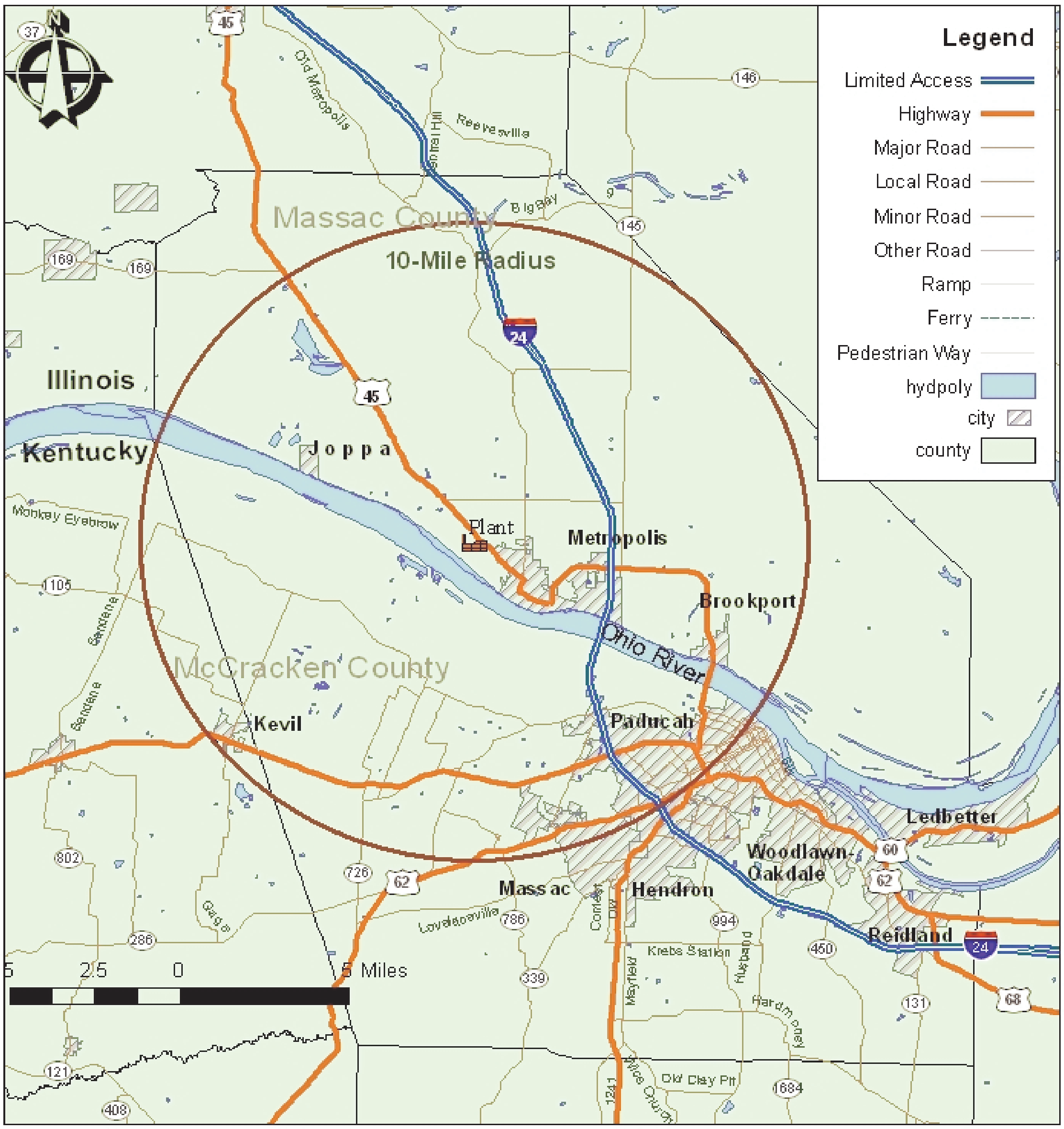

Figure 1.1 Location of the Honeywell Metropolis Works facility

gaseous diffusion plant or to foreign customers for enrichment of the uranium-235 (U-235) isotope; following enrichment, the uranium is converted into fuel for use in nuclear power reactors.

As part of UF_6 production, the site also includes (1) a storage area for uranium ore concentrates received from uranium mills; (2) a uranium sampling facility; (3) a bulk storage area for process chemicals such as hydrofluoride (HF), sulfuric acid (H_2SO_4), ammonia (NH_3), and sodium hydroxide (NaOH); (4) a facility for electrolytic production of F_2 from HF; and (5) treatment systems and storage ponds for liquid wastes. The feed materials building, where most of the UF_6 conversion activities occur, is located in the center of the industrialized portion of the industrialized area.

The present application for renewal of the license identifies several planned modifications to the facility, including: (1) closure of all surface impoundments by the year **2020**; (2) an expansion of the existing environmental protection facility (EPF) to be completed and operational by the end of 2005; and (3) the installation of a cooling tower in 2006 to cool replacement rectifiers in the fluorine production facility. **These planned modifications are outside the scope of the proposed license renewal and are not assessed in this EA. A partial list of changes to the physical plant since the last license renewal in 1995 includes:**

- Implementation of digital control systems for the fluorine plant and feed building.
- Closure of one surface impoundment, pond A, in 2001.
- An EPF expansion that will enhance the capacity of the existing EPF. The newly constructed EPF will contain an additional high capacity clarifier, new sand filters, and two off-specification effluent holding tanks to replace the use of ponds E and F.
- Removal of the solid waste incinerator.
- Replacement of outdated oil-cooled rectifiers in the fluorine production facility with water-cooled units. (Honeywell, 2005b)
- Installation of scrubbers on hydrofluorination dust collector blower discharges.
- Installation of HF mitigation systems on major HF vessels. (Honeywell, 2005c)

If, during the next license renewal period, any major new facilities or expanded operations are proposed for the NRC-licensed UF_6 production facilities, the applicant is required to provide environmental evaluations to the NRC for staff review.

1.3 The Proposed Action

The proposed action is the renewal of the Honeywell Source Material License SUB-526 for 10 years. With this renewal, the MTW facility will continue to convert natural uranium ore concentrates into UF_6 for the commercial nuclear power industry. The production of UF_6 is one phase in the fuel cycle resulting in production of fuel elements for nuclear reactors.

1.4 Need for the Proposed Action

Honeywell performs a service for the commercial nuclear power industry by converting natural uranium ore concentrates into UF_6. The UF_6 product is then shipped to gaseous diffusion plants, or to foreign customers, for the enrichment of the uranium (U-235) isotope; following enrichment, the uranium is converted into fuel for use in nuclear power reactors. Currently,

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MTW is the sole UF_6 conversion facility operating within the United States. Demand for UF_6 by the commercial nuclear power industry is expected to continue. Denial of the license renewal for the Honeywell's MTW facility is an alternative available to the NRC, but would require the construction of a new facility at another site to meet future demand.

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2.0 THE PROPOSED ACTION AND ALTERNATIVES

2.1 The License Renewal Alternative

Implementation of the license renewal alternative involves continued operation of the facility at production levels consistent with the current design capacity of the plant. No major construction or major process modifications are proposed. (Honeywell, 2005b.) The manufacturing process and waste management practices are described in this section. The system and process description presented in this section is adapted from material presented in the applicant's Environmental Report for Renewal of Source Material License SUB-526. (Honeywell, 2005b)

2.1.1 Description of Facility Activities

The Metropolis facility is a chemical processing plant that produces several halogenated industrial chemicals as described in Section 1.2. The proposed license renewal is for a portion of the facility which produces uranium hexafluoride (UF_6) from uranium ore concentrates. The current design capacity of the plant is 14,000 metric tons of UF_6 per year (15,400 tons per year). The feed ore contains approximately 75 percent uranium by weight, generally in the form of triuranium octoxide (U_3O_8). The product UF_6 is nearly pure, containing less than 300 parts per million by weight of residual compounds.

The primary processing steps for licensed material are feed ore sampling and preparation, U_3O_8 reduction, uranium oxide (UO_2) hydrofluorination, uranium tetrafluoride (UF_4) fluorination, and UF_6 distillation (product purification). These process steps are conducted in a sequential manner with recycle used only for recovery of uranium from secondary process streams. A diagram showing the conversion process is presented in Figure 2.1. Separate buildings are used for ore sampling, feed preparation, uranium recovery, and conversion processing. The chemical conversion and product purification steps take place in the feed materials building. Industrial chemicals required for the operations include sulfuric acid (H_2SO_4), ammonia (NH_3), hydrogen fluoride (HF), potassium hydroxide (KOH), sodium hydroxide (NaOH), and fluorine (F_2). The balance of this section provides a more detailed discussion of the primary conversion process, which is essentially unchanged from that assessed in the EA for the last license renewal in 1995 (**NRC, 1995b**). Waste management operations are described in Section 2.1.2.

Feed Storage, Sampling, and Preparation

Uranium oxide ore concentrates are shipped to the plant via truck in 208-liter (55-gallon) drums and stored onsite on asphalt pads. Up to 650 feed ore shipments are received each year and approximately 15,000 metric tons (16,500 tons) of ore are currently stored onsite (Honeywell, 2005e). Each drum is transported to the sampling plant where the lid is removed and a representative sample is collected to determine the general composition of the ore and to characterize impurities using an auger mechanism. The lid is replaced and the drum is weighed and moved to a storage area until needed as process feed.

Feed containing high levels of sodium or potassium is rinsed leached with sulfuric acid. Uranium feed is removed from the rinse solution by filtration and transferred to the feed preparation system. The filtered rinse solution is pumped to settling ponds 3 and 4 and some

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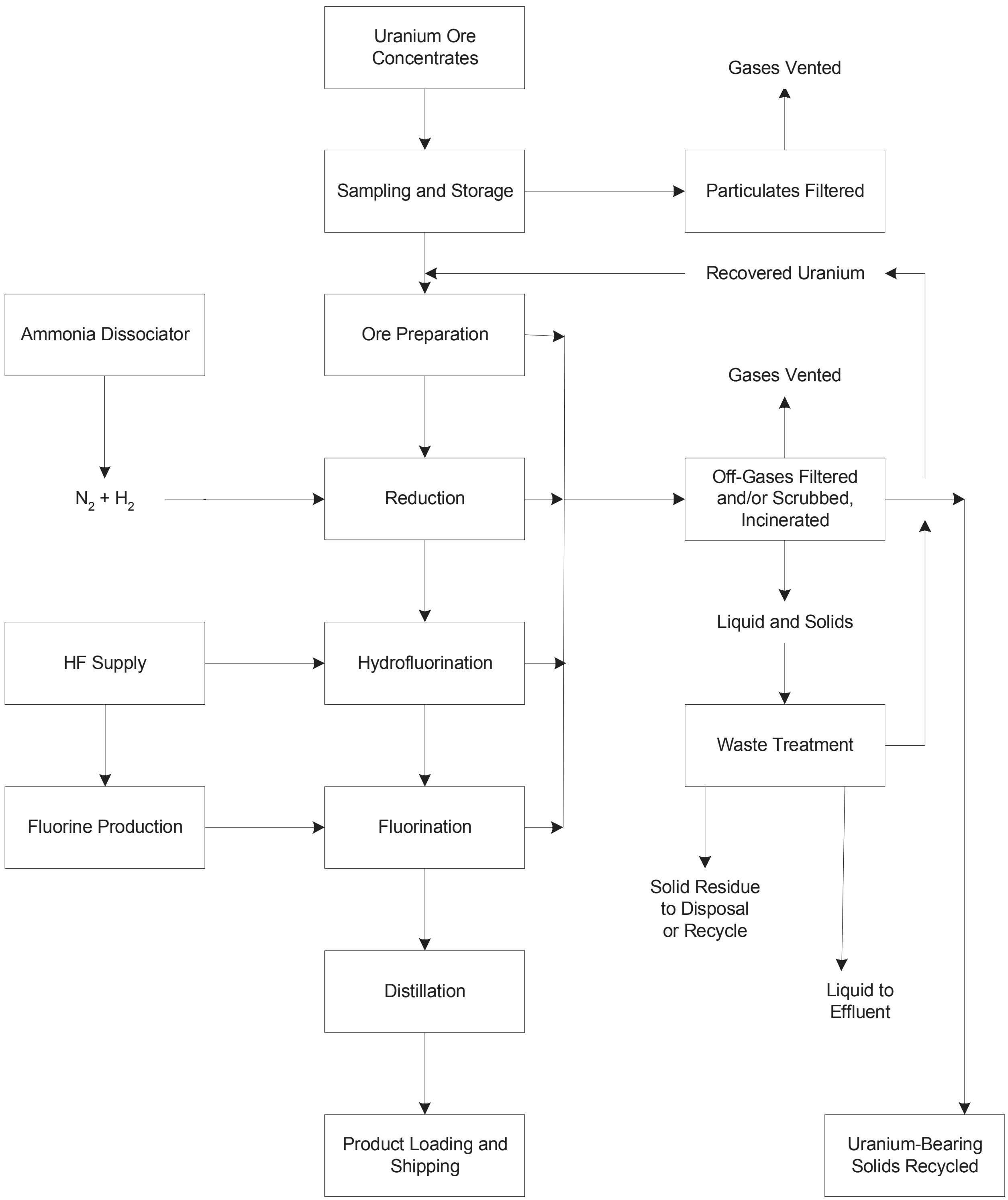

Figure 2.1 Flow schematic of the U_3O_8 to UF_6 Conversion Process at the Metropolis Facility

particulates are released to the atmosphere.

Feeds with an acceptable purity level are calcined, crushed, and classified to produce solid particles, which are processed in fluidized bed reactors. Ventilation air from the feed preparation building is filtered before release to the atmosphere, solid waste filter bags are produced in this operation, and a contaminated liquid stream produced in drum washing is routed to settling ponds 3 and 4.

Reduction

The initial step in the conversion process is reduction of U_3O_8 to UO_2, which is accomplished by contacting feed U_3O_8 with hydrogen (H_2) gas in a fluidized bed reactor at 565°C (1050°F). The H_2 is produced by cracking NH_3 over a catalyst at a temperature of 900°C (1650°F). The reactor offgas is cooled, filtered, and incinerated to oxidize residual H_2 and sulfur compounds before release to the atmosphere. The reduction reactor is fitted with relief valves, alarmed H_2 analyzers, a rupture disk, and pressure sensors to prevent and mitigate the effects of potential explosive conditions. The uranium solids filtered from the reactor offgas are recycled to the ore preparation system. No liquid effluent stream is produced by the reduction process.

Hydrofluorination

Solid UO_2 is converted to solid UF_4 by contacting the UO_2 with gaseous HF in two fluidized bed reactors arranged in series. The hot (455°C [851°F]) reactor offgas is filtered and scrubbed with water, then with KOH solution before release to the atmosphere. The spent scrubber liquid is processed through the environmental protection facility (EPF) for neutralization and recovery of fluorine as calcium fluoride (CaF_2). The UF_4 solids filtered from the offgas are combined with the UF_4 product stream for transfer to fluorination reactors.

Fluorination

The final chemical reaction in the conversion process is fluorination of UF_4 to UF_6 using F_2 gas. The gaseous F_2 is produced by decomposition of HF in electrolytic cells located in a building adjoining the feed materials building. The fluorination reaction is accomplished at a temperature of 480°C (900°F) in a fluidized bed containing CaF_2 bed material. The bed material gradually becomes too fine and contaminated with uranium and is continuously removed along with residual uranium deposits from the process while fresh bed material is continuously added. Contaminated bed material may either be processed onsite or shipped offsite for uranium recovery. The reactor effluent gas stream containing the UF_6 product is passed through two series filters and three series cold traps. The UF_6 is condensed in the cold traps and transferred to the distillation area. Gases exiting the cold traps are scrubbed with KOH solution in series-arranged spray and packed towers. A potassium fluoride mud is removed from the scrubber solution, washed, and recycled to the uranium recovery system. The spent scrubber solution is transferred to the EPF for neutralization, recovery of KOH, and recovery of fluorine as CaF_2. Filtered and scrubbed offgases are released to the atmosphere.

