Draft Environmental Assessment for the
 Proposed Renewal of Source Material License SUB–526
 Metropolis Works Uranium Conversion Facility
 (Massac County, Illinois)

Honeywell International, Inc.
Docket No. 040-03392

October 2018

U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001
# TABLE OF CONTENTS

List of Figures .................................................................................................................................................. vii

List of Tables ....................................................................................................................................................... ix

Abbreviations and Acronyms ............................................................................................................................ xi

1 Introduction .................................................................................................................................................. 1-1
  1.1 Background ........................................................................................................................................... 1-1
  1.2 Proposed Action .................................................................................................................................... 1-4
  1.3 Purpose of and Need for the Proposed Action .................................................................................... 1-5
  1.4 Alternatives to the Proposed Action .................................................................................................. 1-5
    1.4.1 Reduced Duration Alternative ....................................................................................................... 1-5
    1.4.2 No-Action Alternative .................................................................................................................... 1-5
  1.5 Scope of the Environmental Analysis .................................................................................................. 1-6
    1.5.1 Federal and State Authorities ....................................................................................................... 1-6
    1.5.2 Basis for Review ............................................................................................................................. 1-6
    1.5.3 Issues Outside the Scope of the EA ............................................................................................... 1-7

2 Proposed Action ......................................................................................................................................... 2-1
  2.1 General Site Location .......................................................................................................................... 2-1
  2.2 Facilities and Other Site Features ..................................................................................................... 2-1
  2.3 Processes and Operations .................................................................................................................... 2-3
    2.3.1 Uranium Oxide Ore Storage, Sampling, and Preparation ............................................................. 2-5
    2.3.2 Reduction (triuranium octaoxide to uranium oxide) .................................................................... 2-5
    2.3.3 Hydrofluorination (uranium oxide to uranium tetrafluoride) ..................................................... 2-5
    2.3.4 Fluorination (uranium tetrafluoride to uranium hexafluoride) .................................................. 2-6
    2.3.5 Distillation and Product Packaging ............................................................................................... 2-6
    2.3.6 Uranium Recovery ........................................................................................................................ 2-6
    2.3.7 Industrial Chemical Storage ......................................................................................................... 2-7
    2.3.8 Gaseous and Liquid Waste Confinement and Effluent Controls .............................................. 2-7
      2.3.8.1 Gaseous Waste Confinement and Effluent Controls .............................................................. 2-7
      2.3.8.2 Liquid Waste Management .................................................................................................... 2-8
    2.3.9 Monitoring Programs .................................................................................................................... 2-10
      2.3.9.1 Effluent Monitoring Program .................................................................................................. 2-10
      2.3.9.2 Environmental Monitoring Program ..................................................................................... 2-13
    2.3.10 Ongoing or Anticipated Future Changes .................................................................................... 2-24
  2.4 Decontamination and Decommissioning .............................................................................................. 2-24
  2.5 Preliminary Staff Recommendation ..................................................................................................... 2-26

3 Affected Environment .................................................................................................................................. 3-1
  3.1 Land Use ............................................................................................................................................... 3-1
    3.1.1 MTW Site ....................................................................................................................................... 3-1
    3.1.2 Site Vicinity .................................................................................................................................... 3-2
  3.2 Transportation ....................................................................................................................................... 3-3
    3.2.1 Current Transportation Resources .............................................................................................. 3-3
    3.2.2 Current MTW Use of Transportation Resources ........................................................................ 3-5
  3.3 Geology and Soils ................................................................................................................................. 3-8
    3.3.1 Geology .......................................................................................................................................... 3-8
LIST OF FIGURES

Figure 1-1  Regional Location of the MTW Site................................................................. 1-2
Figure 1-2  Local Map of the MTW Site........................................................................ 1-3
Figure 2-1  Facility Site Features at the MTW Site............................................................. 2-2
Figure 2-2  Schematic of the Uranium Oxide to Uranium Hexafluoride Conversion Process MTW Production Process......................................................................................... 2-4
Figure 2-3  Flow Diagram for Wastewater Disposition...................................................... 2-9
Figure 2-4  Environmental Air Sampling Locations.......................................................... 2-12
Figure 2-5  Environmental Monitoring Sampling Locations for Surface Water, Sediment, Soil, and Vegetation......................................................................................... 2-14
Figure 2-6  Location of Groundwater Monitoring Wells Associated with the Calcium Fluoride Ponds..................................................................................................................... 2-22
Figure 3-1  Environmental Land Use Control Boundary and Stream Features.................. 3-9
Figure 3-2  Geologic Cross Section, Northwest to Southeast Across the Footprint of the MTW Site ....................................................................................................................... 3-10
Figure 3-3  Regional Geologic Setting.............................................................................. 3-11
Figure 3-4  Surface Water Features................................................................................. 3-13
Figure 3-5  Aerial View of the MTW Looking to the Southwest, Across U.S. Highway 45 ..... 3-32
Figure 3-6  Map of Block Groups Used in the Environmental Justice Analysis.................. 3-37
Figure 4-1  Locations of MTW Buildings Relative to the Nearest Offsite Residence (NR-7) .. 4-18
LIST OF TABLES

Table 1-1  Federal and State Licenses and Permits for Activities at the MTW ................................. 1-6
Table 2-1  Industrial Chemical Maximum Quantities at MTW ........................................................ 2-7
Table 2-2  Uranium Emissions (curies) from MTW (total for all emission sources) .......................... 2-7
Table 2-3  Nonradiological Air Emissions from the MTW (metric tons) ........................................ 2-8
Table 2-4  Summary of Outfall 002 Monitoring ........................................................................... 2-13
Table 2-5  Summary of Effluent and Environmental Monitoring Programs ................................. 2-15
Table 2-6  Surface Water Monitoring Annual Averages ................................................................. 2-16
Table 2-7  Sediment Monitoring Annual Averages ........................................................................ 2-17
Table 2-8  Soil Monitoring Annual Averages, 2010–2014 .............................................................. 2-18
Table 2-9  Vegetation Monitoring Annual Averages, 2010–2014 ..................................................... 2-18
Table 2-10 Average of External Gamma Monitoring Quarterly Results (milliSieverts) a .................... 2-20
Table 3-1  Land Use Land Cover on the MTW Site ...................................................................... 3-1
Table 3-2  Illinois Department of Transportation Average Daily Traffic Count Data ..................... 3-4
Table 3-3  Traffic Fatality Data for Massac County .................................................................... 3-5
Table 3-4  Annual Shipments for MTW Operations ...................................................................... 3-5
Table 3-5  Hazard Information for MTW Process Chemicals .......................................................... 3-6
Table 3-6  Massac County, IL, and McCracken County, KY, Federally Threatened, Endangered, or Candidate Species ................................................................................ 3-19
Table 3-7  Summary of National and Illinois Ambient Air Quality Standards ............................. 3-24
Table 3-8  Massac County, IL, Estimated Stationary Point Source Emissions, 2015 (metric tons per year) .................................................................................................................. 3-25
Table 3-9 Federal Highway Administration Noise Abatement Criteria Levels ............................... 3-26
Table 3-10 NRHP-Listed or -Eligible Properties in Proximity to the MTW Site ............................. 3-29
Table 3-11 Population Trends in the Area of the MTW Site ............................................................ 3-33
Table 3-12 Minority Populations in the Area of the MTW Site ....................................................... 3-33
Table 3-13 Employment Structure by State and County ............................................................. 3-34
Table 3-14 Median Household Income in the Area of the MTW Site ............................................ 3-34
Table 3-15 Personal Income in the Area of the MTW Site ............................................................ 3-34
Table 3-16 Poverty Rates in the Area of the MTW Site ................................................................. 3-35
Table 3-17 Comparison of Minority and Poverty Status in the Area of the MTW Site ................ 3-36
Table 3-18 Occupational Exposure ......................................................................................... 3-40
Table 3-19 Low-Level Radioactive Waste Annual Generation Rate, 2010–2016 ............................ 3-41
Table 4-1 Estimated Highway and Rail Fatalities ....................................................................... 4-2
Table 4-2 Impacts to Federally Listed Species ............................................................................. 4-10
Table 4-3 Summary of Monitoring Results of Total Uranium, 2001–2004 ..................................... 4-20
Table 6-1 Documentation—Agencies and Persons Consulted ...................................................... 6-2
ABBREVIATIONS AND ACRONYMS

ADAMS Agencywide Documents Access and Management System
AEP American Electric Power Company
ALARA as low as reasonably achievable
APE area of potential effect
BNSF Burlington Northern Santa Fe
°C degree Celsius
CAAPP Title V Clean Air Act Permit Program
CAP-88 Clean Air Act Assessment Package–1988
CFR Code of Federal Regulations
DOE U.S. Department of Energy
EA environmental assessment
EF Enhanced Fujita
ELUC environmental land use control
ENERCON Enercon Services, Inc.
EPA U.S. Environmental Protection Agency
EPF Environmental Protection Facility
ER environmental report
ESA Endangered Species Act of 1973, as amended
°F degree Fahrenheit
FMB feed materials building
ft³/s cubic feet per second
GCRP U.S. Global Change Research Program
GHG greenhouse gas
Honeywell Honeywell International, Inc.
IAC Illinois Administrative Code
IEPA Illinois Environmental Protection Agency
IL Illinois
IPaC Information for Planning and Consultation
ISA Integrated Safety Analysis Summary
KAR Kentucky Administrative Regulations
KHC Kentucky Heritage Council
kph kilometer per hour
KY Kentucky
LBCS Land-Based Classification Standards
μCi/ml microcuries per milliliter
μg/g micrograms per gram
m³/s cubic meter per second
mg/L milligrams per liter
mph mile per hour
mrem millirem
mrem/yr millirem per year
mSv milliSieverts
mSv/yr milliSievert per year
MTW Metropolis Works Plant
NEPA National Environmental Policy Act of 1969, as amended
NHPA National Historic Preservation Act
NMSZ New Madrid seismic zone
NPDES National Pollutant Discharge Elimination System
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>NR</td>
<td>nearest residence</td>
</tr>
<tr>
<td>NRC</td>
<td>U.S. Nuclear Regulatory Commission</td>
</tr>
<tr>
<td>PGDP</td>
<td>Paducah Gaseous Diffusion Plant</td>
</tr>
<tr>
<td>PM$_{2.5}$</td>
<td>particulate matter less than 2.5 micrometers in diameter</td>
</tr>
<tr>
<td>PM$_{10}$</td>
<td>particulate matter less than 10 micrometers in diameter</td>
</tr>
<tr>
<td>ppm</td>
<td>parts per million</td>
</tr>
<tr>
<td>PSD</td>
<td>prevention of significant deterioration</td>
</tr>
<tr>
<td>RAI</td>
<td>request for additional information</td>
</tr>
<tr>
<td>RCRA</td>
<td>Resource Conservation and Recovery Act</td>
</tr>
<tr>
<td>SER</td>
<td>safety evaluation report</td>
</tr>
<tr>
<td>SHPO</td>
<td>State Historic Preservation Office</td>
</tr>
<tr>
<td>STF</td>
<td>surface treatment facility</td>
</tr>
<tr>
<td>SUB-526</td>
<td>Source Materials License SUB-526</td>
</tr>
<tr>
<td>TEDE</td>
<td>total effective dose equivalent</td>
</tr>
<tr>
<td>TLD</td>
<td>thermoluminescence dosimeter</td>
</tr>
<tr>
<td>TSS</td>
<td>total suspended solids</td>
</tr>
<tr>
<td>TVA</td>
<td>Tennessee Valley Authority</td>
</tr>
<tr>
<td>USACE</td>
<td>U.S. Army Corps of Engineers</td>
</tr>
<tr>
<td>USFWS</td>
<td>U.S. Fish and Wildlife Service</td>
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</tbody>
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1 INTRODUCTION

On February 8, 2017, Honeywell International, Inc. (Honeywell) submitted an application and accompanying environmental report (ER) (Honeywell 2017a; ENERCON 2017) to the U.S. Nuclear Regulatory Commission (NRC) to request renewal of Source Materials License SUB-526 (SUB-526) for a period of 40 years in accordance with Title 10 of the Code of Federal Regulations (10 CFR) 40.43, “Renewal of Licenses.” The NRC issued the current license in May 2007 for a 10-year period. Under the conditions of the license, Honeywell operates a uranium hexafluoride processing plant at the Metropolis Works Plant (MTW), located about 1.6 kilometers (1.0 mile) west of Metropolis, Illinois (IL), in Massac County. The NRC staff accepted the Honeywell license application for detailed technical review in May 2017, determining that the application contained sufficient information to conduct a detailed environmental and safety review (NRC 2017a). The NRC issued a formal request for additional information on October 25, 2017 (NRC 2017d), and Honeywell provided responses to that request on January 22, 2018 (Honeywell 2018a).

The purpose of this environmental assessment (EA) is to assess the potential environmental impacts of the proposed license renewal and of reasonable alternatives while reflecting regulatory changes and operational and environmental experience obtained during the most recent 10 years of facility operation. The NRC prepared this EA following NRC regulations in 10 CFR Part 51, “Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions,” that implement the National Environmental Policy Act of 1969 (NEPA), as amended (Title 42 of the United States Code (42 U.S.C.) § 4321 et seq.), and pursuant to NRC staff guidance in NUREG-1748, “Environmental Review Guidance for Licensing Actions Associated with NMSS Programs,” issued August 2003 (NRC 2003).

In parallel with the ER described in this EA, the NRC is performing its detailed safety analysis to assess compliance with applicable regulations 10 CFR Part 20, “Standards for Protection Against Radiation,” and 10 CFR Part 40, “Domestic Licensing of Source Material.” The NRC’s safety analysis will be documented in a separate safety evaluation report (SER). The NRC decision whether to renew the Honeywell license as proposed will be based on the results of the NRC’s review, as documented in this EA and in the SER.

In early 2018, Honeywell, in response to market conditions, decided to temporarily idle the production of uranium hexafluoride and placed the MTW in a “ready idle” status. Honeywell is maintaining minimal operations to support a future restart when market conditions improve (Honeywell 2018b). When this EA identifies “current” or “existing” plant conditions, it refers to the conditions that can be observed when the plant is fully operational.

Note that in this document, the term “MTW” refers to the uranium hexafluoride processing plant and its support facilities, while the term “MTW site” refers to the 405-hectare (1,000-acre) Honeywell-owned property where the MTW is located.

1.1 Background

The MTW is located on a site of about 405 hectares (1,000 acres) of land in a mostly undeveloped, rural region of forested and cultivated areas. The MTW site is bordered on the north by U.S. Highway 45 and on the south by the Ohio River, as shown in Figures 1-1 and 1-2. The site is bordered on the west by a coal blending plant and on the east by privately developed land (ENERCON 2017). As shown in Figure 1-2, the MTW occupies a small portion of the site, which is otherwise predominantly undeveloped forestland.
Figure 1-1 Regional Location of the MTW Site (Source: ENERCON 2017)
Figure 1-2  Local Map of the MTW Site (Source: Honeywell 2018a)
The initial facility was constructed in 1958, and uranium hexafluoride was first produced in 1959 as part of a 5-year contract for conversion services with the former Atomic Energy Commission. The conversion contract was completed in 1964, and the conversion process was suspended. Because of increasing demand for uranium hexafluoride, the facility was rehabilitated in 1967 with commercial conversion services beginning in 1968. From 1968–1969, the annual capacity of the facility reached about 9,000 metric tons (9,920 tons). The operator increased the annual capacity to 11,500 metric tons (12,677 tons) in 1975 and again to 12,700 metric tons (13,999 tons) in 1995. The licensee reengineered the facility in 2001 and 2007 to increase capacity to 14,000 metric tons (15,432 tons) and 15,000 metric tons (16,535 tons), respectively. To date, the highest production conducted is about 13,000 metric tons (14,330 tons) (Honeywell 2016). In 2013, Honeywell completed additional upgrades to the MTW to reduce the risks to human health and the environment from a seismic or high wind/tornado event (NRC 2014a). Section 2.2 of this EA describes such seismic and high wind/tornado upgrades.

1.2 Proposed Action

In its application (Honeywell 2017a), Honeywell has requested authorization and provided a justification to continue licensed activities at its Metropolis, IL, facility for a 40-year period. In accordance with the provisions of 10 CFR Part 40, the current license authorizes Honeywell to receive, possess, store, use, and ship source material. Under this proposed action, Honeywell would continue conversion of uranium ore concentrates, also known as yellowcake, to gaseous fluorine and uranium hexafluoride at an authorized capacity not to exceed 15,000 metric tons (16,535 tons). Honeywell would then ship the uranium hexafluoride to enrichment facilities for further processing into enriched uranium. The primary processing steps include feed ore sampling and preparation, triuranium octaoxide reduction, uranium oxide hydrofluorination, uranium tetrafluoride fluorination, and uranium hexafluoride distillation (product purification). These process steps are conducted in a sequential manner, with recycling used only for the recovery of uranium from secondary process streams. Current MTW major facilities and operations include the following:

- a storage area for uranium ore concentrates received from uranium recovery facilities
- a uranium sampling facility
- a bulk storage area for process chemicals, such as aqueous ammonia, sodium hydroxide, potassium hydroxide, ammonium hydroxide, anhydrous hydrogen fluoride, potassium bifluoride, sulfuric acid, and liquid hydrogen
- a facility for the production of uranium hexafluoride from yellowcake
- a facility for electrolytic production of gaseous fluorine from hydrogen fluoride
- treatment systems and storage ponds for liquid wastes

In its license renewal request, Honeywell is proposing no changes in how it processes uranium ore, and no planned significant changes in the MTW’s authorized operations during the proposed 40-year license period. Should the NRC approve the license renewal, Honeywell may in the future decide that operational changes are necessary. Before making any such change to

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1 In the case of processing at Honeywell, source material is generally material containing uranium that is not enriched in the isotope of uranium-235 above that found in nature.
the site, structures, processes, systems, equipment, components, computer programs, or personnel activities, Honeywell must determine in accordance with 10 CFR 40.44, “Amendment of Licenses at Request of Licensee,” whether a license amendment is required at that time. In cases where a license amendment is required, Honeywell would submit the request to the NRC, who would perform an EA and safety analysis at that time.

Because Honeywell is proposing continued operations, it is currently not required to submit or have in place an approved detailed site decommissioning plan for the MTW; however, in accordance with 10 CFR 40.36, “Financial Assurance and Recordkeeping for Decommissioning.” Honeywell has submitted a decommissioning funding plan that includes a decommissioning cost estimate (ENERCON 2016) that must be updated at intervals not to exceed 3 years. Chapter 4 of this EA includes a general assessment of the potential environmental impacts of decommissioning the entire site as part of its assessment of the impacts of the proposed action. The NRC would complete additional NEPA documentation in conjunction with its review of a detailed site decommissioning plan for the MTW.

Chapter 2 of this EA, which describes the proposed action, provides more detail regarding the manufacturing process and the facilities used to support these processes.

1.3 Purpose of and Need for the Proposed Action

The purpose of granting the license renewal is to enable Honeywell to continue its production of uranium hexafluoride for enrichment and, ultimately, fuel manufacturing. The need for NRC action is to ensure the safe use of radioactive materials in accordance with the NRC’s authority under the Atomic Energy Act. Currently, the MTW is the sole uranium hexafluoride conversion facility operating within the United States. Were the NRC to deny a renewal of the license, enrichment facilities in the United States would be reliant entirely on foreign sources of uranium hexafluoride.

1.4 Alternatives to the Proposed Action

This EA presents and analyzes two alternatives: (1) an alternative that allows the license renewal of SUB-526 for a period of less than 40 years, called the reduced duration alternative, and (2) the no-action alternative, which is the denial of the license renewal application.

1.4.1 Reduced Duration Alternative

Under the reduced duration alternative, the NRC would approve a license renewal period that is less than 40 years. For previous renewals of SUB-526, the NRC approved license periods of 10 years. In 2016, the NRC approved a recommendation to increase the standard of a 10-year licensing period to a 15-year licensing period for materials licenses (NRC 2016a, 2016b). Based on the environmental and safety reviews of Honeywell’s application, under this alternative the NRC could decide to approve a renewal period for SUB-526 consistent with the last renewal (10 years), the newly adopted 15-year license renewal period, or another time period that the NRC could decide is justifiable. This EA analyzes impacts for this alternative in relation to the proposed action.

1.4.2 No-Action Alternative

Under the no-action alternative, the NRC would not approve Honeywell’s requested renewal of the MTW license. The alternative of no license renewal for the MTW would mean cessation of
conversion and manufacturing and commencement of decontamination and decommissioning of the facility. Accordingly, Honeywell would need to submit and the NRC would need to review and approve a decommissioning plan.

### 1.5 Scope of the Environmental Analysis

#### 1.5.1 Federal and State Authorities

The NRC has authorized Honeywell to conduct activities at the MTW in accordance with the license conditions in SUB-526 issued under 10 CFR Part 40. In addition to this EA, NRC staff is preparing an SER addressing Honeywell’s compliance with the provisions in 10 CFR Parts 20 and 40. In preparing this EA and the SER, the NRC will have evaluated the potential impacts to public health and safety and the environment associated with the proposed continuation of licensed operations at the MTW site for 40 years. The NRC decision on the proposed action will be based on the results of both the EA and SER.

Other Federal and State agencies have authority over different aspects of the activities taking place at MTW through licenses and permits. Table 1-1 summarizes the major Federal and State agency licenses and permits issued to Honeywell for activities at the MTW.

<table>
<thead>
<tr>
<th>Agency</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRC</td>
<td>Radioactive Source Materials License SUM-526. Licenses the possession and use of radioactive source material.</td>
</tr>
<tr>
<td>U.S. Environmental Protection Agency (EPA)</td>
<td>Resource Conservation and Recovery Act (RCRA) (ID ILD006278170). Identifies Honeywell as a large quantity generator of hazardous and mixed waste. Toxic Substances Control Act (ID 100606388). Requires reporting, recordkeeping and testing requirements, and restrictions relating to chemical substances and/or mixtures.</td>
</tr>
<tr>
<td>Illinois Environmental Protection Agency (IEPA)</td>
<td>RCRA permit (#B-65R2-M-17). Regulates the Environmental Protection Facility (EPF) calcium fluoride ponds (Ponds B, C, D, and E) and storage of drummed hazardous waste on the waste storage pad. National Pollutant Discharge Elimination System (NPDES) permit (No. IL 0004421). Effective through June 30, 2020. Regulates liquid effluent releases to the Ohio River through three outfalls. Title V Clean Air Act permit (ID No. 127854AAD). Issued in December 2016. Regulates emissions to the air.</td>
</tr>
</tbody>
</table>

#### 1.5.2 Basis for Review

The NRC prepared this EA in accordance with the requirements of 10 CFR Part 51 and staff guidance found in NUREG-1748.

The NRC reviewed and considered the following documents in the development of this EA:

- Honeywell license application, dated February 8, 2017 (Honeywell 2017a) and accompanying ER (ENERCON 2017)
• Honeywell responses to NRC requests for additional information (Honeywell 2018a, 2018c)
• Honeywell’s RCRA closure plan for the onsite surface impoundments referred to as Ponds B through E (Honeywell 2018d)
• selected previous NRC environmental review documents for the MTW site (NRC 2006a, 1995)
• information gathered from NRC site visits (NRC 2017b)
• other publicly available documents and databases as referenced in this EA

Previous License Renewal Environmental Analyses

Because the Atomic Energy Commission had licensed the MTW in 1958, prior to the implementation of NEPA, no environmental review was performed for the construction and initial operation of the MTW. However, since 1958, the NRC has evaluated multiple license renewals for the continued operation of the MTW, which included environmental reviews as follows:

• Environmental Impact Appraisal of the Allied Chemical Corporation Nuclear Services Division Uranium Hexafluoride Conversion Facility Metropolis, Illinois, August 1977 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16236A155)
• Environmental Impact Appraisal for Renewal of Source Material License No. SUB-526, NUREG-1071, issued May 1984 (ADAMS Accession No. ML16236A154)
• Environmental Assessment for Renewal of Source Material License No. SUB-526 Docket 40-3392, April 10, 1995 (ADAMS Accession No. ML16231A195)
• Environmental Assessment for Renewal of Source Material License No. SUB-526 for the Honeywell Specialty Materials Metropolis Work Facility, June 2006 (ADAMS Accession No. ML061780260)

1.5.3 Issues Outside the Scope of the EA

As discussed further below, the NRC determined the following listed areas to be outside the scope of this EA:

• material control and accountability
• criticality safety controls
• equipment failures
• plant building stability
• seismic risk analysis (likelihood)
• accidents (in part)
• safety culture
• terrorism
• license violations
• NRC enforcement actions
The potential environmental impacts from postulated accidents are addressed in Chapter 4. To the extent that postulated accidents raise safety issues, such issues would be addressed in the SER.

Through an NRC Confirmatory Order, Honeywell was subject to an assessment of its safety culture as conducted by an independent organization (NRC 2015a). In 2015, the NRC issued a report on the safety culture at the MTW (NRC 2015b). In response to this assessment and in compliance with the Confirmatory Order, Honeywell made changes to strengthen the safety culture at the site; these actions are subject to NRC oversight. Safety culture at the MTW is evaluated as part of the NRC staff’s safety review, as documented in the SER.

Concerning terrorism, it is the NRC’s position that NEPA does not require analysis of the potential environmental impacts associated with acts of terrorism. While the NRC recognizes that the United States Court of Appeals for the Ninth Circuit ruled to the contrary, the NRC has determined not to analyze the potential environmental impacts of terrorism when the proposed action is located outside the jurisdiction of that court (see Commission Memorandum and Orders CLI-07-08, CLI-07-09, and CLI-07-10, ADAMS Accession Nos. ML070570511, ML070570526, ML070570736, all dated February 26, 2007) (NRC 2007a, 2007b, 2007c). Because the geographic location of the MTW site is not within that court’s jurisdiction, this EA does not address the environmental impacts of terrorist acts.

The remaining topics listed above concern aspects of facility design and operation; as such, the NRC staff addresses them in its safety review, as documented in the SER, and addresses only their environmental effects in this EA.
2 PROPOSED ACTION

This chapter describes the site and ongoing activities at the MTW that comprise the proposed action. As discussed previously, Honeywell requests renewal of its NRC license for a period of 40 years. Sections 1.3.1 and 1.3.2 discuss two alternatives to the proposed action, the reduced duration alternative and the no-action alternative, respectively. Unless otherwise referenced, the primary source of information is the ER submitted as part of the license application (ENERCON 2017).

2.1 General Site Location

The MTW is situated on about 405 hectares (1,000 acres) of mostly forested land. As stated in Chapter 1 of this EA, the MTW is bordered on the north by U.S. Highway 45 (with a small portion of the site extending beyond Highway 45), on the south by the Ohio River, on the west by a coal blending plant, and on the east by privately developed land (Figure 1-1 in Chapter 1 of this EA). The restricted area, shown in Figure 1-2 in Chapter 1 of this EA, is a 24-hectare (59-acre) area that is secured by two security fences. U.S. Highway 45 provides access to the site. A railroad parallels the highway with a spur entering the MTW site. The Metropolis Municipal Airport is about 1.6 kilometers (1 mile) north-northeast of the MTW site.

The MTW is located at 2768 North U.S. 45 Road, approximately 400 meters (1,300 feet) from the northeast corner of the outer fence to the city limits of Metropolis, IL (Honeywell 2018a, Response to Request for Additional Information (RAI) PA-6). Farther east of Metropolis is Brookport, IL, which is about 12.1 kilometers (7.5 miles) from the MTW site. Joppa, IL, is located downstream on the Ohio River, about 8.9 kilometers (5.5 miles) west of the MTW site. Paducah, KY, is about 17.7 kilometers (11 miles) southeast of the MTW site, upstream and across the Ohio River. Kevil, KY, is about 14.5 kilometers (9 miles) southwest of the MTW site.

The nearest resident is 538 meters (1,765 feet) north-northeast from the center of the MTW site. The nearest lodging is 3.6 kilometers (2.3 miles) southeast of the MTW. The nearest school is 3 kilometers (1.9 miles) southeast of the MTW site.

Section 2.2 and 2.3 describe the MTW and the processes it supports.

2.2 Facilities and Other Site Features

The restricted area within which access to the site is controlled is located between U.S. Highway 45 and the Ohio River (Figure 2-1). All process, support, storage, and treatment buildings and facilities are located within the restricted area. The primary process buildings in the restricted area include the feed materials building (FMB) and associated pads, wet process/sodium removal building, potassium hydroxide muds building, and sampling plant.

Support facilities include the ore storage building, ore sampling building, bed material filter fines building, pond muds filter calciner building, cylinder wash building, drum dumping building where yellowcake was removed from the drums, gaseous fluoride plant building, south gaseous fluoride plant, liquid nitrogen facility, calcium fluoride building, liquid hydrogen system, powerhouse, drum shredder building, and drum crusher.

Storage and treatment facilities include five ore storage pads, the RCRA hazardous waste storage buildings, uranium hexafluoride cylinder storage area, long-term cylinder storage area,
environmental protection facility (EPF), sanitary wastewater treatment facility, uranium settling Ponds 3 and 4, and calcium fluoride Ponds B, C, D, and E (only Pond D is active).

Figure 2-1  Facility Site Features at the MTW Site  (Honeywell 2018a)
Section 2.3 presents these facilities.

Honeywell has made several upgrades and modifications to the process facilities and site infrastructure since 2006, when the NRC published the last license renewal EA. These upgrades and modifications are listed below.

- The existing EPF was expanded in 2006 with the construction and completion of the surface treatment facility (STF). This expansion increased the capacity of the existing EPF and added an additional clarifier and sand filter. The STF is considered part of the EPF.

- Outdated oil-cooled rectifiers in the fluoride production facility were replaced with new water-cooled units.

- A new cooling tower was installed to cool the waste heat from the new rectifiers before discharging to the Ohio River.

- A new sewage treatment facility was put into operation in 2015.

- Seismic/tornado protection upgrades were completed in 2013. These upgrades strengthened the FMB structure, piping supports, and vessel restraints to prevent possible releases of uranium hexafluoride and hydrogen fluoride; increase the protection of the liquid uranium hexafluoride inventory through implementation of seismic actuated shutoff valves and tornado missile shielding; and provide additional measures to confine the distillation area to reduce the release rate of any uranium hexafluoride and hydrogen fluoride releases (NRC 2013b, 2014a).

- The process used to produce hydrogen gas from catalytic cracking of aqueous ammonia was replaced with vendor-supplied liquid hydrogen, eliminating a nonradiological air emission source.

The NRC has taken these upgrades and modifications into account when applicable in determining the impacts identified in Chapter 4 of this EA. No other major upgrades or mitigation systems are anticipated for the proposed license renewal term (Honeywell 2018a, Response to RAI PA-3).

Also, on the MTW site is an inactive landfill (shown in Figure 2-1) and a site near the landfill called the “Old Creosoter Area,” which was a wood treatment facility that predates the establishment of the MTW (IEPA 2015b). These areas are located in the northeast portion of the property and are approximately 4.5 hectares (11 acres). According to Honeywell, the landfill received waste in the form of empty drums from around 1959–1998, and disposal took place on an as-needed basis. Honeywell is currently working with the Illinois Environmental Protection Agency (IEPA) to certify closure of the landfill (Honeywell 2018a, Response to RAI LU-1).

2.3 Processes and Operations

Figure 2-2 provides a schematic of the production process, followed by information describing the production process at MTW.
Figure 2-2  Schematic of the Uranium Oxide to Uranium Hexafluoride Conversion Process MTW Production Process  (Source: ENERCON 2017)
2.3.1 Uranium Oxide Ore Storage, Sampling, and Preparation

Uranium oxide ore concentrates, often referred to as yellowcake, are shipped to the plant via truck in 208-liter (55-gallon) drums and stored on site on asphalt pads. About 650 uranium oxide ore shipments are received each year and approximately 30,000 metric tons (33,000 tons) of ore are currently stored on site. Each drum is transported to the sampling plant where it is weighed, and a representative sample is collected to determine the general composition of the ore and to characterize impurities in the ore sampling building. After sampling, the drum lid is replaced, and the drum is then moved to a storage area until needed as process feed.

Feed containing high levels of sodium or potassium is leached with sulfuric acid. Uranium feed is removed from the rinse solution by filtration and transferred to the ore preparation system. The filtered rinse solution is pumped to uranium settling Ponds 3 and 4 and some particulates are released to the atmosphere. Ore with an acceptable purity level is calcined, crushed, and sized to produce uniform solid particles, which are processed in fluidized bed reactors. Ventilation air from the feed preparation building is filtered before release to the atmosphere at an efficiency greater than 95 percent (Honeywell 2018a, Response to RAI PA-10A). Solid waste filter bags are produced in this operation. The contaminated liquid stream produced in drum washing is routed to uranium settling Ponds 3 and 4.

2.3.2 Reduction (triuranium octaoxide to uranium oxide)

The initial step in the conversion process is reduction of solid triuranium octaoxide to solid uranium oxide, which is accomplished by contacting feed triuranium octaoxide with hydrogen gas in a fluidized bed reactor at 565 degrees Celsius (°C) (1,050 degrees Fahrenheit (°F)) in the FMB. A liquid hydrogen system maintained by a vendor is used as a source of hydrogen, with the tank located to the west of the FMB, next to the STF. The liquid hydrogen system is located within a gated enclosure south of the maintenance building and consists of a 68,100-liter (18,000-gallon) cryogenic storage tank and vaporizers. A nitrogen/hydrogen mixing station, located outside the liquid hydrogen system fence, provides fluidizing and reactive gas mixtures to the reactor. Four hydrogen gas analyzers are placed in and around the fenced area to monitor for leaks. If two or more detectors sense a leak exceeding action levels, the hydrogen supply automatically shuts down. Reduction off-gases consist of hydrogen sulfide, hydrogen, nitrogen, and metallic sulfides. These are processed through a gas-fired incinerator to burn off the excess hydrogen and convert hydrogen sulfide and other sulfides. The off-gas is run through a sintered metal filter bowl to remove the particulates from the stream. The stream is processed through a gas-fired incinerator to produce carbon dioxide, which then exits the incinerator stack (Honeywell 2018a, Response to RAI PA-10B).

2.3.3 Hydrofluorination (Uranium Oxide to Uranium Tetrafluoride)

In the FMB, solid uranium oxide is converted to solid uranium tetrafluoride by contacting the uranium oxide with gaseous hydrogen fluoride in two series-arranged fluidized bed reactors. The hot (455°C (851°F)) reactor off-gas is filtered and scrubbed with water, then scrubbed with potassium hydroxide solution before release to the atmosphere. The spent scrubber liquid is processed through the EPF for neutralization and recovery of fluorine as calcium fluoride. The uranium tetrafluoride solids filtered from the off-gas are combined with the uranium tetrafluoride product stream for transfer to fluorination reactors.
2.3.4 Fluorination (Uranium Tetrafluoride to Uranium Hexafluoride)

The final chemical reaction in the conversion process is fluorination of solid uranium tetrafluoride in the FMB using fluorine gas to generate gaseous and then liquid uranium hexafluoride. The gaseous fluorine is produced by decomposition of hydrogen fluoride in electrolytic cells located in a building near the FMB. The fluorination reaction is accomplished at a temperature of 480°C (900°F) in a fluidized bed containing calcium fluoride bed material. The bed material, which gradually becomes too fine and contaminated with uranium, 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 on site, as described in Section 2.3.6 below, or shipped off site for uranium recovery. The reactor effluent gas stream containing the uranium hexafluoride product is passed through two filters in series and three cold traps in series. The uranium hexafluoride is condensed in the cold traps to create liquefied crude uranium hexafluoride that is transferred to the distillation area.

Gases exiting the cold traps are scrubbed with potassium hydroxide solution in series-arranged spray and packed towers. 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 potassium hydroxide, and recovery of fluorine as calcium fluoride. Filtered and scrubbed off-gases (primarily hydrogen fluoride) are released to the atmosphere.

2.3.5 Distillation and Product Packaging

In the FMB, impurities are removed from the liquefied crude uranium hexafluoride in two series-arranged distillation columns. Crude uranium hexafluoride 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 uranium hexafluoride product that meets or exceeds ASTM C787, “Standard Specification for Uranium Hexafluoride for Enrichment,” purity requirements are collected in the overheads. Each column is fitted with temperature and pressure indicators, a relief valve, and a rupture disk to prevent accidental release of uranium hexafluoride. Gaseous effluents from the distillation process are fed back to the fluorination system and treated with the fluorination off-gas. The purified product uranium hexafluoride vapor is condensed and transferred as liquid to cylinders for shipment. Flow meters are used to measure the amount of uranium hexafluoride transferred to the cylinders, and the uranium hexafluoride entering the cylinders is continuously sampled. On occasion, filled cylinders are heated in a steam chest for vaporization and sampling. The filled cylinders are moved to cooling and storage areas.

2.3.6 Uranium Recovery

Fluorinator filter fines and bed material, solids from settling Ponds 3 and 4, and process liquids may be routed and 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 ore preparation. The spent liquid is transferred to the EPF, just north of the FMB, for neutralization and fluoride recovery.
2.3.7 Industrial Chemical Storage

The primary industrial chemicals used in the conversion process, sulfuric acid, aqueous ammonia, potassium hydroxide, sodium hydroxide, liquid hydrogen, potassium bifluoride, and hydrogen fluoride, are stored on site. Table 2-1 summarizes the tank storage capacities and quantity of chemicals stored. Sulfuric acid, potassium hydroxide, and sodium hydroxide are stored as liquids in horizontal tanks just south of the ore storage building; centrifugal pumps transfer these chemicals to the process, as needed. Honeywell had previously stored ammonia as a liquid under pressure, but it currently is not used in the manufacturing process; it has been replaced with aqueous ammonia (Honeywell 2018a, Response to RAI POH-2). Anhydrous hydrogen fluoride is stored on site in railcars (up to seven), with one railcar connected to the process at a given time (on the southeast side of the FMB, between the FMB and ore storage building) and is transferred to the process under inert gas pressure.

Table 2-1 Industrial Chemical Maximum Quantities at MTW

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Storage Tank Capacity (kilograms (pounds))</th>
</tr>
</thead>
<tbody>
<tr>
<td>29 percent aqueous ammonia</td>
<td>45,115 (99,461)a</td>
</tr>
<tr>
<td>Anhydrous hydrogen fluoride</td>
<td>1,100,000 (2,400,000)b</td>
</tr>
<tr>
<td>45 percent potassium hydroxide</td>
<td>177,290 (390,850)c</td>
</tr>
<tr>
<td>20 percent sodium hydroxide</td>
<td>74,658 (164,592)d</td>
</tr>
<tr>
<td>93 percent sulfuric acid</td>
<td>59,940 (132,145)e</td>
</tr>
<tr>
<td>Liquid hydrogen</td>
<td>4,182 (9,219)f</td>
</tr>
<tr>
<td>Potassium bifluoride</td>
<td>9,090 (20,000)</td>
</tr>
</tbody>
</table>

a 95 percent volume in tank U-467. Shipments received in the anhydrous form.
b Contained in up to seven 80-ton railroad cars inside the restricted area fence; up to eight 80-ton railroad cars outside the restricted area fence.
c 104,710 kilograms (230,850 pounds) 95 percent volume in storage tank U-436 and one 80-ton railcar inside of the restricted area fence.
d 95 percent volume in Tank U-28.
e 95 percent volume in Tanks U-440, U-852, and U-921.
f Vendor-supplied storage tank.
Sources: Honeywell 2018a, Response to RAI TRN-1; ENERCON 2017, Table 2.1-1

2.3.8 Gaseous and Liquid Waste Confinement and Effluent Controls

2.3.8.1 Gaseous Waste Confinement and Effluent Controls

The MTW has 53 individual stacks and exhaust fans used for the release of radioactive material and 14 emission units for the release of nonradioactive material. These emission sources are at various elevations, with most of the emission sources associated with operations in the FMB. Stack heights at the MTW range from 3 meters (10 feet) for the FMB first floor exhaust fan to 47 meters (154 feet) for the hydrogen sulfide incinerator stack located on the southwest side of the FMB. Table 2-2 presents the annual uranium emissions combined for all emission points for five recent years of operation (2010 through 2014).

Table 2-2 Uranium Emissions (curies) from MTW (total for all emission sources)

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>0.0836</td>
<td>0.0779</td>
<td>0.0471</td>
<td>0.0594</td>
<td>0.255</td>
</tr>
</tbody>
</table>

Source: ENERCON 2017
Gaseous effluents from the MTW contain both radioactive and nonradioactive constituents. Uranium is the primary radiological constituent released through the MTW’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 as low as is reasonably achievable (ALARA).

The ventilation system used in the FMB process area consists of a series of 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 exchange approximately once every 5 minutes. A separate air-conditioning system supplies fresh air to the main control room. The control room is kept under a slight positive pressure.

Four process stacks on site are associated with the uranium recovery system and the drum dumping building. There are no stacks associated with the calcium fluoride facility that are monitored for uranium emissions. Hydrogen fluoride and particulates are the primary nonradiological constituents released through stacks on the FM. Gaseous effluent streams containing nonradioactive pollutants discharge in accordance with IEPA-issued operating permits. Honeywell submits emissions reports to the IEPA in accordance with the requirements of the Title V Clean Air Act Permit Program (CAAPP) Permit (IEPA 2016a) issued December 2016 by the IEPA Division of Air Pollution Control. Table 2-3 summarizes annual nonradiological emissions from the MTW for the same five-year period.

Table 2-3  Nonradiological Air Emissions from the MTW (metric tons)

<table>
<thead>
<tr>
<th>Air Emissions</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon monoxide</td>
<td>10.53</td>
<td>13.84</td>
<td>5.42</td>
<td>3.53</td>
<td>14.65</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>Not reported</td>
<td>16,964.9</td>
<td>6,844.84</td>
<td>4,457.33</td>
<td>18,489.8</td>
</tr>
<tr>
<td>Hydrogen fluoride</td>
<td>1.73</td>
<td>2.38</td>
<td>1.12</td>
<td>1.41</td>
<td>4.19</td>
</tr>
<tr>
<td>Lead</td>
<td>5.52 x 10^{-05}</td>
<td>6.02 x 10^{-05}</td>
<td>2.91 x 10^{-05}</td>
<td>2.10 x 10^{-05}</td>
<td>6.21 x 10^{-05}</td>
</tr>
<tr>
<td>Methane</td>
<td>Not reported</td>
<td>0.32</td>
<td>0.13</td>
<td>0.08</td>
<td>0.34</td>
</tr>
<tr>
<td>Nitrous oxide</td>
<td>Not reported</td>
<td>0.04</td>
<td>0.01</td>
<td>0.01</td>
<td>0.04</td>
</tr>
<tr>
<td>Nitrogen oxides</td>
<td>12.56</td>
<td>16.47</td>
<td>6.45</td>
<td>4.20</td>
<td>17.44</td>
</tr>
<tr>
<td>Particulates</td>
<td>5.06</td>
<td>5.86</td>
<td>2.55</td>
<td>2.97</td>
<td>7.93</td>
</tr>
<tr>
<td>PM_{10}</td>
<td>5.03</td>
<td>5.86</td>
<td>2.55</td>
<td>2.97</td>
<td>7.93</td>
</tr>
<tr>
<td>PM_{2.5}</td>
<td>5.03</td>
<td>5.86</td>
<td>2.55</td>
<td>2.97</td>
<td>7.93</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>290.94</td>
<td>318.05</td>
<td>147.91</td>
<td>53.22</td>
<td>130.01</td>
</tr>
<tr>
<td>Volatile organic material</td>
<td>0.94</td>
<td>1.15</td>
<td>0.56</td>
<td>0.43</td>
<td>1.15</td>
</tr>
</tbody>
</table>

PM_{10} = particulate matter less than 10 micrometers in diameter; PM_{2.5} = particulate matter less than 2.5 micrometers in diameter.

Note: To convert metric tons to tons, multiply by 0.907.
Source: ENERCON 2017

2.3.8.2 Liquid Waste Management

Liquid waste streams generated at the MTW are categorized as low-level radioactive and nonradioactive waste streams. Each of the waste streams is recycled or treated separately. IEPA has permitted three NPDES outfalls (Outfalls 002, 003, and 005) for Honeywell’s use. Most uranium hexafluoride process-related liquid effluents from the plant discharge to the Ohio River via an unlined drainage ditch flowing from Outfall 002 (with an average discharge rate of
10.86 million liters per day (2.87 million gallons per day) in 2014). Outfalls 003 and 005 are used for nonradioactive stormwater discharges to the Ohio River, and these discharges are conveyed through the same drainage ditch. Some liquid wastes may be containerized and sent to an appropriate disposal facility. Figure 2-3 is a flow diagram showing liquid waste streams and their disposition.

Figure 2-3 Flow Diagram for Wastewater Disposition (Source: ENERCON 2017)
**Low-Level Radioactive Liquid Waste Streams and Treatment**

Low-level radioactive liquid wastes the MTW produces consist of wash water from the drum dumping building (where yellowcake is introduced into the process), ammonium sulfate process solutions from the pretreatment facility, hydrogen fluoride scrubber liquors from the hydrofluorinators, potassium hydroxide scrubbing solutions from air pollution abatement equipment, sodium hydroxide leach liquors from uranium recovery and uranium hexafluoride cylinder washing, and uranium-contaminated stormwater from the FMB area.

The potassium hydroxide scrubbing solutions are recycled, with the solids removed to recover calcium fluoride. Wash waters from the drum dumping building and ammonium sulfate solutions from the preparation process are routed to uranium settling tanks within the wet process or uranium settling ponds. Solids that have settled out in the tanks are routed to uranium recovery, while the liquids are routed to uranium settling Ponds 3 and 4. Effluent from the ponds, which averages about 95 liters per minute (25 gallons per minute), mixes with other MTW effluents and discharges to Outfall 002. Sludge from the ponds is periodically drummed and then processed in a mud calciner, drummed again, and sent either to the ore preparation building for recovery of additional uranium or to offsite disposal.

Wastewaters with significant quantities of fluoride (i.e., scrubbing liquors and uranium recovery leach liquors) are routed to the EPF for lime treatment and recovery of the fluoride as calcium fluoride, which is then routed to calcium fluoride Pond D for settling. Honeywell added the STF to the EPF in 2006 to increase its capacity (see Section 2.2 of this EA). Calcium fluoride that precipitates in Pond D or is recovered through the STF is recycled by commercial industry and used as a substitute for natural fluorspar. Effluent from Pond D discharges to Outfall 002.

**Sanitary Wastewater**

A sanitary wastewater treatment system is located on site. Treated wastewater discharges to the Ohio River through an unlined drainage ditch flowing from Outfall 002 after comingling with other waste discharges. Sanitary waste discharges are monitored for flowrate, total suspended solids, biological oxygen demand, and coliform.

2.3.9 Monitoring Programs

Monitoring programs at the MTW 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 NRC staff will include its evaluation of the occupational monitoring program in the Safety Evaluation Report to be issued for this license renewal activity. Data from the effluent and environmental monitoring programs provide the background information associated with the affected environment presented in Chapter 3 of this EA and the bases for the impact analysis presented in Chapter 4. The following subsections describe the monitoring activities in more detail.

2.3.9.1 Effluent Monitoring Program

The MTW produces gaseous and liquid effluent streams. Each of these effluent streams is monitored at or just before the point of release. Honeywell reviews the results from the gaseous and liquid radiological effluent monitoring program weekly and reports undesirable trends to plant management via ALARA meetings, quarterly health physics audits, or immediately depending on the severity of the condition. Honeywell also reports the results from the
monitoring program in the semiannual effluent reports submitted to NRC. The following paragraphs describe the monitoring programs for gaseous and liquid releases.

**Gaseous Release Monitoring**

Gaseous effluents released from the facility contain both radiological and nonradiological constituents, as described in Section 2.3.8 of this EA. Stack monitoring is the primary method used to measure gaseous effluents containing uranium. MTW workers sample these release points continuously at isokinetic flow conditions using particulate filters to capture the uranium. Stack samples with higher loading potential (based on process evaluations and 45 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. When the investigation limit is exceeded on three successive samples, plant workers conduct an informal investigation and take corrective actions to decrease emissions. If the corrective action does not remedy the situation, additional actions are taken, including shutdown of the unit. In accordance with the requirements of 10 CFR 40.65(a), Honeywell submits the results of the effluent monitoring analyses to the NRC in semiannual monitoring reports (see Table 2-2 in this EA for a summary of the annual uranium air emissions from 2010 through 2014). The investigation level for gaseous uranium emissions is based on the average of four continuous air samples collected along the restricted area fence line. The samples are collected and analyzed for trends on a weekly basis. The investigation level is established as a quarterly uranium concentration that would produce an annualized dose of 0.1 milliSieverts (mSv) (10 millirem (mrem)).

Uranium in the air is monitored at air sampling location NR-7, located adjacent to the nearest residence downwind of the MTW (see Figure 2-4). MTW workers collect the NR-7 air sample weekly, except for those periods required for disassembly or repair. If the average concentration of total alpha radioactivity (the sum of natural uranium, radon-226, and thorium-230) measured from samples collected from location NR-7 exceeds $3.0 \times 10^{-14}$ microcuries per milliliter ($\mu$Ci/ml) over any calendar quarter, then within 30 days, Honeywell 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 action level was developed to ensure the dose for the maximally exposed individual of the general public is a small fraction of the NRC’s 1.0-mSv (100-mrem) annual limit in accordance with 10 CFR 20.1301, “Dose Limits for Individual Members of the Public,” and to provide assurance that facility operations will have no significant impact on public health and safety. Samples taken at sampling location NR-7 are also composited at least quarterly and analyzed for uranium solubility.
Liquid Release Monitoring

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

Honeywell continuously samples the Outfall 002 effluent 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 detection limit for uranium is less than 0.001 part per million (ppm).

The Outfall 002 effluent is also analyzed for various parameters and numerous nonradiological constituents, including total fluorides, total suspended solids (TSS), and biological oxygen demand. Table 2-4 summarizes the NPDES permit requirements and effluent monitoring results from 2010 through 2014. During this period, the 30-day averages for TSS, total fluorides, and pH were all within the limits specified in the NPDES permit. The NPDES permit does not specify limits for total uranium or temperature (IEPA 2015a).
Table 2-4  Summary of Outfall 002 Monitoring

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow rate</td>
<td>MGD</td>
<td>N/A</td>
<td>6.53 3.51</td>
<td>6.03 3.00</td>
<td>3.92 1.92</td>
<td>7.04 2.22</td>
<td>4.13 2.87</td>
</tr>
<tr>
<td>Uranium</td>
<td>mg/L</td>
<td>N/A</td>
<td>3.63 0.59</td>
<td>2.06 0.51</td>
<td>2.06 0.33</td>
<td>3.91 0.35</td>
<td>1.94 0.34</td>
</tr>
<tr>
<td>pH</td>
<td>N/A</td>
<td>6.0 to 9.0</td>
<td>8.21 7.47</td>
<td>8.22 7.17</td>
<td>7.07 6.61</td>
<td>8.22 7.03</td>
<td>7.86 7.11</td>
</tr>
<tr>
<td>Temperature</td>
<td>°C</td>
<td>N/A</td>
<td>(c) (c)</td>
<td>24.2 20.34</td>
<td>24.8 20.54</td>
<td>22.00 18.28</td>
<td>21.90 19.73</td>
</tr>
<tr>
<td>Total fluorides</td>
<td>mg/L</td>
<td>15d 30e</td>
<td>15.96 3.28</td>
<td>8.90 3.12</td>
<td>11.60 3.06</td>
<td>26.00 3.96</td>
<td>28.00 4.98</td>
</tr>
<tr>
<td>TSS</td>
<td>mg/L</td>
<td>15d 30e</td>
<td>15.00 3.49</td>
<td>11.00 3.55</td>
<td>72.00 4.63</td>
<td>149.00 11.17</td>
<td>6.0 1.65</td>
</tr>
<tr>
<td>Biological oxygen demand</td>
<td>mg/L</td>
<td>30d 60e</td>
<td>37.00 6.22</td>
<td>18.00 4.65</td>
<td>29.00 7.73</td>
<td>21.00 5.49</td>
<td>33.00 7.79</td>
</tr>
</tbody>
</table>

a  Millions of gallons per day.
b  Milligrams per liter.
c  This parameter in this location not monitored until 2011.
d  30-day average.
e  Daily maximum.
f  Biological oxygen demand limits are specific to the sanitary wastewater before combining with the Outfall 002 discharge.

Excursions involving TSS, fluoride, fecal coliform, and temperature occurred between 2010 and 2015. Honeywell discontinued temperature monitoring in 2010. TSS excursions in 2012 and 2013 were attributed to stormwater runoff mixing with sediment from capital projects. Honeywell subsequently implemented controls to minimize the potential for additional excursions, including adding sediment filters and discharging wastewater to uranium settling Ponds 3 and 4. Fluoride excursions were attributed to leaking of trenches and an associated sump; Honeywell replaced the trenches and sump. In order to reduce fecal coliform, Honeywell has increased the frequency of routine maintenance and improved its documentation of maintenance (Honeywell 2017b).

2.3.9.2  Environmental Monitoring Program

MTW conducts an environmental monitoring program that includes sampling of sediment, soil, vegetation, surface water, and air, and measuring direct gamma radiation at locations on or near the facility. The locations of onsite air sampling points are shown in Figure 2-4 above, and the offsite sampling locations are shown on Figure 2-5 below. Table 2-5 provides a summary of the site monitoring programs.

Honeywell reviews the results from the radiological environmental monitoring program and notifies plant management of undesirable trends and results that may indicate noncompliance with applicable standards. Elements of the environmental monitoring program are described in the following paragraphs. The plant ALARA committee meets quarterly to evaluate data, identify any undesirable trends in environmental exposures, and develop investigation and action plans, as necessary.
Figure 2-5 Environmental Monitoring Sampling Locations for Surface Water, Sediment, Soil, and Vegetation (Source: ENERCON 2017)
Table 2-5  Summary of Effluent and Environmental Monitoring Programs

<table>
<thead>
<tr>
<th>Sample Medium</th>
<th>Number of Stations</th>
<th>Analytical Frequency</th>
<th>Sample Type</th>
<th>Type of Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Onsite</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air</td>
<td>6</td>
<td>Weekly for uranium;</td>
<td>Continuous</td>
<td>uranium, radon-226, thorium-230</td>
</tr>
<tr>
<td></td>
<td></td>
<td>quarterly for radon-226 and</td>
<td></td>
<td>fluoride</td>
</tr>
<tr>
<td></td>
<td></td>
<td>thorium-230</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil</td>
<td>6</td>
<td>Semiannually</td>
<td>Grab</td>
<td>uranium, fluoride</td>
</tr>
<tr>
<td>Vegetation</td>
<td>6</td>
<td>Semiannually</td>
<td>Grab</td>
<td>uranium, fluoride</td>
</tr>
<tr>
<td>Ambient radiation</td>
<td>6</td>
<td>Quarterly</td>
<td>Continuous</td>
<td>gamma</td>
</tr>
<tr>
<td>Surface water</td>
<td>1</td>
<td>Monthly</td>
<td>Continuous</td>
<td>uranium, gross alpha, gross beta</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>suspended solids, dissolved solids, pH, fluoride, other chemicals</td>
</tr>
<tr>
<td>Sediment</td>
<td>2</td>
<td>Semiannually</td>
<td>Grab</td>
<td>uranium, fluoride</td>
</tr>
<tr>
<td><strong>Offsite</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air</td>
<td>2</td>
<td>Weekly for uranium;</td>
<td>Continuous</td>
<td>uranium, radon-226, thorium-230</td>
</tr>
<tr>
<td></td>
<td></td>
<td>quarterly for radon-226 and</td>
<td></td>
<td>fluoride</td>
</tr>
<tr>
<td></td>
<td></td>
<td>thorium-230</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil</td>
<td>8</td>
<td>Semiannually</td>
<td>Grab</td>
<td>uranium, fluoride</td>
</tr>
<tr>
<td>Vegetation</td>
<td>8</td>
<td>Semiannually</td>
<td>Grab</td>
<td>uranium, fluoride</td>
</tr>
<tr>
<td>Ambient radiation</td>
<td>2</td>
<td>Quarterly</td>
<td>Continuous</td>
<td>gamma</td>
</tr>
<tr>
<td>Surface water</td>
<td>7</td>
<td>Semiannually</td>
<td>Grab</td>
<td>uranium, fluoride</td>
</tr>
<tr>
<td>Sediment</td>
<td>7</td>
<td>Semiannually</td>
<td>Grab</td>
<td>uranium, fluoride</td>
</tr>
</tbody>
</table>

Source: ENERCON 2017, Table 2.1-6

Air Monitoring

The environmental air monitoring program uses continuous air samples collected at four points along the restricted area fence line (Sampling Location Nos. 9, 10, 12 and 13), at two points near the MTW 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 1.6 kilometers (1 mile) downwind of the FMB). Figures 2-4 and 2-5 show the sampling locations. MTW workers change each low volume (No. 6, 8, 9, 10, 11, 12, and 13) sample filter weekly and analyze the samples for uranium and fluoride content. Honeywell contracts with an analytical laboratory to analyze the quarterly composite of the 13 weekly samples for radon-226 and thorium-230 collected for this facility. Honeywell analyzes the weekly samples obtained at the nearest residence (NR-7) sample station for uranium. The quarterly composites of the weekly (NR-7) samples are analyzed for radon-226 and thorium-230. If the average concentration of total alpha radioactivity (the sum of natural uranium, radon-226, and thorium-230) measured in samples collected from location NR-7 exceeds 3.0 x 10^{-14} \muCi/ml over any calendar quarter, MTW must submit a written report to the NRC within 30 days. The report must identify the cause for exceeding the limit and the corrective actions being taken to reduce the radioactivity release rates. Tabulated values in Table 2.1-8 of the ER (ENERCON 2017) indicate that one exceedance of the 3.0 x 10^{-14} \muCi/ml action level occurred in the 2010–2014 timeframe.
The environmental monitoring results for fluoride indicate that from 2010 through 2014 (Table 2.1-7 of the ER (ENERCON 2017)), the highest annual average fluoride concentration (0.346 μg/m$^3$) was measured on the restricted area fence line at Station No. 10, downwind of the calcium fluoride loading area. Fluoride concentrations were not measurable at most of the other sampling stations from 2011 through 2013 in part because of the temporary shutdown of the MTW to complete seismic/tornado safety upgrades from May 2012 to July 2013 (NRC 2012). The State of Illinois does not have air quality standard for fluoride. The State of Kentucky’s standard is stipulated in Title 401 of the Kentucky Administrative Regulations (KAR) Chapter 53, “Ambient Air Quality,” Section 010, “Ambient Air Quality Standards,” as the annual arithmetic mean standard one-month average of 0.82 μg/m$^3$. All fluoride emissions from 2010 through 2014 were within the Kentucky standard. For more detailed discussions of air quality conditions and potential impacts, see Sections 3.6 and 4.1.6 of this EA.

**Surface Water and Sediment Monitoring**

Surface water and sediment samples are collected semiannually at area lakes and ponds and on the Ohio River. Four sample locations are on the Ohio River: one sample is located upstream of the plant, another is downstream of the plant outflow where Outfall 002 discharges to the river, another is at the point of outflow into the river, and the fourth is located on the Kentucky side of the river from the outflow point. Three inland locations at lakes and ponds are also sampled. The surface water and sediment samples are analyzed for uranium and fluoride. Table 2-6 shows the results of uranium and fluoride surface-water sampling from 2010 through 2014.

<table>
<thead>
<tr>
<th>Location</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uranium (ppm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TVA (Ohio River, opposite MTW)</td>
<td>0.02</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>MTW outflow to river</td>
<td>0.01</td>
<td>0.01</td>
<td>0.13</td>
<td>0.02</td>
<td>0.14</td>
</tr>
<tr>
<td>Brookport Dam (river upstream)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Joppa boat ramp (river downstream)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Lamb Farm Lake</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.05</td>
<td>0.00</td>
</tr>
<tr>
<td>Lindsay Lake</td>
<td>0.00</td>
<td>0.03</td>
<td>0.04</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Oak Glenn Lake</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Fluoride (ppm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TVA (Ohio River, opposite MTW)</td>
<td>1.52</td>
<td>0.16</td>
<td>0.13</td>
<td>0.09</td>
<td>0.14</td>
</tr>
<tr>
<td>MTW outflow to river</td>
<td>4.49</td>
<td>0.42</td>
<td>1.64</td>
<td>0.40</td>
<td>1.56</td>
</tr>
<tr>
<td>Brookport Dam (river upstream)</td>
<td>2.51</td>
<td>0.19</td>
<td>0.15</td>
<td>0.15</td>
<td>0.17</td>
</tr>
<tr>
<td>Joppa boat ramp (river downstream)</td>
<td>3.40</td>
<td>0.20</td>
<td>0.17</td>
<td>0.16</td>
<td>0.17</td>
</tr>
<tr>
<td>Lamb Farm Lake</td>
<td>1.73</td>
<td>0.13</td>
<td>0.12</td>
<td>0.76</td>
<td>0.12</td>
</tr>
<tr>
<td>Lindsay Lake</td>
<td>1.98</td>
<td>0.16</td>
<td>1.12</td>
<td>0.20</td>
<td>0.19</td>
</tr>
<tr>
<td>Oak Glenn Lake</td>
<td>1.63</td>
<td>0.18</td>
<td>0.16</td>
<td>0.19</td>
<td>0.19</td>
</tr>
</tbody>
</table>

Note: The detection limit for uranium is <0.001 ppm.
Source: ENERCON 2017, Table 2.1-9

From 2010 through 2014, the uranium concentration in surface water at the point of release into the Ohio River (MTW outflow sample station) has ranged from 0.02 to 0.14 ppm. Most other measurements at the other sampling locations have been near or below the detection limit for uranium (<0.001 ppm) for this same period. Annual fluoride concentrations in surface water near the MTW outflow have varied yearly with no clear increasing or decreasing trend. Both uranium and fluoride concentrations in surface water meet applicable standards.
From 2010 through 2014, the offsite sediment (mud) samples show generally uniform uranium concentrations upstream and downstream of the MTW except near the MTW outflow (sampling Station C on Figure 2-5 in this EA). Table 2-7 shows sediment sampling results from 2010 through 2014. The sediment sampling data indicate an increasing trend in uranium concentration over the 5-year period and a decreasing trend in fluoride.

*Table 2-7 Sediment Monitoring Annual Averages*

<table>
<thead>
<tr>
<th>Location</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Uranium (ppm)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effluent ditch, 700 feet</td>
<td>12.54</td>
<td>69.02</td>
<td>343.50</td>
<td>439.50</td>
<td>28.30</td>
</tr>
<tr>
<td>Effluent ditch, 1,400 feet</td>
<td>30.14</td>
<td>243.79</td>
<td>376.45</td>
<td>1,775.00</td>
<td>370.00</td>
</tr>
<tr>
<td>TVA (Ohio River, opposite MTW)</td>
<td>0.12</td>
<td>0.28</td>
<td>0.34</td>
<td>0.78</td>
<td>1.12</td>
</tr>
<tr>
<td>MTW outflow</td>
<td>0.43</td>
<td>13.82</td>
<td>23.75</td>
<td>0.68</td>
<td>2.30</td>
</tr>
<tr>
<td>Brookport Dam (upstream)</td>
<td>0.07</td>
<td>0.19</td>
<td>0.71</td>
<td>1.00</td>
<td>0.57</td>
</tr>
<tr>
<td>Joppa boat ramp (downstream)</td>
<td>0.09</td>
<td>0.29</td>
<td>0.44</td>
<td>0.55</td>
<td>0.76</td>
</tr>
<tr>
<td>Lamb Farm Lake</td>
<td>0.29</td>
<td>0.63</td>
<td>1.13</td>
<td>2.55</td>
<td>0.97</td>
</tr>
<tr>
<td>Lindsay Lake</td>
<td>0.09</td>
<td>0.56</td>
<td>0.91</td>
<td>1.45</td>
<td>0.79</td>
</tr>
<tr>
<td>Oak Glenn Lake</td>
<td>0.22</td>
<td>0.42</td>
<td>0.49</td>
<td>1.65</td>
<td>1.09</td>
</tr>
<tr>
<td><strong>Fluoride (ppm)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effluent ditch, 700 feet</td>
<td>817.13</td>
<td>7,677.08</td>
<td>43.50</td>
<td>110.00</td>
<td>60.50</td>
</tr>
<tr>
<td>Effluent ditch, 1,400 feet</td>
<td>32,782.09</td>
<td>5,220.50</td>
<td>27.40</td>
<td>105.50</td>
<td>31.00</td>
</tr>
<tr>
<td>TVA (Ohio River, opposite MTW)</td>
<td>9.90</td>
<td>5.07</td>
<td>0.55</td>
<td>0.24</td>
<td>2.30</td>
</tr>
<tr>
<td>MTW outflow</td>
<td>161.65</td>
<td>7.21</td>
<td>6.10</td>
<td>0.54</td>
<td>8.15</td>
</tr>
<tr>
<td>Brookport Dam (upstream)</td>
<td>6.83</td>
<td>1.62</td>
<td>1.19</td>
<td>0.50</td>
<td>0.84</td>
</tr>
<tr>
<td>Joppa boat ramp (downstream)</td>
<td>12.28</td>
<td>1.75</td>
<td>1.32</td>
<td>0.29</td>
<td>1.70</td>
</tr>
<tr>
<td>Lamb Farm Lake</td>
<td>5.34</td>
<td>0.94</td>
<td>1.35</td>
<td>1.20</td>
<td>1.79</td>
</tr>
<tr>
<td>Lindsay Lake</td>
<td>0.99</td>
<td>1.64</td>
<td>0.57</td>
<td>1.80</td>
<td>2.90</td>
</tr>
<tr>
<td>Oak Glenn Lake</td>
<td>1.84</td>
<td>1.03</td>
<td>1.36</td>
<td>2.10</td>
<td>0.54</td>
</tr>
</tbody>
</table>

Note: Detection limits are fluoride, 0.005 mg/L; uranium, 0.025 micrograms per gram of soil, sediment, or vegetation (μg/g).

Source: ENERCON 2017, Table 2.1-10

MTW collects sediment samples from the liquid effluent drainage ditch at points 213 meters (700 feet) and 427 meters (1,400 feet) upstream of Outfall 002 to identify the presence of uranium and fluoride. As identified in Figure 3-1 in Section 3.3.1 of this EA, Outfall 002 is located along the Ohio River where it is met by the drainage ditch. See Section 4.1.4.1 of this EA for additional information on surface water and sediment conditions and their potential impacts on the environment.

**Soil and Vegetation Monitoring**

Honeywell collects 14 soil and vegetation samples semiannually. Six sample stations are located on site at the same location as the low volume air samplers (see Figure 2-4 in this EA). Seven stations are located off site within a 13-kilometer (8-mile) radius covering portions of Illinois and Kentucky (see Figure 2-5 in this EA), with an eighth station located at the nearest resident (NR-7). Tables 2-8 and 2-9 show results over the period from 2010 through 2014 for soils and vegetation measurements, respectively.
### Table 2-8 Soil Monitoring Annual Averages, 2010–2014

<table>
<thead>
<tr>
<th>Location</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Uranium (ppm)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lamb Farm(^a)</td>
<td>0.96</td>
<td>1.36</td>
<td>1.09</td>
<td>1.45</td>
<td>1.07</td>
</tr>
<tr>
<td>Brubaker Farm(^a)</td>
<td>1.94</td>
<td>0.55</td>
<td>1.2</td>
<td>1.23</td>
<td>1.09</td>
</tr>
<tr>
<td>Texaco Station(^a)</td>
<td>1.90</td>
<td>0.72</td>
<td>1.1</td>
<td>1.3</td>
<td>1.09</td>
</tr>
<tr>
<td>IL Power Equipment Station(^a)</td>
<td>1.23</td>
<td>0.46</td>
<td>0.97</td>
<td>1.2</td>
<td>1.11</td>
</tr>
<tr>
<td>Reiniking property(^a)</td>
<td>6.65</td>
<td>0.70</td>
<td>1.17</td>
<td>1.35</td>
<td>2.15</td>
</tr>
<tr>
<td>Metropolis Municipal Airport(^a)</td>
<td>1.10</td>
<td>2.50</td>
<td>1.75</td>
<td>2</td>
<td>2.10</td>
</tr>
<tr>
<td>Maple Grove School(^a)</td>
<td>1.32</td>
<td>1.19</td>
<td>0.91</td>
<td>0.8</td>
<td>0.79</td>
</tr>
<tr>
<td>North of FMB</td>
<td>12.45</td>
<td>11.93</td>
<td>25.55</td>
<td>21</td>
<td>37.5</td>
</tr>
<tr>
<td>West of FMB</td>
<td>10.34</td>
<td>14.30</td>
<td>14.85</td>
<td>12.55</td>
<td>16.5</td>
</tr>
<tr>
<td>South of FMB</td>
<td>7.06</td>
<td>6.22</td>
<td>8.15</td>
<td>8.15</td>
<td>12.5</td>
</tr>
<tr>
<td>Northwest of FMB</td>
<td>13.80</td>
<td>15.36</td>
<td>19.35</td>
<td>4.35</td>
<td>26</td>
</tr>
<tr>
<td>East of FMB</td>
<td>49.88</td>
<td>89.44</td>
<td>71.55</td>
<td>12.55</td>
<td>162.15</td>
</tr>
<tr>
<td>North of FMB</td>
<td>16.89</td>
<td>19.52</td>
<td>27</td>
<td>23.5</td>
<td>27.5</td>
</tr>
<tr>
<td>Nearest residence(^a)</td>
<td>5.21</td>
<td>6.84</td>
<td>8.5</td>
<td>7.3</td>
<td>9</td>
</tr>
<tr>
<td><strong>Fluoride (ppm)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lamb Farm(^a)</td>
<td>4.49</td>
<td>1.61</td>
<td>1.85</td>
<td>4.95</td>
<td>1.31</td>
</tr>
<tr>
<td>Brubaker Farm(^a)</td>
<td>37.31</td>
<td>1.10</td>
<td>0.615</td>
<td>1.35</td>
<td>0.52</td>
</tr>
<tr>
<td>Texaco Station(^a)</td>
<td>3.74</td>
<td>24.61</td>
<td>0.91</td>
<td>0.89</td>
<td>0.16</td>
</tr>
<tr>
<td>IL Power Equipment Station(^a)</td>
<td>4.38</td>
<td>2.63</td>
<td>0.56</td>
<td>2.08</td>
<td>0.87</td>
</tr>
<tr>
<td>Reiniking property(^a)</td>
<td>3.55</td>
<td>3.88</td>
<td>2.35</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>Metropolis Municipal Airport(^a)</td>
<td>2.83</td>
<td>2.22</td>
<td>2.2</td>
<td>1.3</td>
<td>1.6</td>
</tr>
<tr>
<td>Maple Grove School(^a)</td>
<td>3.62</td>
<td>1.22</td>
<td>2.9</td>
<td>0.89</td>
<td>1.575</td>
</tr>
<tr>
<td>North of FMB</td>
<td>1.76</td>
<td>4.66</td>
<td>8.4</td>
<td>15.5</td>
<td>8.05</td>
</tr>
<tr>
<td>West of FMB</td>
<td>1.23</td>
<td>4.27</td>
<td>4.85</td>
<td>7.3</td>
<td>5.85</td>
</tr>
<tr>
<td>South of FMB</td>
<td>1.67</td>
<td>4.78</td>
<td>11.6</td>
<td>16</td>
<td>8.9</td>
</tr>
<tr>
<td>Northwest of FMB</td>
<td>3.59</td>
<td>1.81</td>
<td>1.75</td>
<td>2.85</td>
<td>3.2</td>
</tr>
<tr>
<td>East of FMB</td>
<td>4.87</td>
<td>6.83</td>
<td>8.95</td>
<td>5.6</td>
<td>11.015</td>
</tr>
<tr>
<td>North of FMB</td>
<td>5.85</td>
<td>5.16</td>
<td>4.95</td>
<td>11.4</td>
<td>7.65</td>
</tr>
<tr>
<td>Nearest residence(^a)</td>
<td>1.10</td>
<td>1.69</td>
<td>1.25</td>
<td>2.6</td>
<td>1.8</td>
</tr>
</tbody>
</table>

\(^a\) Offsite sample locations.