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Distillation and Product Packaging

Impurities are removed from the liquefied crude UF_6 in two series-arranged distillation columns. Crude UF_6 is fed to the first column and impurities with high vapor pressure are removed as the overheads from this column. The bottoms from the first column are fed to the second column where impurities with low vapor pressure are removed as the bottoms and the purified UF_6 product is collected in the overheads. Each column is fitted with temperature and pressure indicators, and a relief valve, and a rupture disk to prevent accidental release of UF_6. The columns are vented to the purification system feed and surge tanks. The purified product UF_6 vapor is condensed and transferred as liquid to cylinders placed on load cells. Flow totalizers are used to measure the amount of UF_6 transferred to the cylinder and the UF_6 entering the cylinder is continuously sampled. On occasion, filled cylinders are heated in a steam chest for vaporization or sampling. Following filling, cylinders are moved to cooling and storage areas.

Uranium Recovery

Fluorinator filter fines and bed material, solids from settling ponds 3 and 4, and process liquids may be processed for uranium recovery. The uranium recovery system is a series of mixing, settling, and separation tanks in which uranium is precipitated as a sodium uranyl carbonate salt through contact with sodium carbonate and sodium hydroxide. The settled or filtered uranium solids are dried and recycled to the feed pretreatment system. The spent liquid is transferred to the EPF for neutralization and fluoride recovery.

Industrial Chemical Storage

The primary industrial chemicals used in the conversion process, sulfuric acid (H_2SO_4), NH_3, KOH, NaOH, and HF, are stored onsite. The tank storage capacities and quantity of chemicals stored are summarized in Table 2.1. Sulfuric acid, KOH, and NaOH are stored as liquids in horizontal tanks and transferred to the process as needed by centrifugal pumps. Ammonia (NH_3) is stored as a liquid under pressure and transferred to the process by increasing this vapor pressure using pressurized steam. The NH_3 storage tank is fitted with a relief valve that vents to the atmosphere at a point 6 meters (20 feet) above grade. Anhydrous HF is stored in three horizontal tanks and is transferred to the process under inert gas pressure. Each tank is fitted with a relief valve and rupture disk and is vented to a dump tank of similar design. The dump tank is vented through a scrubber with noncondensible gases released to the atmosphere and absorbed HF transferred to the plant wastewater treatment plant.

Gaseous, liquid, and solid wastes are produced at the Metropolis facility. Each of these waste streams was assessed in the EA for the last license renewal in 1995 (NRC, 1995b). The applicant's Environmental Report (ER) for Renewal of Source Material License SUB-526 (Honeywell, 2005b) stated that during the most recent license term (1995 - 2005) there have been no significant changes to the waste streams and the associated waste confinement and effluent controls from those discussed in the EA for the last license renewal.

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Table 2.1 Bounding quantities of industrial chemicals used in the conversion process at the Metropolis facility

Chemical	Storage Capacity (lbs) [Honeywell, 2005e]	Maximum Quantity Stored (lbs) [Honeywell, 2005b]
NH_3	120,000 (plus one 80-ton rail car)	117,618
HF	424,000 (plus up to four 80-ton rail cars)	161,158
KOH	102,400	419,722 (see Note)
NaOH	109,000	8,903
H_2SO_4	256,000	55,816

Note: For KOH, the maximum quantity stored includes the total on-site quantity of KOH in a variety of vessels, including that stored in designated storage tanks, as reported under Title III, Section 312, of the Superfunds Amendment Reauthorization Act (SARA) of 1986.

Sources: Honeywell, 2005b, Honeywell, 2005c, Honeywell, 2005e.

2.1.2 Waste Confinement and Effluent Controls

2.1.2.1 Gaseous Waste Management

The Metropolis facility has 52 individual stacks and exhaust fans used for release of radioactive material and 25 stacks for release of nonradioactive material. These emission sources are at various elevations and are primarily from the 32-meter (105-foot) feed materials building. The applicant's ER reported contaminant discharged, type of pollution control device (including its rated efficiency), discharge direction, height, flow, and estimated annual release of radioactivity for each plant process and ventilation stack. Table 2.2 presents the annual uranium emissions for the past four years of operation (2001 - 2004) and those reported for the five-year period preceding the previous licensing period (1989 - 1993).

Thirteen process and 33 ventilation exhaust stacks are located on the feed materials building. The ventilation system used in the UF_6 process area consists of a series of Dravo fresh-air intake units and a series of window and roof exhaust fans for cleaning workroom air. The total air flow through the process building is sufficient to ensure a complete air change out approximately once every five minutes. A separate air-conditioning system is used to supply fresh air to the main control room. The control room is kept under a slight positive pressure.

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Table 2.2 Radiological air emissions from the Metropolis plant - 2001 to 2004

	Uranium emissions (Ci/yr)				
	2001[a]	2002[a]	2003[a]	2004[a]	1989 - 2003[b]
Process emissions	5.87×10^{-2}	1.02×10^{-1}	7.61×10^{-2}	3.46×10^{-2}	4.44×10^{-2}
Ventilation emissions	6.85×10^{-2}	6.89×10^{-2}	3.40×10^{-2}	4.05×10^{-2}	4.22×10^{-2}
Total process and ventilation emissions	1.27×10^{-1}	1.70×10^{-1}	1.10×10^{-1}	7.51×10^{-2}	8.66×10^{-2}

Sources:

a. Honeywell, 2005f. **(Reflects values to be in Honeywell ltr to be issued in Jan. 06)**
b. NRC, 1995b.

Gaseous effluents from the UF_6 production facility contain both radioactive and nonradioactive constituents. Uranium is the primary radiological constituent released through the plant's stacks. Uranium processing areas that produce dusts, mists, or fumes containing uranium or other toxic materials are provided with dust collectors or scrubbers to reduce employee or environmental exposure to as low as is reasonably achievable (ALARA). Uranium emissions from the plant stacks are indicated in Table 2.2. All plant emissions that may contain significant amounts of radioactive material are monitored continuously as described in Section 2.2.1. Gaseous effluent streams containing nonradioactive pollutants are discharged in accordance with operating permits issued from the Illinois Environmental Protection Agency (IEPA). Fluoride (as HF) and particulates are the primary nonradiological constituents released through stacks on the feed materials building.

The four process stacks onsite are associated with the uranium recovery system and the ore sampling building. There are no stacks associated with the **CaF_2 facility that are monitored** for uranium emissions. (Honeywell, 2005e) Nonradiological emissions include fluoride, hydrogen sulfide (H_2S), sulfur dioxide (SO_2), and ammonia (NH_3). Fluoride (as HF) and particulates are the primary nonradiological constitures released through stacks on the feed materials building. Gaseous effluent streams containing nonradioactive pollutants are discharged in accordance with operating permits issued from the Illinois Environmental Protection Agency (IEPA). Emissions reports are submitted to the IEPA in accordance with the requirements of the Title V Clean Air Act Permit (IEPA, 2003). Annual nonradiological emissions from the plant are summarized in Table 2.3.

2.1.2.2 <u>Liquid Waste Management</u>

Liquid waste streams generated at the Metropolis facility are categorized as low-level radioactive and nonradioactive waste streams. Each of the waste streams are recycled or treated separately. Most UF_6 process-related liquid effluents from the plant are discharged from Outfall 002 to the Ohio River through a natural drainage. Some liquid wastes may be containerized and sent to an appropriate disposal facility. A flow diagram showing liquid waste streams and their disposition is given in Figure 2.2.

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Low-Level Radioactive Liquid Waste Streams and Treatment

Low-level radioactive liquid wastes produced at the Metropolis facility consist of wash water from the ore sampling building, ammonium sulfate [$(NH_4)_2SO_4$] process solutions from the pre-treatment facility, HF scrubber liquors from the hydrofluorinators, KOH scrubbing solutions from air pollution abatement equipment, leach liquors from uranium recovery and UF_6 cylinder washing, and uranium-contaminated stormwater from the feed material building area.

NRC assessed the treatment of low-level radioactive liquid wastes at the Metropolis facility in the EA for the previous license renewal (NRC, 1995a). With the exception of ongoing modifications to enhance the capacity of the Environmental Protection Facility (EPF), MTW's treatment of this waste stream is essentially unchanged from that assessed in the previous EA. Honeywell states that the modifications to the EPF, which will increase this facility's capacity by adding a high-capacity clarifier and new sand filter, with off-specification tanks, will be completed during 2005. (Honeywell, 2005b) These facilities will replace the surface impoundments for the treatment and settling of wastewater. The surface impoundments will be taken out of service and closed as stipulated in the current Resource Conservation and Recovery Act (RCRA) permit.

Table 2.3 Nonradiological air emissions from the Metropolis plant – 2001 to 2004[a]

Contaminant (tons)	Title V Permitted Emissions	2001	2002	2003	2004	2001 – 2004 Average	Estimated 1993 Emissions[e]
HF	n/a	4.251	4.2848	4.1904	6.0096	4.565	2.363
NH_3	n/a	n/a	0.49495	1.0105	0.9305	0.812	3.515
Non-VOM[d]	n/a	8.8458	7.5505	Not required[c]	Not required[c]	8.198	—
NO_x	57.63	18.4335	19.6651	13.0062	11.9475	16.359	—
PM	47.86	5.0898	5.6822	4.2847	5.7149	5.107	—
SO_2	424.37	175.3188	172.9204	175.2911	87.1096	155.944	145
VOM[d]	43.69	1.0659	1.4984	1.1614	0.6791	2.621	—

Notes:

a. **Includes emissions from non-licensed activities.**
b. **Honeywell to provide basis for "n/a" entries for NH_3 in 2000 and 2001.**
c. Non-VOM emission reporting no longer required after Title V permit issuance.
d. Relationship between VOM and Non-VOM was reinterpreted, resulting in a higher proportion of Non-VOM contaminants in 2001 and 2002 and a correspondingly lower proportion of VOM contaminants in 2001 and beyond.
e. Only includes contaminants identified in EA for last license renewal period (NRC, 1995a).

Source: Honeywell, 2005b.

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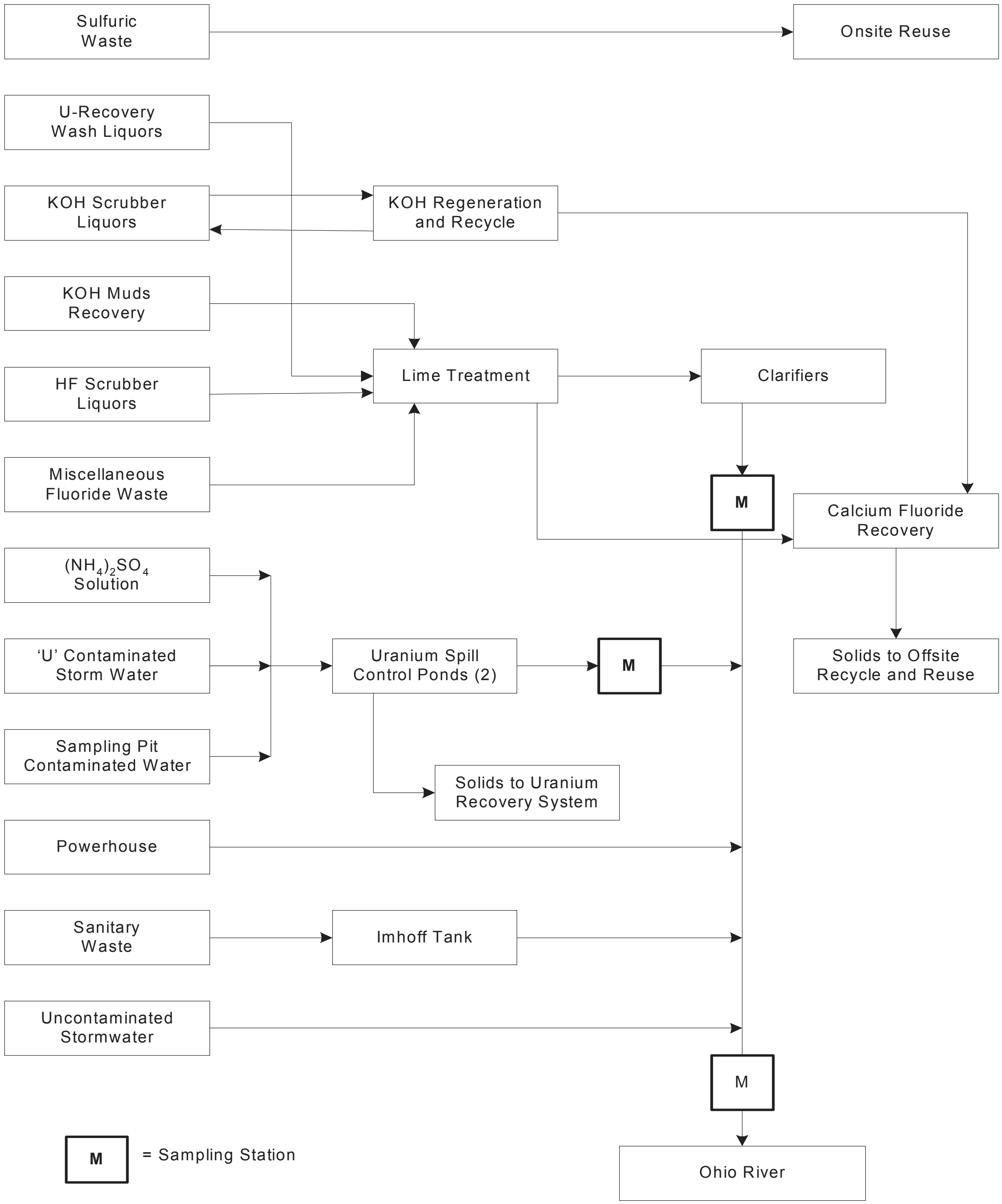

Figure 2.2 Flow diagram for wastewater disposition

The KOH scrubbing solutions are regenerated and recycled onsite. Solids removed from the scrubber solutions are processed for calcium fluoride (CaF_2) recovery. Wastewaters with significant quantities of fluoride (i.e., HF scrubbing liquors and uranium recovery leach liquors) are routed to the EPF for lime treatment and recovery of the fluoride as CaF_2 in settling ponds D and E. Calcium fluoride that precipitates in the EPF settling basins is recovered for recycle by commercial industry to use as a substitute for natural fluorspar. Washwaters from the ore sampling building and ammonium sulfate solutions from the pretreatment facility area are routed to uranium settling ponds 3 and 4. Sludge from the ponds is periodically pumped to the ponds mud calciner where it is dried and processed through the uranium recovery system for uranium recovery.

Liquid Waste Streams and Treatment

There are no mixed waste streams generated as part of the UF_6 manufacturing process. Liquid mixed waste currently in onsite storage was generated from activities that support UF_6 production, including maintenance or laboratory activities. Typical mixed wastes include items such as radiologically contaminated xylene paint thinner, used lubricating oils, and waste naphtha from maintenance or cleaning activities; and waste acetone, tributylphosphate, TEHP, and CFC-113 from various laboratory activities.

The volume of liquid mixed waste generated at the plant is quite variable. Currently, 1,539 gallons of liquid mixed waste is stored on site. All of the mixed waste is stored on a RCRA-permitted storage pad pending the availability of offsite facilities to either treat or dispose of these wastes.