FMB = feed materials building; ppm = parts per million.

Note: Detection limits are fluoride, 0.005 mg/L; uranium, 0.025 μg/g.

Source: ENERCON 2017, Table 2.1-12

### Table 2-9 Vegetation Monitoring Annual Averages, 2010–2014

<table>
<thead>
<tr>
<th>Location</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Uranium (ppm)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lamb Farm(^a)</td>
<td>4.46</td>
<td>18.62</td>
<td>0.08</td>
<td>0.46</td>
<td>0.15</td>
</tr>
<tr>
<td>Brubaker Farm(^a)</td>
<td>3.83</td>
<td>15.61</td>
<td>no result</td>
<td>0.25</td>
<td>0.36</td>
</tr>
<tr>
<td>Texaco Station(^a)</td>
<td>3.39</td>
<td>11.90</td>
<td>0.27</td>
<td>0.14</td>
<td>0.14</td>
</tr>
<tr>
<td>IL Power Equipment Station(^a)</td>
<td>2.26</td>
<td>22.04</td>
<td>0.18</td>
<td>0.28</td>
<td>0.19</td>
</tr>
<tr>
<td>Reiniking property(^a)</td>
<td>2.17</td>
<td>9.76</td>
<td>0.07</td>
<td>0.21</td>
<td>1.00</td>
</tr>
<tr>
<td>Metropolis Municipal Airport(^a)</td>
<td>4.00</td>
<td>4.12</td>
<td>0.26</td>
<td>0.16</td>
<td>0.54</td>
</tr>
</tbody>
</table>
Sampling results from 2010 through 2014 show constant uranium concentrations in soils at the nearest residence ranging from 5.21 to 9 ppm. Uranium concentrations at other offsite locations have not fluctuated significantly during those years. The highest uranium concentration in soil at the Reiniking property was measured at 6.65 ppm in 2010. The overall offsite average concentration is 3.9 ppm, which is 6.5 times higher than the preoperational value of 0.6 ppm in soil. Uranium concentrations in onsite soils are higher, with the highest concentration measured in 2014 east of the FMB. The east side of the FMB generally has the highest uranium concentrations in soils. These values ranged from 36.5 to 162.15 ppm. All other locations on the site measured less than 90 ppm over this same period. The average onsite uranium concentration is 25 ppm, which is 42 times the preoperational value of 0.6 ppm in soil, and 2.7 times higher than the onsite 4-year average of 15.8 ppm reported in 1995 (NRC 1995).

Fluoride concentrations in soils at offsite locations have shown a decreasing trend, with the highest concentrations in 2014 measured at the Maple Grove School (1.575 ppm). Soil concentrations located at the nearest residence were all at or below 1.8 ppm. Onsite, fluoride concentrations in soils have generally increased, with the highest concentrations (11.015 ppm in 2014) occurring on the east side of the FMB.

The average onsite uranium concentration in vegetation was 8.6 ppm from 2010 through 2014, which is twice the value reported in the NRC’s 2006 license renewal EA. This concentration is
about 30 times the preoperational value of 0.28 ppm (NRC 2006a). Onsite uranium concentrations are higher than offsite concentrations, which averaged 3.9 ppm for the period from 2010 through 2014.

Fluoride concentrations in vegetation at offsite locations were highest during 2012. In 2012, concentrations of fluoride in vegetation ranged from 264.00 to 1,665.00 ppm at offsite locations. In 2014, offsite concentrations ranged from 177.20 to 351.00 ppm. The State of Illinois does not have an applicable fluoride standard. The State of Kentucky standard at 401 KAR 53:010 allows a 40-ppm average fluoride concentration during a 6-month growing season; a 60-ppm average concentration for a 2-month average; and an 80-ppm concentration for a 1-month average.

See Sections 3.3.2 and 4.1.3 of this EA, respectively, for additional information and impacts associated with soils. See Sections 3.5.1 and 4.1.5.1 of this EA, respectively, for additional information and impacts associated with vegetation.

**External Gamma Monitoring**

Direct radiation is continuously monitored using environmental thermoluminescence dosimeters (TLDs) at nine locations. Four of these environmental TLDs are located on the restricted area fence line on each side of the MTW, one is at the nearest site boundary line, one is at the Metropolis Municipal Airport (1.6 kilometers (1 mile) north-northeast of the MTW site), and two are at the nearest residence (NR-7 South and NR-7A North). A ninth TLD provides a control measurement. Honeywell analyzes the results of the environmental TLDs and replaces the TLDs every quarter. Table 2-10 shows the average external gamma monitoring results.

<table>
<thead>
<tr>
<th>Location</th>
<th>2010</th>
<th>2011</th>
<th>Year 2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>0.28</td>
<td>0.31</td>
<td>0.29</td>
<td>0.27</td>
<td>0.27</td>
</tr>
<tr>
<td>North fence&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.44</td>
<td>0.43</td>
<td>0.23</td>
<td>0.17</td>
<td>0.13</td>
</tr>
<tr>
<td>East fence&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.96</td>
<td>1.00</td>
<td>0.88</td>
<td>0.64</td>
<td>0.69</td>
</tr>
<tr>
<td>South fence&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.42</td>
<td>0.81</td>
<td>0.73</td>
<td>0.26</td>
<td>0.71</td>
</tr>
<tr>
<td>West fence&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.31</td>
<td>0.33</td>
<td>0.13</td>
<td>0.04</td>
<td>0.05</td>
</tr>
<tr>
<td>North MTW site boundary</td>
<td>0.38</td>
<td>0.41</td>
<td>0.20</td>
<td>0.07</td>
<td>0.10</td>
</tr>
<tr>
<td>Airport</td>
<td>0.25</td>
<td>0.28</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>NR-7 A north</td>
<td>0.26</td>
<td>0.28</td>
<td>0.10</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>NR-7 south</td>
<td>0.28</td>
<td>0.29</td>
<td>0.16</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

<sup>a</sup> To convert mSv to mrem, multiply by 100.
<sup>b</sup> Restricted area fence.
M = below the minimal measurable quantity.
Source: ENERCON 2017, Table 2.1-13

The 2010–2014 monitoring results for the control, onsite, and offsite environmental TLDs identified the east and south restricted area fences as receiving the maximum annual average of direct gamma radiation. This distribution is attributed to a large ore concentrate storage area immediately adjacent to the sampling station. The NRC dose limit from manmade external sources in any unrestricted area is 1 mSv (100 mrem) per year according to 10 CFR Part 20, Subpart D, “Radiation Dose Limits for Individual Members of the Public.” The shortest distance...
from the east restricted area fence to the site boundary is approximately 1 kilometer (0.6 mile). As shown in Table 2-10 of this EA, the annual average radiation doses at the Metropolis Municipal Airport and at the nearest residence for the years 2010 through 2014, did not exceed the background levels presented as “control” levels in Table 2-10).

**Groundwater Monitoring**

Honeywell employs three groundwater contaminant monitoring programs at the MTW, including the sanitary well monitoring, process well routine monitoring to detect any leaks and migration from the settling ponds, and monitoring of the inactive landfill located beyond the restricted area. The following information briefly describes the monitoring programs.

- The first program covers the sanitary well and process well #3, which monitor for inorganic constituents, volatile organic compounds, radionuclides, and general parameters, including pH, turbidity, chlorine, total coliform, and fecal coliform. Two monitoring wells are associated with this program.

- The second program covers routine compliance monitoring under RCRA to detect any leaks and migration from the calcium fluoride ponds and consists of two upgradient and seven downgradient wells with an additional well used only for groundwater surface elevation measurements (see Figure 2-6), sampled and analyzed quarterly for pH, specific conductance, fluoride, gross alpha and gross beta. In addition to monitoring wells, all calcium fluoride ponds have a two-part liner system and a leachate collection system that leads to sumps that are sampled for pH and fluorides. All ponds are also equipped with lysimeters that are monitored quarterly for pH, fluorides, and potassium to help identify possible leaks that could occur that could impact groundwater (IEPA 2015b).

- The third program, also under RCRA, addresses the inactive landfill. This network, consisting of eight monitoring wells, monitors for pH, specific conductance, other environmental constituents, gross alpha, gross beta, radon-226, and radium-228.

Implementation of the calcium fluoride ponds and landfill monitoring programs satisfies periodic monitoring requirements and corrective action requirements of the MTW’s RCRA permit (IEPA 2015b). Figure 2-6 shows the locations of the groundwater wells that support the three monitoring programs.

Two RCRA groundwater corrective actions have occurred that prompted investigations at the MTW. The first is related to the chlorinated solvent/arsenic area, and the second is the closure of underground process sewers.
Figure 2-6  Location of Groundwater Monitoring Wells Associated with the Calcium Fluoride Ponds (Source: ENERCON 2017)
**Chlorinated Solvent/Arsenic Area**

In April 2001, in response to elevated contaminant levels identified in groundwater from onsite monitoring wells, IEPA issued a violation notice to Honeywell. Honeywell undertook an investigation to identify the source of the groundwater contaminants, which include dissolved arsenic, total arsenic, chloroform, trichloroethene, tetrachloroethene, and trichlorofluoromethane. Honeywell entered an IEPA-accepted compliance commitment agreement as part of its investigation of the source of the groundwater contamination (NRC 2013a). In August 2014, the IEPA approved Honeywell’s assessment, which determined the risks associated with residual groundwater impacts were below regulatory thresholds, and no additional investigation or remediation was necessary (ENERCON 2017, Section 3.4.8.3.1). In March 2016, the IEPA approved an environmental land use control (ELUC) for most of the MTW site (see Figure 3-1 in Section 3.3.1 of this EA for a graphical representation) (IEPA 2016b). Honeywell will attach the terms of the ELUC to the property deed, which places the following limitations on the property:

- Most of the site is limited to industrial and commercial uses.
- Groundwater cannot be used as a potable water supply within the ELUC area. The ELUC area does not encompass the entire MTW property. The existing potable water supply wells (sanitary well and process well #3) may continue to be used as potable water supply wells.
- All existing or potential buildings must have a full concrete slab on-grade or a full concrete basement floor and walls.

No current groundwater monitoring is being performed in this area. The investigation is complete, and Honeywell is coordinating with the IEPA to obtain regulatory closure for the area.

**Process Sewers**

Under its RCRA permit and as part of its consultation with the IEPA, MTW continues to investigate the condition of MTW’s underground process sewers and structures. By the spring of 2016, MTW had identified two areas of concern where liquids may have migrated from the underground process sewers into the underlying soils. The first area of concern is related to trenches and a process sewer line associated with the F2 building. The second area of concern is related to a sump (SU-562) on the Green Salt South Pad, at the northwest side of the FMB.

The Illinois EPA (IEPA) authorized two work plans in early 2016 (IEPA 2018a) for the two areas of concern. Honeywell conducted groundwater monitoring on a quarterly basis for both areas of concern under the plans. By the end of July 2018, MTW had completed eight quarters (i.e., two years) of monitoring (Honeywell 2018f; IEPA 2018b). Additional measures were implemented as part of the corrective action process. These remedial measures include filling the trenches with concrete at the first area of concern and sampling the soil and replacing sump SU-562 at the second area of concern. Based on these results, the IEPA concurred that no further remediation or corrective action related to these two areas of concern is required (IEPA 2018a).

The MTW will continue its soil investigation under the Sewer Inspection & Maintenance Plan authorized by the IEPA (IEPA 2018a). If the ongoing investigations identify additional areas of groundwater contamination, Honeywell will delineate the new areas of concern and undertake corrective actions under the authority of the IEPA (IEPA 2018b).
Monitoring Program Status

The NRC staff 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 MTW monitoring program is protective of the environment and public health and safety. Furthermore, the staff concludes that IEPA will provide effective oversight of the corrective action monitoring activities required by the facility's RCRA permit.

2.3.10 Ongoing or Anticipated Future Changes

As discussed in Section 2.2 above, Honeywell does not anticipate any major facility upgrades or mitigation systems for the proposed license renewal term (Honeywell 2018c, Response to RAI PA-3). Honeywell recently completed treatment upgrades of the EPF to (1) facilitate the removal of fluoride from the waste stream and compliance with fluoride discharge limits, and (2) enable the removal of the calcium fluoride ponds, which no longer receive effluents. The EPF upgrades comply with Honeywell's renewed NPDES permit Special Condition 26 and provide enhanced treatment to meet the new fluoride discharge limits.

Honeywell submitted a final RCRA closure plan to the IEPA in March 2018 (Honeywell 2018d) and will remove and close the calcium fluoride ponds in accordance with RCRA permit requirements by the end of 2020 (Honeywell 2018d). Separately, the NRC is reviewing this proposed activity to determine what NRC approvals may be needed concerning waste removal and the status of the ponds. Specifically, the NRC is reviewing Honeywell's plans for removal of waste from the ponds and shipment to a disposal facility. The NRC is also assessing the status of the ponds regarding NRC decommissioning requirements. Any NRC approvals required for the ponds and associated activities will be accompanied by a separate NRC environmental review.

2.4 Decontamination and Decommissioning

In accordance with 10 CFR 20.1406, “Minimization of Contamination,” Honeywell operates the facility using ALARA practices to minimize subsurface contamination. Honeywell has a procedure for decommissioning planning that states that any work on the facility, the ground surface, or the subsurface of the site requires an evaluation to be performed of the potential impacts to the decommissioning of the site (Honeywell 2018a, Response to RAI PA-4). Honeywell documents the estimated volume and contamination levels of the material being disturbed.

The NRC requires that licensees comply with the License Termination Rule in 10 CFR Part 20, Subpart E, “Radiological Criteria for License Termination.” This rule provides radiological criteria for unrestricted and restricted use, financial assurance and recordkeeping conditions, and timeliness conditions. NRC guidance for implementation of the License Termination Rule is found in NUREG-1757, “Consolidated Decommissioning Guidance” issued September 2006 (NRC 2006b).

The overall objective of decommissioning the site is to remediate the MTW to an unrestricted use condition that corresponds to a calculated dose to the public that is less than 0.25 mSv/yr (25 mrem/yr) from applicable pathways. The 25-mrem/yr dose limit is codified at 10 CFR 20.1402, “Radiological Criteria for Unrestricted Use.”
Normally, decommissioning of a facility occurs once the licensee decides to cease operations and notifies the NRC that the facility status is changing from operating to decommissioning. In addition, any separate building or area that has not been used for 2 years must be promptly remediated if the remediation activities are allowed by the existing license. If the remediation activities are not currently allowed under an existing license, the licensee must develop a decommissioning plan and submit a request for a license amendment within 1 year. The decommissioning process is to be completed within 2 years, unless an alternative schedule is approved.

In 2009, Enercon Services, Inc. (ENERCON) conducted a radiological characterization of the MTW to assess the levels of radiological activity that Honeywell will need to address during decommissioning of the MTW site in the future. An initial site characterization for the MTW site is not available. The radiological characterization is used to support the development of decommissioning cost estimates. The focus of the site characterization was on surface and subsurface soil; other media such as groundwater were not characterized. The radiological characterization data for soils collected show the presence of radiologically contaminated areas within the MTW restricted area and radiological impacts outside the restricted area that are greater than the potential release criteria (ENERCON 2010). Honeywell used this information to update its decommissioning cost estimate (ENERCON 2016).

In 10 CFR 40.36(a) and (d), the NRC requires that each applicant for a specific license authorizing the possession or use of more than 100 µCi of source material in a readily dispersible form must submit a decommissioning funding plan consisting, in part, of a cost estimate. The NRC’s regulations at 10 CFR 40.46(d)(2) requires that the decommissioning cost estimate be revised at intervals not to exceed 3 years. The periodic update is necessary to reflect physical and environmental changes at the facility and changes in cost-estimating assumptions, for example, cost escalation and disposal cost. In addition, Honeywell must provide funding using the appropriate financial assurance mechanisms described in 10 CFR 40.36(e). ENERCON revised the decommissioning cost estimate in 2016 (ENERCON 2016). The decommissioning cost estimate takes into account current radiological conditions at the site and operations continuing as currently conducted under the license. The decommissioning cost estimate does not take into consideration how much longer the facility operates (i.e., 40 more years versus a shorter time frame). Changes at the MTW will be taken into consideration during the triennial updates to the cost report.

In order to protect public health and safety and the environment, Honeywell will decontaminate the facilities before the NRC will terminate SUB-526. Radiological contamination will be reduced to levels that allow the release of a portion of the facility for unrestricted use as specified in the License Termination Rule. However, use of part of the site will remain restricted because of the presence of chemical contamination and will be subject to the ELUC approved by the IEPA. The ELUC will be attached to the deed to the property, as described in Section 2.3.9.2 of this EA.

ENERCON’s 2016 decommissioning cost estimate assumes that Honeywell will remove source material and waste from processing areas and that the administrative areas will not require remediation. Items to be removed include most buildings, some pads, such as the drum storage pads, soils surrounding or underlying buildings, equipment, process drain lines and most stormwater drain lines, and the uranium settling ponds. Buildings that may remain, but that would need to be decontaminated, include the ore storage building, bed materials and filter fines building, cylinder wash building, hazardous waste storage building, drum crusher building, and drum washing building. The ore storage pads, drum storage pad, and waste storage pad...
Facilities not expected to require remediation include several support buildings, the liquid fluorine facility, liquid nitrogen facility, STF, and calcium fluoride building. Areas with known soil contamination outside the restricted area that will be remediated; these include the drainage swale from Outfall 002, contamination located in a drainage swale east of the ore storage pads, about 8 meters (25 feet) on either side of a 229-meter (750-foot) section along River Road, and in isolated areas along the road to the inactive landfill (ENERCON 2016).

Following completion of decontamination activities, Honeywell will complete radiological surveys and generate a report documenting cleanup to the target levels. Honeywell will perform the surveys using the guidance in NUREG-1575, “The Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)” issued August 2000 (NRC 2000). The NRC will review the completed decontamination activities and final survey before approval and termination of the license, in accordance with 10 CFR 40.42, “Expiration and Termination of Licenses and Decommissioning of Sites and Separate Buildings or Outdoor Areas.” Financial assurance for the potential costs of decontamination and decommissioning activities associated with the license termination are provided through a corporate self-guarantee, an NRC-approved mechanism (NRC 2014b).

2.5 Preliminary Staff Recommendation

The NRC staff weighed the potential impacts of the proposed action, in accordance with 10 CFR 51.91(d), and set forth its NEPA recommendation regarding the proposed action. The NRC staff recommended that the Commission issue a “finding of no significant impact” and grant the license renewal for the proposed action as requested. The staff bases its environmental recommendation on (1) the license application, which includes the ER, supplemental documents, and the applicant’s responses to the NRC staff’s requests for additional information; (2) consultation with Federal, State, and local agencies; (3) independent NRC staff review; and (4) the assessments presented in this draft EA.
3 AFFECTED ENVIRONMENT

3.1 Land Use

The area of review for the land use assessment is the area within a 3.2-kilometer (2-mile) radius of the MTW site to encompass neighboring uses.

3.1.1 MTW Site

As described in more detail in Section 2.1 of this EA, the MTW site is in Massac County, at the southeastern tip of Illinois, along the northern bank of the Ohio River (see Figures 1-1 and 1-2). The northeastern corner of the outermost fence is approximately 400 meters (1,300 feet) from the city limits of Metropolis (Honeywell 2018a, Response to RAI PA-6). The perimeter of the developed portion of the site is formed by U.S. Highway 45 and the Burlington Northern Santa Fe (BNSF) railroad right-of-way to the north, although a small portion of the MTW property extends beyond U.S. Highway 45 to the northeast. The Ohio River forms the southern border. An industrial coal blending plant lies generally to the west, and privately owned developed land is to the east. Kentucky industrial sites and farmland lie generally to the south on the other side of the river.

The total MTW area covers about 405 hectares (1,000 acres) of land containing a 24-hectare (59-acre) fenced, restricted area in the north-central portion of the site (Honeywell 2018a, Response PA-7). Section 2.2 of this EA lists the existing facilities on the site.

The MTW area consists of the gently rolling hills that are typical of southern Illinois. The site is at an elevation of between 91 and 116 meters (300 and 380 feet) above mean sea level. The restricted area is on an alluvial terrace about 18 meters (60 feet) above the floodplain of the Ohio River (NRC 2006a). This terrace is generally level, except for surface water drainage channels that flow south to the Ohio River. For comparison, the probable elevation of the 100-year flood is 103 meters (338 feet) above mean sea level (NRC 2006a).

Honeywell used the Multi-Resolution Land Consortium National Land Cover Database to further characterize land use land cover within the property boundary. Approximately 16 percent of the site is categorized as Developed, with the remaining 84 percent Undeveloped. The largest land use cover classification is Deciduous Forest, at approximately 67 percent. Table 3-1 provides specific land use land cover details (Honeywell 2018a, Response to RAI LU-1).

<table>
<thead>
<tr>
<th>Land Use Land Cover Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Water (MTW ponds)</td>
<td>1.63</td>
</tr>
<tr>
<td>Developed</td>
<td>16.12</td>
</tr>
<tr>
<td>Barren Land (Rock, Sand, Clay)</td>
<td>0.14</td>
</tr>
<tr>
<td>Deciduous Forest</td>
<td>66.96</td>
</tr>
<tr>
<td>Pasture/Hay</td>
<td>2.41</td>
</tr>
<tr>
<td>Cultivated Crops</td>
<td>5.99</td>
</tr>
<tr>
<td>Woody Wetlands</td>
<td>6.75</td>
</tr>
</tbody>
</table>

Source: Honeywell 2018a, RAI LU-1
The onsite inactive landfill discussed in Section 2.2 and shown in Figure 2-1 of this EA is located in the northeast portion of the MTW site and is approximately 4.5 hectares (11 acres). Honeywell is currently working with IEPA to certify closure of the landfill (Honeywell 2018a, Response to RAI LU-1). Honeywell is also conducting site investigation activities at the Old Creosoter Area.

The MTW site drains to the Ohio River via four creeks, or channels, that are located in undeveloped areas outside the restricted area (see Figure 3-1 in Section 3.3.1 of this EA; ENERCON 2017, Section 3.5.2.5). One 305-meter (1,000-foot)-wide portion of the site between the restricted area and the Ohio River is within the 500-year floodplain; it had previously been farmed and is now returning to more natural vegetation (ENERCON 2017, Section 3.1.1, p. 3-1, and Section 3.5.2.4). The U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory maps show that wetlands occur on the site, including freshwater forested/shrub wetland areas along the Ohio River and in the southeastern forested portion of the site (USFWS 2017a; Honeywell 2018a, RAI response PA-1).

An electrical transmission line crosses the MTW site from the northwest to the southeast, about halfway between the Ohio River and the southern border of the fenced, restricted area (light-green linear strip shown in Figure 2-1 in Chapter 2 of this EA). The transmission line corridor is maintained in grasses and low-growing shrubs. A buried natural gas transmission line serving both the site and the city of Metropolis crosses the property about 152 meters (500 feet) north of the administration building (Honeywell 2018a, Response to RAI PA-8).

### 3.1.2 Site Vicinity

Land within a 3.2-kilometer (2-mile) radius of the MTW site is mainly agricultural or undeveloped, with the exception of Metropolis and industrial areas. Within this area, about 28 percent of the land is developed, with the remainder of the area consisting of open water (about 22 percent), barren land (about 1 percent), forest (about 22 percent), wetlands (about 5 percent), and herbaceous and planted or cultivated land (about 22 percent) (ENERCON 2017, Table 3.1-1).

According to the most recent agricultural census, as of 2012 about 66 percent (41,379 hectares out of 62,678 hectares (102,249 acres out of 154,880 acres)) of the land in Massac County is used for agricultural purposes; corn and soybeans continue to be the principal cash crops and cattle and hogs are the principal livestock (USDA 2012). Between 2007 and 2012, the amount of land in farms in Massac County increased by 14 percent, with a 77-percent increase in the market value of sales (USDA 2012). The nearest pastureland is located approximately 2 kilometers (1.5 miles) northeast of the MTW and is used to graze beef cattle. The nearest dairy cattle graze approximately 13 kilometers (8 miles) east of the plant (ENERCON 2017, Section 3.1.1).

Massac Memorial Hospital is immediately northeast of the MTW, across U.S. Highway 45/West 10th Street. The Metropolis Municipal Airport is about 1.1 kilometers (0.7 mile) north-northeast of the MTW, and the Barkley Regional Airport is about 10.8 kilometers (6.7 miles) to the south (ENERCON 2017, Section 3.2). Major nearby industrial developments include the Tennessee Valley Authority (TVA) Shawnee Fossil Plant and the U.S. Enrichment Corporation’s Paducah Gaseous Diffusion Plant (PGDP) (a uranium enrichment facility) located across the Ohio River to the east of the MTW in Kentucky. The American Electric Power Company (AEP) Cook Coal Terminal, a coal blending plant, is located immediately northwest of the MTW site. Other
nearby industrial uses include a coal-fired power plant operated by Electrical Energy, Inc., about 9.5 kilometers (6 miles) to the northwest in Joppa, IL (ENERCON 2017, Section 3.1.4).

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 Sielback Forest State Natural Area, owned by The Nature Conservancy, is located about 3.2 kilometers (2 miles) to the north (TVA 2017). Fort Massac State Park is east of the city of Metropolis. The Halesia Nature Preserve is located about 1.6 kilometers (1 mile) to the northwest on AEPC-owned property (TVA 2017; ILDNR 2018). The West Kentucky Wildlife Management Area, which includes the Bayou Creek Ridge Tennessee Valley Authority Habitat Protection Area, is across the Ohio River, 3.2 kilometers (2 miles) southwest of the MTW site and adjacent to PGDP (TVA 2017). The Metropolis Lake State Nature Preserve, under the jurisdiction of the Kentucky State Nature Preserves Commission, contains a 20.2-hectare (50-acre) lake, and Metropolis Lake Tennessee Valley Authority Habitat Protection Area, owned by TVA, are located directly across the river from the MTW site (TVA 2017; KSNPC 2012).

The Ohio River in the area of the MTW is used for barge transportation, commercial and sport fishing, musseling, and a source of water supply (ENERCON 2017, Section 3.4.2).

Honeywell does not allow any recreational hunting, fishing, or trapping on its property and has posted signs to that effect.

3.2 Transportation

The NRC’s transportation assessment encompasses the area within an 8-kilometer (5-mile) radius of the MTW site. The assessment evaluates the potential impacts that MTW operations could have on the local transportation network.

3.2.1 Current Transportation Resources

As noted in Section 3.1.1 of this EA, the northeast corner of the outer fence of the MTW is 400 meters (1,300 feet) from the city limits of Metropolis. As shown in Figure 1-2 of this EA, U.S. Highway 45 and the BNSF railroad run along the northern border of the MTW site, and the Ohio River forms the southern border. The railroad and U.S. Highway 45 follow the same path southeast through Massac County, until the railroad joins with another line headed south through the county at Metropolis and crosses over the Ohio River into Kentucky. In addition, three spurs from the railroad service the site for receiving supplies and shipping product, byproducts, and waste.

U.S. Highway 45 continues southeastwardly past the site into Metropolis (where the highway becomes West 10th Street) and continues generally to the east until it turns south and then crosses the Ohio River at Brookport, IL, about 6.4 kilometers (4 miles) from Metropolis. The Illinois Department of Transportation has designated portions of U.S. Highway 45 as part of the Ohio River Scenic Byway, including the segment serving the MTW (IDOT 2017a), for its views of the Ohio River. Interstate 24 is approximately 7.2 kilometers (4.5 miles) east of the MTW site. It runs southeastwardly through Massac County, then continues south near the eastern border of the city of Metropolis, where it crosses the Ohio River to continue through Paducah, KY, the largest populated area within 32 kilometers (20 miles) of the MTW, heading east.
Table 3-2 gives the Illinois Department of Transportation average daily traffic count data for locations on U.S. Highway 45 northwest and southeast of the MTW entrance and at points north and south of U.S. Highway 45 on Interstate 24 (IDOT 2017b).

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Traffic Count</th>
<th>Truck Count</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U.S. Highway 45, northwest of MTW, near Doug Sumner Lane, both directions</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>4,950</td>
<td>(a)</td>
</tr>
<tr>
<td>2007</td>
<td>4,800</td>
<td>(a)</td>
</tr>
<tr>
<td>2009</td>
<td>5,000</td>
<td>(a)</td>
</tr>
<tr>
<td>2011</td>
<td>4,300</td>
<td>(a)</td>
</tr>
<tr>
<td>2013</td>
<td>4,050</td>
<td>(a)</td>
</tr>
<tr>
<td>2015</td>
<td>3,850</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>U.S. Highway 45, southeast of MTW, near James Drive, both directions</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>9,800</td>
<td>(a)</td>
</tr>
<tr>
<td>2007</td>
<td>9,100</td>
<td>(a)</td>
</tr>
<tr>
<td>2009</td>
<td>9,300</td>
<td>(a)</td>
</tr>
<tr>
<td>2011</td>
<td>7,000</td>
<td>(a)</td>
</tr>
<tr>
<td>2013</td>
<td>6,650</td>
<td>(a)</td>
</tr>
<tr>
<td>2015</td>
<td>5,950</td>
<td>430</td>
</tr>
<tr>
<td></td>
<td>Interstate 24, north of U.S. Highway 45, both directions</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>15,700</td>
<td>(a)</td>
</tr>
<tr>
<td>2006</td>
<td>16,900</td>
<td>(a)</td>
</tr>
<tr>
<td>2014</td>
<td>16,900</td>
<td>(a)</td>
</tr>
<tr>
<td>2015</td>
<td>20,400</td>
<td>7,000</td>
</tr>
<tr>
<td></td>
<td>Interstate 24, south of U.S. Highway 45, both directions</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>26,100</td>
<td>(a)</td>
</tr>
<tr>
<td>2006</td>
<td>28,200</td>
<td>(a)</td>
</tr>
<tr>
<td>2014</td>
<td>29,600</td>
<td>(a)</td>
</tr>
<tr>
<td>2015</td>
<td>31,700</td>
<td>8,450</td>
</tr>
</tbody>
</table>

a Data not taken prior to 2015.
Source: IDOT 2017b

Table 3-3 gives National Highway Transportation Safety Administration traffic fatality information for Massac County. These data show that for 2015, Massac County had a per capita fatality rate in the middle third of all U.S. counties and in the upper third for truck fatalities (NHTSA 2017a). Between 2011 and 2016, there was one collision between a train and a vehicle or pedestrian at a railroad crossing in Massac County (ICC 2017). The NRC reviewed the annual Illinois Commerce Commission reports for 2007 through 2016 on railroad incidents involving hazardous materials releases or derailments of trains carrying such materials, or both, and did not find any such incidents that took place in Massac County.

As noted in Section 3.1.2 of this EA, the Metropolis Municipal Airport is about 1.1 kilometers (0.7 mile) north-northeast of the MTW site, and the Barkley Regional Airport is about 10.8 kilometers (6.7 miles) to the south (ENERCON 2017, Section 3.2). Ohio River ports are located in Massac County, IL, and McCracken County, KY (ENERCON 2017, Section 3.2).
3.2.2 Current MTW Use of Transportation Resources

U.S. Highway 45 is the road used to access the MTW site from all points. MTW activities account for only a small fraction of the traffic on area roads. As of February 2016, MTW employed 237 people (ENERCON 2017, Section 3.10.1). Of the 237 employees, 62 percent reside in Kentucky and 27 percent reside in Metropolis or Brookport, IL. The employees residing in Kentucky, Metropolis, and Brookport, a total of 89 percent or 211 employees, commute to MTW via U.S. Highway 45 northbound when arriving and southbound when leaving. Typical daily traffic for Highway 45 at the MTW entrance during normal MTW operations is 2,052 vehicles for northbound traffic and 2,103 vehicles for southbound traffic (Honeywell 2018a, Response to RAIs TRN-1).

MTW also uses local transportation routes to ship its uranium hexafluoride product, byproduct, and waste materials and to receive process materials. Table 3-4 presents the shipments of feed materials, process chemicals, wastes and byproducts, based on current MTW operations. MTW activities do not involve any particular use of the airport resources.

The list of hazardous chemicals used in MTW operations includes hydrogen fluoride, ammonium hydroxide (aqueous ammonia), sodium hydroxide, potassium hydroxide, potassium bifluoride, sulfuric acid, and liquid hydrogen (Honeywell 2018a, Response to RAIs TRN-1 and POH-2). Table 3-5 provides hazard information for MTW process chemicals.

### Table 3-3 Traffic Fatality Data for Massac County

<table>
<thead>
<tr>
<th>Year</th>
<th>All Traffic Fatalities</th>
<th>All Fatalities per 100,000 Population</th>
<th>Traffic Fatalities Involving a Large Truck</th>
<th>Truck Fatalities per 100,000 Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>5</td>
<td>32.63</td>
<td>1</td>
<td>6.53</td>
</tr>
<tr>
<td>2012</td>
<td>2</td>
<td>13.20</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>2013</td>
<td>1</td>
<td>6.68</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>2014</td>
<td>1</td>
<td>6.72</td>
<td>1</td>
<td>6.72</td>
</tr>
<tr>
<td>2015</td>
<td>3</td>
<td>20.32</td>
<td>1</td>
<td>6.77</td>
</tr>
</tbody>
</table>

Source: NHTSA 2017b

### Table 3-4 Annual Shipments for MTW Operations

<table>
<thead>
<tr>
<th>Material</th>
<th>Mode</th>
<th>Annual Shipments</th>
<th>Frequency</th>
<th>Origin or Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incoming</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uranium ore</td>
<td>Truck; international shipping plus truck</td>
<td>700</td>
<td>1–2 per day</td>
<td>Wyoming; Saskatchewan, Canada; international (other than Canada)</td>
</tr>
<tr>
<td>Ammonium hydroxide</td>
<td>Truck</td>
<td>9</td>
<td>2 per quarter</td>
<td>Granite City, IL</td>
</tr>
<tr>
<td>Hydrogen fluoride</td>
<td>Rail</td>
<td>88</td>
<td>2–4 railcars per week</td>
<td>Geismer, LA</td>
</tr>
<tr>
<td>Potassium hydroxide</td>
<td>Rail</td>
<td>12</td>
<td>1 per month</td>
<td>Ashtabula, OH or Charleston, TN</td>
</tr>
<tr>
<td>Sodium hydroxide</td>
<td>Truck</td>
<td>22</td>
<td>2 per month</td>
<td>St. Louis, MO</td>
</tr>
<tr>
<td>Sulfuric acid</td>
<td>Truck</td>
<td>63</td>
<td>1–2 per week</td>
<td>Clarksville, TN</td>
</tr>
<tr>
<td>Liquid hydrogen</td>
<td>Truck</td>
<td>30</td>
<td>1 per week</td>
<td>McIntosh, AL</td>
</tr>
<tr>
<td>Potassium bifluoride</td>
<td>International shipping plus</td>
<td>1</td>
<td>1 per year</td>
<td>Baltimore, MD</td>
</tr>
</tbody>
</table>
### Table 3-5 Hazard Information for MTW Process Chemicals

<table>
<thead>
<tr>
<th>Material</th>
<th>U.S. Department of Transportation Hazard Class</th>
<th>NFPA Health Rating</th>
<th>Human Health Hazard, Acute Exposure</th>
</tr>
</thead>
</table>
| Ammonium hydroxide                   | 8/ Corrosive                                   | 3                  | - Irritant and corrosive to the skin, eyes, respiratory tract, and mucous membranes.  
|                                      |                                               |                    | - May cause severe chemical burns to the eyes, lungs, and skin.  
|                                      |                                               |                    | - Skin and respiratory-related diseases could be aggravated by exposure.  
|                                      |                                               |                    | - The extent of injury dependent on the duration of the exposure, the concentration of the liquid or vapor, and the depth of inhalation. |
| Anhydrous hydrogen fluoride          | 8/ Corrosive                                   | 4                  | - Inhalation and contact hazard.  
|                                      |                                               |                    | - Consequences are dependent on release quantity, population density, and meteorological conditions.  
|                                      |                                               |                    | - Acute health effects include irritation of the skin, eyes, mucous membranes, and respiratory tract; accumulation of fluid in the lungs (pulmonary edema); nausea and vomiting; gastric pain; irregular heart rate (cardiac arrhythmia); tissue destruction and burns; low blood calcium (hypocalcemia); and possibly death. |

Source: Honeywell 2018a, Response to RAI TRN-2
<table>
<thead>
<tr>
<th>Material</th>
<th>U.S. Department of Transportation Hazard Class</th>
<th>NFPA Health Rating</th>
<th>Human Health Hazard, Acute Exposure</th>
</tr>
</thead>
</table>
| Potassium hydroxide, solution  | 8/ Corrosive                                   | 3                 | • Primarily a contact exposure and exposure of respiratory system via mist.  
• Health effects include severe lesions and burns.  
• Dust or mist exposures may cause eye or respiratory irritation. |
| Potassium bifluoride           | 8/ Corrosive                                   | 3                 | • Primarily a contact hazard.  
• Corrosive to tissues; can cause severe burns and systemic effects.  
• In case of a fire, decomposition product can include hydrogen fluoride. |
| Sodium hydroxide solution      | 8/ Corrosive                                   | 3                 | • Primarily a contact hazard.  
• Can cause severe burns in tissues that come in contact with it.  
• Inhalation of low levels of sodium hydroxide as aerosols may cause irritation of the nose, throat, and respiratory airways. |
| Sulfuric acid                  | 8/ Corrosive                                   | 3                 | • Inhalation and contact hazard.  
• Highly reactive and produces toxic fumes.  
• Consequences are dependent on release quantity, population density, and meteorological conditions.  
• Corrosive to all body tissues.  
• Inhalation of vapor may cause serious lung damage.  
• Contact with the eyes may result in total loss of vision.  
• Skin contact may produce severe necrosis.  
• Fatal in small doses. |
| Liquid hydrogen                | 2.1/ Flammable gas 2.1/ T75, TP5 318           | 3                 | • Forms explosive mixtures in air.  
• Produces vapor cloud.  
• Inhalation and contact hazard.  
• Consequences are dependent on release quantity, population density, and meteorological conditions.  
• Contact with liquid may cause cold burns/frostbite.  
• Asphyxiant in high concentrations. |

Sources: Honeywell 2018a, Response to RAI TRN-1; ATSDR 2002, 2004; CDC 2011, 2017a, 2017b; ScienceLab.com 2013a, 2013b; Cameo 2017a, 2017b; Praxair 2016
3.3 Geology and Soils

The geology and soils assessment was limited to the MTW site because potential impacts would be localized. The NRC analyzed potential impacts of seismic activity on the MTW within a 32-kilometer (20-mile) radius of the MTW site, which includes the New Madrid Seismic Zone (NMSZ).

3.3.1 Geology

The MTW site has a relatively flat topography, lying between 91 and 116 meters (300 and 380 feet) above mean sea level. The restricted area is on a bluff overlooking the Ohio River and is between 113 and 116 meters (370 and 380 feet) above mean sea level (ENERCON 2017, Section 3.3.1). Four ravines with an average dissection depth of 9 to 12 meters (30 to 40 feet) branch away from the bluff from due south to due west. The ravines and this bluff grade into a terrace located between 6 and 12 meters (20 and 40 feet) above the river elevation (ENERCON 2017, Section 3.3.1). These ravines are also mapped, as shown by blue lines (streams) in Figure 3-1 (Honeywell 2018a, Figure 3.4-3).

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 are covered by a few meters of Quaternary loess. Surface soils at the MTW site 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 high-energy and low-energy fluvial and reported aeolian depositional environments.

Figure 3-2 presents a partial geologic cross section (AA') of the MTW site. The Metropolis Formation, which underlies the Cahokia Formation, consists of clay-rich silty sand and sandy silt, ranging in thickness from 6 to 17 meters (20 to 50 feet). The deeply weathered, poorly sorted, and burrowed alluvial sediments of the Metropolis Formation are fluvial sediments that occupied an underfit valley ancestral to the modern Ohio River (Nelson and Masters 2008). This formation is known as a low-yield aquifer in regions to the east and north of the MTW site (Nelson et al. 2002). However, at the MTW site, the Metropolis Formation is not identified as an aquifer, but rather is described as a partially saturated formation. It overlies the uppermost aquifer, the Mounds Gravel, which is composed of gravel and sand from 11 to 20 meters (35 to 65 feet) thick. The Mounds Gravel is made up of the deposits of large, braided rivers that were, in part, ancestral to the modern Tennessee River (Nelson and Masters 2008). Groundwater monitoring wells at the MTW site are located within the Mounds Gravel (ENERCON 2017). Section 4.1.4.2 describes these monitoring wells in more detail.
Figure 3-1  Environmental Land Use Control Boundary and Stream Features
(Source: Honeywell 2018a, RAI Responses Figure 3.4-3)
Bedrock underlying the unconsolidated Mounds Gravel surface deposits consists of Cretaceous McNairy Formation sandstones and shales; Cretaceous Post Creek gravels, sands, and clays; and Mississippian limestones and sandstones. The McNairy Formation sands, silt, and clay are approximately 40 to 49 meters (130 to 160 feet) thick. The Post Creek Formation is approximately 6 to 11 meters (20 to 35 feet) thick underlying the site. The Mississippian Salem Limestone is approximately 67 meters (220 feet) thick and occurs at depths of 85 to 150 meters (280 to 500 feet) (Nelson and Masters 2008).

The AA’ cross section in Figure 3.2 identifies the Layne Western No. 3 well, which is labeled “Well #3” on Figure 31 of this EA. Well No. 3, Wells Nos. 1 and 2, and the sanitary well are each screened within the Mississippian Salem Limestone.

The nearest active mineral extraction operations are sand and gravel extractions along the Ohio River (dredging). There appear to be three active gravel quarries in the Mounds Formation.
about 3 to 8 miles (4.8 to 12.9 kilometers) to the west-northwest of the site (Nelson and Masters 2008). Many additional inactive quarries of the same type are found within the same region. Commodities mined within 80 kilometers (50 miles) of the MTW site are bauxite clay, crushed stone, Fuller’s earth, silica, and silicon (ENERCON 2017, Section 3.3.4).

3.3.2 Soils

The dominant soil types on the MTW site include Stoy silt loam, 0 to 2 percent slopes (primarily northwest of the restricted area); Stoy silt loam, 2 to 5 percent slopes (southeast of the restricted area); and Weir silt loam, 0 to 2 percent slopes (southeast, near the restricted area). Stoy silt loam is prime farmland, and the Weir silt loam is considered a hydric soil prone to ponding. They are not generally suited for building (ENERCON 2017, Section 3.3.3.2).

The soils within the restricted area of the MTW site (i.e., the developed part of the site) and the northern portion of the site below U.S. Highway 45 are primarily orthents; that is, erodible material has been removed so that typical soil horizon indicators are absent. Belknap silt loam, Armiesburg silty clay loam, Peoria silty clay loam, and Armiesburg-Sarpy complex lie along the lower part of the site, along the river, and are typical of floodplains.

3.3.3 Seismicity

The MTW site is located near several major fault zones (Figure 3-3). Figure 3-3 includes annotations and also identifies the NMSZ and St. Genevieve fault system, which are approximately 24 kilometers south and 50 kilometers northwest (15 and 31 miles) of the site, respectively. As shown in Nelson and Masters (2008), the Raum fault zone trends southwest to northeast and lies approximately 6 kilometers (4 miles) to the west-northwest of the site. The Lusk Creek fault zone (Figure 3-3) parallels the Raum zone and lies approximately 6 kilometers (4 miles) farther to the west.
A large number of earthquakes associated with the NMSZ have occurred in northeastern Arkansas and southeastern Missouri, as well as a few in northwestern Kentucky into southwestern Illinois. The U.S. Geological Survey has recorded twenty-eight earthquakes of magnitude greater than 2.5 within 80 kilometers (50 miles) of the MTW site since the end of 2007; the largest occurring in 2012, registering a magnitude of 3.9 about 8 kilometers (5 miles) southwest of Charleston, MO—about 80 kilometers west of the MTW site (USGS 2017a). The associated Modified Mercalli Intensity for these earthquakes ranges from II to III. Under this categorization it could be felt by persons indoors and vibrations would be similar to that of a passing truck (USGS 2017b). The major historic earthquakes felt in this area were the 1811–1812 New Madrid earthquakes, whose epicenters were approximately 97 kilometers (60 miles) southwest of the MTW site. The strongest of these earthquakes is estimated to have produced a Modified Mercalli Intensity IX earthquake, that is, a seismic event capable of causing considerable damage to well-constructed buildings, breaking some underground pipes, and causing serious damage to reservoirs at Metropolis.

The U.S. Geological Survey National Seismic Hazard Maps display probability levels for selected earthquake magnitudes and intensities across the United States, including the NMSZ, in which the MTW site is located (USGS 2017c). A sampling of two maps provides some ranges of seismic assessment relevant to the MTW site in the southeastern tip of Illinois. The first map (USGS 2018a) identifies that the MTW site lies within an area with a risk of approximately 1 to 2 percent chance in 2018 for potentially minor-damage ground shaking. The second map (USGS 2018b) identifies that the MTW site also lies within a zone that has a 2-percent probability of exceedance in 50 years of relatively significant peak ground acceleration (approximately 0.7605g (USGS 2017a)), which is equivalent to a frequency of 1 occurrence every 2,475 years. These two maps are complementary. The first map relates directly to the potential for damage, whereas the second map focuses on the peak ground acceleration, regardless of what damage might be caused.

### 3.4 Water Resources

The area of review for the surface water assessment includes the MTW site, the discharge points from the MTW site to the Ohio River, and the water sampling points in the river identified in Section 2.3.9.2 of this EA. The area of review for groundwater is the subsurface below the MTW site.

#### 3.4.1 Surface Water

##### 3.4.1.1 Features and Flow Characteristics

The MTW site borders the Ohio River on the south, approximately 56 kilometers (35 miles) upstream from where the Ohio joins the Mississippi River. At the site, the Ohio River is about 910 meters (3,000 feet) wide with a normal pool elevation of 88 meters (290 feet) above mean sea level (ENERCON 2017, Section 3.4.1). As noted in Section 3.1.1 of this EA, wetlands are present on the site. As Figure 3-4 shows, a 46.3-hectare (114.3-acre) forested, broad-leafed deciduous, temporary flooded wetland area (PFO1Ah) occurs along the bank of the Ohio River, and a similar 56.2-hectare (138.8-acre) wetland (PFO1A) is in the southeastern forested portion of the site (USFWS 2017a; Honeywell 2018a, RAI Response PA-1). Other than the settling ponds themselves, no wetlands have been mapped in the restricted area. Four creeks are located outside of the restricted area, as indicated in Figure 3-4. Three of the creeks have intermittent flow from stormwater runoff. The fourth creek receives discharges from NPDES Outfall 002, resulting in continuous flow.
Figure 3-4  Surface Water Features  (Source: Honeywell 2018a)
The southern portion of the MTW site is located within the 100-year floodplain, although no MTW structures are located in this area (ENERCON 2017, Section 3.4.5). Since recordkeeping began in 1928, the maximum recorded peak flow on the Ohio River at Metropolis, IL, was 52,386 cubic meters per second (m$^3$/s) (1,850,000 cubic feet per second (ft$^3$/s)) and occurred on February 1, 1937 (USGS 2017b). Although river flooding occurs annually, flood waters reportedly have never reached the MTW site (ENERCON 2017, Section 3.4.2). The elevation of the restricted area (between 113 and 116 meters (370 and 380 feet)) is considerably above the probable elevation of the 100-year flood, which is 103 meters (338 feet) (ENERCON 2017, Section 3.4.2). The restricted area is about 198 meters (650 feet) from the 100-year floodplain. As a comparison, the historic 1937 flood reached an elevation of 104 meters (341 feet) (NRC 2013a). The maximum peak stage of the 2011 flood event of 35,679 m$^3$/s (1,260,000 ft$^3$/s) recorded an elevation of 103 meters (338 feet) (ENERCON 2017, Section 3.4.2). The nearest flow control structure is Lock and Dam No. 52 at Brookport, IL, about 11 kilometers (7 miles) upstream from the site (ENERCON 2017, Section 3.4.2). However, this structure does not impact flooding downstream because it is for navigational purposes only.

### 3.4.1.2 Quality and Use

Outfall 002, which the MTW uses to discharge treated sanitary and process wastewater, noncontact cooling water, and stormwater, is located on one of the four creeks (see Figure 3-1 in this EA), about 610 meters (2,000 feet) from the Ohio River. Until recently, Outfall 002 received discharge from calcium fluoride Pond D (a surface impoundment), which was part of the MTW’s wastewater treatment system. Effluent from Pond D mixed with other MTW effluents before discharging at Outfall 002 (ENERCON 2017, Section 3.4.1). Presently, Outfall 002 receives wastewater directly from the recently upgraded EPF instead of Pond D. The MTW’s liquid effluent discharge rate averaged about 0.12 m$^3$/s (4.18 ft$^3$/s) between 2010 and 2014, with the monthly average ranging from 0.05 m$^3$/s to 0.19 m$^3$/s (6.65 ft$^3$/s to 1.84 ft$^3$/s) (ENERCON 2017, Table 3.4-1). These discharge rates are well below the annual average flow rate of 7,915 m$^3$/s (279,501 ft$^3$/s) for the Ohio River (USGS 2017c).

Honeywell also monitors biological oxygen demand, pH, TSSs, total fluoride, and total uranium at Outfall 002; the results are discussed in Section 2.3.9.1 of this EA. The drainage ditch leading to Outfall 002 on the MTW site is not used for potable water, fishing, recreation, or irrigation before it discharges directly into the Ohio River (ENERCON 2017, Section 3.4.1). Stormwater runoff from the restricted area discharges from Outfalls 003 and 005 (ENERCON 2017, Section 2.1.2.2.6).

The MTW does not use surface water as potable water or process water, and the onsite intermittent streams are not accessible for fishing, recreational, irrigation, or other agricultural uses (ENERCON 2017, Section 3.4.3). The nearest public drinking water intake is from the Ohio River at Paducah, KY, about 17.7 kilometers (11 miles) upstream from the MTW. The nearest downstream public drinking water intake is from the Mississippi River at Cairo, IL, about 51 kilometers (32 miles) away (ENERCON 2017, Section 3.4.3).

As discussed in Section 2.3.9.1 of this EA, NPDES permit number IL0004421 stipulates the effluent limits for Outfall 002 (IEPA 2015a). Effluent at the outfall is sampled daily for uranium and weekly for numerous nonradiological constituents. Concentrations of NPDES-monitored contaminants in the MTW effluent have not had adverse trends within the past 5 years (ENERCON 2017, Section 3.4.4). Excursions involving total suspended solids (TSS), fluoride,
fecal coliform, and temperature (temperature limits were discontinued in 2010) occurred between 2010 and 2015, as presented in Section 2.3.9.1.

The Ohio River Valley Water Sanitation Commission’s most recent biennial assessment of Ohio River designated uses, considering conditions in 2010–2014, found that the 88.8-kilometer (55.2-mile) segment of the Ohio River that includes the MTW site (river miles 925.8 to 981.0) supports the river’s uses for warm-water aquatic life, public water supply, and contact recreation. Certain species found in the Ohio River near the MTW site, such as carp, catfish, and bass, are covered under a fish consumption advisory (ORSANCO 2016, 2017).

Section 2.3.9 of this EA provides further detail on surface-water quality and monitoring results.

3.4.2 Groundwater

3.4.2.1 Hydrogeologic Setting

The unsaturated profiles across the site illustrated by ER Figures 3.3-2a–3.3-2c (ENERCON 2017) indicate broad patterns of clay-rich to sand-rich horizons at multiple depths through and below the water table approximately 15 meters (50 feet) below the elevation of the MTW restricted area.

The uppermost units are fluvial and windblown sediments of Quaternary ages. Lenses of clay, sand, and silt are identified within those profiles. These sediments most likely are the Cahokia Formation, the clay rich Equality Formation, and the Peoria, Roxana, and Loveland silts (Nelson and Masters 2008). The fluvial sources range from low- to high-energy streams. Because the clay zones appear discontinuous, they are not relied upon as a barrier to any potential migration of contaminants from the overlying MTW footprint.

The upper surface of the Metropolis Formation lies approximately 8 meters (25 feet) below the surface at the restricted area of the MTW. This formation is a permeable zone consisting of clay-rich silty sand and sandy silt, ranging in thickness from 6 to 17 meters (20 to 50 feet). The deeply weathered, poorly sorted, and burrowed alluvial sediments of the Metropolis Formation are interpreted as fluvial sediments that occupied an underfit valley ancestral to the modern Ohio River (Nelson and Masters 2008). This zone appears to be discontinuous and the water table is found directly below the Metropolis Formation in the transmissive Mounds Gravel Formation, which has an upper surface elevation 15 meters (50 feet) below the land surface (ENERCON 2017, Nelson and Masters 2008). The Mounds Gravel is made of gravel and sand 11 to 20 meters (35 to 65 feet) thick.

Within the Mounds Gravel, the water table slopes from northeast to south by 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. Temporary slope reversals occur within the water table aquifer on a periodic basis in association with flooding on the Ohio River. The duration of reversal events is approximately 10 to 34 days; however, a series of multiple events may extend the flow reversal for up to 58 days (NRC 2006a).

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. Three deeper, confined aquifers underlie the MTW site. Two aquifers are in the Cretaceous sediments, and the third is within the Mississippian Salem Limestone described in Section 3.3 of this EA. The Cretaceous McNairy Formation may yield enough water for domestic use, but the
high iron content and fine-grained matrix make the groundwater quality generally unattractive (NRC 2006a). The principal source of groundwater for industrial, utility, and municipal water use is the highly fractured and cavernous Mississippian Salem Limestone that underlies the MTW site at depths from 85 to 150 meters (280 to 500 feet) below the surface.

3.4.2.2 Quality and Use

Nelson and Masters (2008) present a map and geological cross section for the region surrounding the MTW site that shows the Mississippian Salem Limestone is the groundwater source for the three industrial water supply wells and the sanitary water well located on the MTW site. The total withdrawal capacity of these wells is 18.43 million liters per day (4.87 million gallons per day), or 12,800 liters per minute (3,380 gallons per minute) (Honeywell 2018a). The depths of these wells range from 126 to 159 meters (412 to 520 feet). 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). The site’s potable water needs are met by the sanitary water well, in accordance with EPA drinking water regulations administered by the Illinois Department of Public Health (ENERCON 2017, Section 3.4.7). A pump test performed in 1971 established connections between all wells except process well #3, which appears to be isolated. Drawdowns were minor after 72 hours and did not exceed 0.6 meters (2 feet) in any well (ENERCON 2017, Section 3.4.7). This suggests high well capacities or high aquifer storage capacity, or both.

As described in Section 2.3.9.2 of this EA, Honeywell has implemented two shallow groundwater corrective actions at the MTW site (ENERCON 2017, Sections 3.4.8.3.1 and 3.4.8.3.2). One corrective action, now complete, was a result of historic activities. An ongoing corrective action is monitoring underground process sewers and structures for possible contamination.

3.5 Ecology

The MTW was cleared of all natural vegetation before the construction of facility buildings, the settling ponds, and other MTW-related facilities (see Figure 1-2 in Chapter 1). The remaining 95 percent of the property remains mostly undeveloped (ENERCON 2017, Section 3.5). The ecological resources that have the potential to be affected by the license renewal are predominately those in the undeveloped portion of the site. Therefore, the area of review for ecological assessment is the entire MTW site.

3.5.1 Terrestrial

The MTW site is located in EPA Level IV Ecoregion 72a, the Wabash-Ohio bottomlands, which is a subregion of Ecoregion 72, interior river valleys and hills (ENERCON 2017, Section 3.5.1; Woods et al. 2006). Ecoregion 72a is a small region along the Ohio River and around Ecoregion 72k, Cretaceous Hill. It is composed of poorly drained floodplains and low terraces. Once covered by bottomland forests and wetlands, Ecoregion 72a has mostly been cleared and drained for agriculture, although seasonally high water tables and localized flooding affect land use (Woods et al. 2006).

The natural vegetation in the area of the MTW site is characteristic of oak-hickory and southern mixed hardwood forests. Associated tree species include oak (Quercus spp.), hickory (Carya spp.), persimmon (Diospyros 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 occidentalis). Vegetation along the electrical transmission line corridor (see Section 3.1.1 of this EA) crossing the MTW site is maintained and includes only grasses and low-growing shrubs such as brome grass (Bromus tectorum), broom sedge (Andropogon virginicus), bluegrass (Poa pratensis), goldenrod (Solidago spp.), sumac (Rhus spp.), and blackberry (Rubus allegheniensis). The MTW site also includes freshwater forested and shrub wetland areas along the Ohio River and in the southeastern forested portion of the site (see Section 3.1.1 of this EA). The floodplain portion of the site had been farmed in the past and is in the process of returning to more natural vegetation (ENERCON 2017, Section 3.5.2.4).

The MTW site is home to animal species that are typical of old field and second-growth forests in the region. 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), and opossum (Didelphis marsupialis). 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. Other important species in the area of the MTW site include recreational game animals (e.g., white-tailed deer (Odocoileus virginianus), furbearers, small game, and resident and migratory game birds) and sport fish.

3.5.2 Aquatic

The aquatic biota of the Ohio River include algal plankton communities comprising 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 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. Freshwater mussels could occur in the area of the Ohio River that is adjacent to the MTW site, but there are no known significant mussel beds in the stretch of river adjacent to the MTW site (KDFWR 2018; USFWS 2018a, 2018b; see also Section 3.5.3 below).

Forage fish that feed largely on detritus, plant material, and 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 near the MTW site, such as carp, catfish, and bass, are covered under a fish consumption advisory (ORSANCO 2016).

3.5.3 Threatened, Endangered, Proposed, and Candidate Species

3.5.3.1 Federally Listed Species

Congress enacted the Endangered Species Act of 1973, as amended (ESA), to prevent further decline of endangered and threatened species and restore those species and their critical habitat. Section 7 of the ESA requires Federal agencies to consult with the USFWS regarding
actions that may affect listed species or designated critical habitats. The ESA and its implementing regulations at 50 CFR Part 402, “Interagency Cooperation—Endangered Species Act of 1973, as Amended,” describe the consultation process that Federal agencies must follow in support of agency actions.

This section lists the federally listed species and critical habitats that could potentially occur in the MTW action area (site) or adjacent Ohio River, which borders both Massac County, IL, and McCracken County, KY. The ESA regulations define “action area” as all areas affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02, “Definitions”). The ESA analysis in this EA considers the action area to include the entire MTW site, as well as the Ohio River directly adjacent to the MTW site, including discharge areas. The NRC expects all direct and indirect effects of the proposed action on ecological resources to be contained within these areas, with the exception of downstream effects of discharges into the river.

The analysis in this EA used the USFWS’s Environmental Conservation Online System’s Information for Planning and Conservation system (IPaC) to identify the potentially present species and habitats associated with both Massac County and McCracken County to ensure the EA evaluated all potentially threatened, endangered, proposed, and candidate species in the Ohio River. Based on IPaC results, 16 federally listed species have the potential to occur in the MTW action area, nine in Massac County, and an additional seven were reported in McCracken County (USFWS 2018a). Table 3-6 lists all these species, followed by brief life histories. There are no proposed species or candidate species in the action area; however, designated critical habitat for one threatened species of mussel, the rabbitsfoot, Quadrula cylindrica, is found within the Ohio River in McCracken County (USFWS 2018a). Two additional federally listed species have been found in McCracken County (wood stork, Mycteria americana, a single record in 2010, and shovelnose sturgeon, Scaphirhynchus platorynchus, a single record in 2006) (KDFWR 2018). These sightings are isolated records and do not appear in IPaC searches conducted for Massac County and McCracken County. The shovelnose sturgeon is listed as a threatened species under the ESA’s “similarity of appearance” provision because of its similarity to the pallid sturgeon and the overlapping ranges of these two fish in the Missouri and Mississippi River basins. This EPA designation, however, does not apply to the Ohio River in the vicinity of the MTW site (USFWS 2018c).

None of these federally listed species has been observed in the restricted area of the site. USFWS did not identify any listed plant species occurring in Massac County.

Federally listed threatened or endangered terrestrial animals whose ranges include Massac County, McCracken County, or both, are the least tern (Sternula antillarum), the Indiana bat (Myotis sodalis), northern long-eared bat (Myotis septentrionalis), and gray bat (Myotis grisescens).

In the interior of the United States, least terns nest on exposed riverine sandbars and forage nearby for small fish. They breed in the summer and fly south to winter along the Gulf of Mexico and on Caribbean Islands (NatureServe 2017a). Least terns are likely summer residents on the Ohio River in fairly close proximity (within 0.6 to 1.2 kilometers (1 to 2 miles)) to the MTW site, with adults present, likely foraging, “across from Metropolis Lake” on the Ohio River, as observed during a 2005 breeding survey (Ciuzio et al. 2005). A sandbar that appears to be suitable habitat based on aerial photos (see Figure 3-1 in this EA) is directly adjacent to the river discharge point of Outfall 002, but no terns have been known to nest there. The nearest known nesting sites consist of two islands about 2.7 kilometers (1.6 miles) downstream, across from
the AEP Cook Coal Terminal. The last record of terns nesting there was in 2012, with eight known nests. River flooding and nest inundation is a problem throughout the Ohio River. The only other known least tern nesting site farther downstream on the Ohio River is near Monkey’s Eyebrow, KY (approximately 23 kilometers, 14.3 miles downstream of the MTW site); 24 nests were reported there in 2012 (Harper 2018).

### Table 3-6 Massac County, IL, and McCracken County, KY, Federally Threatened, Endangered, or Candidate Species

<table>
<thead>
<tr>
<th>Name</th>
<th>Federal Status</th>
<th>State Status</th>
<th>Present on MTW Site?</th>
</tr>
</thead>
<tbody>
<tr>
<td>least tern (Sternula antillarum)</td>
<td>endangered</td>
<td>IL and KY endangered</td>
<td>Likely as a migrant or summer resident, breeding on sandbars in the river (INHS 2018; KDFWR 2018); last observed in Massac County in 1996 (ILDNR 2016); last observed in McCracken County in 2012 (KDFWR 2018); adults observed on the Ohio River “opposite Metropolis Lake” during breeding season in 2005 (Ciuzio et al. 2005).</td>
</tr>
<tr>
<td>Indiana bat (Myotis sodalis)</td>
<td>endangered</td>
<td>IL and KY endangered</td>
<td>Potential habitat statewide, but no known occurrence in Massac County (USFWS 2017b). Fifteen records for McCracken County, last observed there in 1999 (KDFWR 2018).</td>
</tr>
<tr>
<td>northern long-eared bat (Myotis septentrionalis)</td>
<td>threatened (4,d rule)</td>
<td>IL and KY endangered</td>
<td>Last observed in Massac County in 2005 (ILDNR 2016). Last observed in McCracken County in 2008 (KDFWR 2018).</td>
</tr>
<tr>
<td>gray bat (Myotis grisescens)</td>
<td>endangered</td>
<td>IL and KY endangered</td>
<td>No Massac County or McCracken County records (ILDNR 2016; KDFWR 2018), but present in McCracken County according to IPaC (USFWS 2018a).</td>
</tr>
<tr>
<td>orangefoot pimpleback (pearlymussel) (Plethobasus cooperianus)</td>
<td>endangered</td>
<td>IL and KY endangered</td>
<td>Potentially in the river; last observed in McCracken County in 2015 (KDFWR 2018).</td>
</tr>
<tr>
<td>pink mucket (pearlymussel) (Lampsilis abrupta)</td>
<td>endangered</td>
<td>IL and KY endangered</td>
<td>Potentially in the river; last observed in McCracken County in 2004 (KDFWR 2018).</td>
</tr>
<tr>
<td>purple cat’s paw (pearlymussel) (Epioblasma obliquata)</td>
<td>endangered</td>
<td>KY endangered</td>
<td>Potentially in the river; no Massac County or McCracken County records (ILDNR 2016; KDFWR 2018), but present in McCracken County according to IPaC (USFWS 2018a).</td>
</tr>
<tr>
<td>fat pocketbook (mussel) (Potamilus capax)</td>
<td>endangered</td>
<td>IL and KY endangered</td>
<td>Potentially in the river; last observed in McCracken County in 2015 (KDFWR 2018).</td>
</tr>
<tr>
<td>rabbitsfoot (mussel) (Quadrula cylindrica cylindrica)</td>
<td>threatened</td>
<td>IL endangered and KY threatened</td>
<td>Potentially in the river, which is critical habitat (USFWS 2016); last observed in McCracken County in 2015 (KDFWR 2018).</td>
</tr>
<tr>
<td>sheepnose (mussel) (Plethobasus cyphyus)</td>
<td>endangered</td>
<td>IL and KY endangered</td>
<td>Potentially in the river; last observed in McCracken County in 2015 (KDFWR 2018).</td>
</tr>
</tbody>
</table>
### Endangered Species

<table>
<thead>
<tr>
<th>Name</th>
<th>Federal Status</th>
<th>State Status</th>
<th>Present on MTW Site?</th>
</tr>
</thead>
<tbody>
<tr>
<td>spectaclecase (mussel) (<em>Cumberlandia monodonta</em>)</td>
<td>endangered</td>
<td>IL and KY endangered</td>
<td>Potentially in the river; last observed in Massac County in 1994 (ILDNR 2016).</td>
</tr>
<tr>
<td>rough pigtoe (mussel) (<em>Pleurobema plenum</em>)</td>
<td>endangered</td>
<td>IL delisted and KY endangered</td>
<td>Potentially in the river; no Massac County or McCracken County records (ILDNR 2016; KDFWR 2018), but present in McCracken County according to IPaC (USFWS 2018a).</td>
</tr>
<tr>
<td>northern riffleshell (mussel) (<em>Epioblasma torulosa rangiana</em>)</td>
<td>endangered</td>
<td>IL and KY endangered</td>
<td>Potentially in the river; no Massac County or McCracken County records (ILDNR 2016; KDFWR 2018), but present in McCracken County according to IPaC (USFWS 2018a).</td>
</tr>
<tr>
<td>ring pink (mussel) (<em>Obovaria retusa</em>)</td>
<td>endangered</td>
<td>IL delisted and KY endangered</td>
<td>Potentially in the river; no Massac County or McCracken County records (ILDNR 2016; KDFWR 2018), but present in McCracken County according to IPaC (USFWS 2018a).</td>
</tr>
<tr>
<td>clubsell (mussel) (<em>Pleurobema clava</em>)</td>
<td>endangered</td>
<td>IL and KY endangered</td>
<td>Potentially in the river; no Massac County or McCracken County records (ILDNR 2016; KDFWR 2018), but present in McCracken County according to IPaC (USFWS 2018a).</td>
</tr>
<tr>
<td>fanshell (mussel) (<em>Cyprogenia stegaria</em>)</td>
<td>endangered</td>
<td>IL and KY endangered</td>
<td>Potentially in the river; no Massac County or McCracken County records (ILDNR 2016; KDFWR 2018), but present in McCracken County according to IPaC (USFWS 2018a).</td>
</tr>
</tbody>
</table>

Sources: USFWS 2018a; ILDNR 2012, 2016; KDFWR 2018

The Indiana bat has been noted as occurring in several Illinois counties, although not Massac County, and the entire State is within its range (NatureServe 2017b). Bats have been reported to the Kentucky Department of Fish and Wildlife Resources as present in McCracken County at least 15 times, with the most recent available record from 1999 (KDFWR 2018). Indiana bats migrate seasonally between winter hibernacula, such as caves and abandoned mines, and summer roosting habitats. In the spring, females emerge from hibernation to summer roosts, where they form nursery colonies in cavities and under the loose bark of living or dead trees. During the summer, the Indiana bats frequent wooded or semi-wooded areas, often, but not always, along streams. They forage for flying insects in riparian areas, upland forests, ponds, and fields, preferring forested landscapes (NatureServe 2017b).

The northern long-eared bat is one of the species of bats most impacted by the disease known as “white-nose syndrome.” As a result of declines caused by this disease and its continued spread, the northern long-eared bat was listed as threatened under the ESA in 2015. Like the Indiana bat, the northern long-eared bat spends the winter hibernating in caves and mines. In the summer, the bat roosts singly or in colonies underneath bark, in cavities, or in crevices of living and dead trees. They forage for insects in the understory of forested hillsides and ridges (USFWS 2017c). The bat’s range includes Massac County and McCracken County, including the forested areas that provide its summer habitat, with records of sightings as recent as 2005 (ILDNR 2016) and 2008 (KDFWR 2018).
The gray bat is federally listed as endangered and is present in McCracken County according to IPaC (USFWS 2018a), although neither State has a record of occurrence in its database of rare species (ILDNR 2016; KDFWR 2018).

Federally listed threatened or endangered aquatic animals whose ranges include the Ohio River in the vicinity of the MTW site are 12 mollusk species: fat pocketbook, orangefoot pimpleback, pink mucket, rabbitsfoot, sheepnose, spectaclecase (USFWS 2018a), rough pigtoe, purple cat’s paw, northern riffleshell, ring pink, clubshell, fanshell (USFWS 2018a) (see Table 3-6 in this EA for details of county records). A mussel survey (including dive surveys) would be required to determine the presence of these species in this portion of the Ohio River, although the stretch of river adjacent to the MTW site is not known to host significant mussel resources or beds (USFWS 2018b). The portion of the Ohio River in Massac County and McCracken County is considered critical habitat for the rabbitsfoot mussel (USFWS 2018a).

3.5.3.2 State-Listed Species

The Illinois Department of Natural Resources designates species as endangered or threatened through the Illinois Endangered Species Protection Board; the Kentucky Department of Fish and Wildlife Resources does the same through the Kentucky State Nature Preserves Commission. The Illinois Endangered Species Protection Act (Chapter 520 of the Illinois Compiled Statutes, Section 10 (520 ILCS 10)) requires Illinois State agencies to ensure that their actions do not jeopardize the continued existence of endangered and threatened species or result in the destruction or modification of critical habitat. Projects that require State-issued permits, use State funds, or are conducted by State agencies require the Illinois Department of Natural Resources to conduct an environmental review for impacts on State-designated endangered and threatened species.