Nonradiological Aqueous Waste Streams and Treatment

Nonradiological aqueous waste streams include sanitary waste water, non-contact cooling water, treated effluents from the EPF, and storm water runoff. An Imhoff tank is used for primary treatment of sanitary waste water before discharge to Outfall 002. Hazardous liquid wastes are drummed, analyzed, and disposed of using outside contractors.

Liquid Waste Release Rates

Liquid effluents from the restricted area is discharged from Outfall 002 to the Ohio River via natural drainage in accordance with a National Pollutant Discharge Elimination System (NPDES) permit. Effluent at Outfall 002 is continuously sampled and monitored. The average effluent discharge rate in 2004 was 3.42 million gallons per day (MGD). (Honeywell, 2005b)

2.1.2.3 Solid Waste Management

Solid wastes generated at the Metropolis facility include low-level radioactive, nonradioactive and hazardous and mixed wastes. As discussed in Section 3.10, a combination of recycling, sale to industrial users, compaction, and offsite disposal are used in management of these wastes.

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2.2 Monitoring Programs

Monitoring programs at the Metropolis facility include effluent monitoring of air and water, environmental monitoring of various media (air, surface water, soil, vegetation and direct gamma radiation), and occupational monitoring for workers. The occupational monitoring program is evaluated in the Safety Evaluation Report for this license renewal activity. This program provides a basis for evaluation of public health and safety impacts, for establishing compliance with environmental regulations, and for development of mitigation measures if necessary. Monitoring activities are described in more detail in the following subsections.

2.2.1 Effluent Monitoring Program

The Metropolis facility produces gaseous and liquid effluent streams. Each of these effluent streams is monitored at or just before the point of release. Results from the gaseous and liquid radiological effluent monitoring program are reviewed weekly. Undesirable trends are reported to plant management via ALARA meetings, quarterly health physics audits, or immediately depending on the severity of the condition. Results from the monitoring program are also reported in the semi-annual effluent reports submitted to NRC. The following paragraphs describe the monitoring programs for gaseous and liquid releases.

2.2.1.1 Gaseous Release Monitoring

Gaseous effluents released from the Metropolis facility contain both radiological and nonradiological constituents as described in Section 2.1.2.1. Stack monitoring is the primary method used to measure gaseous effluents containing uranium. These release points are sampled continuously at isokinetic flow conditions using particulate filters to capture the uranium. Stack samples with higher loading potential (based on process evaluations and 35 years of historical data) are collected twice per 24 hours and counted for alpha radioactivity. If the uranium loading potential is smaller, the samples are collected and counted once each 24 hours.

The dust collectors typically have primary and secondary (backup) units arranged in series. Secondary dust collector exits have an investigation limit of 5,000 disintegrations per minute (dpm) except the ash dust collector, which has an investigation limit of 10,000 dpm because it is exposed to 2-3 percent uranium. Primary dust collector exits have an investigation limit of 15,000 dpm. When the investigation limit is exceeded on three successive samples, an informal investigation is conducted and actions taken to decrease emissions. If the action does not remedy the situation, additional actions are taken including shutdown of the unit. (Honeywell, 2005b) In accordance with the requirements of 10 CFR 40.65(a), the results of the effluent monitoring analyses are submitted to the NRC in semi-annual monitoring reports. (IEPA, 2003) Annual uranium air emissions from 2001 to 2004 are summarized in Table 2.2.

An investigation level for gaseous uranium emissions is used based on the average of four continuous air samples collected at the restricted area fence line. The samples are collected and analyzed for trends on a weekly basis. The investigation level is based on a quarterly uranium concentration which would produce an annualized dose of 10 mrem.

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In addition, uranium in the air is monitored at sampling location NR-7, adjacent to the home of the nearest residence north-northeast of the plant (see Figure 2.3). The air sampler at Station No. NR-7 is operated continuously, except for those periods required for disassembly or repair. If the average concentration of total alpha radioactivity (the sum of natural uranium, Ra-226, and Th-230) measured from samples collected from location NR-7 exceeds 3.0×10^{-14} µCi/ml over any calendar quarter, then within 30 days MTW must submit a written report to the NRC identifying the cause for exceeding the limit and the corrective actions to reduce the radioactivity release rates. This concentration would produce an annualized dose of 10 mrem committed effective dose equivalent (CEDE) if an individual were continuously present at the fence line. Samples taken at Station No. NR-7 are also composited at least quarterly and analyzed for uranium solubility.

Review of the tabulated values indicates that there have been two exceedances of the 3.0×10^{-14} µCi/ml action level in the 2000-2003 timeframe. These exceedances, which occurred in the second quarter of 2001 and the fourth quarter of 2003, were reported in letters dated July 13, 2001 (**Honeywell, 2001**) and January 20, 2004 (**Honeywell, 2004**), respectively. **The analytical results of additional environmental samples collected from the path of the plume after the 2003 release indicated that the levels of uranium on vegetation and soil after this event were similar to levels routinely found on vegetation and soil before the event. The calculated dose to members of the public, 24 hours after this release, was 1.5×10^{-2} millirem Committed Effective Dose Equivalent (CEDE), which is well below the public dose limits. (NRC, 2004)**

A comprehensive environmental air monitoring program consisting of onsite and offsite sampling is also conducted to demonstrate compliance with applicable environmental air quality standards as described in Section 2.2.2. Continuous air sampling is conducted at all stations. The air samples are composited at each station and analyzed at least monthly for uranium and at least quarterly for Ra-226 and Th-230.

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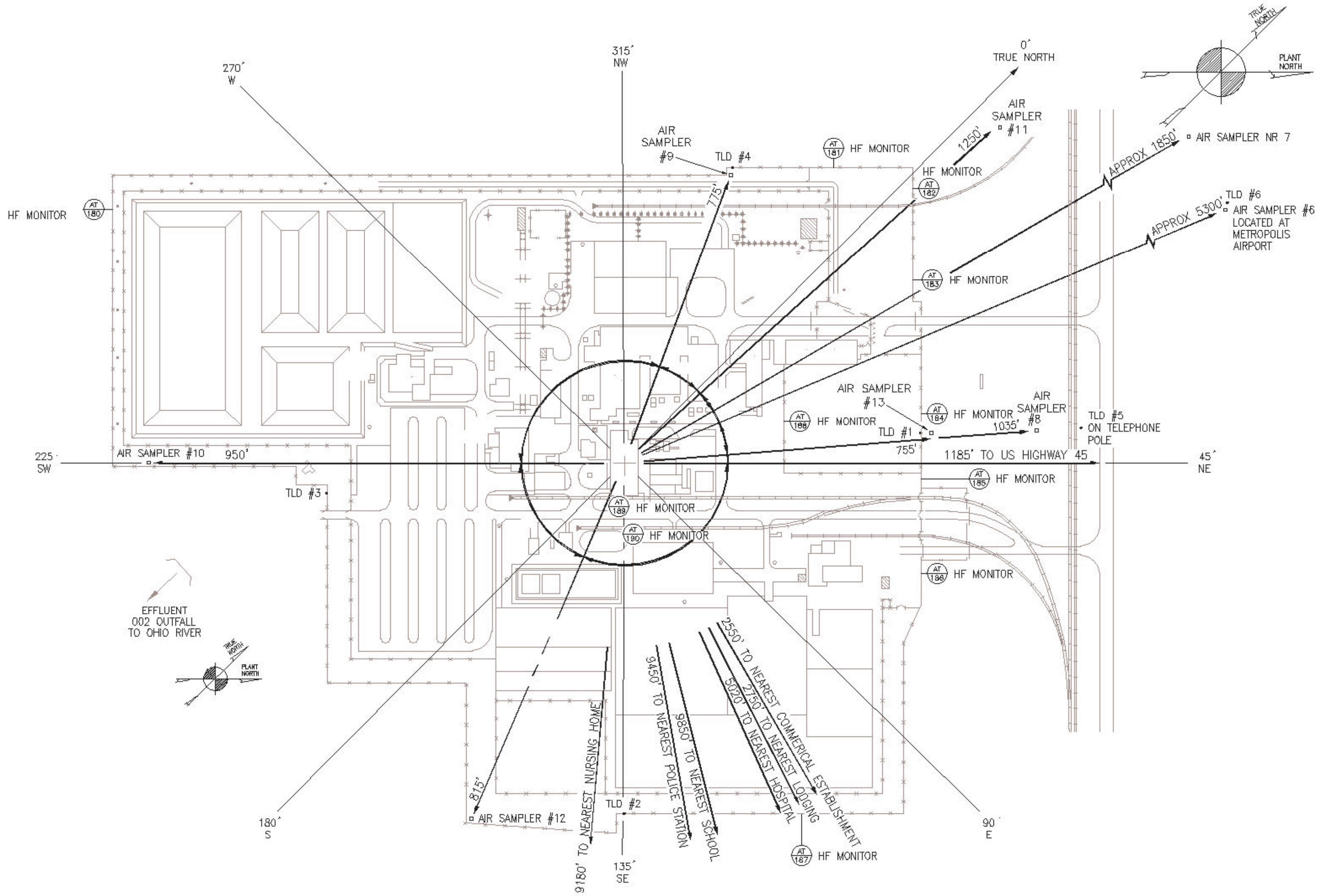

Figure 2.3 Environmental air sampling stations

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2.2.1.2 Liquid Release Monitoring

All treated process and sanitary liquid wastes from the Metropolis facility are discharged through Outfall 002, an NPDES-controlled release point. The outfall discharges to an unlined, natural drainage ditch that flows into the Ohio River. This ditch also carries runoff during periods of heavy precipitation.

The Outfall 002 effluent is continuously sampled to produce a daily composite, which is analyzed for uranium. The daily composites are combined into a monthly composite, which is analyzed for uranium, gross alpha, gross beta, and several nonradiological constituents. The investigation level for uranium in the liquid effluent is established at 1.0 ppm uranium as a monthly average.

The Outfall 002 effluent is also analyzed for various parameters and numerous nonradiological constituents, including total fluorides, total suspended solids (TSS), biological oxygen demand (BOD). The NPDES permit requirements and effluent monitoring results for the past 4 years (2001 to 2004) are summarized in Table 2.4. During the past 5 years (2000 - 2004), the 30-day averages for TSS, total fluorides, and pH were all within the limits specified in the NPDES permit. Thermal emissions were also within the instantaneous and period average limitations specified in the permit. The NPDES permit does not specify limits for total uranium or biological oxygen demand (BOD).

Since 2000, there have been five excursions from the NPDES permit limits. The staff's review of these excursions, as provided in written notification to the IEPA, found that all of these excursions were promptly terminated, and the appropriate steps were taken to reduce, eliminate, or prevent recurrence of the described incidences.

From 2000 to 2004, the annual average gross alpha activity released ranged from 21 to 102 pCi/L. The annual average gross beta activity released ranged from 158 pCi/L to 201 pCi/L during this same 5-year period. (Honeywell, 2005b) Operating experience indicates that beta activity results from Th-234 in the effluent. (NRC, 1995b) Review of this data shows decreasing trend in the major liquid effluent contaminant concentrations and in dissolved solids from 2000 to 2004. (Honeywell, 2005b)

2.2.2 Environmental Monitoring Program

MTW conducts an environmental monitoring program that samples sediment, soil, vegetation, surface water, air, and measures direct gamma radiation at locations on or near the facility as summarized in Table 2.5. The frequency of sampling and the constituents sampled as part of this program are also summarized in Table 2.5. The location of onsite air sampling points are shown in Figure 2.3 and offsite sampling locations are shown on Figure 2.3 and Figure 2.4. Results from the radiological environmental monitoring program are reviewed by the MTW Health Physicist. Plant management is made aware of undesirable trends and results that may indicate non-compliance with applicable standards. Elements of the environmental monitoring program are described in the following paragraphs.

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Table 2.4 Summary of NPDES requirements and monitoring results for process wastewater and final effluent at NPDES Outfall 002 for the period 2000 to 2004

Process Wastewater[a]	NPDES Limits[a]		2001[b]		2002[c]		2003[c]		2004[c]	
	30-day Avg.	Daily Max	30-day Avg.	Daily Max	30-day Avg.	Daily Max	30-day Avg.	Daily Max	30-day Avg.	Daily Max
Total Suspended Solids (TSS) (mg/l)	15	30			2.4	10.7	3.4	14.2	2.3	11.3
Fluoride (mg/l)	15	30			5.1	22.7	6.4	27.2	4.5	20.3
Final Effluent	30-day Avg.	Daily Max	Daily Max	30-day Avg.	Daily Max	30-day Avg.	Daily Max	30-day Avg.	Daily Max	Daily Max
Total Suspended Solids										
- Quantity (lbs/day)	227.4	454.9			36.2	157.0	52.5	224.5	32.8	153.1
- Concentration (mg/l)	--	--			1.2	5.2	1.9	7.4	1.2	6.4
Biochemical Oxygen Demand (BOD)										
- Quantity (lbs/day)	--	--			135.2	572.5	70.7	215.6	36.3	197.7
- Concentration (mg/l)	--	--			4.4	16.4	2.6	7.1	1.3	6.7
Total Uranium (U_3O_8)										
- Quantity (lbs/day)	--	--		--	0.5	--	0.4	--	2.46	--
- Concentration (mg/l)	--	--			0.02	0.2	0.02	0.3	0.08	0.52
Total Fluoride										
- Quantity (lbs/day)	227.4	454.9			87.8	212.0	88.2	578.3	54.5	280.4
- Concentration (mg/l)	--	--			2.9	7.1	3.1	18.5	1.9	8.9
pH range	6.0 – 9.0		# - #		7.1 - 7.6		7.0 – 7.9		6.9 - 7.8	
Temperature (ºC[ºF])	28.9ºC (84ºF)	31.7ºC (89ºF)	22.8ºC (73.0ºF)	19.3ºC (66.7ºF)	21.9ºC (71.4ºF)	19.8ºC (67.6ºF)	22.8ºC (73.0ºF)	19.3ºC (66.7ºF)	21.9ºC (71.4ºF)	22.3ºC (72.1ºF)
Average Flow (MGD)	--	3.40	4.73	3.54	5.03	3.40	4.73	3.54	5.03	4.86

Sources: Honeywell, 2005b; Honeywell, 2006

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Table 2.5 Summary of effluent and environmental monitoring programs[a]

Sample Medium	Number of Stations	Analytical Frequency	Sample Type	Type of Analysis[b]
		Onsite		
Air	6	Quarterly	Continuous	Uranium, Ra-226, Th-230, fluoride
Soil	6	Semiannually	Grab	Uranium, fluoride
Vegetation	6	Semiannually	Grab	Uranium, fluoride
Ambient radiation	4	Quarterly	Continuous	Gamma
Surface water	1	Monthly	Continuous	Uranium, gross alpha, gross beta
		Monthly	Continuous	Suspended solids, dissolved solids, pH, fluorides, other chemicals (see Table 2.4)
Sediment	2	Semiannually	Grab	Uranium, fluoride
		Offsite		
Air	2	Weekly	Continuous	Uranium, Ra-226, Th-230, fluoride
Soil	7	Semiannually	Grab	Uranium, fluoride
Vegetation	7	Semiannually	Grab	Uranium, fluoride
Ambient radiation	2	Quarterly	Continuous	Gamma
Surface water	7	Semiannually	Grab	Uranium, fluoride
Sediment	7	Semiannually	Grab	Uranium, fluoride

a. Refer to Figures 2.3 and 2.4 for sampling locations.
b. Does not include NPDES monitoring or RCRA monitoring requirements.

Source: Honeywell, 2005b.

The plant ALARA committee meets quarterly to evaluate data and identify any undesirable trends in environmental exposures. Investigation and action plans are developed, as necessary.