As a Federal agency, the NRC is not required to analyze impacts on resources that are subject to the Illinois Endangered Species Protection Act. However, this EA evaluates the State-listed species that have the potential to be present in the MTW action area, and assesses the likely impacts on those species, in order to provide a complete assessment of the potential impacts of the proposed action for the purposes of NEPA. The NRC staff used the Illinois Natural Heritage Database (updated in 2016) to identify State-listed species with the potential to occur in the MTW action area within Massac County (ILDNR 2016) and the Kentucky Species Information portal to search for State-listed species in McCracken County with the potential to occur near, on, or in the Ohio River (KDFWR 2018). Table 3-6 in this EA denotes the State status of federally listed species for Illinois and Kentucky.

The Illinois Department of Natural Resources lists 57 threatened or endangered plant and animal species that are present in Massac County (ILDNR 2016). Fifty of these species are not federally listed. Of the 50 species, 25 are plant or lichen species, 1 is a bat species (southeastern myotis, Myotis austroriparius), 5 are additional mussel species (not already federally listed), 8 are bird species, 4 are reptiles (three snakes and one turtle), 4 are fish, 1 is a crayfish, 1 is a frog (bird-voiced treefrog, Hyla avivoca), and 1 is an amphibian, the hellbender salamander (Cryptobranchus alleganiensis).

The NRC staff is not aware of any biological surveys that confirm the presence of State-listed species in the vicinity of the MTW site. Seven additional State-listed species are also federally listed (discussed above). Of the State-listed bird species, five are likely to be found in the Ohio River habitat adjacent to or within the project site, either as raptors fishing in the river
(e.g., Mississippi kite (*Ictinia mississippiensis*), osprey (*Pandion haliaetus*)) or as waterfowl using the river itself (e.g., common gallinule (*Gallinula galeata*)).

The Kentucky Department of Fish and Wildlife Resources lists 73 threatened or endangered animal species that are present in McCracken County; however, no plant species are listed (KDFWR 2018). Three State-listed species are bats, including the southeastern myotis and two additional species not listed federally or in Illinois, the evening bat (*Nycticeius humeralis*) a species of special concern, with a record from 2016, and Rafinesque's big-eared bat (*Corynorhinus rafinesquii*) also a species of special concern, with a record from 2009. Only one species is also State-listed in Illinois, the eastern ribbon snake (*Thamnophis sauritus sauritus*). The Kentucky State-listed species recorded in McCracken County are not co-listed in Illinois or at the Federal level. These species include 1 frog, 1 snake, and 2 turtle species, 16 fish species, 1 mollusk, 1 crustacean, and 5 aquatic gastropods (snails). In addition, 23 bird species are State-listed with records in McCracken County, 14 of which are likely to be found in or around the Ohio River (e.g., waterfowl or raptors that feed on aquatic species). The aquatic species, fish-eating species, and aerial insect-eating species (bats), could be found in and around the Ohio River in proximity to the MTW site.

The bald eagle (*Haliaeetus leucocephalus*) is one of the fish-eating species reported in McCracken County and likely forages for fish in the Ohio River in the vicinity of the MTW site (KDFWR 2018). Bald eagles are protected by the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.). Bald eagles use mature, forested riparian areas near rivers, streams, lakes, and wetlands and are present along all the major river systems in Ohio and Illinois, with some of the largest wintering roosts in the continental United States occurring in Illinois (Steenhof et al. 2008). Suitable habitat exists in the action area, but there is no documentation of regularly inhabited roosts.

### 3.6 Meteorology, Climatology, and Air Quality

#### 3.6.1 Meteorology and Climatology

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. The general climate of the area of the MTW site remains as that described in the NRC's EA for the previous license renewal (NRC 2006a). Because of the MTW site's proximity to the Ohio River, its climate is more typical of western Kentucky than southern Illinois. Winter is characterized by evenly distributed precipitation events and moderate diurnal changes in temperature. In the summer, frontal and pressure systems generally pass north of the region, resulting in a more tranquil weather pattern over the area.

Previous analyses have relied on meteorological data from the National Weather Service’s station at Paducah, KY, on the far bank of the Ohio River, approximately 11.3 kilometers (7 miles) south of the site. Instead, this EA examines data from the Paducah Barkley Regional Airport from January 1, 2005, through December 31, 2016 (NOAA 2017a).

#### 3.6.1.1 Temperature

The average annual temperature in the area 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 (NRC 2006a). The maximum temperature at the Paducah airport station was 41.1 °C (106.0 °F), recorded in 1952; the minimum temperature of -24.4 °C (-12.0 °F) was recorded in
1951. National Weather Service data from 1997 through 2004 indicate that 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 (NRC 2006a).

Based on an analysis of the new data for Paducah from 2005 through 2016 (NOAA 2017a), the average annual temperature remains about 14.7 °C (58.5 °F), with monthly average temperatures ranging from 26.1 °C (78.9 °F) during July to 1.9 °C (35.5 °F) during January. A new record maximum was recorded in June 2012 at 42.2 °C (108 °F); the minimum temperature was -23.3 °C (-10 °F), in February 2015. The high temperature exceeded 32.2 °C (90.0 °F) on an average of 44.5 days per year and was 0 °C (32 °F) or below on an average of 24 days per year.

3.6.1.2 Precipitation

Precipitation in the region is fairly uniform throughout the year (NRC 2006a). The mean annual precipitation for the Paducah, KY, station is 117.8 centimeters (46.38 inches), with more rainfall typically occurring between March and July than for the remainder of the year. Additionally, the region experiences approximately 70 thunderstorm days annually (NRC 2006a). 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 (NRC 2006a).

The NRC's analysis of the new data for Paducah from 2005 through 2016 (NOAA 2017a) shows that these parameters generally remained consistent. Mean annual precipitation increased to about 128.3 centimeters (50.5 inches), with annual snowfall averaging 26.7 centimeters (10.5 inches). The maximum monthly rainfall at Paducah from 2005 through 2016 was 29.6 centimeters (11.64 inches) in September 2006.

3.6.1.3 Winds, Tornados, and Storms

Based on data from 1997 through 2004, the predominant wind direction at the MTW site is from the southwest quadrant with a secondary maxima from the north-northwest. The average wind speed over this period was 10.1 kilometers per hour (kph) (6.3 miles per hour (mph)), with individual year averages ranging from 9.8 to 10.8 kph (6.1 to 6.7 mph). The maximum hourly average wind speed observed during this period was 55.5 kph (34.5 mph), and the maximum gust was 113 kph (70.2 mph) in 2001. Based on an analysis of the new data for Paducah from 2005 through 2016 (NOAA 2017a), the average wind speed remained consistent at 10.3 kph (6.4 mph), with individual year averages ranging from 9.3 to 11.1 kph (5.8 to 6.9 mph). The maximum daily average wind speed was 33.5 kph (20.8 mph), and the maximum gust was 127.1 kph (79 mph) in 2011 (NRC 2006a).

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 (NRC 2006a).

Tornados are measured on the Enhanced Fujita (EF) scale, where EF0 is the weakest, with winds of 105 to 137 kph (65 to 85 mph), and EF5 is the strongest, with winds over 322 kph.
Between 1950 and 2015, there were no EF5 tornados and one EF4 tornado (May 6, 2003) (winds 26 to 322 kph (166 to 200 mph)) in the seven counties around the MTW site. The EF4 tornado began approximately 32.2 kilometers (20 miles) west-northwest of Metropolis and traveled 9.7 kilometers (6 miles) into Massac County (NRC 2006a). EF3 tornados (winds 219 to 266 kph (136 to 165 mph)) occurred in 2006, about 6.4 kilometers (4 miles) west of the MTW site, and in 2013, south of Paducah, KY (MRCC 2017). Smaller tornados in the immediate vicinity of the site include an EF2 tornado (winds 179 to 266 kph (111 to 165 mph)) in 2012, an EF1 tornado (winds 138 to 177 kph (86 to 110 mph)) in 2011, and an EF0 tornado in 2005—all just northwest of the MTW site (MRCC 2017).

### 3.6.2 Air Quality

The area of review for the air quality assessment is Massac County, IL, and McCracken County, KY.

Section 2.3.9.1 of this EA presents the results of air emission monitoring for radionuclides and fluoride implemented at MTW. Air quality is measured against the EPA-established National Ambient Air Quality Standards, which were established to protect human health and welfare (primary standards) and to protect against damage to the environment and property (secondary standards). The National Standards regulate total suspended particulates (inhalable particulate matter with aerodynamic diameters less than 10 micrometers (PM10) and less than 2.5 micrometers (PM2.5)), ozone, nitrogen dioxide, sulfur dioxide, carbon monoxide, and lead. Illinois Administrative Code (IAC) Title 35, “Procedural and Environmental Rules,” Subtitle B, “Air Pollution,” Chapter I, “Pollution Control Board,” Section 243, “Air Quality Standards,” adopted the national ambient air quality standards for pollutants. Table 3-7 summarizes the ambient air quality standards for the regulated pollutants.

Compliance with these standards is determined individually for each pollutant. An area is classified as "in attainment" when concentration levels are below the National Standards. As of February 2017, Massac County, IL, and McCracken County, KY, continue to be in attainment with regard to these six criteria pollutants (EPA 2017a, 2017b).

#### Table 3-7 Summary of National and Illinois Ambient Air Quality Standards

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Primary/Secondary</th>
<th>Averaging Time</th>
<th>Level</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Monoxide</td>
<td>Primary</td>
<td>8-hour</td>
<td>9 ppm</td>
<td>Not to be exceeded more than once per year</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1-hour</td>
<td>35 ppm</td>
<td></td>
</tr>
<tr>
<td>Lead</td>
<td>Primary and secondary</td>
<td>Rolling 3-month average</td>
<td>0.15 µg/m³</td>
<td>Not to be exceeded</td>
</tr>
<tr>
<td>Nitrogen Dioxide</td>
<td>Primary</td>
<td>1-hour</td>
<td>100 ppb</td>
<td>98th percentile, averaged over 3 years</td>
</tr>
<tr>
<td></td>
<td>Primary and secondary</td>
<td>Annual</td>
<td>52 ppb</td>
<td>Annual mean</td>
</tr>
<tr>
<td>Ozone</td>
<td>Primary and secondary</td>
<td>8-hour</td>
<td>0.070 ppm</td>
<td>Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years</td>
</tr>
<tr>
<td>Particle Pollution</td>
<td>PM2.5(^a)</td>
<td>Primary Annual</td>
<td>12.0 µg/m³</td>
<td>Annual mean, averaged over 3 years</td>
</tr>
<tr>
<td></td>
<td>Secondary Annual</td>
<td></td>
<td>15.0 µg/m³</td>
<td>Annual mean, averaged over 3 years</td>
</tr>
<tr>
<td>Pollutant</td>
<td>Primary/ Secondary</td>
<td>Averaging Time</td>
<td>Level</td>
<td>Form</td>
</tr>
<tr>
<td>--------------</td>
<td>--------------------</td>
<td>----------------</td>
<td>------------</td>
<td>-----------------------------------------------------------</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>Primary and secondary</td>
<td>24-hour</td>
<td>35 µg/m³</td>
<td>98th percentile, averaged over 3 years</td>
</tr>
<tr>
<td>Sulfur Dioxide</td>
<td>Primary</td>
<td>1-hour</td>
<td>75 ppb</td>
<td>99th percentile of 1-hour daily maximum concentrations, averaged over 3 years</td>
</tr>
<tr>
<td></td>
<td>Secondary</td>
<td>3-hour</td>
<td>0.5 ppm</td>
<td>Not to be exceeded more than once per year on average over 3 years</td>
</tr>
</tbody>
</table>

a PM₂.₅ standards are referenced to local conditions of temperature and pressure rather than standard conditions (760 millimeters of mercury and 25 °C).

ppb = parts per billion.

Source: IEPA 2016c

Table 3-8 shows the IEPA annual air quality report for 2016 estimated stationary point source emissions in Massac County, IL.

**Table 3-8 Massac County, IL, Estimated Stationary Point Source Emissions, 2015 (metric tons per year)**

<table>
<thead>
<tr>
<th>Carbon Monoxide</th>
<th>Nitrogen Oxides</th>
<th>PM₁₀</th>
<th>Sulfur Dioxide</th>
<th>Volatile Organic Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,296.0</td>
<td>5,523.8</td>
<td>845.9</td>
<td>14,990.6</td>
<td>254.4</td>
</tr>
</tbody>
</table>

Note: To convert metric tons to tons, multiply by 0.907.

Source: IEPA 2015b

The EPA established prevention of significant deterioration (PSD) requirements in 40 CFR 52.21, “Prevention of Significant Deterioration of Air Quality,” identify maximum allowable increases in concentration for particulate matter, sulfur dioxide, and nitrogen dioxide for areas designated as in attainment. Different increment levels are identified for different PSD classes. Class I areas are high-value locations and have the most stringent standards. The Mammoth Cave National Park is the closest PSD Class I area, located about 240 kilometers (150 miles) east of the MTW site. Since EPA promulgated the PSD regulations in 1977, no PSD permits have been required for any emission source at MTW.

Burning fossil fuels and other agricultural and industrial processes produce greenhouse gases (GHGs). These gases can trap heat in the atmosphere. Examples of GHGs include carbon dioxide, methane, nitrous oxide, and certain fluorinated gases such as hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. These gases vary in their ability to trap heat.

In Illinois, the level of carbon dioxide emissions (including the MTW) was 233.9 million metric tons (257.8 million tons) in 2014, which represents about 4 percent of the total GHG emissions in the United States (EPA 2017c). MTW released 18,489 metric tons (20,381 short tons) of carbon dioxide in 2014 (ENERCON 2017, Table 2.1-4), which is about 0.0000008 percent of the State total emissions.

Recent improvements in the emissions and the science of climate change have enabled the U.S. Global Change Research Program (GCRP) to estimate regional climate changes in the
United States. The GCRP’s Third National Climate Assessment (GCRP 2014) delineates the MTW site as located in the Midwest region of the United States. For the region of Illinois where the proposed project is located, GCRP forecasts an increase in heat wave frequency and intensity, increased humidity, decreased air quality, and increased number of extreme rainfall events.

3.7 **Noise**

The area of review for the noise assessment is the area within a 3.2-kilometer (2-mile) radius of the MTW site.

3.7.1 **Noise Guidelines**

EPA has identified an equivalent continuous noise level (24-hour) of 70 decibels or less as adequate to protect against hearing loss over a lifetime and a day-night average sound level outdoors of 55 decibels or less to be adequate to protect against activity interference and annoyance (EPA 1974, Table 1). EPA identifies noise at or greater than 55 A-weighted decibels (a weighted measure used to approximate the noise response of the human ear), with a margin of safety determined to protect hearing, as causing outdoor-activity interference and annoyance. As points of comparison, heavy highway traffic at 91 meters (300 feet) has a noise level of 60 A-weighted decibels and a gas-powered lawn mower at 30 meters (100 feet) has a noise level of 70 A-weighted decibels. Noise levels lessen with increasing distance from the respective source.

The Federal Highway Administration has codified noise abatement criteria levels (Categories A to E) for noise-sensitive receptors based on types of land use and human activity. Table 3-9 gives some of the categories and their associated noise abatement criteria.

Illinois promulgated its own sound emission standards in 35 IAC 901, “Sound Emission Standards and Limitations for Property Line Noise Sources,” which contains sound emission standards and limitations for property line-noise sources. Section 901.101, “Classification of Land According to Use,” classifies land according to its use, based on the Land-Based Classification Standards (LBCS) of the American Planning Association (APA 2001). The MTW site is Class C land, LBCS code 3110, for primarily plant or factory-type activities. Residential land, within LBCS code 1000, is considered a Class A land use. In accordance with 35 IAC 901.102, “Sound Emitted to Class A Land,” daytime noise from Class C land to Class A land cannot exceed 75 decibels at low frequencies (31.5 hertz) to 40 decibels at high frequencies. Nighttime limits are 69 decibels at low frequencies and 32 decibels at high frequencies. These limits apply at any point within the receiving land.

**Table 3-9 Federal Highway Administration Noise Abatement Criteria Levels**

<table>
<thead>
<tr>
<th>Category</th>
<th>Location</th>
<th>Description</th>
<th>Level (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Exterior</td>
<td>Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.</td>
<td>57</td>
</tr>
<tr>
<td>B</td>
<td>Exterior</td>
<td>Residential</td>
<td>67</td>
</tr>
<tr>
<td>C</td>
<td>Exterior</td>
<td>Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public</td>
<td>67</td>
</tr>
</tbody>
</table>
### 3.7.2 Existing Levels at the MTW Site

Honeywell conducted noise monitoring in October 2011 and December 2014 within the MTW. The highest noise levels measured were within the FMB, ranging from 78.8 to 109.3 decibels. Noise readings in other MTW buildings consistently measured about 70 decibels (Sanders 2016).

In addition to the MTW, other sources of noise near the site include U.S. Highway 45, the BNSF railroad, and the Metropolis Municipal Airport. Honeywell has not performed any noise surveys at the boundary of the restricted area, and no ambient noise survey data are available for the area around the MTW site.

The distance from the restricted area to potential receptors helps mitigate any offsite noise impacts from facility operations. The nearest residence is more than 538 meters (1,765 feet) north-northeast of the FMB in the restricted area (ENERCON 2017, Section 3.7). There are no other noise-sensitive receptors (e.g., residences, schools, hospitals) in close proximity.

### 3.8 Historic and Cultural Resources

As required by Section 106 of the National Historic Preservation Act (NHPA), the NRC is considering the impact of this license renewal on historic, archaeological, and traditional cultural resources. In accordance with 36 CFR 800.8 (the implementing regulations for NHPA), “Coordination with the National Environmental Policy Act,” the NRC is using the NEPA process to coordinate its obligations under NHPA Section 106. The staff conveyed this information to the Illinois State Historic Preservation Office (SHPO) in a letter dated July 11, 2018 (NRC 2018a).

For this proposed action, the area of potential effect (APE) is the entire MTW site, comprising approximately 405 hectares (1,000 acres), which is owned by Honeywell. The majority of the APE is densely forested land, with actual plant operations taking place on about 5 percent of the site.
within a 24-hectare (59-acre) fenced, restricted area in the north central portion of the APE (see Figure 2-1).

Beyond the MTW APE, the NRC staff selected an 8-kilometer (5-mile) radius from the approximate center point of the previously disturbed restricted area in order to identify historic properties listed or eligible for listing on the National Register of Historic Places (NRHP) and evaluate potential adverse effects of the proposed license renewal on the viewsheds associated with those properties (Honeywell 2017b). The extended 8-kilometer radius includes land in southern Massac County, IL, and northern McCracken County, KY.

3.8.1 Identified Historic and Cultural Resources

Information evaluated for this review derives from the license renewal ER (ENERCON 2017), as updated and supplemented in this analysis. Data for known or previously recorded historic and cultural properties within the APE and the extended radius come from several sources. Historic properties listed on the NRHP can be found on the U.S. National Park Service NRHP Web site (NPS 2018a, 2018b). For the State of Illinois, information for historic architectural resources is available in the Historic and Architectural Resources Geographic Information System (HARGIS). HARGIS is maintained by the Illinois Historic Preservation Agency and includes all architectural resources that have been listed in the NRHP, determined eligible for listing in the NRHP, or surveyed without an NRHP determination. Data for archaeological resources are derived from the Inventory of Illinois Archaeological Sites geographic information system database. This database is maintained by the Illinois Department of Natural Resources and the Illinois State Museum.

3.8.1.1 National Register of Historic Places Listed or Eligible Properties Outside the Area of Potential Effect

Several historic properties either listed on the NRHP or determined eligible are situated in proximity to the MTW site, but lie outside the APE. Two NRHP-listed properties are in Massac County, IL, and one is in McCracken County, KY. These properties are within 8 kilometers (5 miles) of the MTW site (Table 3-10). Two other NRHP-eligible historic buildings located in downtown Metropolis, IL, and one NRHP-eligible historic district located in McCracken County also lie within 8 kilometers of the site. The closest of these properties is the TVA Shawnee Steam Plant (also known as the Shawnee Fossil Plant), which was listed on the NRHP in August 2016 (NPS 2016). This operating facility is located on the southern bank of the Ohio River, directly across from the MTW site at a distance of 1.8 kilometers (1.1 miles) from the southern boundary of the MTW site (also the APE boundary). Also located within 8 kilometers of the MTW site are the Elijah P. Curtis House in Downtown Metropolis (NPS 1978) and the site of historic Fort Massac, just southeast of Metropolis (NPS 1971). Three NRHP-eligible historic properties lie within 8 kilometers of the MTW site, including Washington Park Band Shell and U.S. Post Office Building in Metropolis (HARGIS 2017), and the PGDP Historic District (CDM 2006).
### Table 3-10 NRHP-Listed or -Eligible Properties in Proximity to the MTW Site

<table>
<thead>
<tr>
<th>Properties Listed or Eligible for Listing in the NRHP</th>
<th>Location, Date Listed/Determined Eligible</th>
<th>Approximate Distance/Direction from the Honeywell MTW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elijah P. Curtis House</td>
<td>Metropolis, Massac County, IL: Listed 1978</td>
<td>3.2 kilometers (2 miles)/southeast</td>
</tr>
<tr>
<td>Washington Park Band Shell</td>
<td>Metropolis, Massac County, IL; Determined Eligible</td>
<td>3.2 kilometers (2 miles)/southeast</td>
</tr>
<tr>
<td>U.S. Post Office Building</td>
<td>Metropolis, Massac County, IL: Determined Eligible</td>
<td>3.2 kilometers (2 miles)/southeast</td>
</tr>
<tr>
<td>Fort Massac Site</td>
<td>Southeast of Metropolis, Massac County, IL: Listed 1971</td>
<td>4.9 kilometers (3 miles)/southeast</td>
</tr>
<tr>
<td>Kincaid Mounds Site</td>
<td>Southeast of Brookport, Massac County, IL: Listed 1966</td>
<td>25.5 kilometers (15.8 miles)/southeast</td>
</tr>
<tr>
<td>Shawnee Steam Plant</td>
<td>Northwest of West Paducah, McCracken County, KY: Listed 2016</td>
<td>1.8 kilometers (1.1 miles)/southwest</td>
</tr>
<tr>
<td>Paducah Gaseous Diffusion Plant Historic District</td>
<td>West of West Paducah, McCracken County, KY: Determined Eligible: 2003</td>
<td>7.1 kilometers (4.5 miles)/southwest</td>
</tr>
</tbody>
</table>

Sources:  Hargis 2017; CDE 2006

### 3.8.1.2 Previous Cultural Resources Surveys in the MTW Area of Potential Effect

Built in 1958, the land acquisition and initial construction of the MTW preceded historic preservation laws and implementing regulations (e.g., NEPA and NHPA). For this reason, very few cultural resources investigations have been conducted on the 405-hectare (1,000-acre) APE. Existing information reveals that less than 25 percent of the APE has been surveyed for potential archaeological and historical sites, and all of this previous fieldwork occurred on land west of the restricted area.

An early literature review and site file search for the Illinois portion of the Ohio River shoreline and the adjacent floodplain did not reveal any known archaeological or historic sites between Metropolis (River Mile 943) and Joppa (River Mile 951) (Muller and Davy 1977).

A 2001 cultural resource field investigation of 110 hectares (275 acres) encompassed the heavily wooded area extending from the west boundary of the restricted area to the western boundary of the site (the APE), recording five cultural resource sites in the process (Neal and Latham 2001):

1. **11Mx283**—a lithic artifact scatter of unknown prehistoric temporal association
2. **11Mx284**—a prehistoric limited activity artifact scatter of undetermined age
3. **11Mx285**—a lithic artifact scatter of unknown prehistoric temporal association
4. **11Mx286**—the remains of an early to mid-20th century farmstead and associated surface artifact scatter
5. **11Mx287**—an abandoned road grade and associated concrete bridge that appears to have been first used about 1825 and then into the middle of the 20th century
Site 11Mx286 lies about 525 meters (0.33 mile) northwest of the southwest corner of the fenced restricted area, and it is the nearest to the MTW. None of the cultural resource sites documented in the 2001 survey was evaluated by the field investigators as being potentially eligible for the NRHP, although SHPO concurrence with these recommendations has not been finalized.

In 2010, a 20.2-hectare (50-acre) cultural resources field survey on the west side of the restricted area did not reveal prehistoric or historic archaeological or historical sites (Mayo et al. 2010, as cited in Favret 2018). Approximately the west half of this survey area overlapped with the previous 2001 field investigation. A recent archaeological literature review for the area west of the restricted area reiterated the results of the 2001 and 2010 field efforts, but it did not add any new information (Favret 2018).

3.8.2 Tribal Associations for the Metropolis Works Site

The NRC completed a cultural affiliation evaluation of the Honeywell MTW vicinity to identify present-day Tribes with specific historic association to the APE (Nickens 2018). Review of treaty/land cession information, including judicially established Indian Lands, revealed that lands in southern Illinois, north of the Ohio River, were ceded to the U.S. Government by the 1803 Treaty with the Kaskaskia Tribe, which also included the Mitchigamia, Cahokia, and Tamaroi Tribes, all members of the larger, former Illiniwek or Illinois Confederacy. Today, the descendants of these Tribes comprise the Peoria Tribe of Oklahoma. The “Jackson Purchase” of western Kentucky, containing lands south of the Ohio River, was ceded to the U.S. Government in 1818 by the Chickasaw Tribe, which today is known as the Chickasaw Nation of Oklahoma. Several other modern-day Tribes can be documented as having a lesser degree of traditional cultural affiliation in the vicinity of the Honeywell MTW APE. These cultural associations are traced through historical documentation of temporary visits or short-term occupations, to the early Fort Massac, which was controlled variously by the French, British, and American forces (1757–1814). In addition, the oral stories and traditions of many present-day Tribes memorialize their ancestors’ experiences on the earlier westward migration routes through the Lower Ohio River Valley.

Based on this evaluation of the historical information, the NRC determined that consultation for the Honeywell MTW would be extended to the following Tribes (NRC 2018b, 2018e):

- Peoria Tribe of Oklahoma
- Chickasaw Nation of Oklahoma
- Absentee-Shawnee Tribe of Indians of Oklahoma
- Shawnee Tribe of Oklahoma
- Miami Tribe of Oklahoma
- Delaware Tribe of Oklahoma
- Kaw Nation of Oklahoma
- Omaha Tribe of Nebraska
- Osage Nation of Oklahoma
- Ponca Tribe of Oklahoma
- Quapaw Tribe of Oklahoma

The NRC extended an invitation to each of these Tribes to initiate consultation. Chapter 6 of this EA provides information regarding the staff’s consultation with the Tribes, including responses received from the Tribes to date. The NRC will incorporate information of cultural
properties and comments on the draft EA received from the consulting Tribes into the final EA, with protection of sensitive information.

3.9 Scenic and Visual Resources

The area of review for the scenic and visual resources assessment is the area within an 8-kilometer (5-mile) radius of the MTW site.

Generally, the area of southern Illinois is an area of swampy, forested bottomlands and low clay and gravel hills. Away from well-traveled roadways and industrial areas such as the MTW site, the area affords pastoral viewsheds where rural residences and undeveloped agricultural land and deciduous forests are the dominant visual features.

U.S. Highway 45 and the BNSF railroad right-of-way run along the north side of the MTW site, with cropland on a small portion of site property that extends beyond the highway. The Illinois Department of Transportation has designated portions of U.S. Highway 45 as part of the Ohio River Scenic Byway, including the segment bordering the MTW site (IDOT 2017a) for its views of the Ohio River. Throughout the MTW vicinity, high-value scenic views are found from sites on the banks of the Ohio River. For example, Fort Massac State Park, east of the city of Metropolis, offers views of the river from numerous picnic areas and pavilions.

As shown in Figure 3-5, the developed portion of the MTW site (the restricted area and surrounding cleared land) has the typical appearance of an industrial complex, with industrial/warehouse-type buildings, open-air material storage, exhaust stacks with pollution-control equipment, parking lots, railroad spurs, settling ponds, and other operational support areas. Two 2.7-meter (9-foot)-high chain-link and barbed-wire security fences, areas. The portion of the site outside of the restricted area is undeveloped and mostly forested. The site buildings are mostly low, and the tallest is the 6-story FMB. The restricted area is visible from U.S. Highway 45.

While Massac County is mainly rural, the area in the immediate vicinity of the MTW site contains other substantial industrial and urban development on both sides of the Ohio River. In addition to MTW buildings, travelers on U.S. Highway 45 are likely to see the coal-fired Joppa Power Station about 9.7 kilometers (6 miles) northwest, the AEP Cook Coal Terminal immediately northwest of the MTW site, and smoke stacks from the TVA Shawnee Fossil Plant across the Ohio River. The industrial area transitions into the Metropolis urban area approximately 3.2 kilometers (2 miles) southeast of the MTW site.

3.10 Socioeconomics and Environmental Justice

The area of review for the socioeconomics assessment is Massac County. The area of review for the environmental justice assessment is a 6.4-kilometer (4-mile) radius around the MTW, as described in Section 3.10.2 of this EA.

3.10.1 Socioeconomics

3.10.1.1 Demographics

The MTW site is in a predominantly undeveloped, rural region with low average population density in Massac County, IL. It is immediately across the Ohio River from McCracken County, KY. The area includes widely scattered villages and small cities. In 2010, 528,404 people lived...
within an 80-kilometer (50-mile) radius of the site (ENERCON 2017, Section 3.10.6).

Table 3-11 depicts population trends in the area. Since the 2010 U.S. Census, the population of Massac County has decreased by an estimated 4.3 percent, with the population of the city of Metropolis decreasing by about 3.6 percent. The population of McCracken County has decreased by 0.8 percent, with the population of the city of Paducah decreasing by about 0.7 percent.

![Aerial View of the MTW Looking to the Southwest, Across U.S. Highway 45](Source: ENERCON 2017, Figure 3.9-1)

Given the request for a 40-year license period, the NRC considered population projections out to 2057. Taking into consideration projections the States of Illinois and Kentucky made, Honeywell determined that the population in Massac County, IL, would increase from 14,766 in 2015 to 15,487 people in 2057, while the population in McCracken County, KY, would increase from 65,018 to 66,781 people over the same period (ENERCON 2017, Section 3.10.6.1). The NRC reviewed the source data and determined that Honeywell’s projections are reasonable.

Table 3-12 depicts the minority populations of the area. The percentages of minority populations in Metropolis are on par with those of Massac County and lower than those of the State of Illinois. The percentages in Paducah are comparable to those in McCracken County and the State of Kentucky, except that the population of African Americans in Paducah exceeds that in McCracken County by about 13 percent and that in the State of Kentucky by about 16 percent.

Almost 73 percent of the population of 41,504 persons who live within 16 kilometers (10 miles) of the plant resides in the southeast quadrant (ENERCON 2017, Figure 3.10-1). Another 11 percent live to the southwest. These quadrants include Metropolis, IL, and Paducah, KY, and the adjacent communities. With the exception of these communities, the remainder of the
two-county area is predominantly rural. In the 2010 U.S. Census, the census block that includes the MTW Site (Block Group 3, Census Tract 9701, Massac County, IL) reported a population of 1,204 people (MCDC 2017).

Table 3-11 Population Trends in the Area of the MTW Site

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Massac County, IL</td>
<td>15,161</td>
<td>15,429</td>
<td>14,766</td>
<td>15,438</td>
<td>15,487</td>
</tr>
<tr>
<td>Metropolis, IL</td>
<td>6,482</td>
<td>6,537</td>
<td>6,334</td>
<td>(a)</td>
<td>(a)</td>
</tr>
<tr>
<td>McCracken County, KY</td>
<td>65,514</td>
<td>65,565</td>
<td>65,018</td>
<td>65,487</td>
<td>66,781</td>
</tr>
<tr>
<td>Paducah, KY</td>
<td>26,307</td>
<td>25,024</td>
<td>24,864</td>
<td>(a)</td>
<td>(a)</td>
</tr>
</tbody>
</table>

a No data.
Source: USCB 2000, 2017a; IDPH 2015; KSDC 2016; ENERCON 2017, Section 3.10.6.1

Table 3-12 Minority Populations in the Area of the MTW Site

<table>
<thead>
<tr>
<th>Location</th>
<th>White</th>
<th>African American</th>
<th>Hispanic</th>
<th>American Indian</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illinoisa</td>
<td>63%</td>
<td>14%</td>
<td>16%</td>
<td>0.11%</td>
<td>7%</td>
</tr>
<tr>
<td>Massac County, ILa</td>
<td>89%</td>
<td>6%</td>
<td>2%</td>
<td>0.6%</td>
<td>3%</td>
</tr>
<tr>
<td>Metropolis, ILb</td>
<td>86%</td>
<td>8%</td>
<td>2%</td>
<td>0.6%</td>
<td>3%</td>
</tr>
<tr>
<td>Kentuckya</td>
<td>86%</td>
<td>8%</td>
<td>3%</td>
<td>0.17%</td>
<td>3%</td>
</tr>
<tr>
<td>McCracken County, KYa</td>
<td>84%</td>
<td>11%</td>
<td>2%</td>
<td>0.3%</td>
<td>3%</td>
</tr>
<tr>
<td>Paducah, KYb</td>
<td>70%</td>
<td>24%</td>
<td>3%</td>
<td>0.2%</td>
<td>4%</td>
</tr>
</tbody>
</table>

a Based on Five-Year American Community Survey 2010–2014 (USCB 2014).
b As of April 1, 2010 (USCB 2017a).

There are two permanent residences and three mobile homes within 610 meters (2,000 feet) of the feed materials building. The two permanent residences are nearest to the site and are located about 538 meters (1,765 feet) north-northeast from the feed materials building (ENERCON 2017, Section 3.7).

3.10.1.2 Economics

As of February 2017, 193 employees and 105 contractor personnel were employed at the site. As stated in Chapter 1 of this EA, Honeywell is now temporarily in a “ready-idle” state, and 26 Honeywell employees will remain on site during this state (Honeywell 2018b). During full operational mode, the MTW employs 269 employees and 157 contactor personnel (Honeywell 2018a, Response to RAI SOC-1). Approximately 34 percent live in Illinois, with 27 percent in Brookport and Metropolis in Massac County. Another 62 percent live in Kentucky, with 37 percent in Paducah and West Paducah in McCracken County. The remaining 4 percent of the employees are scattered among other states (ENERCON 2017, Section 3.10.1). The MTW’s annual shutdown for routine maintenance activities typically results in an increase in contractor personnel depending on the amount of work required during the shutdown.
Table 3-13 compares employment statistics between 2010 and 2016 for Massac County and McCracken County as compared to their respective States. The labor forces and unemployment rates both decreased. The MTW accounts for less than 4 percent of employment in Massac County, and less than 0.7 percent of employment among the two counties.

### Table 3-13 Employment Structure by State and County

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Illinois</td>
<td>6,645,000</td>
<td>675,000</td>
<td>10.2%</td>
<td>6,578,000</td>
<td>386,000</td>
<td>5.9%</td>
</tr>
<tr>
<td>Massac County</td>
<td>7,075</td>
<td>674</td>
<td>9.5%</td>
<td>6,059</td>
<td>427</td>
<td>7.0%</td>
</tr>
<tr>
<td>Kentucky</td>
<td>2,056,000</td>
<td>212,000</td>
<td>10.3%</td>
<td>2,004,000</td>
<td>99,000</td>
<td>4.9%</td>
</tr>
<tr>
<td>McCracken County</td>
<td>30,650</td>
<td>2,774</td>
<td>9.1%</td>
<td>28,851</td>
<td>1,632</td>
<td>5.7%</td>
</tr>
</tbody>
</table>

Sources: BLS 2010, 2016, 2017

Table 3-14 depicts the trend in median household income, and Table 3-15 shows personal income and average wages.

### Table 3-14 Median Household Income in the Area of the MTW Site

<table>
<thead>
<tr>
<th>Location</th>
<th>Median Household Income in 2010&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Median Household Income, 2011–2015&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illinois</td>
<td>$55,735</td>
<td>$57,574</td>
</tr>
<tr>
<td>Massac County, IL</td>
<td>$41,077</td>
<td>$40,977</td>
</tr>
<tr>
<td>Metropolis, IL</td>
<td>$32,715</td>
<td>$31,875</td>
</tr>
<tr>
<td>Kentucky</td>
<td>$41,576</td>
<td>$43,740</td>
</tr>
<tr>
<td>McCracken County, KY</td>
<td>$41,630</td>
<td>$44,067</td>
</tr>
<tr>
<td>Paducah, KY</td>
<td>$29,275</td>
<td>$33,608</td>
</tr>
</tbody>
</table>

<sup>a</sup> In 2000 dollars. Source: USCB 2010  
<sup>b</sup> In 2015 dollars. Source: USCB 2017a

### Table 3-15 Personal Income in the Area of the MTW Site

<table>
<thead>
<tr>
<th>Location</th>
<th>Per Capita Personal Income</th>
<th>Average Wages and Salaries</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2010</td>
<td>2015</td>
</tr>
<tr>
<td>Illinois</td>
<td>$41,698</td>
<td>$50,377</td>
</tr>
<tr>
<td>Massac County, IL</td>
<td>$30,800</td>
<td>$34,828</td>
</tr>
<tr>
<td>Kentucky</td>
<td>$33,026</td>
<td>$38,592</td>
</tr>
<tr>
<td>McCracken County, KY</td>
<td>$37,523</td>
<td>$44,428</td>
</tr>
</tbody>
</table>

Sources: BEA 2016, 2017a, 2017b

Table 3-16 depicts poverty rates in the area. The percentage of low-income populations in Metropolis and Paducah exceed the corresponding percentages in their respective counties and States, but by less than 10 percent.
### Table 3-16  Poverty Rates in the Area of the MTW Site

<table>
<thead>
<tr>
<th>Location</th>
<th>% Persons in Poverty, 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illinois</td>
<td>13.6%</td>
</tr>
<tr>
<td>Massac County, IL</td>
<td>16.8%</td>
</tr>
<tr>
<td>Metropolis, IL</td>
<td>23.0%</td>
</tr>
<tr>
<td>Kentucky</td>
<td>18.5%</td>
</tr>
<tr>
<td>McCracken County, KY</td>
<td>15.2%</td>
</tr>
<tr>
<td>Paducah, KY</td>
<td>23.9%</td>
</tr>
</tbody>
</table>

Source: USCB 2017a

#### 3.10.1.3 Health and Social Services

The nearest school is 3 kilometers (1.87 miles) southeast; the nearest hospital is 1.5 kilometers (0.95 mile) southeast; and the nearest nursing home is 1.2 kilometers (0.73 mile) southeast to the MTW site (ENERCON 2017, Section 6.1.2.2).

In accordance with SUB-562, the MTW participates in mutual assistance agreements with State and local emergency agencies to ensure proper response in the event of an emergency at the MTW. The MTW currently has agreements with the Massac County Emergency Services and Disaster Agency, City of Metropolis Office of Emergency Management, Massac County and City of Metropolis Fire Departments, Massac County Sheriff, City of Metropolis Police Department, Massac Memorial Hospital, and Lourdes Hospital and Baptist Health Hospital in Paducah, KY (ENERCON 2017, Section 3.10.2). All parties review and renew the respective agreements annually unless specified otherwise. Under the agreements with Massac County and the City of Metropolis, Honeywell provides training to local emergency responders in general awareness and MTW-specific hazards. In return, the local emergency responders provide law enforcement, fire and emergency services, and coordination to protect public health and safety during any MTW plant emergency. Under the agreements with the hospitals, Honeywell offers training specific to the types of injuries that might occur at the MTW and assistance with chemical/radiological decontamination in the event of exposure during the treatment of an injured employee.

#### 3.10.2 Environmental Justice

On August 24, 2004, the NRC published a final policy statement on the treatment of environmental justice matters in NRC regulatory and licensing actions (Volume 69 of the Federal Register, page 52040 (69 FR 52040)) (NRC 2004). The policy statement provides that one of the first steps in the environmental justice analysis is to identify the geographic area for which to obtain demographic information. Current staff guidance in NUREG-1748 (NRC 2003), which the 2004 policy statement affirms, provides that the potentially affected area is normally determined to be within a 1.0-kilometer (0.6-mile) radius of the center of the proposed site in urban areas and 6.4 kilometers (4 miles) if the facility is located in a rural area. Once the potentially affected area is identified, demographic data for the area are collected from the U.S. Census Bureau at the census block group level. The goal is to evaluate the communities, neighborhoods, or areas that may be disproportionately impacted (NRC 2003).
Census data are obtained to identify both minority and low-income populations, if present, by determining the percentages of these populations within each of the census block groups. The census block percentages are compared to percentages at the county and State levels. When the minority or low-income populations in a block group exceed the State or county percentages for these groups by 20 percent, a more detailed environmental justice analysis must be conducted (NRC 2003). When the minority or low-income populations in a block group exceed 50 percent, this is also a significant difference and requires a detailed analysis (NRC 2003). When elevated percentages are not present, a detailed environmental justice review is not required.

For the purposes of this review, the NRC staff identified 12 block groups within a 6.4-kilometer (4-mile) radius of the centerpoint of the MTW site. The staff compared the relevant population, demographic, and economic data from the U.S. Census’ Five-Year American Community Survey for 2011–2015 (USCB 2017b) to that for Massac County, IL; McCracken County, KY; and the States of Illinois and Kentucky, in addition to using EPA’s EJSCREEN, an environmental justice mapping and screening tool (EPA 2017d). As shown in Table 3-17, none of the census block groups within 6.4 kilometers of the MTW site contains minority populations or households below the poverty level that exceed the criteria noted above. Figure 3-6 shows the location of the block groups.

### Table 3-17 Comparison of Minority and Poverty Status in the Area of the MTW Site

<table>
<thead>
<tr>
<th>Block Group ID</th>
<th>State</th>
<th>Minority (percent)</th>
<th>Low Income (percent)</th>
<th>Difference from State Values</th>
<th>Minority (percent)</th>
<th>Low Income (percent)</th>
<th>Difference from County Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>171279701003</td>
<td>IL</td>
<td>13.75</td>
<td>12.26</td>
<td>-23.78</td>
<td>-1.19</td>
<td></td>
<td>2.89</td>
</tr>
<tr>
<td>171279701004</td>
<td>IL</td>
<td>1.09</td>
<td>3.38</td>
<td>-36.44</td>
<td>-10.07</td>
<td></td>
<td>-9.77</td>
</tr>
<tr>
<td>171279702001</td>
<td>IL</td>
<td>6.72</td>
<td>9.06</td>
<td>-30.81</td>
<td>-4.39</td>
<td></td>
<td>-4.14</td>
</tr>
<tr>
<td>171279702002</td>
<td>IL</td>
<td>11.86</td>
<td>26.52</td>
<td>-25.67</td>
<td>13.08</td>
<td></td>
<td>1.00</td>
</tr>
<tr>
<td>171279702003</td>
<td>IL</td>
<td>4.38</td>
<td>13.81</td>
<td>-33.15</td>
<td>0.37</td>
<td></td>
<td>-6.48</td>
</tr>
<tr>
<td>171279702004</td>
<td>IL</td>
<td>19.52</td>
<td>29.83</td>
<td>-18.02</td>
<td>16.39</td>
<td></td>
<td>8.66</td>
</tr>
<tr>
<td>171279704001</td>
<td>IL</td>
<td>19.18</td>
<td>33.18</td>
<td>-18.36</td>
<td>19.74</td>
<td></td>
<td>8.31</td>
</tr>
<tr>
<td>171279704002</td>
<td>IL</td>
<td>12.61</td>
<td>27.78</td>
<td>-24.93</td>
<td>14.33</td>
<td></td>
<td>1.74</td>
</tr>
<tr>
<td>171279704003</td>
<td>IL</td>
<td>9.10</td>
<td>7.69</td>
<td>-28.43</td>
<td>-5.75</td>
<td></td>
<td>-1.76</td>
</tr>
<tr>
<td>Massac County</td>
<td>IL</td>
<td>10.86</td>
<td>16.12</td>
<td>(a)</td>
<td>(a)</td>
<td></td>
<td>(a)</td>
</tr>
<tr>
<td>State of Illinois</td>
<td>IL</td>
<td>37.53</td>
<td>13.44</td>
<td>(a)</td>
<td>(a)</td>
<td></td>
<td>(a)</td>
</tr>
<tr>
<td>211450314002</td>
<td>KY</td>
<td>11.17</td>
<td>19.24</td>
<td>-3.28</td>
<td>0.72</td>
<td></td>
<td>-4.83</td>
</tr>
<tr>
<td>211450315001</td>
<td>KY</td>
<td>7.87</td>
<td>10.36</td>
<td>-6.58</td>
<td>-8.16</td>
<td></td>
<td>-8.13</td>
</tr>
<tr>
<td>211450315002</td>
<td>KY</td>
<td>15.40</td>
<td>19.75</td>
<td>0.95</td>
<td>1.24</td>
<td></td>
<td>-0.60</td>
</tr>
<tr>
<td>McCracken County</td>
<td>KY</td>
<td>16.00</td>
<td>16.94</td>
<td>(a)</td>
<td>(a)</td>
<td></td>
<td>(a)</td>
</tr>
<tr>
<td>State of Kentucky</td>
<td>KY</td>
<td>14.45</td>
<td>18.52</td>
<td>(a)</td>
<td>(a)</td>
<td></td>
<td>(a)</td>
</tr>
</tbody>
</table>

a Not applicable.

Sources: USCB 2017b; EPA 2017d
3.11 Public and Occupational Health

3.11.1 Background Radiological Characteristics

The average annual radiation dose per person in the United States is 6.20 mSv (620 mrem), about half from background sources (e.g., cosmic rays and terrestrial sources) and half from manmade sources (EPA 2017e). Medical procedures account for nearly all (96 percent) of human exposure to manmade radiation (NRC 2017f). Assuming no medical exposures, a resident of Metropolis, IL, would have an estimated total yearly dose from external background radiation of 1.15 mSv (115 mrem) (EPA 2017f). Of this, about 0.28 mSv (28 mrem) is attributable to cosmic rays, while terrestrial sources contribute about 0.46 mSv (46 mrem) per year. Radionuclides within the body, such as potassium, contribute about 0.4 mSv (40 mrem) per year. Massac County is in EPA Radon Zone 3, which means that predicted average indoor radon screening levels are less than 2 picocuries per liter, the lowest of the three zones (EPA 2017g). If a home had this level, this would contribute another 2.88 mSv (288 mrem) to the dose (EPA 2017f).

Activities and effluents from industrial facilities using radioactive materials would also contribute to an individual’s dose. As noted in Section 3.1.2 of this EA, the area around the MTW site also includes the Paducah Gaseous Diffusion Plant. Although the plant is no longer in production, it is undergoing remediation activities that involve radiological releases. For 2013, the DOE...
estimated a combined (internal and external) dose to the maximally exposed individual member of the public of 0.054 mSv (5.4 mrem) per year, and it estimated an annual cumulative dose of 1.02 person-rem to members of the public residing within 80 kilometers (50 miles) of the plant (DOE 2016).

The background uranium concentrations in the soil and vegetation, as determined by preoperational sampling, were 0.6 ppm and 0.28 ppm, respectively, and the background uranium concentration in surface water was 0.009 ppm (NRC 2013a). The U.S. Geological Survey map of uranium concentrations indicates a concentration of 2.5 ppm elemental uranium (USGS 2013).

3.11.2 Public Health and Safety

3.11.2.1 Sources of Exposure

The area of review for radiological impacts is the area within 80 kilometers (50 miles) of the MTW site because this is the area in which doses are assessed. The area of review for nonradiological impacts is the regional area surrounding the MTW site that covers the major population centers.

In addition to the background radiation exposures described in Section 3.11.1, MTW employees and members of the public in the immediate vicinity of the MTW site may be exposed to low levels of radiation and radioactive materials and chemical contaminants. These contaminants are emitted as a result of liquid and airborne plant effluents and external gamma radiation from routine controlled releases and nonroutine releases from unplanned events over the course of plant operations and the transportation of process materials, products, and waste materials.

Radioactive materials released from the MTW may migrate into the environment through a variety of transport pathways that could result in both internal and external exposures. 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 may come from ingesting water or irrigated crops, while external exposures may result from recreational activities such as swimming and boating.

Fluoride releases and exposure mechanisms would be through air and liquid emissions. For atmospheric releases, internal exposures may occur through inhalation or ingestion. For liquid releases, internal exposures may come from ingesting water or irrigated crops.

Gaseous effluent streams containing radioactive and nonradioactive pollutants are discharged in accordance with operating permits issued by IEPA (IEPA 2016a). MTW operations release small amounts of radioactive material to the atmosphere from 53 monitored release points (ENERCON 2017, Section 2.1.2.2.1). These releases are primarily uranium, although the facility also releases relatively small amounts of thorium-230 and radium-226. Fluoride is the primary nonradiological gaseous contaminant released through stacks on the FMB. Section 2.3.8 of this EA summarizes MTW emissions.

The MTW is subject to its NPDES permit (IEPA 2015a) for liquid releases. Liquid wastes discharge to the Ohio River via one monitored release point, NPDES Outfall 002. Two other NPDES outfalls discharge stormwater to the Ohio River. Liquid waste streams generated at the
MTW are categorized as low-level radioactive and nonradioactive waste streams. Before discharge into the Ohio River, both radioactive and nonradioactive waste from MTW operations are processed through the EPF. Table 2-4 in Chapter 2 of this EA summarizes data for flow rate, uranium, pH, temperature, total fluorides, total suspended solids, and biological oxygen demand from 2010 through 2014.

In addition to the air permit and NPDES permit requirements, radiological emissions must meet the NRC radiological dose limits in 10 CFR Part 20 for occupational and public exposures. Exposure limits include a limit of 0.05 Sv (5 rem) per year for an occupational worker and 1 mSv (100 mrem) per year to a member of the public. Honeywell must also meet EPA exposure limits in 40 CFR Part 190, “Environmental Radiation Protection Standards for Nuclear Power Operations,” Subpart B, “Environmental Standards for the Uranium Fuel Cycle,” which specifies an annual whole-body dose equivalent limit of 0.25 mSv (25 mrem).

3.11.2.2 Current Exposure Levels

Honeywell implements an environmental monitoring program that involves the periodic collection of air, surface water, bottom sediments, vegetation, soil, and external gamma radiation samples at onsite and offsite sampling points. Section 2.3.9.2 of this EA presents sampling results representative of 2010 through 2014 for each of these areas.

3.11.3 Occupational Health and Safety

MTW workers have occupational health and safety risks from exposure to industrial hazards, hazardous materials, and radioactive materials. Industrial hazards at the MTW are similar to other industrial facilities of the same size; that is, chemical exposures, heavy-machinery accidents, crush injuries, and cuts and abrasions. These hazards apply to workers conducting material processing operations as well as monitoring, research, general office, and industrial site activities. The chemical manufacturing sector as a whole had an injury and illness rate of 2.0 per 100 full-time workers in 2016 (BLS 2018). Honeywell seeks to limit these risks by implementing safety programs that meet Occupational Safety and Health Administration requirements and corporate standards (ENERCON 2017, Section 4.12). The MTW programs use the Occupational Safety and Health Administration recordable incident rate to measure and compare work injuries, illnesses, and accidents within and between industries. The MTW has had no work-related fatalities, and it had an average recordable injury rate of 2.5 per year from 2010 through 2014 (ENERCON 2017, Section 3.11.5).

Operations at the MTW use nonradiological materials that could pose a risk to worker health and safety through chronic exposure or improper handling. Table 3-5 in Section 3.2.2 of this EA provides the list of hazardous chemicals used in operations and the hazard information associated with these chemicals. Plant employees could experience chemical exposures through routine exposures from controlled system drainage, venting, and leakage points and nonroutine exposures resulting from unplanned excursions. Honeywell implements a process safety management program, consistent with 29 CFR 1910.119, “Process Safety Management of Highly Hazardous Chemicals,” to provide a comprehensive assessment of chemical safety hazards and specific processes and programs to mitigate them (ENERCON 2017, Section 4.12).

MTW workers may have (1) external radiation exposure from working close to natural uranium, its daughter products, and other licensed materials in storage and in the plant process and (2) internal exposures resulting from inhalation or ingestion of radioactive process materials.
Radiation exposure from normal operations is primarily a result of inhaled radioactive material during the uranium conversion process. Honeywell maintains a radiation protection program in accordance with 10 CFR Part 20 to ensure that radiation doses are maintained below NRC limits and meet ALARA principles. Historical data and plant operating experience indicate that employees are unlikely to receive an annual total effective dose equivalent (TEDE) of more than 50 mSv (5,000 mrem). MTW employees working in the ore concentrate sampling plant, or other jobs where close contact with uranium or its daughter products occur, such as in the FMB, are most likely to receive higher than average exposures (NRC 2006a; Honeywell 2018a, Response to RAI POH-1).

Table 3-17 gives the occupational exposure from 2010 through 2014 in average and maximum TEDE to monitored workers at the site (Honeywell 2018a, Response to RAI POH-1). For the 5-year period from 2010 through 2014, the average TEDE for MTW workers was less than 1.27 mSv (127 mrem). The maximum individual TEDE for the workers averaged 0.01477 Sv (1.477 rem), reaching the annual maximum of 0.02459 Sv (2.459 rem) in 2011.

### Table 3-18 Occupational Exposure

<table>
<thead>
<tr>
<th>Year</th>
<th>Average Individual Occupational Dose in TEDE Sv (rem)</th>
<th>Maximum Individual Occupational Dose in TEDE Sv (rem)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>0.00155 (0.155)</td>
<td>0.01642 (1.642)</td>
</tr>
<tr>
<td>2011</td>
<td>0.00228 (0.228)</td>
<td>0.02459 (2.459)</td>
</tr>
<tr>
<td>2012</td>
<td>0.00131 (0.131)</td>
<td>0.01827 (1.827)</td>
</tr>
<tr>
<td>2013</td>
<td>0.00057 (0.057)</td>
<td>0.00866 (0.866)</td>
</tr>
<tr>
<td>2014</td>
<td>0.00062 (0.062)</td>
<td>0.00591 (0.591)</td>
</tr>
<tr>
<td>10 CFR 20.1201(a)(1)(i)</td>
<td>0.05 (5)</td>
<td>0.05 (5)</td>
</tr>
</tbody>
</table>

Source: ENERCON 2017, Table 3.11-1

### 3.12 Waste Management

The area of review for the waste management assessment is the MTW site. Current MTW operations produce low-level radioactive, nonradioactive hazardous, mixed, and nonradioactive liquid and solid wastes. The facility manages these wastes by using a combination of recycling and offsite disposal. Two byproduct streams, synthetic fluorspar (calcium fluoride) and filter fines, are sent off site for reclamation and reuse and are not considered waste streams (ENERCON 2017, Section 3.12).

#### 3.12.1 Low-Level Radioactive Waste

Low-level radioactive solid waste consists of items that are contaminated with uranium residuals. Such items include environmental control filters, maintenance and housekeeping wastes, personal protective equipment, and equipment removed from service. Personnel collect these dry active waste and debris waste streams into marked containers, segregate the containers by radioactivity, drum or bag and ultimately ship the waste containers to a properly permitted disposal facility. The MTW disposes of drums that held uranium feedstock and process intermediates. These drums are crushed and shipped off site for disposal. Approximately 1,529 cubic meters (2,000 cubic yards) of crushed drums were shipped off site for disposal from 2010 through 2014 (ENERCON 2017, Section 3.12.1).
Table 3-19 shows the volume of low-level radioactive waste generated at the MTW from 2010 to 2016. The plant was shut down to complete seismic upgrades from 2012 to 2013, which explains the low generation rates of low-level radioactive waste and other wastes during this period (Honeywell 2018a, Response to RAI WM-1).

<table>
<thead>
<tr>
<th>Year</th>
<th>Cubic meters (cubic yards)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>3,644.37 (4,766.66)</td>
</tr>
<tr>
<td>2011</td>
<td>3,256.44 (4,259.26)</td>
</tr>
<tr>
<td>2012</td>
<td>991.09 (1,296.30)</td>
</tr>
<tr>
<td>2013</td>
<td>184.37 (241.15)</td>
</tr>
<tr>
<td>2014</td>
<td>1,070.1 (1,399.7)</td>
</tr>
<tr>
<td>2015</td>
<td>3,610.4 (4,722.1)</td>
</tr>
<tr>
<td>2016</td>
<td>4,001 (5,233)</td>
</tr>
</tbody>
</table>

Sources: ENERCON 2017; Honeywell 2018a

Honeywell currently ships its unimportant source quantity waste to the U.S. Ecology facility in Grandview, ID, for disposal. The facility holds a RCRA Part B permit and is permitted to dispose of waste that includes residuals of source material in permitted levels. Two other NRC-licensed facilities would be available to receive this waste: Waste Control Specialists in Andrews, TX, and EnergySolutions in Clive, UT (ENERCON 2017, Section 3.12.1).

3.12.2 Mixed Waste

The MTW manufacturing process does not generate mixed waste (waste that contains both RCRA hazardous waste and radioactive constituents) but does produce some incidental mixed waste streams as part of laboratory and maintenance activities. The MTW stores mixed waste in two RCRA-permitted storage facilities. 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, tributyl phosphate, and Freon. About 6,350 kilograms (14,000 pounds) of mixed waste was shipped off site in 2013, with 18 containers remaining in storage in 2014. There were no mixed wastes shipped off site during 2015 and 2016. MTW does not expect any projects that might cause a large increase in mixed waste generation (Honeywell 2018a, Response to RAI WM-2).

Mixed waste is currently disposed of at the Waste Control Specialists facility in Andrews County, TX, or the EnergySolutions disposal facility in Clive, UT (ENERCON 2017, Section 3.12.4).

3.12.3 Hazardous Waste

MTW is a large-quantity generator (RCRA ID ILD006278170) of RCRA hazardous waste. Management of RCRA waste at MTW is regulated by IEPA through a RCRA permit (Permit #B-65R2-M-17). Facilities under the RCRA permit include two storage areas for the storage of containerized waste and calcium fluoride-contaminated liquid waste stored in ponds (Ponds B, C, D, and E). Sources of hazardous waste include production activities, EPF residuals, and laboratory and maintenance activities.
About 5,900 to 12,000 kilograms (13,000 to 27,000 pounds) of RCRA hazardous waste was generated annually between 2010 and 2014. These quantities are not considered indicative of normal operations, because they resulted from housecleaning efforts and plant shutdown from 2010 to 2012. Approximately 5,580 kilograms (12,275 pounds) of hazardous waste was shipped during calendar year 2015 and 4,500 kilograms (9,900 pounds) during 2016. These quantities should be representative of the annual hazardous waste generation in the future. MTW does not expect any projects that might cause a large increase in hazardous waste generation (Honeywell 2018a, Response to RAI WM-3).

3.12.4 Nonradioactive, Nonhazardous Waste

Nonradioactive, nonhazardous waste generated at the MTW includes cleaning compounds, antifreeze, floorsweep, compressed gases, and miscellaneous trash. Personnel collect these items in roll-off containers and frontload dumpsters and send them off site for disposal or recycling. In 2014, the MTW generated about 3,901 kilograms (8,600 pounds) of universal waste (hazardous but common waste such as batteries or light bulbs), 54,431 kilograms (120,000 pounds) of nonhazardous waste, and 171 metric tons (188 tons) of debris or trash (ENERCON 2017, Section 3.12.2). The site collects office waste in four dumpsters with 2-cubic-yard capacity and two dumpsters with 8-cubic-yard capacity; these are dumped once to twice weekly. In 2014, the MTW also generated about 526 metric tons (580 U.S. tons) of soil from nonroutine remediation activities.

Two byproduct streams that are not considered waste include synthetic calcium fluoride and filter fines. These two waste streams are transported off site for reclamation and reuse. Synthetic calcium fluoride is shipped to industrial users who use it as a substitute for natural calcium fluoride (fluorspar). Filter fines are shipped off site for recovery of uranium, which is returned to the MTW for re-introduction into the manufacturing process.

In 2014, the MTW used Clean Harbors (various locations), Safety-Kleen (various locations), and Spring Grove Resource Recovery in Ohio for recycling and disposal, and the Southern Illinois Regional Landfill for the soil disposal. As of 2015, the Southern Illinois Regional Landfill had a remaining disposal capacity of 30 million cubic meters (39 million cubic yards) (ENERCON 2017, Section 3.12.2).
4 ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION AND ALTERNATIVES

This chapter presents an evaluation of the potential environmental impacts from the proposed action to continue MTW site activities for 40 years (Section 4.1) and from the reasonable alternatives to the proposed action; that is, the reduced duration alternative (Section 4.2) and no-action alternative (Section 4.3). In performing this evaluation, the NRC staff reviewed Honeywell’s license renewal application and ER (ENERCON 2017); collected information from local, State, and Federal agencies; and then independently evaluated the environmental impacts to the various resources of the affected environment (as described in Chapter 3 of this EA), in accordance with NUREG-1748 (NRC 2003). The analysis of potential environmental impacts is based on (1) Honeywell’s forecast of activities over the proposed 40 years, and (2) data that reflect current site conditions, activities, and effluent levels.

Most of the impacts associated with the proposed action are expressed as annual impacts, and annual impacts are not expected to change if MTW operates for fewer years, as proposed in the reduced duration alternative. Because the impacts from the proposed action would be similar to or greater than the impacts from the reduced duration alternative, this EA does not separately address each resource area evaluated in the EA for the reduced duration alternative.

Regardless of which alternative the NRC adopts, 10 CFR 70.38, “Expiration and Termination of Licenses and Decommissioning of Sites and Separate Buildings or Outdoor Areas,” requires that Honeywell submit a detailed site decommissioning plan when operational activities at the MTW are terminated, unless Honeywell applies for an additional licensing term. Facility decommissioning of the MTW would begin upon NRC approval of that plan. The NRC’s review would address both the health and safety and the environmental aspects of the proposed site decommissioning plan. The decommissioning process is described in Section 2.4 of this EA. Section 4.4 evaluates potential impacts from site decommissioning for the proposed action and the alternatives to the proposed action.

The NRC also evaluated the cumulative environmental impacts; that is, the potential impacts that could result when the incremental impacts of the proposed action and alternatives are considered together with the impacts of other past, present, and reasonably foreseeable future actions. This analysis of cumulative impacts is discussed in Chapter 5 of this EA.

4.1 Proposed Action

4.1.1 Land Use

As discussed in Section 3.1.2 of this EA, land uses in Massac County are predominantly pasture, cropland, and forestland. Undeveloped land uses within a 3.2-kilometer (2-mile) radius of the MTW site are generally forest, planted and cultivated areas, and open water, which combined cover 72 percent of the area.

Continued MTW operations for the proposed duration of 40 years would not involve major construction or expansion of the facility such that additional acreage would be needed. Land use impacts from the continued operation of the MTW would be consistent with its current land use. The NRC concludes that the proposed action would have no significant impacts on the environment of the MTW site and the areas surrounding the site.
4.1.2 Transportation

The transportation impacts analysis in the proposed license renewal (ENERCON 2017) considers the impacts to local traffic and the nonradiological and radiological public and occupational safety impacts from incident-free transportation and from potential transportation accidents. Under the proposed action, Honeywell would continue converting uranium ore concentrates to gaseous fluorine and uranium hexafluoride at the authorized capacity of 15,000 metric tons (16,535 tons). The uranium hexafluoride would continue to be shipped to enrichment facilities for further processing into enriched uranium. Therefore, the transportation activities associated with the proposed action would be similar to typical transportation activities occurring during the current license period.

4.1.2.1 Traffic Volume

To evaluate the impacts of the proposed transportation on local traffic, the NRC staff compared the magnitude of proposed transportation activities with the existing traffic volumes near the site shown in Tables 3-2 and 3-3. In February 2016, MTW employed 237 people (ENERCON 2017, Section 3.10.1). The employees residing in Kentucky, Metropolis, and Brookport, a total of 89 percent, or 211 employees, commuted to MTW via U.S. Highway 45 northbound when arriving and southbound when leaving. The number of employee trips are small compared to the traffic counts on these highways, as shown in Table 3-2 in Chapter 3 of this EA, consisting of less than 10 percent of the daily directional traffic. The proposed action would not increase traffic volumes; therefore, continued MTW operations would have no significant impact to local roadways in the area of review.

4.1.2.2 Nonradiological Impacts from Traffic Accidents

Honeywell estimated commuting mileage based on employee resident zip code groupings and used information from Table 3-3 in Chapter 3 of this EA to estimate annual commuting mileage for truck and rail transportation. Table 4-1 presents the estimated mileage and potential fatalities based on 2015 national fatality rates of 1.1 fatalities per 100 million vehicle miles in 2015 (car and truck) (BTS 2017) and 1.01 fatalities per million train miles (FRA 2018).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Annual Mileage (km (mi))b</th>
<th>Annual Risk of Fatalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commuting plus truck shipment for MTWa</td>
<td>3,900,000 (6,300,000)</td>
<td>0.043</td>
</tr>
<tr>
<td>Rail shipment for MTW</td>
<td>309,000 (497,000)</td>
<td>0.003c</td>
</tr>
</tbody>
</table>

a Commuting: 3,170,000 kilometers (1,970,000 miles); truck shipment: 3,106,000 kilometers (1,930,000 miles).
b Mileage is from Honeywell 2018a, Table 4.2-2.
c Statistics for the total fatalities and mileage from FRA 2018 are for trains and were used to determine fatalities per train-mile. This value was multiplied by the number of miles specific to MTW shipments (see footnote b). To assign a probability of a fatality to a single railcar-mile, the analysis assumed 105 railcars per train, so the risk associated with a train was divided by 105 railcars. This approach assumes that shipments to and from the MTW are normally made by one or two railcars at a time, and a whole train dedicated to these shipments is not used.

km = kilometer; mi = mile
Because the magnitude of transportation activities associated with the proposed action is a small fraction of existing traffic for local roads, the current impacts are not projected to change, and the estimated number of annual fatalities would continue to be much less than 1, the NRC staff concludes the MTW impact to local traffic would not be significant. Furthermore, because Honeywell is not proposing major changes to the current operating license, the local transportation impacts in the area of review would represent a continuation of existing levels of traffic.

4.1.2.3 Radiological and Chemical Hazards from Traffic Accidents

Radiological Transportation Hazards from Traffic Accidents

The NRC evaluated the potential impacts of transporting radioactive materials and documented its findings in NUREG-0170 “Final Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes” issued December 1977 (NRC 1977). That analysis concluded that “the average radiation dose to the population at risk from normal transportation is a small fraction of the limits recommended for members of the public from all sources of radiation other than natural and medical sources and is a small fraction of natural background dose” (NRC 1977). This earlier environmental analysis considered the types of activities conducted at the MTW, including the receipt of yellowcake and shipment of uranium hexafluoride. In addition, there have been no significant changes in MTW transportation types, rates, or routes since that evaluation. Thus, the conclusion remains valid for the proposed action.

More recently, the NRC evaluated the radiological impacts of an accident related to transporting yellowcake to the MTW from uranium recovery facilities (NRC 2009a, Section 4.2.2.2). That analysis showed an accident dose risk of up to 0.01 latent cancer fatality per year for transporting yellowcake to the MTW from a generic in situ recovery facility.

Two incidents have occurred since 2010 related to the transport of radiological materials to and from the MTW. On September 20, 2015, the engine of a uranium ore truck caught fire outside the MTW restricted area fence, but the payload of uranium ore drums was not compromised. Massac County and Metropolis City fire departments responded and extinguished the fire (Honeywell 2018a, RAI Response TRN-1). In a second incident, on January 12, 2017, Energy Fuels, Inc. notified Honeywell that a drum of calcined-recovered ore leaked about 0.9 kilogram (2 pounds) of material while in transit to its receiving facility, contaminating the floor of the trailer. Energy Fuels, Inc., the receiving operator, performed the cleanup and decontamination. The NRC issued a notice of violation and Honeywell implemented corrective actions to prevent reoccurrence (NRC 2017c). The NRC concluded that there was reasonable assurance that the leak did not result in significant safety consequences to the public.

Safety controls and compliance with existing transportation regulations in 10 CFR Part 71, “Packaging and Transportation of Radioactive Material,” add confidence that radiological materials and wastes can be shipped safely with a low potential of affecting the environment and human health. For example, transport drums must meet specifications of 49 CFR Part 173, “Shippers—General Requirements for Shipments and Packagings,” which is incorporated in NRC regulations at 10 CFR Part 71.

Based on the two aforementioned reports and regulatory controls in place for transporting radiological materials, the NRC concludes that transportation of these materials to and from the MTW under the proposed action would not cause significant environmental impacts.
Chemical Transportation Hazards from Traffic Accidents

The process chemicals used for MTW operations involve inhalation and contact hazards for persons exposed during a transportation accident that involves a release of the material. The consequences are dependent on the release quantity, meteorological conditions that could spread contamination or promote reactivity, and the location of the accident in relation to human population. Table 2-1 in Chapter 2 of this EA lists the industrial chemicals used at the MTW, and Table 3-5 in Chapter 3 of this EA shows the hazard information for these chemicals. Based on the table of reportable quantities (49 CFR 172.101, “Purpose and Use of Hazardous Materials Table,” Appendix A), the transport of hydrogen fluoride would present the greatest hazard in the event of a release. In a DOE analysis (DOE 2004a, Section 5.2.3.3), DOE determined that releases of hydrogen fluoride in quantities typically transported by truck or rail could result in upwards of 3,000 permanent health effects (in an urban setting). The transport of anhydrous hydrogen fluoride, with its greater concentration, would involve greater consequences; however, the probability of such accidents is very low for both truck and rail shipments (MTW would receive shipments of anhydrous hydrogen fluoride by rail (Honeywell 2018a, Response to RAI TRN-1)). According to Honeywell, the estimated mileage for transport of hydrogen fluoride over the proposed 40-year license renewal term is approximately 3,376,000 kilometers (2,110,000 miles), which is less than what DOE analyzed—4,800,000 kilometers (3,000,000 miles).

In addition, compliance with NRC and U.S. Department of Transportation packaging and transportation regulations (10 CFR Part 71 and 49 CFR Parts 100–199) provides protection for workers and the public from exposure to unsafe levels of radiation during transport and limits the potential for releases of hazardous and radioactive materials during transportation accidents. These regulations address a variety of factors related to safety, including packaging design and content limitations, labeling, signage (placarding), driver qualifications, routing, incident reporting, and emergency preparedness. Roles and responsibilities of shippers, carriers, emergency responders, and applicable State and Federal agencies are established in these regulations or by other coordination actions to ensure prompt response and support is provided for incidents involving releases of hazardous (including radioactive) materials during transport. MTW has procedures in place that govern the packaging, loading, and inspection of shipping containers and loads prior to shipment. MTW also uses dedicated railcars and trailers for much of the shipping (Honeywell 2018a, Response to RAI TRN-1).

Based on the low probability of an accident and the regulatory framework and shipping practices related to the transport of hazardous materials, the NRC staff concludes that the potential impacts from the transport of hazardous materials under the proposed action would not cause significant environmental impacts.