2.2.2.1 Air Monitoring

The environmental air monitoring program uses **continuous air samples collected at four points along the restricted area fence line (Station Nos. 9, 10, 12 and 13), at two points located near the site boundary in the prevailing wind direction (Station Nos. 8 and 11), and at two offsite points (Station No. NR-7, at the nearest downwind residence**, and Station No. 6, approximately one mile downwind of the feed materials building). The sampling locations are shown on Figure 2.3. Cumulative samples are collected weekly and analyzed for uranium and fluoride.

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A quarterly composite of the 13 weekly samples is analyzed for airborne concentrations of Ra-226 and Th-230.

A review of the environmental air monitoring results for the 4-year period beginning 2001 identified the maximum annual average uranium concentration in air (3.94×10^{-14} µCi/ml) occurred in 2001 at Station No. 13. The contribution of soluble forms of uranium to this measured concentration is approximately 0.4 percent of the 10 CFR Part 20, Table 2 concentration limits. The contribution of insoluble forms of uranium to this measured concentration is approximately 8.9 percent of the 10 CFR Part 20 Table 2 limits. The maximum concentration of Ra-226 (1.22×10^{-16} µCi/ml) occurred in 2001 at Station No. NR-7 and the maximum concentration of Th-230 (4.24×10^{-15} µCi/ml) occurred in 2003, also at Station No. NR-7. The maximum average annual concentrations for Ra-226 and Th-230 represent 0.014 percent and 21.2 percent, respectively, of the 10 CFR Part 20, Table 2 limits (i.e., Ra-226 at 9.0×10^{-13} µCi/ml, and Th-230 at 2.0×10^{-14} µCi/ml). Comparison of the air monitoring results from 2001 to 2004 to those reported in the previous license renewal application (for the period 1989 to 1993) indicate that concentrations of all three radiological contaminants (i.e., uranium, radium and thorium) in air have increased. (Honeywell, 2005b) The increase in Th-230 concentration is attributed primarily to the December 22, 2003 incident, as concentrations at most sampling points returned to a range consistent with the historical data.

The environmental monitoring results for fluoride indicate that from 2001 through 2004, the highest annual average fluoride concentration was measured on the restricted fence line at Station No. 10, downwind of the CaF_2 loading area, and ranged from 0.228 µg/m^3 in 2003 to 0.838 µg/m^3 in 2002. For this 4-year period, the average concentration was 0.288 µg/m^3 and 0.154 µg/m^3 across all fence line and onsite sampling locations, respectively (Honeywell, 2005b).

Although the State of Illinois has no air quality standard for fluoride, Kentucky has an annual arithmetic mean standard of 0.82 µg/m^3 (Kentucky, 1988). An examination of the air monitoring data across all 4 years (2001 – 2004) shows that this standard was not exceeded at any onsite or offsite sampling location. **The site has not recorded any exceedances of National Ambient Air Quality Standards or State ambient air monitoring limits during the past licensing period (1995 - 2005). (Honeywell, 2005e)**

2.2.2.2. <u>Surface Water and Sediment Monitoring</u>

Surface water and sediment samples are collected semi-annually at area lakes and ponds and on the Ohio River. Four sample locations are on the Ohio River: one sample is taken upstream and one downstream of the plant outflow, one at the point of outflow into the river, and a fourth from a location on the opposite side of the river. Three inland locations at lakes and ponds are also sampled. The surface water and sediment samples are analyzed for uranium and fluoride.

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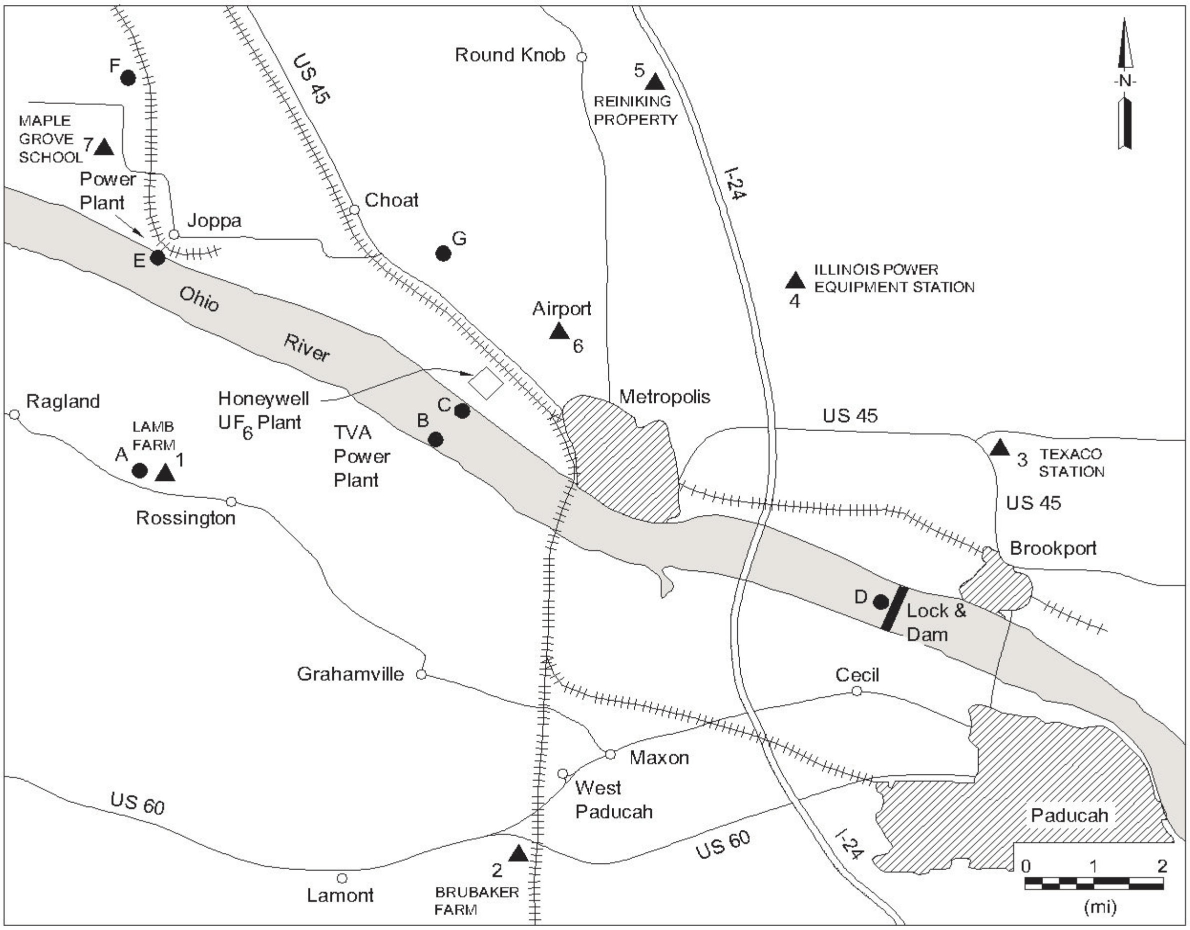

● Surface Water and Sediment (Mud) Samples ▲ Soil and Vegitation Samples

A	Lamb Farm	1	Lamb Farm
B	TVA	2	Brubaker Farm
C	Plant Site Outflow	3	Texaco Station
D	Bookport Dam	4	Illinois Power Equipment Station
E	Joppa Power Plant	5	Reiniking Property
F	Lindsay Lake	6	Metropolis Airport
G	Oak Glenn Lake	7	Maple Grove School

Figure 2.4 **Environmental monitoring sample locations for surface water, sediment, soil, and vegetation**

Surface Water

The uranium concentration in surface water at the point of release into the river (Plant Site Outflow sample station) shows a decreasing trend from 2001 to 2004 and a 12 percent decrease from the reported average for 1989-1993. (NRC, 1995b) The surface water concentrations of uranium upstream and downstream of the Metropolis facility are generally close except for the year 2001, which shows substantially greater concentration of uranium downstream than upstream. The 4-year average (2001-2004) of uranium concentrations both upstream and downstream is very close to the preoperational value of 0.009 ppm for uranium in surface water. Annual fluoride concentrations in surface water near the plant outflow have varied yearly and do not parallel the decreasing trend seen in the uranium concentrations. Both uranium and fluoride concentrations in surface water and meet applicable standards.

Sediment

During the period 2001 to 2004, the offsite sediment (mud) samples show generally uniform uranium concentrations upstream and downstream of the plant except near the plant outflow (sampling Station C on Figure 2.4). The sediment sampling data indicates a decreasing trend in both uranium and fluoride concentration over the 4-year period. The average annual uranium concentration in offsite sediment samples shows a moderate increase from the samples for the period 1989 to 1993, although the change in concentration varies significantly from location to location. While the fluoride concentration in offsite sediment is less variable than that for uranium, the general trend shows a decrease from the 1989-1993 samples. There are no established standards for uranium or fluoride in stream sediments.

Sediments collected from the liquid effluent drainage ditch at 213 and 427 meters (700 and 1,400 feet) downstream of Outfall 002 are sampled for uranium and fluoride. The uranium and fluoride concentrations fluctuate with the sampling event, most likely due to slightly different sampling locations as well as the dynamic nature of the effluent ditch environment. Results of this sampling indicate that the effluent drainage ditch is contaminated by current operations and this contamination is being transported to the Ohio River. However, the projected dose from this contamination is a small fraction of NRC and EPA regulatory limits.

2.2.2.3 <u>Soil and Vegetation Monitoring</u>

Thirteen soil and vegetation samples are collected semi-annually. Six sample stations are located onsite at the same location of the low volume air samplers (Figure 2.3). Seven stations are located in a 13-kilometer (8-mile) radius covering portions of Illinois and Kentucky (Figure 2.4). (Honeywell, 2005b)

Soil

Sampling results from 2001 to 2004 show a gradual decrease in uranium concentration in onsite soils at the restricted fence line and near the property boundary, with the exception of sampling Station Nos. 12 and 13. Higher concentrations at these locations are expected since they are located in the prevailing wind direction and windborne constituents would be deposited on the soil. The average onsite uranium concentration is 16.67 ppm, which is 28 times the preoperational value measured of 0.6 ppm in soil, and slightly higher than the onsite 4-year average of 15.8 ppm reported in 1995 (NRC, 1995b). The uranium concentration in soil at offsite locations has decreased over the 4-year period, although the average uranium concentration in offsite soils (1.41 ppm) is about two times the 0.7 ppm concentration reported in 1995 (NRC, 1995b).

The fluoride concentration in soil at both onsite and offsite locations showed a gradual decrease over the 4-year reporting period, with the exception of 2002. In 2002, an increase in fluoride concentration was observed at all onsite and offsite locations; however, the decreasing trend returned in 2003. Fluoride concentrations in the onsite soils are slightly higher than observed for offsite locations.

Vegetation

The results of onsite and offsite vegetation samples analyzed for uranium and fluoride for the period 2001 - 2004 indicate a fluctuation in uranium concentrations over the 4-year reporting period. The average onsite uranium concentration in vegetation was 4.25 ppm from 2001 through 2004. (Honeywell, 2005b) Although this concentration is about 15 times the preoperational value of 0.28 ppm, the value reported for this most recent 4-year reporting period is lower than the average concentration reported for the 1989 - 1993 period (5.2 ppm). (NRC, 1995b) The 4-year average for onsite uranium concentrations is higher than the offsite concentration, which averaged 2.92 ppm for the period from 2001 through 2004.

Like the uranium concentrations in vegetation, the fluoride concentrations in both onsite and offsite vegetation samples varied with the sampling event and no trend in increasing concentrations was noted. The 4-year average for onsite samples collected from Stations Nos. 8 through 13 was 70.09 ppm compared to a 1989 - 1993 average of 57.1 ppm. A relatively flat trend was observed in the offsite samples. The 4-year average offsite concentration for 2001 - 2004 was 28.29 ppm. Average fluoride concentrations in onsite vegetation were compared with State of Kentucky standards since the State of Illinois does not have an applicable standard. The Kentucky standard allows a 40.0 ppm average fluoride concentration during a 6-month growing season; or 60 ppm as a 2-month average; or 80 ppm as a 1-month average. (Kentucky, 1988) The onsite fluoride concentration at the Metropolis facility could exceed these standards; however, none of the vegetation is used for forage and cattle are not allowed to graze on the property. (Honeywell, 2005b)

External Gamma Monitoring

Direct radiation is continuously monitored using environmental thermoluminescense dosimeters (TLDs) at nine locations. The environmental TLDs are located on the restricted fence line on each side of the plant (total of four), at the nearest boundary line, at the Metropolis Municipal Airport (1.6 kilometers [1 mile] northeast of the plant), and two at the nearest residence (NR-7 South and NR-7A North). A ninth TLD is a control measurement. The environmental TLDs are analyzed and replaced every quarter.

The control, onsite, and offsite environmental TLD monitoring results from 2001 to 2004 indicate that the maximum annual average of the direct gamma radiation consistently occurs at the east and south restricted area fences. This is attributed to a large ore concentrate storage area immediately adjacent to the sampling station. The maximum annual average environmental TLD dose is a small fraction of the NRC's limit for dose in any unrestricted area from external sources. (10 CFR Part 20, Subpart D - Radiation Dose Limits for Individual Members of the Public) In addition, the shortest distance from the east restricted area fence to the site boundary is approximately 1 kilometer (0.6 miles). Thus, the direct dose to any potential offsite individual would be significantly less than the regulatory limits. Background annual average radiation doses at the airport have varied from 91 to 102 mrem. Radiation doses at the nearest residence were similar to background and ranged from 86 to 103 mrem during the period from 2001 to 2004.

2.2.2.4 Other Monitoring Programs

Groundwater Monitoring

Honeywell employs several groundwater contaminant monitoring programs at the MTW facility, including the sanitary and process well monitoring program, the RCRA groundwater and compliance monitoring program, a RCRA corrective action program to investigate the source of groundwater contaminants, and a RCRA surface impoundment liner leakage monitoring program. Implementation of these programs satisfy periodic monitoring requirements and corrective action requirements of the facility's RCRA permit.

Two of the site's four deep wells, the sanitary well and Process Well #1, are monitored for inorganic constituents, volatile organic compounds, radionuclides, and other general parameters. A comparison of analytical results for the years 2003 and 2004 to the Groundwater Quality Standards indicated no apparent impact of these parameters in the deep Mississippian limestone aquifer. (Honeywell, 2005b)

There are numerous groundwater monitoring wells on the plant site. Ten observation wells related to compliance monitoring are located within the 22-hectare (54-acre) restricted fenced area, nine of which are sampled quarterly for pH, fluoride, specific conductance, gross alpha activity and gross beta activity. The gross alpha and gross beta results for the groundwater monitoring wells were reviewed for 2001 to 2004. Gross beta concentrations in groundwater varied from 0.5 pCi/L to a maximum of 45.48 pCi/L from 2001 to 2004. Gross alpha activities varied from -1.66 to 17.6 pCi/L over the reporting period. Plotting the concentration data over the reporting period indicated that groundwater concentrations are very cyclic over time, reflecting the variability in naturally-occurring radioactivity as well as the influence of changing water levels in the Ohio River as discussed in Section 3.6.2. Fluoride concentrations in groundwater varied from 0.11 to 0.63 mg/L over the same time period and also showed a cyclic trend over time. (Honeywell, 2005b)

In April 2001, in response to elevated contaminant levels identified in groundwater from the on-site monitoring wells, IEPA issued a violation notice to Honeywell. In response to this apparent violation, Honeywell prompted an investigation of the source of the groundwater contaminants. Honeywell's on-going efforts to investigate the groundwater contaminant source are being conducted as part of an IEPA-accepted Compliance Commitment Agreement. IEPA continues to monitor Honeywell's investigative activities in accordance with the approved Groundwater Workplan. (IEPA, 2005)

The facility's RCRA permit also establishes requirements for monitoring leakage from the surface impoundments. The monitoring activities that are required to identify pond leakage include visual inspections of the impoundment liners for tears and punctures; determination of liquid volume and pH in each impoundment's leak containment sump; and removal of liquid from the impoundment liners. These monitoring are performed weekly and after storms. In addition, in response to identified leakage of the ethylene propylene diene monomer (EPDM) liners of Ponds B, D, and E, a soil moisture monitoring plan has been established as a required corrective action of the RCRA permit. The quarterly lysimeter samples have provided no indication of leakage beyond the 15-foot thick in-situ clay layer that underlies the EPDM liner. (Honeywell, 2005e)

2.2.2.5 Monitoring Program Status

The NRC staff has reviewed the location of the environmental monitoring program sampling points, the frequency of sample collection, and the trends of the sampling program results in conjunction with environmental pathway and exposure analysis and concluded that the monitoring program provides adequate protection of public health and safety. Furthermore, the staff concludes that IEPA will provide adequate oversight of the corrective action monitoring activities required by the facility's RCRA permit.