4.1.3 Geology and Soils

The proposed action involves continuing operations with minor modifications to existing onsite systems, as described in Section 2.2 of this EA. Such system modification would not have a significant impact to geological features, including soil compaction, soil erosion, subsidence, landslides, or disruption of natural drainage patterns. Honeywell is addressing contamination associated with the calcium fluoride ponds, process sewers, chlorinated solvent and arsenic area, landfill, and Old Creosoter areas with regulatory oversight from the IEPA, as described in Section 2.3.9 of this EA. Section 4.1.4.2 of this EA discusses the potential impacts in these contaminated areas.
The NRC concludes that the proposed action would not have a significant impact on geology and soils in the area of review. This conclusion is based on the absence of new construction, the implementation of spill prevention and cleanup procedures, in conjunction with the use of monitoring wells, and active IEPA oversight. Honeywell complies with RCRA requirements in treating contamination from past operations and implements the protective measures stipulated in the ELUC, and the NRC expects that Honeywell would promptly investigate and, if necessary, remediate any future releases of contaminants.

**Seismicity**

As discussed in Section 3.3.3 of this EA, the MTW site is in a region of recognized seismic activity caused by the NMSZ. 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 MTW site. 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 effect of another seismic event similar to the 1811–1812 earthquakes could potentially result in damage to MTW buildings, containments, and piping with possible releases of uranium hexafluoride. The return period for an earthquake on the NMSZ could be as low as 475 years (Pezeshk 2004).

Honeywell has implemented several upgrades and modifications to the process facilities and site infrastructure since 2006, when the last license renewal EA was published, as described in Section 2.2 of this EA. These upgrades and modifications include seismic and tornado protection upgrades that were completed in 2013 (ENERCON 2017, Section 1.1). In its safety evaluation of these upgrades, the NRC concluded with reasonable assurance that the FMB structure that houses equipment and piping that contain uranium hexafluoride would not sustain damage leading to significant releases of uranium hexafluoride from facilities, equipment, or piping for up to a 1,700-year return period earthquake (NRC 2013b, 2014a).

The NRC concludes that the risk of significant environmental impacts from a seismic or tornado event is minimized because of the upgrades made at the MTW, as described above.

4.1.4 Water Resources

4.1.4.1 Surface Water and Sediments

Liquid waste streams generated at MTW are categorized as low-level radioactive and nonradioactive waste streams. Section 2.3.8 of this EA discusses these waste streams. Each of the waste streams is recycled or treated separately. IEPA has permitted three NPDES outfalls (Outfalls 002, 003, and 005) for Honeywell’s use. Most of the uranium hexafluoride process-related liquid effluents from the MTW are discharged through Outfall 002 into the Ohio River. The liquid effluent discharge rate from Outfall 002 averaged 0.12 m³/s (4.18 ft³/s) from 2010 through 2014 (see Table 2-4 in Chapter 2 of this EA). This discharge rate is significantly below the annual average flow rate of the Ohio River of 7,915 m³/s (279,501 ft³/s) (USGS 2017c). The NRC does not anticipate that the liquid effluent discharge would have a significant impact on the flow rate for the Ohio River.

As discussed in Section 3.4.1 of this EA, the MTW does not use surface water as a source of potable water or process water, and the onsite intermittent streams are not used for fishing, recreation, irrigation, or other agricultural uses. The nearest public drinking water intake is
located at Paducah, KY, about 17.7 kilometers (11 miles) upstream. The nearest downstream public drinking water intake is in Cairo, IL, about 51 kilometers (32 miles) from the MTW site. The groundwater wells will continue to provide process and potable water for the facility under the proposed action.

Some nearby water users in the vicinity of MTW also use the Ohio River. Nearby industrial use of the river is primarily limited to effluent discharge, cooling water makeup discharge, or both. The nearest downstream city, Joppa, IL, located approximately 12.9 kilometers (8 miles) to the northwest, does not use the Ohio River for drinking water supply (ENERCON 2017, Section 4.4.2). The volumetric water discharges from the MTW represent only 0.0015 percent of the average river flows. Accounting for this small quantity, the distance (51 kilometers (32 miles)) to the nearest public water supply intake, and plant’s compliance with the NPDES permit, the NRC staff concludes that potential impacts to water ingestion receptors from activities associated with the MTW under the proposed action would not be significant.

Based on the data in Table 2-6 in Chapter 2 of this EA, the uranium and fluoride concentrations in surface waters are generally higher for the MTW outflow location than for the upstream and downstream sample locations in all years. Dissolved uranium concentrations in the Ohio River above and below the MTW outflow have been mostly below detection. Fluoride concentrations have been variable at each river sampling location.

The sediment sampling data in Table 2-7 in Chapter 2 of this EA indicate a slightly decreasing trend in uranium concentration over the 5-year reporting period (2010 through 2014) and a slightly increasing trend in fluoride. In both the effluent ditches and offsite locations, analyses for the upstream and downstream sample locations show a slight increasing trend in uranium over the period, and an overall decreasing trend in the fluoride concentration over the same period.

Regarding sediment contamination, as documented in Table 2-7, Honeywell noted an increase in uranium and fluoride concentrations within suspended solids in 2013 for both the 213- and 427-meter (700- and 1,400-foot) MTW Outfall 002 effluent ditch sample locations. A related study of soils in and along that location by ENERCON (2010) assumed that “the entire length of the drainage from Outfall 002 to the Ohio River is impacted” by overflows of the site ponds during high precipitation storm events. Because of recent improvements in the MTW’s wastewater treatment, the NRC concludes that continued operation of the plant under the proposed action would not have a significant impact on surface water quality related to discharges from Outfall 002 into the Ohio River.

Surface-water quality is protected by the adherence to release limits and monitoring programs required under the NPDES permit. Current effluent quality characteristics are within the permit limitations. Infrequent exceedances of NPDES permit limits would not have a significant impact on the surface-water quality of the Ohio River because of the large dilution volume. Recent facility upgrades at the EPF have further reduced fluoride discharge amounts into the Ohio River and reduced associated impacts to the river.

The NRC concludes that the proposed continued operations at MTW would not have a significant impact on surface-water resources in the area of review. Specifically, no significant impacts are anticipated because of (1) the small volume of discharge relative to the volume of water in the Ohio River, (2) the minimal downstream water intakes, (3) Honeywell’s compliance with the NPDES permit, and (4) the oversight and enforcement authority of the IEPA under the NPDES permit. In addition, because Honeywell is required to address uranium contamination
as part of decommissioning, while uranium deposition in sediments in the Outfall 002 drainage ditch would likely continue, the impact of uranium deposition in sediments would not be significant or permanent.

4.1.4.2 Groundwater

The groundwater quality at the site is protected through the use of three groundwater contaminant monitoring programs, which require certain mitigative actions, if elevated contaminant levels are identified. These monitoring programs are described in Section 2.3.9.2 of this EA. The following points summarize ongoing activities associated with these programs, as well as actions related to the process sewers:

- The RCRA surface impoundment liner leakage monitoring program (see Section 2.3.9.2 of this EA) for the calcium fluoride ponds is designed to identify pond leakage through the impoundment liners and to specify corrective actions before leakage jeopardizes the groundwater underlying the impoundments. Potential groundwater impacts from the ponds would not be significant in the area of review because the groundwater monitoring network provides early notification of leakage. Any needed remediation in response to the monitoring results would localize and limit contamination.

- As described in Section 2.3.9.2 of this EA, Honeywell is investigating the condition of its underground process sewers and structures under its RCRA permit. Two areas of concern were identified where contaminants appear to have migrated out of the underground process sewers. Honeywell worked with IEPA to identify the extent and significance of potential releases associated with the two areas of concern. After reviewing Honeywell’s remedial actions, the results of the well monitoring, and the soil investigation, the IEPA approved Honeywell’s request to close the investigations of the two existing areas of concern (IEPA 2018b). Honeywell continues to inspect the remaining process sewers at the plant and reports to the IEPA annually on the progress of its investigations (see Section 2.3.9.2 of this EA) (NRC 2018c). IEPA approved an ELUC for the MTW site and Honeywell will attach the terms of the ELUC to the property deed. The NRC concludes that no significant impacts on groundwater from past process sewer leaks are anticipated in the area of review. The NRC bases its finding on (1) the low contamination levels, (2) the localized nature of contamination, and (3) the remediation measures already implemented by Honeywell.

- Honeywell monitors groundwater around the inactive landfill and in the adjacent Old Creosoter Area. Honeywell is actively working with IEPA to assess the status of the landfill. The IEPA will determine whether additional investigations and remediation actions are required.

- Remedial actions at the Old Creosoter Area (excavation and capping) have been completed, with only administrative controls left to finalize, such as the delineation of an ELUC (NRC 2018c).

The upper surface elevation of the Metropolis Formation lies 15 meters (50 feet) below the land surface (see Section 3.4.2 of this EA). The Metropolis Formation is not used for drinking water within or downdgradient of the MTW. This formation provides water to a very limited number of domestic wells, which are upgradient and east of the site (see Nelson et al. 2002). The Mississippian Salem Limestone is the principal source of groundwater for industrial, utility, and municipal water use, and it underlies the MTW site at depths from 85 to 150 meters (280 to
500 feet). The great depth of the aquifer and the low permeability clays in the overlying McNairy and Post Creek Formations are expected to prevent contamination from migrating from MTW and contaminating groundwater. The monitoring of the limestone wells and IEPA’s regulatory oversight provide additional protection of the aquifer.

The NRC staff concludes that groundwater impacts in the area of review would not be significant due to the localized effects of subsurface contamination from past events and the depth to groundwater resources.

4.1.5 Ecology

As noted in Section 3.5 of this EA, MTW operations all take place within a single restricted area, which covers about 5 percent of the license area. Site workers cleared the restricted area of all natural vegetation to permit the construction of buildings, settling ponds, and other MTW-related facilities. The remaining 95 percent of the property has remained mostly undeveloped. Therefore, the descriptions of ecological resources in this section refer to just those in the unrestricted portion of the site, with the exception of the approximately 40.5 hectares (100 acres) of cropland north of U.S. Highway 45.

4.1.5.1 Terrestrial

Under the proposed action, there would be minimal terrestrial resources impacts from continued plant operation because there would be no associated major expansion of existing facilities.

The primary potential impact on the terrestrial resources as part of continued operations would be from the nonradiological constituents released to the environment. The NRC previously examined the effects of these releases (NRC 1995, 2006a) in reviewing previous Honeywell license renewal applications and concluded that continued operation of the facility would not result in significant adverse impacts on terrestrial biota or people near the facility. Fluoride concentrations in the air, soil, and vegetation off site would be below levels that are expected to result in adverse effects. As discussed in Sections 4.1.3, and 4.1.6 of this EA, there has been no degradation in soil, offsite air, or vegetation from fluoride since the previous assessments were documented, and the expected releases during the next 40 years would be the same as under current operations. Therefore, the proposed action is expected to result in minimal adverse impacts to the offsite environment. Because fluoride can adversely affect vegetation at relatively low concentrations and be hazardous to livestock when it accumulates in forage crops, monitoring of fluoride in local vegetation will continue (see Section 2.3.9 of this EA).

4.1.5.2 Aquatic

As discussed in Sections 3.4.1 and 4.1.4.1 of this EA, the volume of water discharged from the Outfall 002 is negligible (0.0015 percent) when compared to the average flow in the Ohio River. Although the surface-water sampling results indicate that nonradiological constituents in surface water (i.e., fluoride) are rapidly diluted in the Ohio River, the sediment sampling results (see Table 2-7 in Chapter 2 of this EA) indicate an increasing trend in uranium concentration from 2010 through 2014 and a decreasing trend in fluoride over the same period. There are no established standards for uranium or fluoride in stream sediments. River sediments in the MTW outflow 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 mode 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. Facility upgrades to the EPF to meet more stringent NPDES requirements for fluoride should decrease impacts of fluoride in river sediment, thus lessening the potential impacts on benthic organisms.

Section 3.4.1 of this EA describes the wetlands located at the MTW site. No significant impacts to wetlands are expected to result from the proposed action, as the natural wetlands along the bank of the Ohio River and in the southeastern portion of the site are located outside of the restricted and immediately adjacent area. The two wetland features identified in the National Wetlands Inventory that are within the restricted area are the calcium fluoride ponds.

Four creeks drain undeveloped portions of the MTW site to the Ohio River, which forms the southern boundary of the MTW site, approximately 549 meters (1,800 feet) southwest of the restricted area. The Ohio River is classified as a jurisdictional traditional navigable water and subject to U.S. Army Corps of Engineer (USACE) regulation. The proximity of the creeks on the MTW site to the Ohio River would be considered a significant nexus with a jurisdictional water of the United States and would subject the creeks to the regulatory jurisdiction of the USACE, as well. However, the proposed license renewal is not subject to review by the USACE because it does not require the discharge of dredge or fill material into the Ohio River or adjacent tributaries or wetlands (ENERCON 2017, Section 4.5, p. 4-7).

Honeywell does not allow any recreational hunting, fishing, or trapping on its property and has posted signs to that effect; therefore, there would be no impacts to wildlife on the site due to these activities. The proposed action would not involve modifications to or abutting the Ohio River. As the NRC concluded in Section 4.1.4.1 of this EA, no significant surface water impacts would occur because of the proposed action. Therefore, the NRC does not expect that the proposed action would have significant impacts on commercial and recreational fishing.

Based on the information provided above, the NRC concludes that potential impacts from the proposed action on aquatic species in the water column would not be significant, and that potential impacts from contaminants in the sediments on benthic organisms or on species that feed on these organisms could be noticeable, but not significant.

4.1.5.3 Threatened, Endangered, Proposed, and Candidate Species

Federally Listed Species

As discussed in Section 3.5.3.1 of this EA, there are 16 federally threatened, endangered, or candidate species in Massac County, IL, or in the Ohio River within Massac County or McCracken County, KY. None of these species occurs in the MTW restricted area. There are no critical habitats in Massac County. There is designated critical habitat in McCracken County for one threatened species of mussel (rabbittsfoot) (USFWS 2018a), which could be impacted by the discharge of effluent and by contaminated sediments within the action area. However, no significant mussel beds are known to exist in the area of river adjacent to the MTW site (USFWS 2018a), and Honeywell has been improving its wastewater treatment, as described in Section 2.2 of this EA. Federally listed threatened or endangered terrestrial animals whose ranges include Massac County and McCracken County are the least tern, the Indiana bat, the northern long-eared bat, and the gray bat (USFWS 2018a). Table 4-2 presents a summary of potential impacts.

The proposed action would not involve significant changes to MTW operations. No bat or tern foraging or roosting habitat is present inside the fenced restricted area, where facility operations
occur. Potential habitats identified outside the restricted area would not be affected by routine MTW operations. The proposed action does not include any plans for riverfront development activities that would either directly disturb potential least tern breeding habitat or encroach on potential nesting sites. Continued operation of the MTW would result in restricted public use of the 405-hectare (1,000-acre) site, including potential least tern nesting sites along the Ohio River. Potential bat foraging habitat (riparian vegetation along intermittent tributaries) present near the site is unlikely to become contaminated from continued operations. Least tern foraging habitats within the action area (i.e., where effluent discharges into the Ohio River occur) may be contaminated by fluoride and uranium; forage fish may concentrate these chemicals, which could bioaccumulate in the tissues of piscivorous birds like terns (Thompson et al. 1997). However, population-level impacts and even sublethal effects of these chemicals on piscivorous birds are not well documented (e.g., Burger and Gochfeld 2007). Therefore, significant impacts are unlikely, especially given that foraging activities would be unlikely to be concentrated within the action area, particularly if turbidity is high (Thompson et al. 1997). Least terns are known to travel great distances to forage (i.e., greater than 12 kilometers (7.5 miles)) from their breeding sites (Schweitzer and Leslie 1996). Therefore, the impact of the proposed action on the least tern and federally listed bat species is not expected to be significant.

### Table 4-2 Impacts to Federally Listed Species

<table>
<thead>
<tr>
<th>Species</th>
<th>Scientific Name</th>
<th>Impact</th>
<th>Federal Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>least tern</td>
<td><em>Sternula antilarum</em></td>
<td>Not likely to adversely affect. Breeds on islands nearby, but nesting habitat not affected by operations at MTW site; foraging habitat could be contaminated locally, but not likely to impact breeding terns due to dilution, lack of foraging in turbid waters, and distribution of foraging habitats.</td>
<td>endangered</td>
</tr>
<tr>
<td>Indiana bat</td>
<td><em>Myotis sodalis</em></td>
<td>Not likely to adversely affect. Species’ preferred habitat/roosting areas would not be affected by proposed action.</td>
<td>endangered</td>
</tr>
<tr>
<td>northern long-eared bat</td>
<td><em>Myotis septentrionalis</em></td>
<td>Not likely to adversely affect. Species’ preferred habitat/roosting areas would not be affected by proposed action.</td>
<td>threatened, 4,d rule</td>
</tr>
<tr>
<td>gray bat</td>
<td><em>Myotis grisescens</em></td>
<td>Not likely to adversely affect. Species’ preferred habitat/roosting areas would not be affected by proposed action.</td>
<td>endangered</td>
</tr>
<tr>
<td>orangefoot pimpleback (pearlymussel)</td>
<td><em>Plethobasus cooperianus</em></td>
<td>Not likely to adversely affect. No known significant mussel beds in adjacent area; water treatment improving, so any existing mussels would not likely be affected by proposed action.</td>
<td>endangered</td>
</tr>
<tr>
<td>pink mucket (pearlymussel)</td>
<td><em>Lampsilis abrupta</em></td>
<td>Not likely to adversely affect. No known significant mussel beds in adjacent area; water treatment improving, so any existing mussels would not likely be affected by proposed action.</td>
<td>endangered</td>
</tr>
<tr>
<td>purple cat’s paw (pearlymussel)</td>
<td><em>Epioblasma obliquata</em></td>
<td>Not likely to adversely affect. No known significant mussel beds in adjacent area; water treatment improving, so any existing mussels would not likely be affected by proposed action.</td>
<td>endangered</td>
</tr>
<tr>
<td>Species</td>
<td>Scientific Name</td>
<td>Impact</td>
<td>Federal Status</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>fat pocketbook (mussel)</td>
<td><em>Potamilus capax</em></td>
<td>Not likely to adversely affect. No known significant mussel beds in adjacent area; water treatment improving, so any existing mussels would not likely be affected by proposed action.</td>
<td>endangered</td>
</tr>
<tr>
<td>rabbitsfoot (mussel)</td>
<td><em>Quadrula cylindrica</em></td>
<td>Not likely to adversely affect. No known significant mussel beds in adjacent area; water treatment improving, so any existing mussels would not likely be affected by proposed action.</td>
<td>threatened, critical habitat</td>
</tr>
<tr>
<td>sheepnose (mussel)</td>
<td><em>Plethobasus cyphyus</em></td>
<td>Not likely to adversely affect. No known significant mussel beds in adjacent area; water treatment improving, so any existing mussels would not likely be affected by proposed action.</td>
<td>endangered</td>
</tr>
<tr>
<td>spectaclecase (mussel)</td>
<td><em>Cumberlandia monodonta</em></td>
<td>Not likely to adversely affect. No known significant mussel beds in adjacent area; water treatment improving, so any existing mussels would not likely be affected by proposed action.</td>
<td>endangered</td>
</tr>
<tr>
<td>rough pigtoe (mussel)</td>
<td><em>Pleurobema plenum</em></td>
<td>Not likely to adversely affect. No known significant mussel beds in adjacent area; water treatment improving, so any existing mussels would not likely be affected by proposed action.</td>
<td>endangered</td>
</tr>
<tr>
<td>northern riffleshell (mussel)</td>
<td><em>Epioblasma torulosa rangiana</em></td>
<td>Not likely to adversely affect. No known significant mussel beds in adjacent area; water treatment improving, so any existing mussels would not likely be affected by proposed action.</td>
<td>endangered</td>
</tr>
<tr>
<td>ring pink (mussel)</td>
<td><em>Obovaria retusa</em></td>
<td>Not likely to adversely affect. No known significant mussel beds in adjacent area; water treatment improving, so any existing mussels would not likely be affected by proposed action.</td>
<td>endangered</td>
</tr>
<tr>
<td>clubsell (mussel)</td>
<td><em>Pleurobema clava</em></td>
<td>Not likely to adversely affect. No known significant mussel beds in adjacent area; water treatment improving, so any existing mussels would not likely be affected by proposed action.</td>
<td>endangered</td>
</tr>
<tr>
<td>fanshell (mussel)</td>
<td><em>Cyprogenia stegaria</em></td>
<td>Not likely to adversely affect. No known significant mussel beds in adjacent area; water treatment improving, so any existing mussels would not likely be affected by proposed action.</td>
<td>endangered</td>
</tr>
</tbody>
</table>

Sources: USFWS 2018a; ILDNR 2012, ILDNR 2016; KDFWR 2018

The proposed action would not involve changes to the quantity or quality of liquid effluents or airborne emissions released as a result of MTW 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 NRC’s regulations (Title 10 of the Code of Federal Regulations) and State-issued permits. The NRC does not expect that normal liquid effluents and infrequent
exceedances of NPDES permit levels would have a significant impact on the Ohio River surface-water quality or the mussel population, as discussed in Section 4.1.4 of this EA. The majority of mussel habitat in the vicinity of the site has been identified upstream from the MTW site (DOE 2003) and would not be affected by routine plant operations; no mussel habitat exists inside the MTW property boundary. Therefore, the NRC concludes that the impact of the proposed action on threatened or endangered aquatic species, including the pink mucket, orangefoot pimpleback, and purple cat's paw pearlymussels, fat pocketbook, ring pink, rabbitsfoot, rough pigtoe, northern riffleshell, clubshell, fanshell, sheenose, and spectaclecase mussels, would not be significant.

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 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 not be significant.

The NRC concludes that continued operations at MTW would not have a significant impact to the ecological resources, including threatened and endangered species, in the vicinity of the site. This conclusion is based on continued compliance with environmental regulations and permits controlling the operation of the MTW, access controls to the MTW that do not allow recreational activities, and lack of significant site development.

**State-Listed Species**

In order to provide a complete assessment of potential impacts of the proposed action, this EA includes State-listed species that are potentially present in the MTW action area. The Illinois Department of Natural Resources lists 57 State-designated threatened or endangered species that occur in Massac County, 21 of which have the potential to occur in or near the Ohio River action area, as aquatic or aerial species, feeding on aquatic species or insects (ILDNR 2016). The Kentucky Department of Fish and Wildlife Resources lists 73 State-designated threatened or endangered species that occur in McCracken County, 63 of which have the potential to occur within the action area, as they are aquatic or aerial (including bats and birds) (KDFWR 2018). Bald eagles are also possible inhabitants of roosts in these counties and may use the river to forage for fish and are protected by the Bald and Golden Eagle Protection Act.

The most likely impact for any of these species that are aquatic or partially aquatic (e.g., piscivorous birds) is bioaccumulation of contaminants, particularly if they are feeding in the river near the effluent discharge. As discussed above, 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, and emissions are in accordance with limits established in the license, NRC regulations (Title 10 of the Code of Federal Regulations), and State-issued permits. The NRC does not expect that normal liquid effluents and infrequent exceedances of NPDES permit levels would have a significant impact on the Ohio River surface water quality, fish, aquatic invertebrate, or, in particular, threatened and endangered mussel populations, as discussed in Section 4.1.4 of this EA. Likewise, aquatic and piscivorous birds (like eagles) would also be unlikely to be exposed to significant contaminants from regular MTW operations.
4.1.6 Meteorology, Climatology, and Air Quality

The general climate at the MTW remains the same as described in the NRC’s EA for the previous license renewal (NRC 2006a). Meteorological characteristics such as temperatures, precipitation, winds, tornadoes, and storms remain consistent with those described in the 2006 EA. It is expected that these characteristics at the site would remain consistent during the continuation of operations under the proposed action.

4.1.6.1 Nonradiological Air Quality Impacts

The NRC does not anticipate changes in impacts to air quality from nonradiological contaminants from the proposed action. Without changes to the facilities or operations, the type of contaminants produced at the site would be similar to past emissions, with some fluctuation in quantities related to variations in operations. State-issued operating permits for processing activities include release limits for volatile organic material, particulate matter, sulfur dioxide, nitrous oxides, aqueous ammonia, and hazardous air pollutants, excluding volatile organic material and particulate matter. Table 2-3 in Chapter 2 of this EA shows emissions from the MTW.

As discussed in Section 3.6.2 of this EA, as of February 2017, Massac County, IL, and McCracken County, KY (across the river), continue to be in attainment with regard to criteria pollutants (see Table 3-7 in Chapter 3 of this EA). This is not expected to change as a result of the proposed action.

A description of the facility gaseous effluent control systems is provided in Section 2.3.8.1 of this EA. MTW currently operates under an IEPA-issued CAAPP permit (ID Number 96030014) (IEPA 2016a). The permit contains terms and conditions that address applicability of Title I of the Clean Air Act, including Federal PSD goals and 35 IAC 203, “Major Stationary Sources Construction and Modification.” Because of emission controls and regulatory compliance associated with enforcement of the CAAPP permit, the NRC concludes that continued operations at the MTW associated with the proposed action would not have a significant impact on the nonradiological aspects of air quality at the site.

4.1.6.2 Radiological Air Quality Impacts

As discussed in Section 2.3.8 of this EA, uranium is the primary radiological constituent released through the MTW’s stacks (see Table 2-2 in Chapter 2 of this EA). 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 meet ALARA principles. MTW is subject to NRC regulations for emissions of radionuclides, and the applicable radiological release limits of 10 CFR Part 20 would continue to apply to the MTW’s radiological releases under the proposed action. The radiological air quality impacts are expressed as radiological doses from routine airborne and liquid effluent radioactive releases to the maximally exposed individual and the surrounding population. Impacts are addressed in detail in Section 4.1.11 of this EA.
4.1.6.3 Greenhouse Gas Emissions

**MTW’s Contribution to Atmospheric Greenhouse Gas Levels**

In CLI-09-21 (NRC 2009b), the Commission provided guidance to the staff on addressing GHG issues in environmental reviews. That guidance directed the staff to “…include consideration of carbon dioxide and other greenhouse gas emissions in its environmental reviews for major licensing actions under the National Environmental Policy Act.”

Operation of the MTW would contribute to GHG emissions. During operations, vehicle traffic related to operation and maintenance, employee commuter vehicles, and truck shipments delivering supplies to the site and removing products and wastes from the site, as described in Section 3.2 of this EA, would generate GHG emissions. As shown in Table 2-3 in Chapter 2 of this EA, the operations at the MTW generate less than 19,000 metric tons (20,944 tons) of carbon dioxide, which is approximately 0.008 percent of the estimated carbon dioxide generated by the State of Illinois (see Section 3.6.2, of this EA).

The NRC staff concludes that the incremental impacts of the proposed action would not significantly contribute to the cumulative impact on climate change. These GHG emissions are below the EPA’s threshold of 25,000 metric tons (27,558 tons) per year of carbon dioxide equivalent, which requires facilities to report GHG emissions to the EPA annually in accordance with 40 CFR Part 98, “Mandatory Greenhouse Gas Reporting.” Given that GHG emissions during operations are small in comparison to the amount of emissions generated by the State of Illinois and the fact that these emissions are below EPA reportable quantities, the NRC staff concludes that GHG impacts from MTW operations associated with the proposed action would not be significant. Therefore, these emissions would have a negligible impact on climate change.

4.1.7 Noise

An outdoor noise source that Honeywell added to MTW since the previous license renewal (NRC 2006a) are the two cooling towers located near the center of the restricted area. The noise level 0.9 meter (3 feet) from the cooling towers was measured at 76.8 A-weighted decibels (ENERCON 2017, Section 4.7). The noise attenuates with distance and also by structures surrounding the towers. As discussed in Section 3.7.2 of this EA, the nearest noise-sensitive receptor to the MTW is a rural residence 538 meters (1,765 feet) north-northeast of the FMB.

MTW activities also create intermittent noise outside the restricted area fence at the railroad siding adjacent to the MTW. MTW workers move railcars to and from the siding to receive shipments of materials and shipping products and waste (ENERCON 2017, Section 4.7). These railroad siding activities take place during daylight hours. MTW has performed noise surveys for occupational health purposes. Using the maximum noise levels from the FMB near the center of MTW and the standard attenuation of 6 A-weighted decibels for each doubling of distance, noise from the MTW will hypothetically attenuate to well below Category B (see Table 3-9 in Chapter 3 of this EA) levels by distance alone.

Noise levels inside the operation buildings, such as the FMB, can exceed levels that are protective against hearing loss, as described in Section 3.7.2 of this EA. Occupational Safety and Health Administration regulations require that workers use hearing protection in these areas.
Honeywell proposes to continue operations with minor modifications to onsite systems (see Section 2 of this EA). The NRC concludes that such system modifications would not have any significant impact to noise levels at the site.

The NRC concludes that continued operations at the MTW under the proposed action would not result in significant noise impact because of protective measures in place to minimize impacts to workers and the fact that noise attenuates over the distance between the facility and offsite receptors.

4.1.8 Historic and Cultural Resources

4.1.8.1 National Register of Historic Places Listed or Eligible Properties Outside the Area of Potential Effect

Section 3.8 of this EA describes four sites listed on the NRHP and three historic properties eligible for listing on the NHRP that lie outside the 1,000-acre APE. The seven NRHP-listed and NRHP-eligible properties, the closest of which is the Shawnee Steam Plant that is 2.8 kilometers (1.7 miles) away, are not visible from the ground level of the MTW because they lie in an undeveloped portion of the MTW property covered by deciduous forest. Because the MTW is located in an isolated and forested area and the results of viewshed analyses show no changes that affect the viewshed, the NRC staff concludes the facility would not be visible from these historic properties (TVA 2017, Section 3.17). For the proposed license renewal action, MTW’s licensed operations would not change and no ground-breaking actions or construction are planned; therefore, the NRC does not expect significant impacts to known cultural or historic sites within the 8-kilometer (5-mile) radius of the MTW site.

4.1.8.2 Cultural Resources in the MTW Area of Potential Effect

As discussed in Section 3.8.1 of this EA, the APE for this proposed action is the entire 405-hectare (1,000-acre) Honeywell-owned site, including the 24-hectare (59-acre) restricted area. Investigators conducted limited cultural resources surveys on areas of the APE that are outside the restricted area. These surveys resulted in the identification of five cultural resources sites. The field investigators did not recommend any of these sites as eligible for the NRHP, and the SHPO has not made a determination.

Honeywell’s request to renew its source and byproduct materials license and continue operation would not involve ground-disturbing activities on the facility property. Honeywell does not propose changes in how it processes uranium ore during the proposed 40-year license period. The facility is fully constructed and no modifications to the site or its surroundings, such as construction or demolition of structures, are planned. Honeywell’s NRC-licensed uranium conversion activities occur within the fenced, 24-hectare (59-acre) portion of the site, which was heavily disturbed during construction of the facility more than 50 years ago (see Figure 3-5 in Chapter 3 of this EA). Based on the nature of the proposed renewal activities, and in consultation with the Advisory Council on Historic Preservation, the NRC has made a preliminary determination under 36 CFR 800.3(a)(1) that the proposed action would not cause effects on historic or cultural resources on the Honeywell property, assuming such historic properties were present. However, the NRC will provide its final determination in the final EA.

As discussed in Section 3.8.2 of this EA, the NRC staff has initiated consultation with several American Indian Tribes to assess the presence of places of religious or traditional cultural importance for Tribes within the APE. As of the publication of this draft EA, the NRC has not
received information from Tribes concerning specific resources of cultural importance on or near the Honeywell property. The NRC staff will incorporate nonsensitive information on any traditional cultural properties the Tribes identify and other concerns raised by the Tribes into the final EA. Chapter 6 of this EA provides further information regarding consultation activities.

As part of the proposed license renewal review, the NRC proposes to add a condition to the Honeywell materials license to ensure proper identification and protection of cultural resources for the proposed licensing term. Additional details about the license condition will be included in the final EA.

The NRC’s preliminary conclusion is that the proposed action, renewal of Honeywell’s license to continued operations at the MTW, would have no significant impacts on historic and cultural resources.

4.1.9 Scenic and Visual Resources

MTW is currently operating under an IEPA-issued Title V CAAPP permit (IEPA 2016a). The permit requires that no emission of fugitive particle matter from any process, including any material storage handling or storage activity, be visible by an observer looking generally overhead at a point beyond the property line of the source unless wind speeds are greater than 40 kph (25 mph). In addition, the permit requires that no emission of smoke or other particulate matter be allowed or emitted to the atmosphere from a regulated process in excess of 30 percent opacity. The facility complies with these permit conditions during normal operation.

The site has not made significant process modifications or construction activities that altered aesthetic or visibility impacts since the previous license renewal, nor are such modifications proposed under the proposed action. MTW structures are not easily visible from locations outside the MTW site, and the site is surrounded by forested areas, limiting the impact of the facility on scenic and visual resources. Section 3.5.1 of this EA describes the vegetation at the MTW site and Figure 3-5 in Section 3.10 shows an aerial view of the site.

The NRC concludes that continued operations at the MTW under the proposed action would have no significant impacts on scenic and visual resources at the site.

4.1.10 Socioeconomics and Environmental Justice

The primary socioeconomic impact of continued operation of the MTW is related to local employment and property taxes. Under the proposed action, the MTW would continue to directly employ about the same number of workers, leading to the continuation of positive economic impacts for those employed at the site and to the local communities and county. In addition, continued operation would ensure the annual renewal of “mutual assistance agreements” between MTW and local emergency responders in Massac County and the City of Metropolis. Emergency response agencies within the immediate vicinity currently benefit from training, emergency drills, and emergency response equipment provided by Honeywell. Payment of property taxes generally benefits Massac County and the City of Metropolis.

The NRC concludes that continued operation of the MTW under the proposed action would not have a significant adverse impact, and that it would have a beneficial impact on the socioeconomics of the area because of employment opportunities provided to the local area, payment of property taxes, and assistance to emergency responders that could be applied to other local industries.
The proposed action would not cause noticeable impacts on populations living in the vicinity of the facility. Given that the proposed action would not cause noticeable impacts on any population, there are no disproportionately high and adverse human health and environmental effects on minority or low-income populations. Therefore, an environmental justice review is not necessary. This is consistent with the NRC’s “Policy Statement on the Treatment of Environmental Justice Matters in NRC Regulatory and Licensing Actions” (69 FR 52040, August 24, 2004). The Policy Statement discusses the evaluation of environmental justice in EAs and notes that, “in the case of most EAs there are little or no offsite impacts and, therefore, an EJ [environmental justice] review is generally not necessary to make a Finding of No Significant Impact (FONSI).”

4.1.11 Public and Occupational Health and Safety

Radioactive and nonradioactive materials released from MTW facilities may migrate in the environment through a variety of transport pathways that could result in both internal and external exposures. 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 could result from ingesting water or irrigated crops, while external exposures may result from recreational activities such as swimming and boating.

This EA assesses the radiological impacts of continued operation of the MTW by calculating the radiation dose to the maximally exposed individual located at the nearest residence and the collective radiation dose to local population living within 80 kilometers (50 miles) of the MTW site.

This section uses the generic term “radiation dose” to refer to the TEDE, which is the sum of (1) the deep dose equivalent from exposure to external radiation for a period of 1 year, and (2) the 50-year committed effective dose equivalent from internal exposure from the intake of radionuclides for a period of 1 year. The generic term radiation dose may be applied to an individual, using units of mSv (mrem) per year, or as the collective radiation dose to populations, using person-Sv (person-rem) per year.

4.1.11.1 Public Health and Safety

Doses from Routine Airborne Releases

As discussed in Section 2.3.8 of this EA, MTW monitors operational releases of radioactive material to the atmosphere from 53 release points and reports measurements of the releases to the NRC on a semiannual basis. These releases are primarily uranium, although the facility also releases relatively small amounts of thorium-230 and radium-226. Fluoride is the primary nonradiological gaseous contaminant released through stacks on the FMB. Table 2-2 in Chapter 2 of this EA summarizes the annual uranium release rates from 2010 through 2014 combined for all emission points.