2.3 Decontamination and Decommissioning

Prior to termination of License SUB-526, Honeywell will decontaminate the facilities to provide for protection of the environment and public health and safety. Contamination will be reduced to levels which allow for release of the facility for unrestricted use (10 CFR Part 20, Subpart E).

Following completion of decontamination activities, a comprehensive radiological survey will be completed and a report documenting cleanup to the target levels will be produced. The complete decontamination activities and final survey will be reviewed and verified by the NRC before termination of the license. (10 CFR 40.42.) Honeywell plans to provide financial assurance for the potential costs of decontamination and decommissioning activities associated with the license termination through a Corporate self-guarantee, a mechanism approved by the NRC. (Honeywell, 2005a)

2.4 The No Action Alternative

Under the "No Action Alternative," the NRC would discontinue activities related to renewing the MTW facility operating license. The alternative of no license renewal for the Honeywell plant at the Metropolis, Illinois, site implies cessation of conversion and manufacturing and commencement of decontamination and decommissioning of the facility. However, assuming the requirements of the commercial nuclear fuel industry remain unchanged, selection of this alternative implies transfer of conversion activities to a new site since the Metropolis facility is the only plant of its kind operating in the United States. Environmental impacts at the new site would be expected to be greater during the construction of a new uranium conversion facility; upon commencement of facility operations, environmental impacts would be expected to be similar to those described in Section 4 for the license renewal alternative.

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3.0 AFFECTED ENVIRONMENT

3.1 Site Description

The Metropolis facility is located in Massac County at the southeast tip of Illinois, along the north bank of the Ohio River (Figure 1.1). The city of Metropolis is located approximately 1.6 kilometer (1 mile) southeast of the site. The site perimeter is formed by U.S. Highway 45 to the north, the Ohio River to the south, an industrial coal blending plant to the west, and privately-owned, developed land to the east.

The plant site occupies approximately 405 hectares (1,000 acres) of land on the gently rolling hills that are typical of southern Illinois. Plant operations are conducted in a fenced, restricted area covering 22 hectares (54 acres) in the north-central portion of the site, on an alluvial terrace some 18 meters (60 feet) above the floodplain of the Ohio River. The terrace surface is generally level except for surface water drainage channels, which flow south to the Ohio River. The site elevation is between 300 and 380 feet above mean sea level.

3.2 Climatology and Meteorology

3.2.1 Climatology

The meteorology and climatology of the MTW site and vicinity was summarized in the EA that assessed the last license renewal application for this plant (NRC, 1995). The source of the meteorological data in the 1995 EA was the National Weather Service Office (WSO) at Paducah, Kentucky, on the far bank of the Ohio River, approximately seven miles south of the MTW site. The information presented in the 1995 EA has been updated to reflect the modest climate changes that have occurred over the most recent license period.

The climate of the area is characteristic of the humid continental zone, where the primary source of heat and moisture for western Kentucky and southern Illinois is the Gulf of Mexico. However, because of the site's proximity to the Ohio River the climate is more typical of western Kentucky than southern Illinois. The region has two predominant weather patterns that define the winter and summer circulation regimes. Winter is characterized by evenly distributed precipitation events and moderate diurnal changes in temperature. During the summer, frontal and pressure systems generally pass north of the region, resulting in a more tranquil weather pattern over the area.

The average annual temperature is 14.4°C (57.9°F), with monthly average temperatures ranging from 26.3°C (79.3°F) during July to 1.3°C (34.5°F) during January. The maximum temperature at the Paducah, Kentucky, WSO was 41.1°C (106.0°F) recorded in 1952 and the minimum temperature of -24.4°C (-12.0°F) was recorded in 1951. NWS data from the 1997 - 2004 timeframe indicates the Paducah area had approximately 42 days annually where the high temperature exceeded 32.2°C (90.0°F) and **about 12 days** where the daily high temperature did not exceed the freezing level.

Precipitation in the region is fairly uniform throughout the year. The mean annual precipitation for the Paducah WSO is 117.8 centimeters (46.38 inches), with more rainfall typically occurring between March and July than the remainder of the year. Additionally, the region nominally experiences approximately 70 thunderstorm days annually. The maximum monthly rainfall (45.0 centimeters, [17.73 inches]) occurred during March 1966 and the greatest daily rainfall (20.3 centimeters [8.00 inches]) occurred on March 4, 1964. Annual snowfall is generally light (22.1 centimeters [8.7 inches]), and usually occurs during January, February, and March. However, measurable snowfall has occurred as early as November and as late as April. The maximum monthly snowfall [57.4 centimeters (22.6 inches)] occurred during January 1978.

3.2.2 Winds, Tornados, and Storms

Based on data for the past eight years (1997 - 2004), the predominant wind direction to be from the southwest quadrant with a secondary maxima from the north-northwest. Analysis of the annual records for all eight individual years indicate that the mode of the wind direction (most common angle) ranged from 200° to 230° measured clockwise from North, including five years during which the mode was 210°. The average wind speed for this period was 5.5 knots, with individual year averages ranging from 5.3 to 5.8 knots. The maximum hourly-average wind speed observed during this period was 30 knots and the maximum gust recorded during the eight-year reference period was 61 knots in 2001. (Honeywell, 2005b)

In general, this region is not directly influenced by tropical cyclone activity. However, because of the region's proximity to the Gulf of Mexico, it occasionally experiences increased rainfall from northward-moving tropical systems from the central and western Gulf Coast.

Tornados are infrequent in Kentucky, occurring on average only eight times per year statewide. From 1953-1992, an annual average of four tornado days per year occurred statewide in a variety of terrains **(NOAA, 1992)**. According to Beavers et al. **(1984), the probability of a tornado with wind speeds of 80 kilometers per hour (kph) (50 miles per hour [mph]) has a recurrence interval of 1,500 years. A tornado with wind speeds of 400 kph (250 mph) has a recurrence interval of 2 million years (Beavers et al, 1984)**. Between 1950 and the present, there was one F4 tornado (May 6, 2003) in the seven counties around the Metropolis site. The tornado began approximately 20 miles west-northwest of Metropolis, and traveled six miles into Massac County. The peak velocity of this tornado event was 210 mph. (Honeywell, 2005b)

3.2.3 Air Quality

Air quality is primarily measured against the National Ambient Air Quality Standards (NAAQS) established by the U.S. Environmental Protection Agency (USEPA) to protect human health and welfare (primary standards) and to protect against damage to the environment and property (secondary standards). The pollutants regulated under the NAAQS are total suspended particulates (inhalable particulate matter with aerodynamic diameters less than 10 microns [referred to as PM_{10}], and less than 2.5 microns [referred to as $PM_{2.5}$]), ozone (O_3), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), and lead (Pb). Illinois has adopted air quality standards that are comparable to the USEPA, with the exceptions of the $PM_{2.5}$ and 8-hour ozone standards, which have not been adopted by the State at this time. (Illinois, 2004) The Illinois air quality standards are summarized in Table 3.1 (Illinois, 2005a).

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Massac County, Illinois and McCracken County, Kentucky (across the river) are presently in attainment with regard to the six criteria pollutants monitored by the States of Illinois and Kentucky.

3.3 Demography and Socioeconomic Profile

The plant site is located in a predominantly undeveloped, rural region of low average population density with widely scattered villages and small cities in Massac County, Illinois, and across the Ohio River from McCracken County, Kentucky. Massac County has a population of 15,161 with 6,482 residing in the town of Metropolis, approximately 1.6 kilometers (1 mile) southeast of the site (US Census, 2000). McCracken County has about 65,514 residents with 26,307 residing in the city of Paducah, approximately 16 kilometers (10 miles) southeast of the site, and an additional 19,117 residing in the communities adjacent to Paducah. Based on information provided by the 2000 Census, the population of Massac County, Illinois has increased by approximately 2.7 percent since 1990, whereas McCracken County, Kentucky has seen a 4.2 percent population growth. (US Census, 2000) The population of Metropolis and Paducah both decreased by about 3.5 percent from 1990 to 2000.

Table 3.1 Illinois primary and secondary ambient air quality standards

Pollutant	Averaging Time	Primary ($\mu g/m^3$)	Secondary ($\mu g/m^3$)
SO_2	Annual Arith. Mean	80	None
	24 hr[a]	365	None
	3 hr[a]	None	1,300
O_3	1 hr[b]	235	Same as Primary
NO_2	Annual Arith. Mean	100	Same as Primary
CO	8 hr[a]	10,000	Same as Primary
	1 hr[a]	40,000	Same as Primary
Pb	3 months	1.5	Same as Primary
PM_{10}	24 hr[a]	150	Same as Primary
	Annual	50	Same as Primary

a. Maximum concentration not to be exceeded more than once per year.
b. Maximum 1-hour concentration not to be exceeded more than one day per year.

Source: Illinois, 2005.

The year 2000 population within 80 kilometers (50 miles) of the plant is given in Table 3.2 for each of the 160 segments defined by 16 radial (compass) directions and 10 radial distances.

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The total 1990 population within the same radius is also shown. Comparison of the 2000 and 1990 population trend shows that fewer people live within 5 miles of the plant than in 1990.

The total population within 80 kilometers (50 miles) of the site is 517,105, a 9.7 percent increase over the 471,410 reported in 1995 (NRC, 1995b). Within 16 kilometers (10 miles) of the plant, almost 63 percent of the population resides in the southeast quadrant. Over 62 percent of the population of 41,000 that lives within 16 kilometers (10 miles) of the site resides to the southeast of the facility. This includes Metropolis, Illinois, and Paducah, Kentucky, and the adjacent communities. With the exception of these communities, the remainder of the two-county area is predominantly rural. In the 2000 Census, the census block that includes the facility (Block Group 3, Census Tract 9701, Massac County, Illinois) reported a population of 1,326. (US Census, 2000)

Table 3.2 Incremental 2000 population within 80 kilometers (50 miles) of the Metropolis facility[a]

	Distance (miles)									
Sector	0-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
N	28	61	80	57	46	168	3670	2069	5073	12027
NNE	24	53	47	48	104	356	648	844	8014	16900
NE	33	156	200	73	62	298	1369	2873	2111	3603
ENE	37	126	73	117	57	358	339	2138	6354	4553
E	143	421	120	153	131	482	1008	1794	5062	9759
ESE	272	1997	728	131	67	1608	2571	7965	6242	2737
SE	3	1136	2095	3	8	13323	25660	8462	13345	7011
SSE	1	30	10	39	121	5987	12860	5698	10320	22914
S	0	8	39	94	259	2467	3051	5988	11813	10099
SSW	0	14	27	66	257	1555	1935	2510	3702	5607
SW	0	0	10	7	6	1727	1450	3006	1112	5521
WSW	0	2	4	5	18	519	3022	4927	6000	14338
W	1	0	2	5	7	371	1047	4263	2684	15650
WNW	2	3	19	29	53	608	937	3834	2003	42891
NW	2	3	101	94	80	343	1546	1947	12765	11432
NNW	12	95	135	101	77	112	2227	3131	15075	54898
2000 Total	558	4105	3690	1022	1353	30282	63340	61449	111675	239631
1999 Total[b]	732	3786	3326	1467	1626	27026	59520	57227	101678	215022

Sources:
a. U.S. Department of Commerce (DOC), 1992.
b. NRC, 1995b.

There are two permanent residences and three mobile homes within 610 meters (2,000 ft.) of the feed materials building. The two permanent residences are nearest to the site and are located about 564 meters (1,850 ft.) north northeast from the feed materials building (Figure 2.3). The nearest school is 2.9 km (9850 ft.); the nearest hospital is 1.5 km (5020 ft.); and the nearest nursing home is 2.8 km (9180 ft.) of the MTW facility. Nearby industrial facilities include the United States Enrichment Company's (USEC's) Gaseous Diffusion Plant west of Paducah, and the Tennessee Valley Authority (TVA) and Electrical Energy, Inc. electrical generating plants situated on the Ohio River.

The Metropolis facility employs a labor force of 311 people. This represents about 25 percent fewer employees that reported at the time of the last license renewal. (NRC, 1995b) Approximately 24 percent of the facility's personnel reside in the Paducah, Kentucky, area (including Massac, Hendron, Ledbetter, Reidland, and Woodlawn-Oakdale), 48 percent live in or near Metropolis, and the remainder reside in small towns scattered throughout the countryside surrounding the plant. Plant employment is not a significant fraction of the employment in Massac and McCracken Counties. For example, USEC's Gaseous Diffusion Plant is the largest employer in the area with about 2,028 direct and indirect employees (USEC, 2003). Based on an state labor statistics, employment at the Metropolis facility accounts for less than 1 percent of the estimated 37,662 people employed in the two-county area. Without accounting for seasonal adjustments, the total civilian labor force in December 2004 was about 7,130 in Massac County, Illinois, and 30,860 in McCracken County, Kentucky (USDOL, 2006a). Unemployment rates in these two counties were about 6.0 percent and 5.3 percent, respectively, which are about the same as the state-wide unemployment rates for Illinois and Kentucky (USDOL, 2006b).

Based on the 2000 Census, the median household income in 1999 for the two-county area ranged from $25,371 for the city of Metropolis and $31,498 for Massac County, Illinois, to $46,201 for the city of Massac, Kentucky and $33,865 for McCracken County, Kentucky. (US Census, 2000) These income levels are more representative of the median household income for the State of Kentucky ($33,672) than they are for the household income for Illinois ($46,590). The percentage of individuals with income below the 1999 poverty level was 14.8 percent for the combined two-county area. In comparison, the percentage of individuals living below the poverty level in 1999 was 10.7 percent in Illinois and 15.8 in Kentucky. (US Census, 2000)

3.4 Land

3.4.1 Site Area

Before being purchased by AlliedSignal about 45 years ago, much of the site was used for agriculture (**NRC, 1995b**). The flood plain within the MTW site, between the restricted area and the Ohio River was cultivated in the past, but it is no longer farmed and is returning to a more natural vegetation stand. Today, most of the MTW land outside the exclusion area is forested. Onsite cropland is limited to approximately 100 acres north of Route 45. An electrical transmission line crosses the Honeywell property about half-way between the Ohio River and the southeastern border of the fenced area. The transmission line corridor is maintained in grasses and low-growing shrubs. A natural gas transmission line, crossing the property about 18 meters (60 feet) north of the administration building, provides gas to the site and continues east to provide natural gas to the City of Metropolis (**Honeywell, 2005b**).

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Major facilities in the 54-acre restricted area include the administration building, the laboratory, the fluorine production facility, the feed materials building, the waste water ponds and treatment plant, and a UF_6 cylinder storage area. Security fences surround the facilities. Only the six-story feed materials building and the administration building are prominently visible from U.S. Highway 45 northeast of the plant structures.

3.4.2 Adjacent Area

The plant is located in a predominantly agricultural area. About 65 percent of the land in Massac County is used for agricultural purposes, with corn and soybeans as the principal cash crops and cattle and hogs as principal livestock (USDA, 2002). **The remaining lands were occupied by woodlands, idle farms, or urban areas. The nearest pastureland is located approximately 2 kilometers (1.5 miles) northeast of the plant and is used to graze beef cattle. The nearest dairy cattle are grazed approximately 13 kilometers (8 miles) east of the plant. Much of the Ohio River floodplain in the vicinity of the plant is cultivated.**

Honeywell has not performed any noise surveys at the boundary of the exclusion area and no ambient noise survey data has been taken for the area around the MTW site. There are no noise-sensitive receptors (e.g., residences, schools, hospitals) in close proximity to the exclusion area; the nearest residence is greater than 550 meters (1,800 feet) north-northeast of the MTW facility. The distance from the buildings to the site boundary helps mitigate any offsite noise impacts from the facility operations. (Honeywell, 2005b)

Major nearby industrial developments include the Tennessee Valley Authority Shawnee Fossil Plant and the U.S. Enrichment Corporation Paducah Gaseous Diffusion Plant (a uranium enrichment facility) located across the river from the Metropolis facility. The American Electric Power Company coal blending plant is located immediately northwest of the MTW site, and a coal-fired power plant operated by Electrical Energy, Inc. is located about 9.5 kilometers (6 miles) to the northwest.

There are two state natural areas within an 8-kilometer (5-mile) radius of the site. The Mermet Lake Conservation Area, which contains the Mermet Swamp Nature Preserve, is about 5.5 kilometers (3.5 miles) to the northwest. This conservation area is under the jurisdiction of the Illinois Department of Conservation. The West Kentucky Wildlife Management Area is across the river, 3.2 kilometers (2 miles) southwest of the site and adjacent to the Paducah Gaseous Diffusion Plant.

3.4.3 Historically Significant Sites

Three National-registered historic sites, and no State-registered historic sites, are located in the immediate vicinity of the Honeywell Metropolis Plant (NRIS, 2005). The Elijah P. Curtis House is located in Metropolis about 1.6 kilometer (1 mile) southeast from the plant, Fort Massac is about 6.5 kilometers (4 miles) upriver, in Fort Massac State Park on the banks of the Ohio River, and the "Kincaid Mounds" site containing 19 prehistoric mounds that rise about 9 meters (30 feet) above the riverbottom along Avery Lake, are near Brookport, Illinois, about 12.1 kilometers (7.5 miles) southeast of the MTW facility. No registered National or State archaelogical sites were identified within the boundaries of the site. (Honeywell, 2005b)

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3.4.4 Floodplains and Wetlands

Although flooding is an annual event, the plant site has never been reached by flood waters. The elevation of the site, 114 meters (375 feet), is considerably above the most extreme projected flood level. The probable elevation of the 100-year flood is 103 meters (337 feet). As a comparison, the 1937 flood reached an elevation of 104 meters (342 feet). (NRC, 1995b)

Wetlands that have been mapped on the plant site include broad-leaved deciduous forests that are temporarily flooded, located near the Ohio River (US Department of the Interior, 1988). No wetland communities have been identified within the restricted fence line.

3.5 Geology, Mineral Resources, and Seismicity

3.5.1 Geology and Soils

The site is located at the northern end of the Mississippi Embayment, a depositional basin filled in with sediments 40 to 100 million years old that overlie older (300 to 600 million year old) bedrock. Surface soils at the Metropolis facility consist of silty loam and silty clay loam which have low permeability and poor drainage. The underlying unconsolidated surface deposits are approximately 24 to 27 meters (80 to 90 feet) thick and consist of sediments from three types of depositional environments.

Alluvial deposits consisting of sand, silt or clay and localized sandy gravel deposits are found along the Ohio River. Locally, the MTW site and much of the surrounding region overlies approximately a few meters of Quaternary loess. Recent Surface Geology Maps (Nelson et al., 2002) developed by the Illinois State Geological Survey (ISGS) exclude this loess veneer. And show the area of the site to overlie the Metropolis Formation, consisting of clay-rich silty sand and sandy silt, ranging in thickness from 6.1 to 17 meters (20 to 50 feet). The deeply weathered, poorly sorted, and burrowed alluvial sediments of the Metropolis Formation is interpreted as fluvial sediments that occupied an underfit valley ancestral to the modern Ohio. The Metropolis Formation underlies the Mounds Gravel, comprised of gravel and sand 11 to 20 meters (35 to 65 feet) thick. The Mounds is interpreted as deposits of large, braided rivers that were in part ancestral to the modern Tennessee River. Groundwater monitoring wells at the MTW site are completed in the Mounds Gravel. (Honeywell, 2005b)

Bedrock underlying the unconsolidated Mounds Gravel surface deposits consist of Tertiary Porter's Creek Clay, Cretaceous McNairy Formation sandstones and shales, and Mississippian limestones and sandstones. The McNairy Formation sands, silt and clay are approximately total thickness of 40 to 49 meters (130 to 160 feet) thick. The Mississippian St. Louis Limestone is approximately 24 meters (80 feet) thick and occurs at an approximate depth of 152 meters (500 feet) (Nelson et al., 2002). Three onsite water supply wells of good quality water are completed in the St. Louis Limestone (Honeywell, 2005b).

3.5.2 Mineral Resources

Mineral resources in the area include sand and fluorspar. Sand dredging on the Ohio River occurs about 11 kilometers (7 miles) upstream of the plant, and fluorspar mining occurs about 64 kilometers (40 miles) northeast of the plant (Honeywell, 2005b).

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3.5.3 Seismicity

The site is located near major fault zones. The New Madrid and St. Genevieve fault zones are approximately 24 and 8 kilometers (15 and 5 miles) from the site, respectively. A large number of earthquakes have occurred in northeastern Arkansas and southeastern Missouri in association with the New Madrid fault zone. The major historic earthquakes felt in this area were from the 1811-1812 New Madrid earthquakes whose epicenter was approximately 97 kilometers (60 miles) southwest of the Metropolis facility. The strongest of these earthquakes is estimated to have produced a Modified Mercalli Intensity IX earthquake (i.e., a seismic event capable of causing considerable damage to well-built buildings, breaking some underground pipes, and causing serious damage to reservoirs) at Metropolis. The silt loam soils surrounding the MTW site may exhibit a viscous or visco-elastic response to earthquake loading and may be susceptible to ground wave motion from distance; however, severe ground motion tends to be reduced due to the soil structure present **(NRC, 1995b)**.

3.6 Hydrology

3.6.1 Surface Water

The MTW site is bound on the south by the Ohio River in the vicinity of River Mile 946 (USGS, 1982). There are four creeks that drain the Honeywell property to the Ohio River. Outfall 002, which is used to discharge the plant's treated sanitary and process waste waters, is located on one of these drainages about 610 meters (2,000 feet) from the Ohio River. **The plant's liquid effluent discharge rate averages about 0.015 m^3/s (5.26 ft^3/s) which is trivial compared to the average discharge rate of 7,860 m^3/s (278,000 ft^3/s) for the Ohio River (USGS, 2005).** There are no downstream receptors for the intermittent drainage channel that receives plant effluent. This water body has no downstream uses for potable water, fishing, recreation, or irrigation prior to discharge to the Ohio River. (Honeywell, 2005b)

The Ohio River at the plant site is about 910 meters (3,000 feet) wide with a normal pool elevation of 88 meters (290 feet) above mean sea level. Ohio River discharge records have been maintained since 1928. The maximum recorded discharge on the Ohio River was 50,410 m^3/s (1,780,000 ft^3/s) and occurred on February 1, 1937. Although flooding is an annual event, the plant site has reportedly never been reached by flood waters. Numerous flood control dams regulate the flow of the Ohio River and have reduced the threat of flooding. The nearest flood control structure is Lock and Dam No. 52 at Brookport, Illinois, which is about 11 kilometers (7 miles) upstream from the site. (NRC, 1995b) **The nearest downstream public drinking water intake is located in Cairo, Illinois, about 51 kilometers (32 miles) away. (Honeywell, 2005e)**

3.6.2 Groundwater

The water table at the site occurs within the sandy deposits of the Quaternary Henry Formation. The water table slopes from northeast to southwest and flows at an average rate of 0.0094 to 0.19 meters per day (0.031 to 0.62 feet per day) towards the Ohio River **(NRC, 1995b)**. **Temporary flow reversals occur within the water table aquifer on a periodic basis in association with Ohio River flooding. The duration of reversal events is about 10 to 34 days; however, a series of multiple events may extend the flow reversal for up to 58 days (NRC, 1995b).**

The first unconfined aquifer is encountered in the mixed gravel, sand and clay of the Pliocene series (the Mounds Gravel Formation). The Mounds Gravel hydrogeologic unit is used as a drinking water source upgradient of the plant, but the productivity is not high enough to support large industrial or municipal withdrawals. (NRC, 1995b) The underlying McNairy Formation may yield enough water for domestic use, but the high iron content and fine-grained matrix make the groundwater quality generally unattractive. (Honeywell, 1995b)

Three deep aquifers underlie the Metropolis facility. Two aquifers are in the Cretaceous sandstones and the third is within the St. Louis Limestone described in Section 3.5. The principal source of groundwater for industrial, utility, and municipal water use is the highly fractured and cavernous St. Louis Limestone that underlies the Metropolis facility at depths of approximately 152 meters (500 feet) below the surface. The St. Louis Limestone is the groundwater source for the three industrial water supply wells and the one sanitary water located at the Metropolis facility. The total capacity of these wells is more than sufficient to meet the normal plant operating requirements of 7,800 to 9,960 liters per minute (2,060 to 2,630 gallons per minute) as reflected by discharge from Outfall 002. (Honeywell, 2005b)

In April 2001, in response to elevated contaminant levels identified in groundwater from the on-site monitoring wells, IEPA issued a violation notice to Honeywell. In response to this apparent violation, Honeywell prompted an investigation of the source of the groundwater contaminants. Honeywell's on-going efforts to investigate the groundwater contaminant source are being conducted as part of an IEPA-accepted Compliance Commitment Agreement. IEPA continues to monitor Honeywell's investigative activities in accordance with the approved Groundwater Workplan. (IEPA, 2005)

3.7 Biota

3.7.1 Terrestrial

The natural vegetation in the vicinity of the MTW site is characteristic of oak-hickory and southern mixed hardwood forests. Tree species associated with these areas include oak (*Quercus* spp.), hickory (*Carya* spp.), persimmon (*Doispyros virginiana*), sassafras (*Sassafras albidum*), and black locust (*Robinia pseudoacacia*). Tree species such as cottonwood (*Populus deltoides*) and a variety of willows (*Salix* spp.) occur along the river in areas that are periodically flooded. Dryer areas along the river support tree species such as box elder (*Acer negundo*), American beech (*Fagus grandifolia*), sweet gum (*Liquidambar styraciflua*), and sycamore (*Plantanus occidentalus*). Vegetation along the transmission line corridor on the site is artificially maintained and supports only grasses and low-growing shrubs. Characteristic species include brome grass (*Bromus tectorum*), broom sedge (*Andropogon virginicus*), bluegrass (*Poa pratensis*), goldenrod (*Solidago* spp.), sumac (*Rhus* spp.) and blackberry (*Rubus allegheniensis*). (NRC, 1995b)

Animal species occurring on the MTW site would be typical of old field and second-growth forests in Illinois. Birds and mammals associated with open habitat such as the transmission line corridor and the cultivated fields include bobwhite quail (*Colinus virginianus*), mourning dove (*Zenaidura macroura*), horned lark (*Eremophila alpestris*), groundhog (*Marmota monax*), deer mouse (*Peromyscus maniculatus*), and the eastern cottontail rabbit (*Sylvilagus floridanus*).

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Birds and mammals that could occur on forested land include the cardinal (*Richmondena cardinalis*), titmice and chickadees (*Parus* spp.), woodpeckers, eastern gray squirrel (*Sciurus carolinensis*), white-footed mouse (*Peromyscus leucopus*), opossum (*Didelphis marsupialis*), and white-tailed deer (*Odocoileus virginianus*). Animals associated with the banks of the Ohio River include muskrats (*Ondatra zibethica*), raccoon (*Procyon lotor*), and a variety of species of turtles, water snakes, salamanders, and frogs. **(NRC, 1995b**)

Other important species in the area of the MTW site include include recreational game animals (i.e., small game, resident game birds, woodland game, migratory game birds, and furbearers) and regulated sport fish.

3.7.2 Aquatic

The Ohio River Basin has changed greatly in the past 100 years due to the construction of locks and dams, continual maintenance dredging for river transportation, and the degradation of water quality associated with industrial and municipal discharges and agricultural runoff. Large-scale damming has changed the habitat and hindered the migration of fish. Water quality changes have also produced changes in the fish population. (NRC, 1995b)

The aquatic biota of the Ohio River include algal plankton communities comprised of yellow-green (diatoms), green, and blue-green algae. Zooplankton communities consist primarily of rotifers.

Benthic communities in the Ohio River are characterized by species adapted to both flowing and restricted circulation conditions. Crustaceans are found in greater abundance in pooled areas behind dams than in the open river. Benthic invertebrate communities are not well developed in the Ohio River, possibly because of the lack of suitable substrates, high turbidity, or of unfavorable chemical environment. Chironomid larvae and turbificids often dominate the community in terms of numbers, and the asiatic clam (*Corbicula manilensis*) occurs in large quantities. Other common organisms include snails and leeches. (NRC, 1995b)

Forage fish that feed largely on detritus, plant material, and on bottom-dwelling invertebrates are abundant. These include the emerald shiner, the gizzard shad, and carp. Although commercial fishing has largely been abandoned on the Ohio River, sport fishing is still fairly popular. Commonly caught species include channel catfish, white bass, and bluegill. **Certain species found in the Ohio River, like carp and catfish, are covered under a fish consumption advisory (USFS, 2005).**

3.7.3 Threatened and Endangered Species

According to the U.S. Fish and Wildlife Service (USDOI, 2005a), the State of Illinois has 23 federally-listed threatened or endangered animal species. In addition, there are nine federally-listed threatened or endangered plant species in Illinois. Eight animal species classified by both the federal and state governments as threatened or endangered exist in Massac County, Illinois or in the Ohio River in the vicinity of McCracken County, Kentucky. (USDOI, 2005b; USDOI, 2005c). The U.S. Fish and Wildlife Service did not identify any listed plant species occurring in Massac County. Table 3.3 provides the list of Federal-listed animal species that are known to occur in Massac County, Illinois or in the Ohio River boarding Massac County. The staff is not aware of any site or area biological surveys that would confirm whether any federal- or state-listed species are present in the vicinity of the MTW facility.

According to the Illinois Endangered Species Protection Board (IDNR, 2004), the State of Illinois has 139 state-listed threatened or endangered animal species. In addition, the state's list of threatened and endangered species includes 339 plant species (Illinois, 2005b).

Table 3.3 Federal-listed threatened and endangered species in Massac County or the Ohio River bordering Massac County

Classification	Common Name (Scientific Name)	Habitat	Source
Endangered	Indiana bat (*Myotis sodalis*)	Caves, mines; small stream corridors with well-developed riparian woods; upland and bottomland forests	a, b
Endangered	Least tern (*Sterna antillarum*)	Bare alluvial and dredge spoil islands	a, b
Endangered	Fat pocketbook pearlymussel (*Potalimus capax*)	Rivers	a, b
Endangered	Pink mucket pearlymussel (*Lampsilis orbiculata*)	Rivers	a, b
Endangered	Orange-footed pearlymussel (*Plethobasus cooperianus*)	Rivers	a, b
Endangered	Ring pink (*Obovaria retusa*)	Rivers	a
Candidate	Sheepnose (*Plethobasus cyphyus*)	Rivers	b
Candidate	Spectaclecase (*Cumberlandia monodonta*)	Rivers	b

Sources:
a. USDOI, 2005b.
b. USDOI, 2005c.

3.7.3.1 <u>Terrestrial</u>

Federally-listed threatened or endangered animals whose ranges include Massac County are the least tern (*Sterna antillarum*) and the Indiana bat (*Myotis sodalis*). The least tern occurs in several Illinois counties along the Mississippi and Ohio Rivers. It nests on bare alluvial and dredge spoil islands and sand/gravel bars in or adjacent to rivers, lakes, gravel pits and power plant cooling ponds. It nests in colonies with other least terns. This species forages in shallow water areas along the river and in backwater areas, such as side channels and sloughs. Foraging habitat must be located in close proximity to nesting habitat (USDOI, 2005b).

The endangered Indiana bat has been noted as occurring in several Illinois counties. Potential habitat for this species occurs statewide; therefore, Indiana bats are considered to potentially occur in any area with forested habitat. Indiana bats migrate seasonally between winter hibernacula and summer roosting habitats. Winter hibernacula include caves and abandoned mines. In the spring, females emerge from hibernation to summer roosts, where they form nursery colonies under the loose bark of trees (dead or alive) and/or cavities. During the summer, the Indiana bat frequents the corridors of small streams with well-developed riparian woods, as well as lowland and upland forests. It forages for insects along stream corridors, within the canopy of floodplain and upland forests, over clearings with early successional vegetation (old fields), along the borders of crop lands, along wooded fence rows, and over farm ponds and in pastures (USDOI, 2005b).

3.7.3.2 Aquatic

Federally-listed threatened or endangered animals whose ranges include the Ohio River in the vicinity of the MTW facility are the fat pocketbook pearly mussel (*Potamilis capax*), pink mucket pearlymussel (*Lampsilis orbiculata*), orange-footed pearlymussel (*Plethobasus cooperianus*), and ring pink mussel (*Obovaria retusa*) (USDOI, 2005b; USDOI, 2005c). The spectacle case mussel (*Cumberlandia monodonta*) and sheepnose mussel (*Plethobasus cyphyus*) are identified as candidate species for the federal threatened and endangered species list. Instream activities in these rivers will typically require a mussel survey (including dive surveys) to determine their presence (USDOI, 2005b).

3.8 Public and Occupational Health

The continued handling of materials and conduct of MTW operations pose a potential impact to public and occupational health. For normal operations, the impacts are related to the release of low levels of toxic or radioactive materials to the environment over extended periods of time. For accident conditions, the hazard may involve releasing higher concentrations of materials over relatively short periods of time.

3.8.1 Background Radiological Characteristics

External background radiation levels in the vicinity of Metropolis, Illinois, are mainly from natural sources of cosmic and terrestrial origin. The total-body dose rate from cosmic rays is about 0.43 mSv (43 mrem) per year, while terrestrial sources contribute about 0.46 mSv (46 mrem) per year (Oakley, 1972).

Additional sources of radiation dose from background consist of radionuclides within the body, such as K-40, naturally occurring radionuclides such as radon progeny, and cosmogenic radionuclides, such as C-14. Radionuclides within the body result in an average effective dose equivalent of about 0.4 mSv (40 mrem) per year, while cosmogenic radionuclides contributed about 0.01 mSv (1 mrem) per year. Radon progeny doses are highly variable, with an average effective dose equivalent of 2.0 mSv (200 mrem) per year (NCRP, 1987).

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The background uranium concentration in the soil and vegetation as determined by preoperational sampling was 0.6 ppm and 0.28 ppm, respectively. The background uranium concentration in surface water was 0.009 ppm (NRC, 1984).

3.8.2 Public Health and Safety

The risks to public health and safety from MTW operations are exposure to chemical contaminants, radiation and radioactive materials as a result of liquid and airborne plant effluents. Members of the public in the immediate plant vicinity may be exposed to chemicals used in the plant as a result of routine controlled effluents and non-routine releases due to unplanned events. Fluoride (as hydrogen fluoride, HF) is the primary non-radiological gaseous contaminant released through stacks on the feed materials building. The environmental air monitoring program requires periodic collection of air samples at on-site and off-site sample points. Cumulative samples are analyzed for uranium and fluoride.

Radioactive materials released from MTW facilities may migrate in the environment through a variety of transport pathways, contributing to public exposures from both internal and external pathways. For atmospheric releases, internal exposures may occur through inhaling radioactive material dispersed in the air or ingesting crops and animal products that come in contact with radioactive material deposited from the air. External exposures may occur through direct radiation from an airborne plume or from particulates deposited on the ground from the plume. For liquid releases, internal exposures from ingesting water or irrigated crops may occur. External exposures from recreational activities, including swimming and boating may occur.

The MTW operations release small amounts of radioactive material to the atmosphere from 52 monitored release points. Gaseous effluent streams containing nonradioactive pollutants are discharged in accordance with operating permits issued from the IEPA. Releases attributable to the MTW facility are primarily uranium, although relatively small amounts of thorium-230 and radium-226 are also released from the facility. Liquid wastes are discharged to the Ohio River via one monitored release point, NPDES Outfall 002. Liquid waste streams generated at the MTW facility are categorized as low-level radioactive and non-radioactive waste streams. Prior to discharge into the Ohio River, radioactive and non-radioactive waste from MTW operations is processed through the EPF to meet 10 CFR Part 20 radiological effluent limits and non-radiological effluent limits specified in the facility's NPDES permit.

3.8.3 Occupational Health and Safety

Risks to occupational health and safety include exposure to industrial hazards, hazardous materials, and radioactive materials. Industrial hazards for the MTW facility are typical for an industrial facility of this size and include chemical exposures, heavy machinery accidents, crush injuries, and cuts and abrasions. These hazards are experienced by workers associated with the material processing operations, as well as by those conducting monitoring, research, general office, and industrial site activities. The MTW Occupational Safety and Health Administration (OSHA) recordable incident rates from 1995 to 2004 ranged from 2.6 in 1998 to 0.8 in 2004 (Honeywell, 2005e). The OSHA recordable incident rate has become a standard for measuring and comparing work injuries, illnesses, and accidents within and between industries. The incident rate accounts for both the number of OSHA recordable injuries and illnesses and the total number of man-hours worked. Average incident rates are calculated for various industry classifications because the incident rate can vary based on the nature of the work. The average incident rate for the classification of industry applicable to facilities like MTW ranged from 3.3 to 4.8 during the same 10-year period (Honeywell, 2005e).

The MTW facility handles nonradiological materials that could pose a risk to worker health and safety through chronic exposue or improper handling. The list of hazardous chemicals used in operations includes hydrofluoride, ammonia, sodium hydroxide, potassium hydroxide, and sulfuric acid. For plant employees, sources of chemical exposures includes routine exposures due to controlled system drainage, venting, and leakage points and non-routine exposures resulting from unplanned excursions. The MTW Process Safety Management System includes requirements for industrial hygiene sampling and monitoring as required by OSHA regulations. New chemicals or physical hazards that may be introduced into the workplace are identified and monitored under the MTW Management of Change process.

Radiation exposure from normal operations is primarily due to inhaled radioactive material during the uranium conversion process. A radiation protection plan is maintained in accordance with 10 CFR Part 20 to ensure that radiation doses are maintained below NRC limits and are as low as reasonably achievable (ALARA). Historical data and plant operating experience indicate employees are unlikely to receive an annual total effective dose equivalent of more than 5.0 mSv [500 mrem]. MTW employees working in the ore concentrate sampling plant, or other jobs where close contact with uranium or its daughter products occur, are most likely to receive highter than average exposures. For the 5-year period from 2000 - 2004, the average total effective dose equivalent for MTW workers was less than 1.25 mSv [125 mrem], and almost 80 percent of the workers were exposed to an annual total effective dose equivalent greater than 5 mSv [500 mrem], or 10 percent of the NRC annual occupational dose limit in 10 CFR 20.1201. For all workers, the annual total effective dose equivalent during this 5-year period was less than 20 mSv [2,000 mrem] (Honeywell, 2005c).

3.9 Transportation

The MTW facility is located approximately 1.6 km [1 mile] west of Metropolis, Illinois. US Highway 45 and Burlington North Railroad border the facility to the north, and the Ohio River bounds the MTW facility to the south. Interstate 24 is located approximately 7.2 km [4.5 miles] east of the facility and provides access across the Ohio River to Paducah, Kentucky (Honeywell, 2005b).

All UF_6 product is shipped from the Metropolis facility by truck. From 2000 to 2004, there were about 570 UF_6 product shipments per year. During this same period, there were no reported traffic accidents involving UF_6 shipments from the Metropolis facility (Honeywell, 2005e).

3.10 Waste

MTW operations produce low-level radioactive, nonradioactive hazardous, mixed, and nonradioactive solid wastes. The facility uses a combination of recycling, compaction, and offsite disposal in management of these wastes.

Dry active waste, consisting primarily of contaminated filters, papers, floor sweeping compounds, cleaning rags, and gloves, is generated by the facility. This waste is collected in marked containers, segrated by radioactivity, drummed and either compacted onsite or shipped to a licensed supercompactor before final disposal at a licensed site. The estimated annual volume of low-level radioactive solid waste produced by the plant is 225 to 285 m^2 (8,000 to 10,000 ft^2) with an average uranium content of 6,000 pCi/g. The MTW facility also produces an annual average of 410 metric tons (904,000 pounds) of fluorination reactor ash with an average uranium content of about 13,500 pCi/g, 3,950 metric tons (8,700,000 pounds) of synthetic calcium fluoride (CaF2) with about 143 pCi/g of uranium, and 140 to 285 m^2 (5,000 to 10,000 ft^2) of contaminated metal (primarily crushed drums). Nonradioactive solid waste not sold or recycled is shipped to a licensed low-level radioactive waste disposal facility (Honeywell, 2005b).

Storage and treatment of hazardous waste generated on-site is regulated by the facility's RCRA permit. The RCRA permit also regulates operation of the EPF ponds and storage of drummed hazardous waste on the waste storage pad. Wastewaters with significant quantities of fluoride (i.e., HF scrubbing liquirs and uranium recovery leach liquors) are routed to the EPF for lime treatment and recovery of fluoride as CaF_2 in settling ponds D and E. Sulfuric acid is introduced into the wastewater stream to satisfy the RCRA land ban requirements for pH prior to releasing to the settling basins, then again to satisfy NPDES requirements prior to release to Outfall 002. Calcium fluoride that precipitates in the EPF settling basins is recovered for recycle by commercial industry (Honeywell, 2005b).

The MTW facility also produces a quantity of "mixed waste," which contains both RCRA hazardous waste and low concentrations of uranium. Liquid mixed waste is generated from either maintenance or laboratory activities, and typically contains radiologically contaminated liquids such as paint thinner, lubricants, solvents or cleaning agents. Approximately 6 m^3 (1,610 gallons) of liquid mixed waste were shipped to a licensed disposal facility in 2004. The mixed waste is stored on a RCRA-permitted storage pad pending the availability of offsite facilities for treatment or disposal (Honeywell, 2005b).

Nonradioactive solid waste generated at the MTW facility includes miscellaneous trash, paper, scrap metal, and wood. In 2004, the facility generated more than 1,700 m^2 (60,000 ft^2) of nonradioactive industrial and special waste and sent approximately 7 m^2 (250 ft^2) of nonradioactive scrap metal to a local scrap metal recycler. Volume reduction is performed by an on-site compactor prior to sending waste to a landfill or other commercial waste disposal facility (Honeywell, 2005b).

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4.0 ENVIRONMENTAL IMPACT OF THE PROPOSED ACTION AND ALTERNATIVES

Implementation of the proposed action, renewal of the Honeywell license, would involve both beneficial and negative impacts. The beneficial impacts include decreasing dependence on fossil fuels and the associated negative environmental impacts related to production and utilization of fossil fuels. The negative impacts from continued plant operations include releases to air and surface water from plant operation. Implementing either the proposed action or the alternative action, nonrenewal of the license, each involves decontamination and decommissioning of the facility with an expected positive environmental impact. Section 4.1 provides an evaluation of the environmental impacts of the proposed action. Section 4.2 presents a discussion of the impacts of the no action alternative.

4.1 Environmental Consequences of Proposed License Renewal

For the proposed action, renewal of the Honeywell license, the continued handling of materials and normal operations of the facility would result in the continued release of low levels of hazardous or radioactive constituents. Under accident conditions, the facility may release higher concentrations of materials over a short period of time. This section evaluates the impacts of normal operations and postulated accidents at the Metropolis facility. The facility would eventually be decontaminated and decommissioned at the end of its useful life, but the impacts of such decontamination and decommissioning are beyond the scope of this Environmental Assessment (EA). The environmental impacts from normal operations are described in Section 4.1.1 and the impacts from postulated accidents are described in Section 4.1.2.

4.1.1 Normal Operations

The level of activity for the various operations changes over time, which can result in fluctuations in the amount of effluents. The evaluation of the environmental impacts of the license renewal, however, can be based on the impacts from past and current operations.

Normal operations at the Metropolis facility would involve withdrawals from groundwater, discharges to surface waters, discharges to the atmosphere, and the production of various airborne, solid and liquid waste streams. In addition, continued operation of the Metropolis facility would involve employment of personnel at the plant. The impacts of normal operations are discussed in the following paragraphs. Nonradiological impacts are discussed in subsection 4.1.1.1 and radiological impacts are discussed in subsection 4.1.1.2.

4.1.1.1 <u>Nonradiological</u>

Land Use

No change in impacts to land use would be anticipated as a result of the proposed action. The facilities at the MTW site already exist and are currently operating. No construction of expansion of the facility requiring additional acreage has been proposed. Future expansion within the industrial portion of the site is likely; however, continued operation of the plant would be consistent with its current land use.

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Air Quality

No change in impacts to air quality from nonradiological contaminants would be anticipated as a result of the proposed action. Without changes to the facilities or operations, the type of contaminants produced at the site would be similar to the past with some fluctuation in quantities due to variations in operations. State-issued operating permits for processing activities include release limits for volatile organic material (VOM), particulate matter (PM), sulfur dioxide (SO_2), nitrous oxides (NO_x), ammonia (NH_3), and hazardous air pollutants (HAP), excluding VOM and PM. The plant emission quantities vary over time, but current levels have been below the applicable State permit limits. **In addition, the concentrations of HF measured at ambient air sampling points are below the level specified by Kentucky State regulations. The applicable radiological release limits of 10 CFR Part 20 will continue to apply to the MTW facility's radiological releases.**

Surface Water

Surface water quality is protected by enforcement of release limits and monitoring programs as required under the National Pollutant Discharge Elimination System (NPDES) permit. Current effluent quality characteristics are within the permit limitations. (Honeywell, 2005b) The infrequent exceedances of NPDES permit limits are not expected to have significant impact on the surface water quality of the Ohio River because of the large dilution volume as discussed in Section 3.6.1.

Groundwater

Groundwater quality is protected through the use of diverse groundwater contaminant monitoring programs, which specify mitigative actions to take if elevated contaminant levels are identified. The RCRA surface impoundment liner leakage monitoring program would identify pond leakage through the impoundment liners and specify corrective actions prior to jeopardizing the groundwater underlying the impoundments. IEPA is currently providing oversight for an on-going corrective action program that was initiated following the identification of groundwater contaminants in on-site monitoring wells in April 2001. Based on IEPA oversight of the various monitoring programs, including the RCRA surface impoundment liner leakage monitoring program and the RCRA groundwater compliance and monitoring program, and the on-going RCRA corrective action program, the impact on the shallow aquifer from continued operation of the plant is expected to be small.

Biotic Resources

<u>Terrestrial</u>. There would be no terrestrial impacts from continued plant operation because no major expansion of existing facilities has been proposed. Consequently, no construction-related impacts that would disturb existing habitat, increase noise, or result in additional traffic are expected.

The primary potential impact on the terrestrial resources is from the nonradiological constituents released to the environment. The effects of these releases were previously examined (NRC, 1995b), and it was concluded that operation of the facility would result in no adverse impacts on terrestrial biota or people near the facility. Fluoride concentrations in the air, soil and vegetation offsite are below those that may result in adverse effects. There has been no degradation in offsite air, soil, and vegetation from fluoride since the previous assessment and the expected releases will be the same as from previous operations. Therefore, no adverse impacts to the offsite environment are expected from the continued operation of the facility. Because fluoride can adversely affect vegetation at relatively low concentrations and be hazardous to livestock when it accumulates in forage crops, the **NRC staff will require continued monitoring of fluoride in local vegetation.**

Aquatic. The volume of water discharged from the plant outfall is negligible when compared to the average flow in the Ohio River and the discharged constituents are rapidly mixed in the river. Although the surface water sampling results indicate that nonradiological constituents in surface water (i.e., fluoride) are rapidly diluted in the Ohio River, review of the sediment sampling results indicates that river sediments near the discharge point have high fluoride concentrations relative to upstream and downstream concentrations. Therefore, there may be a localized impact on benthic (bottom-dwelling) organisms in the effluent mixing zone in the river. Phytoplankton and zooplankton production in the effluent mixing zone could also be reduced from decreased light penetration from the suspended solids in the effluent. These effects would be highly localized.

Threatened and Endangered Species

The U.S. Fish and Wildlife Service identified two terrestrial species (least tern and Indiana bat) and six mussel species that may be present in the vicinity of the MTW facility. NRC Staff review of the proposed MTW facility license renewal activity determined that renewal of the facility's license, as proposed, is not likely to affect any listed species of concern.

The proposed license renewal action would not involve any expansion of the current facility or any changes to the operation or design of the facility. No bat or tern foraging or roosting habitat is present inside the site fence where facility operations would occur. Potential habitats identified outside the site fence would not be affected by routine plant operations. No terrestrial or aquatic alteration or destruction would occur as a result of the proposed action. The proposed action does not include any plans for river front development activities that would either directly disturb potential least tern breeding habitat or encroach on potential nesting sites. Continued operation of the MTW facility would result in restricted public use of the 405-hectare (1,000-acre) site, including potential least tern nesting sites along the Ohio River. There are no plans to perform any construction or clearing activities outside the complex located within the fenced, protected area. Potential bat foraging habitat (riparian vegetation along intermittent tributaries) present near the site is unlikely to become contaminated from continued plant operations. Therefore, the impact of the proposed action on the least tern and Indiana bat is expected to be insignificant.

The proposed action would not involve changes to the quantity or quality of liquid effluents or airborne emissions released as a result of facility operations. Routine operating procedures currently leave minimal opportunity for direct exposure of local biota and their prey to unacceptable levels of chemicals or radioactive material, as emissions are in accordance with limits established in the Commission's regulations (10 CFR) and State-issued permits. Normal liquid effluents and infrequent exceedances of NPDES permit levels would not be expected to have a significant impact on the Ohio River surface water quality or the mussel population because of the large dilution volume, as discussed in Section 3.6.1. The majority of mussel habitat in the site vicinity has been identified upstream from the MTW site (USDOE, 2003) and would not be affected by routine plant operations; no mussel habitat exists inside the site fence and where continued plant operations are proposed. Therefore, the impact of the proposed action on aquatic species, including the fat pocketbook, pink mucket, and orange-footed pearlymussels, and ring pink, sheepnose, and spectaclecase mussels, ise expected to be insignificant.

While there is a small potential for exposure of these species to radiation or chemical exposure as a result of an accident during the period of continued operation, the facility is designed and operated to ensure the probability of occurrence for such an event is extremely low. Therefore, the possibility of exposure to any threatened or endangered species would also be low, and the effects of exposure as a result of an accident would be discountable.

Cultural Resources

Operation of the MTW facility has not affected regional historic or cultural resources. The proposed action would not result in any additional impacts to the regional historic and cultural resources because the facility already exists, and no expansion into areas not previously disturbed is associated with this license renewal. Continued normal operation of the facility is also not expected to have any impact on these resources. The short-term impact for the no action alternative may have historical and archeological impacts within the MTW site, because areas not previously disturbed, which may contain potentially significant archaeological resources, may be impacted by decommissioning activities.

Socioeconomics

The primary socioeconomic impacts of continued operation of the Metropolis facility is from local employment. Under the proposed action, the MTW facility would continue to directly employ about 310 workers, representing less than one percent of the employment sector in Metropolis/Paducah regional civilian labor force (311 out of about 23,500 workers). Continued operation will have a positive economic impact for those employed at the site. There is sufficient available housing to meet likely fluctuations in the MTW work force. The no-action alternative would include a negative socioeconomic impact, as decontamination and decommissioning activities would require fewer workers than currently employed at the site.

Noise

No change in impacts to noise levels is anticipated from the proposed action because renewal of the facility license is not an activity that would result in a noise level change. The short-term impact for the no-action alternative might be an increase in noise levels if decommissioning activities would include demolition of facilities.

Transportation

No change in impacts from transportation routes to the plant site would be anticipated to result from the proposed action. The quantity and type of shipments to and from the site are anticipated to continue at present levels, so the proposed action would not cause an increase in traffic or require an infrastructure expansion. The short-term impact for the no-action alternative would be an increase in transportation of uranium oxide ore concentrates from the MTW site to a new uranium concentration facility.

Environmental Justice

The NRC staff has reviewed the proposed action, and found that the proposed renewal of Source Material License SUB-526 would not result in a significant impact to the environment. Furthermore, the staff has not identified special circumstances indicating that the proposed action has a clear potential for offsite impacts to minority and low-income communities associated with the proposed action. Therefore, it is concluded that, consistent with the Environmental Justice analysis performed for the last license renewal of this facility in 1995 (NRC, 1995b), there is no potential for disproportionate adverse impacts to minority populations or low-income households in the surrounding communities.

4.1.1.2 Radiological

The radiological impacts of the continued operation of the Metropolis facility were assessed by calculating the radiation dose to the maximally exposed individual located at the nearest residence and the collective radiation dose to the local population living within 80 kilometers (50 miles) of the plant site. The results and methodology of the dose assessments are summarized in this section, and a detailed description of the methodology is provided in Appendix A of the 1995 EA (NRC, 1995b).

Throughout this section, the generic term "radiation dose" is used. This term means the total effective dose equivalent (TEDE), which is the sum of (1) the effective dose equivalent (EDE) from exposure to external radiation for a period of one year, and (2) the 50-year committed effective dose equivalent (CEDE) from internal exposure from the intake of radionuclides for a period of one year. The generic term radiation dose may be applied to an individual, using units of mrem per year, or as the collective radiation dose to populations, using units of person-rem per year.

Doses from Routine Airborne Releases

LATER. [Provide airborne radiological assessment summary.]

Dose to the Maximally Exposed Individual

LATER. [Provide MEI dose assessment summary.]

Dose to the Surrounding Population

LATER. [Provide surrounding population dose assessment summary.]

Doses from Aqueous Releases

LATER. [Provide aqueous release dose assessment summary.]

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Dose to the Maximally Exposed Individual from Airborne and Aqueous Emissions

The maximally exposed individuals for the atmospheric and aqueous pathways are not located in the same location; the maximally exposed individual for atmospheric emissions is located 564 meters (1,850 feet) north northeast of the Metropolis facility while the maximally exposed individual for aqueous emissions is located 8 kilometers (5 miles) down the Ohio River in Joppa, Illinois. Therefore, it is not appropriate to add the estimated radiation doses for these two receptors in order to estimate the combined radiation dose from both the atmospheric and aqueous pathways.

The Paducah Gaseous Diffusion Plant is located near the Metropolis facility. Based on data presented by USEC, Inc., the radiation dose (TEDE) to the maximally exposed individual from atmospheric emissions from the Paducah Gaseous Diffusion Plant was estimated to be 3.54×10^{-4} mSv (0.0354 mrem) per year (USEC, 2004). Therefore, the Paducah Gaseous Diffusion Plant would not contribute appreciably to the radiation dose for the Metropolis facility maximally exposed individual. In addition, the NRC staff has previously concluded that the Tennessee Valley Authority Shawnee Steam Plant located across the Ohio River from the Metropolis facility would not appreciably contribute to the radiation dose at the nearest residence (NRC, 1980).

4.1.2 Evaluation of Potential Accidents

The NRC is performing a detailed safety review of the MTW facility. This review, including consideration of potential accident scenarios, consequences, and compliance with NRC regulations, will be documented in the safety evaluation report associated with this license renewal activity.

Within the MTW facility, materials are handled that could pose a risk to public health and safety if released during accident. An accident scenario may result in releasing a higher concentration of material over a shorter time period relative to releases associated with normal operations. In accordance with NRC regulations in 10 CFR Part 70, Honeywell has conducted an integrated safety analysis (ISA) of the MTW facility. The ISA identifies potential accident sequences, designates plant features and procedures to either prevent such accidents or mitigate their consequences to an acceptable level, and describes management measures to provide reasonable assurance of the availability and reliability of the plant features and procedures. The ISA uses a hazard analysis method to identify the relevant hazards. The hazard identification process results in identification of physical, radiological or chemical characteristics that have the potential for causing harm to site workers, the public, or the environment. The hazard identification also identifies potentially hazardous conditions that have a potential impact on the discrete components of the process systems.

The results of the ISA are intended to give assurance that the potential failures, hazards, accident sequences, scenarios, and plant features and procedures have been investigated in an integrated fashion, so as to adequately consider common mode and common cause situations. Based on the available safety analysis reports, the accident scenarios with the greatest consequences were all associated with ..**LATER. [Provide summary info from ISA.]**

4.1.3 Summary of Environmental Effects of the Proposed License Renewal

The environmental impacts from the proposed license renewal at the Metropolis facility would be small and similar to those over the past 4 years since no major changes in the manufacturing process or in the production rate are anticipated.

The impacts from normal operations are expected to be very small.
LATER. [Provide summary of radiological assessment.]

4.2 Mitigating Measures

Releases of radiological or nonradiological constituents to the air, water, and soil creates an environmental impact. Honeywell has special processes to minimize the environmental impact associated with plant operations (Honeywell, 2005a). Settling ponds are used to remove contaminants from the effluent streams to reduce the volume of these constituents released to the Ohio River. The EPF removes fluoride from the main effluent stream in settling basins B through E and effluent with significant quantities of uranium is routed through settling ponds 3 and 4 to allow the uranium to settle out. A settling pond may be removed from service because of leaks, degradation of a liner, or excessive buildup of solids.

In addition to the engineering control measures such as scrubbers, air filters, and waste treatment systems, Honeywell has set action levels for the effluent monitoring program. Exceeding an action level triggers an investigation into the cause of the exceedance and may trigger corrective actions that could include shutdown. Approaches used in reduction of contaminant sources include equipment repair, cleaning, modification, replacement, and addition of effluent control equipment. Approaches used in contaminant removal include excavation of soil and disposal in permitted offsite facilities.

To reduce gaseous emissions that could contain significant quantities or uranium or hazardous chemicals, dust collectors and scrubbers are operated in series. Each emission source is operated in accordance with an operating permit issued by the IEPA. Operational and administrative controls are used to shutdown and repair the emission source to prevent violation of the air permit or excessive concentrations of radioactive materials at the restricted fence line.

4.3 Cumulative Impacts

The NRC staff has evaluated whether cumulative environmental effects could result from the incremental impacts of the SUB-526 license renewal for the MTW facility when added to relevant past, present, or reasonably foreseeable future actions in the area. The relevant other actions include the past, current, and future operation of the MTW facility (under a renewed license) and the continued operation of the nearby TVA's Shawnee power plant, the Joppa, Illinois, power plant, and USEC's Gaseous Diffusion Plant. No significant cumulative effects were identified for the area discussed as the affected environment. The MTW facility is in compliance with relevant environmental standards and regulations and NRC regulations. Further, the facility uses a formal ALARA program, routine environmental and radiation monitoring, and other planning and management measures to minimize the associated direct, indirect, and cumulative effects.

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4.4 Environmental Consequences of No Action Alternative

If the license to continue operations was not renewed, the facility would move into the decontamination and decommissioning phase. Honeywell would do a thorough survey of the site grounds and buildings and develop a detailed decontamination and decommissioning plan. Such a plan would be expected to include the decontamination of buildings, the generation and offsite shipment of significant quantities of low-level waste, and disturbance of contaminated soils.

It is expected that decontamination and decommissioning operations would result in the release of small amounts of activity to the atmosphere and the Ohio River. Specific estimates of the quantities and associated doses are not available, but the expected range could be from about the same as those associated with continued operation to one order of magnitude (a factor of 10) less. Consequently, doses to the maximally exposed individual and general population would be expected to be about the same to an order of magnitude less (NRC, 1995b).

The decontamination and decommissioning operations are expected to require fewer people, so there would be a negative socioeconomic impact when uranium conversion operations ceased.

The cessation of operations would also mean there would be no operating facility to convert uranium ore to UF_6 with a potential impact on the commercial nuclear fuel industry.

5.0 AGENCIES AND PERSONS CONSULTED

In accordance with NUREG-1748, Environmental Review Guidance for Licensing Actions Associated with NMSS Programs (NRC, 2003), the NRC staff consulted with other agencies regarding the proposed action. These consultations were intended to provide other agencies an opportunity to comment on the proposed action and to ensure that the requirements of Section 106 of the National Historic Preservation Act and Section 7 of the Endangered Species Act were met with respect to the proposed action. Consultation letters for this environmental assessment are provided in the Appendix to this environmental assessment.

5.1 State of Illinois

[Letter to be sent to State of Illinois, pending completion of radiological assessment.]

5.2 Illinois State Historic Preservation Office

[Letter sent to Illinois SHPO on 1/31/06.]

5.3 U.S. Fish and Wildlife Service

[This Enclosure is provided with letter sent to USFWS, Region 3.]

6.0 CONCLUSION

The NRC staff concludes that the proposed renewal of license SUB-526 involving the continued Honeywell operations at the MTW site in Metropolis, Illinois, will not result in a significant impact to the environment. The NRC staff concludes that the proposed action is not likely to adversely affect federally listed species or federally designated critical habitat because the facility is already built, no expansion of the facility is planned, and no changes to the facility operations are associated with the license renewal. The NRC staff finds that no historic properties will be affected by the proposed action. The proposed action can be viewed as a continuation of impacts and can be evaluated based on the previous impacts from past operations.

Airborne effluents released through stacks and liquid effluents released in the Ohio River are below regulatory limits for nonradiological and radiological contaminants.
LATER. [Provide summary of radiological assessment.] Occupational doses are also well below regulatory limits.

The environmental impacts of the proposed action have been evaluated in accordance with the requirements presented in 10 CFR Part 51. The NRC staff has determined that the renewal of license SUB-526 allowing continued Honeywell operations at the MTW facility will not have a significant impact on the human environment. No environmental impact statement is required, and a finding of no significant impact is appropriate in accordance with 10 CFR 51.31.

7.0 LIST OF PREPARERS

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M. Raddatz, Project Manager, Radiological Dose Assessment.

8.0 LIST OF REFERENCES

10 CFR Part 20. Code of Federal Regulations, Title 10, *Energy*, Part 20, "Standards for Protection Against Radiation," Subpart D, "Radiation Dose Limits for Individual Members of the Public," and Subpart E, "Radiological Criteria for License Termination."

10 CFR Part 40. Code of Federal Regulations, Title 10, *Energy*, Part 40, "Domestic Licensing of Source Material."

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APPENDICES

A. Consultation Letters