Honeywell calculated the doses from routine airborne releases using CAP-88 as the dose modeling software. The EPA issued CAP-88 for estimating the dose from radionuclide emissions to air. CAP-88 allows the modeling of up to six emission points for a single building. All nuclides are assumed to be Class M (i.e., moderate rate of absorption) to better correlate with absorption into the bloodstream from the respiratory tract (ENERCON 2017, Section 4.6.5).
To predict the air impacts over a 40-year licensing term (the proposed action), Honeywell used the projected demand for uranium enrichment services as a basis for emission rates for future years. The projections were used for impacts analysis to bound dose rates from routine airborne radiological emissions through the final year of the license renewal (ENERCON 2017, Section 4.6.5.1). Honeywell selected the Energy Resources International 2012 Fuel Cycle Report (ERI 2012) as the best dataset for developing growth factors to be used in CAP-88 modeling; NRC concurs with the use of this dataset because it is a conservative estimate given that the nuclear energy market, and uranium production in particular, has declined since 2012.

Dose to the Maximally Exposed Individual

The maximally exposed individual is located at the nearest residence north-northeast of the MTW. Figure 4-1 (ENERCON 2017, Figure 4.6-1) provides the location of the ore sampling plant and the FMB in relation to the nearest residence (NR-7), 538 meters (1,765 feet) away from the FMB. Honeywell staff entered projected emissions for the year 2057 into the CAP-88 model along with meteorological data. The exposure at 0.5 kilometer north of the MTW was calculated to be 0.0217 mSv/yr (2.17 mrem/yr) using model runs computed for an individual (exposure) located at the nearest residence (NR-7). The dose predicted at this distance includes exposure from all radionuclides and all pathways. The estimated radiation dose to the maximally exposed individual of 0.0217 mSv/yr is less than the limit of 1 mSv/yr (100 mrem/yr) the NRC established in 10 CFR Part 20.

For comparison, Section 2.3.9.2 of this EA states that background annual average radiation doses at the airport did not exceed 0.28 mSv (28 mrem) in a given year from 2010 through 2014. Radiation doses at the nearest residence and airport, as measured by TLDs, were similar to background (the Control set in Table 2-10 in Chapter 2 of this EA), as measured at the airport, never exceeding 0.29 mSv (29 mrem) from 2010 through 2014.

![Figure 4-1 Locations of MTW Buildings Relative to the Nearest Offsite Residence (NR-7)
(Source: Honeywell 2017b)](image-url)
The highest internal organ dose is to the lungs from moderately soluble forms of uranium. The estimated lung dose of 0.119 mSv/yr (11.9 mrem/yr) is less than the limit of 0.25 mSv/yr (25 mrem/yr) the EPA established in 40 CFR Part 190. The thyroid doses are also a small fraction of the 0.75 mSv/yr (75 mrem/yr) thyroid dose limit the EPA established in 40 CFR Part 190.

**Dose to the Surrounding Population**

Honeywell estimated the projected population for the year 2057 within an 80-kilometer (50-mile) radius of the MTW to be 574,948 people. As with the maximally exposed individual, Honeywell used the CAP-88 software to estimate the collective radiation dose to the population.

Honeywell estimated the collective radiation dose to the population within an 80-kilometer radius of the MTW to be 0.0452 person-Sv (4.52 person-rem) per year. Accordingly, the collective radiation dose associated with atmospheric releases from the MTW is a small percentage of the collective radiation dose from background radiation for these same number of people.

The NRC reviewed Honeywell’s methodology and assumptions, input to the CAP-88 calculations, and results, and confirmed that continued operations at the MTW would not have significant radiological impacts to the public from airborne releases at the site based on calculated exposures to the nearest residence that are below the limits set forth in 10 CFR Part 20 and 40 CFR Part 190 and the population dose being a small fraction of the dose the population receives from naturally occurring sources of radiation.

**Doses from Liquid Effluent Releases**

As discussed previously in this EA, the MTW is operating in accordance with its NPDES permit (IEPA 2015a). Liquid wastes are discharged to the Ohio River via one monitored release point, NPDES Outfall 002. Two other outfalls discharge stormwater to the Ohio River. Liquid waste streams generated at the MTW are categorized as low-level radioactive and nonradioactive waste streams. Before discharge into the Ohio River, both radioactive and nonradioactive waste from MTW operations is processed through the EPF to meet radiological effluent limits in 10 CFR Part 20 and nonradiological effluent limits specified in the facility’s NPDES permit.

The NRC analyzed the radiological effects of liquid effluent releases in previous license renewal applications submitted by Honeywell (NRC 1995, 2006a). The dose analysis the NRC performed for the 1996 license renewal, as reported in the 1995 EA (NRC 1995) concluded that the estimated radiation dose (TEDE) to the maximally exposed individual located 8 kilometers (5 miles) downstream of the MTW site, as a result of expected liquid effluent releases, was 0.000013 mSv (0.0013 mrem) per year. This estimated radiation dose is far less than the 0.1-mSv (100-mrem) per year limit the NRC established in 10 CFR Part 20 and also far less than the 0.25-mSv (25-mrem) per year limit the EPA established in 40 CFR Part 190. The estimated radiation dose of 0.000013 mSv per year is also far less than the dose of 0.04 mSv (4 mrem) per year that is the basis for the drinking water standard contained in 40 CFR Part 141, “National Primary Drinking Water Regulations.”

The dose analysis, as a result of liquid effluent releases the NRC performed for the 1996 license renewal (NRC 1995), estimated collective radiation dose to the population (4,846 people) located in Cairo, IL. The dose was estimated to be 0.000030 person-Sv (0.0030 person-rem) per year. Based on an average background radiation dose of 0.00310 Sv (0.310 rem) per year for individuals in the United States (see Section 3.11.1 of this EA), this same population would
receive about 14.80 person-Sv (1,480 person-rem) per year from background radiation; the collective radiation dose associated with liquid effluent releases from the MTW is a small percentage of the collective radiation dose from natural background radiation.

The dose analysis the NRC performed for the 2006 license renewal (NRC 2006a) compared the annual average uranium concentration in liquid releases from 1989 to 1993 (NRC 1995) to the concentration in liquid releases from four years of data (2001 to 2004), shown in Table 4-3. The NRC concluded at that time that the data indicated a declining trend in the 30-day average uranium concentration. Based on the declining trend in liquid effluent releases from levels reported from the previous license renewal (which were determined to result in radiation doses far less than regulatory limits), the NRC concluded in 2006 that the releases would also produce doses that are far less than the regulatory limits.

### Table 4-3 Summary of Monitoring Results of Total Uranium, 2001–2004

<table>
<thead>
<tr>
<th>Total Uranium</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity (pounds per day)</td>
<td>4.97</td>
<td>2.97</td>
<td>3.46</td>
<td>2.46</td>
</tr>
<tr>
<td>30-day average concentration (milligrams per liter)</td>
<td>0.18</td>
<td>0.10</td>
<td>0.11</td>
<td>0.08</td>
</tr>
</tbody>
</table>

Source: NRC 2006a, Table 2.5

The summary of monitoring results of total uranium released for the 5-year period from 2010 through 2014 are shown in Table 2-2 in Chapter 2 of this EA. The data indicate that the average uranium concentrations at Outfall 002 from 2010 through 2014 are within an order of magnitude of the results in Table 4-3. While uranium concentrations were 3 to 5 times higher from 2010 through 2014 than from 2001 to 2004, radiation doses from these higher concentrations would still be far less than the regulatory limits.

**Doses from Direct Radiation**

Table 2-10 in Chapter 2 of this EA provides data related to external gamma monitoring annual averages for the years from 2010 through 2014. As discussed in Section 2.3.9.2 of this EA, the maximum annual average of the direct gamma radiation generally occurs at the east and south restricted area fences. This is because of a large ore concentrate storage area immediately adjacent to the sampling station. The average annual environmental dosimeter dose at the east fence is 0.834 mSv (83.4 mrem), approximately 83 percent of the 1-mSv (100-mrem) limit specified in 10 CFR 20.1301(a)(1) for dose in any unrestricted area from external sources (ENERCON 2017, Section 4.6.8.3). Because the shortest distance from the eastern restricted area fence to the MTW site boundary is approximately 1 kilometer (0.6 mile), the direct dose to any potential offsite individual would be substantially less than the regulatory limit since the dose will decrease with distance because the dose is inversely proportional to the square of the distance. (For example, at 1 kilometer, the dose will be reduced by at least four orders of magnitude.)

The proposed action is to continue operation of the MTW for 40 years at current licensed levels of production. Direct radiation levels during a renewed license term are expected to be similar to those discussed above and are less than applicable environmental and health standards in Section 3.11.2 of this EA. Therefore, the NRC expects that impacts to public health would be within regulatory limits and meet ALARA principles, and the NRC concludes that continued operations at the MTW would not result in a significant impact to the public from exposure to direct radiation.
4.1.11.2 Occupational Health and Safety

MTW workers also have occupational health and safety risks from exposure to industrial hazards, hazardous materials, and radioactive materials.

As discussed in Section 3.11.3 of this EA, industrial hazards at the MTW include chemical exposures, heavy-machinery accidents, crush injuries, and cuts and abrasions, which are similar to the hazards of other industrial facilities of the same size. These hazards apply to workers conducting material processing operations as well as monitoring, research, general office, and industrial site activities. The MTW has had no work-related fatalities, and it had an average recordable injury rate of 2.5 per year from 2010 through 2014.

Equipment in the uranium hexafluoride process that produces dusts, mists, or fumes containing uranium or other toxic materials is provided with dust collectors and scrubbers or other ventilation equipment designed to reduce employee or environmental exposure to levels that meet ALARA principles. Honeywell established a system to sample operating exhaust points to determine uranium content. Honeywell implements a program of effluent monitoring to identify any failures in the effluent clean-up systems and, should any such failure be detected, imposes operational controls to ensure effluents remain within established limits. Honeywell implements a process safety management program consistent with the Occupational Safety and Health Administration requirements at 29 CFR 1910.119, which provide a comprehensive assessment of chemical safety hazards and describe specific processes and programs that mitigate hazards. Honeywell’s process safety management program implements a process of periodic review and feedback to allow continuous improvement of administrative and engineering controls. Honeywell implements engineering controls to limit workplace concentrations of hazardous and radioactive constituents (ENERCON 2017, Section 4.12).

Honeywell implements a respiratory protection program consistent with the requirements of 10 CFR Part 20, 29 CFR 1910.134, “Respiratory Protection,” and Regulatory Guide 8.15, “Acceptable Programs for Respiratory Protection” (NRC 1999). These measures limit employees’ exposures to both hazardous chemicals and radioactive materials. Honeywell has conducted detailed air- and noise-sampling processes to characterize the workplace hazards and provide for establishment of appropriate controls, consistent with applicable regulatory requirements and good industrial practice.

Honeywell also implements an environmental monitoring program addressing radiological and nonradiological hazards. As discussed in Section 3.11.3 of this EA, Honeywell’s radiation protection program routinely surveys work spaces to identify and mitigate radiation hazards and monitors individual worker’s exposure with dosimeters and a bioassay program. Therefore, any potential health effects are expected to be within the range of those effects for comparable licensed facilities and other industrial concerns. As shown in Table 3-18 in Chapter 3 of this EA, individual occupational radiation doses at the MTW are maintained well below the limits established in 10 CFR Part 20, which are designed protect workers’ health.

Continued operation of the MTW is likely to result in continued low-level deposition of uranium in soils both on and off site. However, uranium has a low specific activity and is relatively benign in a radiological sense and is not considered a significant chemical hazard. Any potential health effects would be bounded by maintenance of the stipulated effluent controls, which limit exposures to individuals within established limits. For these reasons, the effects of the very limited exposure to industrial hazards, hazardous materials, and radioactive materials at the MTW are not considered significant. Therefore, the NRC concludes that continued operations...
at MTW under the proposed action would not have a significant impact to workers from exposure to direct radiation.

4.1.11.3 Discussion of Potential Accidents

It is possible that accidents could release radioactive materials or chemicals to the environment, potentially affecting workers and members of the public. The MTW Integrated Safety Analysis Summary (ISA) (Honeywell 2016) provides details on Honeywell’s analyses of the hazards arising from accident sequences identified using the criteria provided in 10 CFR 70.61, “Performance Requirements.” The ISA identifies potential accident sequences, and designates MTW features and procedures to either prevent such accidents or mitigate their consequences to an acceptable level. The ISA further describes management measures to provide reasonable assurance of the availability and reliability of the MTW features and procedures. The ISA uses a hazard analysis method to identify the relevant hazards. The hazard identification process results in the identification of physical, radiological, and chemical characteristics, as appropriate, that have the potential for causing harm to site workers, the public, or the environment. The hazard identification also identifies potentially hazardous conditions that could potentially impact the discrete components of the process systems.

The results of the ISA are intended to give assurance that the potential failures, hazards, accident sequences, and scenarios, as well as MTW features and procedures have been investigated in an integrated fashion, so as to adequately consider common-mode and common-cause situations. Honeywell evaluated selected high-consequence chemical accident sequences that were found to bound all consequences from credible accidents at the MTW. The accidents analyzed include the following (Honeywell 2016a, Table 7-2):

- rupture of the hydrogen fluoride unloading hose
- failure of the nitrogen pressure supply line to the delivery railcar
- failure of the process gas incinerator system
- failure of the redactors from overheating
- contact of hydrocarbons (oil) with gaseous fluorine or uranium hexafluoride
- potential uranium hexafluoride release due to the overpressure failure of a uranium hexafluoride product cylinder

Possible initiators for these accidents include personnel activities, seismic events, tornadoes, tornado missile and high winds, snow and ice, flooding, heavy rain, transportation, aircraft, pipelines, highway traffic, railroads, onsite natural gas, and the effects of operations of other nearby facilities. Honeywell tabulated the radiological and chemical consequences of these events and further evaluated those considered to be credible. For credible events with a potential for high consequences, the ISA provided a detailed evaluation of plant features and procedures that would tend to mitigate those consequences.

Section 4.1.2.3 of this EA presents transportation accident consequences and mitigation measures for accidents involving railroad cars. Rail cars are used at MTW to store anhydrous hydrogen fluoride and potassium hydroxide, as described in Table 2-1 in Chapter 2 of this EA. As stated in Section 4.1.2.3, compliance with NRC and U.S. Department of Transportation
packaging and transportation regulations, 10 CFR Part 71 and 49 CFR Parts 100–199, protects workers and the public by limiting the potential for releases of hazardous and radioactive materials during transportation accidents. Compliance with these regulations must continue while the rail cars are being used as storage units within the MTW.

Honeywell maintains an emergency response plan that describes measures developed and implemented at the MTW for preventing, recognizing, and responding to emergency conditions that may arise (Honeywell 2015). The facility’s risk management plan update provides details of a highly unlikely worst-case scenario for release of hydrogen fluoride, and alternative scenarios for ammonia (anhydrous) and fluorine (liquid) from onsite bulk storage tanks. In conjunction with the NRC, IEPA, and the local emergency response agencies, MTW developed protective action and supporting notification plans to minimize the potential of any adverse consequences to the workers and members of the public in the unlikely event that such a release occurs (Honeywell 2016a). Honeywell interactions with local emergency responders are further described in Sections 3.10.1.3 and 4.1.10 of this EA.

The NRC is performing a detailed safety review of the MTW. The review includes consideration of potential accident scenarios, potential consequences, and the licensee’s overall record of compliance with NRC regulations, and will be documented in the SER for this license renewal. The impacts of accidents with the potential to release radioactive materials or chemicals and affect public health and the environment would be mitigated by the protective measures identified in the ISA. These accident impacts will be described by the NRC staff in its SER. NRC regulations require that licensees identify and maintain controls to make high-consequence accidents highly unlikely.

4.1.12 Waste Management

As discussed in greater detail in Section 3.12 of this EA, current MTW operations produce low-level radioactive, nonradioactive hazardous, mixed, and nonradioactive solid wastes. The MTW manages these wastes by using a combination of recycling and offsite disposal. Two byproduct streams, synthetic fluor spar (calcium fluoride) and filter fines, are sent offsite for reclamation and reuse and are not considered waste streams (ENERCON 2017, Section 3.12).

Chapter 2 and Section 3.12 of this EA present a detailed description of the sources, types, quantities, and composition of solid, hazardous, and mixed wastes generated during current operations at the MTW. Under the proposed action, the MTW would continue generating the waste streams presented in Section 3.12, albeit in similar quantities; no new waste streams are anticipated. Honeywell would continue to manage the waste as presented in Section 3.12 (ENERCON 2017, Section 4.13). Section 3.12 also discusses the availability of the various recycling and disposal facilities available for treatment and disposal of MTW waste. The NRC staff expects that ample capacity will remain available for the disposal of nonhazardous solid waste, hazardous waste, and construction and demolition wastes under the proposed action. The NRC staff recognizes the uncertainty for the long-term availability of commercial offsite storage of low-level radioactive waste (beyond the year 2023 or so). While this uncertainty exists under the proposed action, the NRC staff assumes that sufficient low-level waste capacity would be made available when needed. Historically, the demand for low-level waste disposal capacity has been met by private industry, and the NRC expects that this trend would continue in the future (NRC 2014c).

Honeywell maintains worker and public radiological safety for waste management operations at the MTW site by implementation of a radiation protection program that complies with the
The NRC staff also considered the waste minimization practices employed at the MTW. The MTW has a waste minimization plan in compliance with its RCRA permit (Honeywell 2018c). The facility recycles potassium hydroxide muds and reclaims both potassium hydroxide and uranium, which are reused in the production of uranium hexafluoride. Additionally, MTW has a procedure that requires that all trash be sorted and segregated based on its radioactivity. The staff concluded that the MTW practices on waste minimization continue to be sufficient.

Based on the evaluation of the types and volumes of wastes the proposed 40-year license renewal would generate and the available waste management options and capacities, the NRC staff concludes the overall impacts on waste management resources at the MTW under the proposed action would not be significant.

**Waste Management Upgrades**

As discussed in Section 2.2 of this EA, Honeywell has made several upgrades and modifications to the process facilities and site infrastructure since 2006, when the NRC published the last license renewal EA. The upgrades related to the waste management system include the following:

- The existing EPF was expanded in 2006 with the construction and completion of the STF. This expansion increased the capacity of the EPF and added a clarifier and sand filter. This upgrade has reduced the incidence of fluoride and pH excursions in wastewater leaving the plant through the permitted outfalls (Honeywell 2018a, Response to RAI PA-2(A)).

- Outdated oil-cooled rectifiers in the fluorine production facility were replaced with new water-cooled units. The water-cooled units were chosen to eliminate the use of oil in the coolers, thus reducing the generation of mixed wastes (Honeywell 2018a, Response to RAI PA-2(B)).

- A new cooling tower was installed to cool the waste heat from the new rectifiers before discharging to the Ohio River. The upgrade enabled the use of less water to cooling the rectifiers (Honeywell 2018a, Response to RAI PA-2(C)).

- A new sewage treatment facility was put into operation in 2015. The new sewage treatment facility improved the ability to treat the sewage generated from the MTW and ensure compliance with the NPDES permit (Honeywell 2018a, Response to RAI PA-2(D)).

The NRC concludes that the upgrades and modifications to the process facilities and infrastructure since the last license renewal in 2006 have provided a positive environmental impact.
4.1.13 Environmental Impact Accumulation from the Proposed Action

The NRC considered whether environmental impacts for some resources have the potential for accumulating over the extended duration of the license renewal period, as described below. (Honeywell 2018a, Response to RAI ALT-1):

- **Geology and Soils**—Impacts to soils from soil disturbance would occur on a per event basis (for example, maintenance activities). The application of best management practices and implementation of the stormwater management controls are expected to control soil erosion. However, the accumulated contaminants in the sediments of the drainage ditch upstream of Outfall 002 demonstrate the potential for accumulation of pollutants within soil and sediment.

- **Ecological Resources**—As noted in the discussion of geology and soils above, pollutants could accumulate in sediments and soils at the MTW, and there is a potential for accumulation of certain pollutants in terrestrial and aquatic wildlife.

- **Socioeconomics**—Positive impacts to the regional community, such as Honeywell’s continued payment of property and State taxes and continued employment of local residents at the facility, are anticipated.

- **Public and Occupational Health**—There is a potential for accumulation of pollutants in offsite vegetation, sediment, and soil. In turn, these affected resources could potentially affect members of the public who come into contact with offsite vegetation, sediments, and soils. However, it is not likely that members of the public would experience cumulative effects from exposure to offsite vegetation, sediments, or soils.

- **Waste Management**—Land disposal of waste would result in the continued accumulation of land acreage used for waste disposal.

Honeywell presented monitoring results for sediment, vegetation, and soil surrounding the MTW site for the years from 2010 through 2014, as well as datasets comparing monitoring results a decade apart (2000 through 2003 and 2010 through 2014) (see Tables 2-7, 2-8, and 2-9). The monitoring results indicate that the surrounding area has not experienced an accumulation of radioactive material and fluoride releases (Honeywell 2018a, Response to RAI ALT-1). Based on these data, the NRC concludes that the potential for accumulation of pollutants in certain resource areas under the proposed 40-year licensing renewal is not significant.

4.2 Reduced Duration Alternative

Under the reduced duration alternative, the NRC would approve a license renewal period of less than 40 years. A shorter license renewal period is considered a reasonable alternative considering the NRC’s past practice of issuing 10-year licensing renewals for this and other similar facilities. The NRC’s safety review of the Honeywell licensing renewal application could lead to a determination that a license renewal period shorter than 40 years is reasonable and appropriate.

This EA does not separately address the operational impacts for the reduced duration alternative because the NRC staff determined that the types of potential environmental impacts associated with site operations during the proposed 40-year license renewal period would be the same or bound those during a shorter license renewal period. The timing of
decommissioning would be different under this alternative, but the types of impacts from decommissioning would be similar.

The NRC staff concludes that the potential environmental impacts from the reduced duration alternative are bounded by those analyzed for the proposed action.

4.3 No-Action Alternative

Under the no-action alternative, the NRC would discontinue activities related to renewing the MTW operating license, SUB-526. If Honeywell’s license to continue operations is not renewed, the facility would move into the decontamination and decommissioning phase sooner. Section 4.4 of this EA addresses decommissioning impacts, which must occur at some point in time regardless of the alternative implemented. If the facility ceased operations, initially, Honeywell would survey 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 subsequent offsite shipment of significant quantities of low-level radioactive waste, and disturbance of contaminated soils.

The short-term and long-term effects of the no-action alternative would include a negative local socioeconomic impact, as decontamination and decommissioning activities require fewer workers than currently employed at the site. In addition, because no local employment opportunities associated with the MTW would exist after decommissioning, the socioeconomic impact to the region could be significant. Under the no-action alternative, operational impacts on transportation would be limited since under the alternative, site operations would cease as the facility shuts down in a manner to protect the environment and public health and safety. As the shutdown progressed, daily commuting trips for operational workers and operational shipping traffic would decrease.

In addition, the cessation of operations would mean there would be no operating facility within the United States to convert uranium ore to uranium hexafluoride, with potential impacts to the commercial nuclear fuel industry very likely.

4.4 Decontamination and Decommissioning Impacts

When the MTW ceases operations, Honeywell is required, in accordance with 10 CFR 70.38(d), to prepare a detailed site decommissioning plan to allow for subsequent license termination. The NRC would conduct a safety and environmental review of the decommissioning plan before approving proposed decommissioning activities. Generally, and as discussed in Section 2.4 of this EA, Honeywell would decontaminate the facilities and continue to provide for protection of the environment and public health and safety. Honeywell would reduce radiological contamination to levels that would allow for release of the facility for unrestricted use under 10 CFR Part 20, Subpart E. Use of a portion of the site would remain restricted because of chemical contamination (see Section 2.3.9.2 of this EA), which would impact potential long-term land use. Following completion of decontamination activities, Honeywell will complete a comprehensive radiological survey and a report documenting cleanup to the target levels. In accordance with 10 CFR 40.42, the NRC staff reviews and verifies that the complete decontamination activities and final survey are properly conducted before terminating a license.

The following points briefly describe the possible impacts to the environmental resource areas described in Chapter 3 from decontaminating and decommissioning the MTW.
- **Land Use**—As previously described in this EA, long-term impacts would occur because of the establishment of one or more ELUCs because potential future uses of the majority of the MTW site are prohibited (see Figure 3-1 in Chapter 3 of this EA).

- **Transportation**—Transportation activities would temporarily increase, primarily because of the removal of equipment, materials, and wastes from the MTW (see Section 2.4 of this EA). After decommissioning, transportation impacts would lessen as transportation activities related to truck and rail shipments and commuting would cease.

- **Geology and Soils**—Short-term soil disturbance would occur across the site; the associated impacts would be moderately significant. Long-term impacts would depend on whether final radiological conditions at the site support unrestricted or restricted release of the site in accordance with 10 CFR 20.1401, “General Provisions and Scope,” or 10 CFR 20.1402, “Radiological Criteria for Unrestricted Use.”

- **Water Resources**—Cessation of operations would mean that generation of process-related effluents would cease, eventually leading to no process-related discharges to NPDES Outfall 002, thus eliminating water discharge impacts to the Ohio River. Best management practices, erosion-control barriers, and discharges under approved permits would limit any near-term impacts to surface waters during decommissioning. Limited, but not significant, groundwater contamination has occurred in the past, and this may be indicative of possible future impacts. Honeywell would address any groundwater impacts through the RCRA process with regulatory oversight by the IEPA, and further oversight by the NRC if radionuclides are involved.

- **Ecology**—Activities could cause impacts from increased sedimentation and intermittent noise. Sedimentation impacts can be controlled through best management practices, while wildlife would avoid the area because of noise. In the long-term, Honeywell would return the restricted area to its undisturbed state, and general noise levels from industrial activities and traffic would decline in the area, depending on future land-use decisions.

- **Air quality**—Decommissioning activities might impact air quality through dust and particulate emissions caused by facility demolition and emissions from construction equipment. Honeywell would complete a detailed assessment during decommissioning planning (Honeywell 2018a, Response to RAI AIR-1).

- **Noise**—Facility demolition and the use of heavy equipment would result in short-term noise impacts. These impacts would be expected to occur during normal daylight working hours and be intermittent. Depending on future land-use decisions, long-term noise impacts would decline from the cessation of truck and rail shipments, reduction in general traffic noise, and elimination of industrial activities.

- **Historic and Cultural Resources**—Decontamination and decommissioning activities would primarily be conducted in the restricted area. Therefore, the potential for impacts to undiscovered historic properties and cultural resources on the site would be small. Potential impacts to historic properties or cultural resources could occur if the site is transferred to new ownership and undisturbed land is developed.

- **Scenic and Visual Resources**—While decontamination and decommissioning activities would cause some increased activity at the MTW, visual impacts would be limited to the site property and the area immediately surrounding the site. Over the long term,
Honeywell would return the majority of the site to unrestricted use and would not further disturb the property. If industrial development of the MTW site occurred, then scenic and visual impacts would most likely be similar to those of current operations.

- **Socioeconomics**—There would be a small, short-term, positive economic impact associated with employment of workers, local purchases of goods and services, and the continued payment of property taxes. Over the long term, there would be a small negative impact as activities cease and employment associated with the MTW ends.

- **Public and Occupational Health**—Public and occupational health impacts would be associated with the potential for chemical or radiological releases during demolition activities. Honeywell would implement the actions to be taken to protect the public and workers as described in its NRC-approved decommissioning plan. Long-term impacts to public health are expected to be limited because the NRC-approved site decommissioning standards for radiological protection would be protective of public health and safety, regardless of the future use of the site after decommissioning. In addition, Honeywell would continue to comply with RCRA requirements.

- **Waste Management**—ENERCON estimates that about 11,800 cubic meters (416,000 cubic feet) of low-level radioactive waste from the MTW will need to be disposed of (ENERCON 2016). Disposal activities would generate other chemical and industrial wastes. All wastes would be disposed of at licensed disposal facilities, with some materials possibly being repurposed or recycled, as appropriate.

In conclusion, there could be some short-term impacts during decontamination and decommissioning, but these impacts are expected to be localized. Over the long term, the impacts associated with removing the MTW from the site would be dependent on future land-use decisions. Because of the ELUC, however, there will be restrictions on land use. The NRC has determined that overall impacts associated with decontamination and decommissioning will not be significant. The inability to predict precisely when decontamination and decommissioning will occur does not change the NRC’s determination because past and potential future impacts from operations have been taken into account.
5 CUMULATIVE IMPACTS

Cumulative impacts are defined as “the impact on the environment that results from the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions” (40 CFR 1508.7, “Cumulative Impact”). The preceding sections discuss the potential impacts from the proposed action.

The cumulative impacts analysis does not separately address cumulative impacts specific to the reduced duration alternative or no-action alternative because the NRC staff determined that the types of potential cumulative impacts related to these alternatives would be the same as or less than those associated with the proposed action. The NRC staff considered an area of review for cumulative impacts within an 8-kilometer (5-mile) radius of the MTW site and the nearby Ohio River management projects because of the proximity of the river to the MTW site.

5.1 Past Actions

Past activities include the operation of the MTW since 1958 and the operation of the uranium enrichment facility at the DOE’s PGDP across the Ohio River from the MTW site. In addition to assessing potential impacts from the proposed action, Chapter 4 of this EA analyzes environmental impacts from past activities at the MTW. Since the NRC published the 2006 EA (NRC 2006a) and accompanying SER (NRC 2006a), Honeywell has made some upgrades to its operations (see Section 2.2 of this EA). Because these upgrades either resulted in no changes to potential environmental impacts or actually reduced the potential impacts (e.g., wastewater treatment system improvements; structural improvements to account for seismic and tornado risks), the NRC has determined that these changes would not result in an increase in cumulative impacts associated with MTW.

The PGDP enriched uranium from 1952 to 2013 (DOE 2015) and is undergoing remediation that is scheduled to continue through the year 2040 (NCSL 2016). The PGDP has contaminated buildings, while chemicals such as trichloroethylene, polychlorinated biphenyl, technetium-99, and uranium have contaminated onsite and offsite groundwater, surface water, and soils. DOE is performing environmental cleanup activities to address the legacy impacts from PGDP operations. Because environmental impacts from past PGDP operations are being addressed, any cumulative impacts to potentially overlapping resource areas, such as groundwater, would be expected to lessen over time. Subsurface impacts from MTW operations are limited to onsite areas, with no offsite excursions. For these reasons, the NRC concludes that the potential for incremental impacts on the environment from continued MTW operation will not contribute significantly to cumulative impacts.

5.2 Present Actions

Present and continuing activities include two nearby coal-burning power plants (TVA’s Shawnee Fossil Plant and EEI’s Joppa Power Station), the Depleted Uranium Hexafluoride Conversion Facility located at the PGDP, and residential and agricultural uses (USDA 2012). The most significant environmental impacts from the two power plants is the emission of air pollutants. Each power plant annually emits several million tons of carbon dioxide and thousands of tons of sulfur dioxide (CEC 2018). In comparison, the MTW emits more than 100 times less than these amounts (see Table 2-3). Groundwater contamination exists at both power plants (TVA 2018; Sierra Club 2018). Because air emissions from the MTW are small in comparison to the two...
power plants, and because the groundwater contamination at the MTW is localized to within the site’s restricted area, the NRC concludes the small incremental impacts would not contribute significantly to cumulative effects.

The PGDP’s Depleted Uranium Hexafluoride Conversion Facility converts depleted uranium hexafluoride to a more stable form of uranium oxide powder. DOE determined in 2004 that the construction and operation of this facility would result in no significant cumulative impacts at the Paducah site and its vicinity (69 FR 44654; July 27, 2004) (DOE 2004b).

Continued residential and agricultural land use near the MTW site could result in soil, nutrients, and other pollutants continuing to enter the Ohio River as stormwater runoff. These land use changes would contribute to fragmentation of wildlife habitat and could introduce invasive species. Species with threatened, endangered, or declining populations are likely to be sensitive to declines in habitat availability and quality and the introduction of invasive species. The NRC does not expect significant changes in land uses in the area and for this reason concludes that impacts to the land are likely to remain similar to present-day conditions. Therefore, the small incremental impacts from the proposed action would not contribute significantly to cumulative impacts.

5.3 Reasonably Foreseeable Future Actions

As presented in Section 2.3.10 of this EA, Honeywell submitted a final closure plan for four calcium fluoride settling ponds to IEPA in March 2018 (Honeywell 2018d). The EPA and IEPA require that Honeywell remove wastes from Ponds B, C, D, and E by the end of 2020 (Honeywell 2018d). In the long term, removal of these calcium fluoride ponds would eliminate a potential source of fluoride and uranium contamination, with the potential to reduce impacts to the Ohio River. The removal of trees and the construction of a rail spur to facilitate waste removal have the potential to contribute to the cumulative impacts on historic properties if unidentified historic properties are present on the rail spur site.

Regarding future activities, Massac County, IL, has not reported plans for significant economic development; however, the Illinois Department of Commerce recently designated the county as an enterprise zone (Hathcock 2017). The city of Metropolis is developing an industrial park and currently has one tenant (Metropolis 2018).

Investors are being sought to team with Cameco to build a global laser enrichment facility at PGDP (WNA 2016). Progress on developing and constructing the facility is on hold because of market conditions; PGDP has not yet submitted a license application to the NRC (NRC 2017e).

McCracken County, KY, has industrial development properties and is part of the Western Kentucky Economic Development Partnership. Two of these properties are in close proximity to the MTW: the future Ohio River Triple Rail Megasite and the future West Kentucky Chemical Site (KCED 2016a). The Ohio River Triple Rail Megasite is a planned transportation infrastructure site on the Kentucky side of the Ohio River between the Shawnee Fossil Plant and PGDP. The site has 271 hectares (670 acres) of land available for development (KCED 2016a). No companies have submitted proposals to build facilities on this site (DOE 2015). The West Kentucky Chemical Site has 81 hectares (201 acres) of land available for development (KCED 2016a). The latest edition of the Kentucky New and Expanding Industries Report does not identify any chemical company locations or expansions in McCracken County (KCED 2016b).
The economic development proposed for Kentucky and Illinois would increase industrial activities in the area near the MTW. However, the extent and types of planned or potential industrial development over the next 40 years is extremely difficult to accurately predict. New industrial activities could result in additional air and water emissions, as well as soil, surface-water, and groundwater contamination, all of which could impact ecological resources and human health. In addition, future activities could bring beneficial socioeconomics impacts because of increased tax revenues and employment opportunities for the region. Negative impacts are expected to be minimal because the laws and regulations for protection of the environment and human health are mandatory and are subject to Federal and State oversight. General land-use patterns are not expected to change because economic development would most likely continue in areas already designated as industrial. For these same reasons, potential impacts to scenic and cultural resources would be minimal. Increased industrial development could lead to increased residential and commercial development. However, estimates of the impacts of future industrial projects remain speculative. The NRC concludes that the incremental impacts associated with the proposed action on all resource areas would not be significant. Therefore, the proposed action’s contribution to cumulative impacts also would not be significant.

The Olmsted Lock and Dam Works is a multibillion dollar USACE construction project to upgrade two existing lock and dam structures along the Ohio River near the MTW site (USACE 2015). Lock and Dam No. 52 is located approximately 11 kilometers (7 miles) upstream from the MTW near Brookport, IL, and Lock and Dam No. 53 is located approximately 32 kilometers (18 miles) downstream from the MTW. The Olmsted replacement dam (construction in progress) is located approximately 1.6 kilometer (1 mile) downstream from Lock and Dam No. 53. This structure and those it replaces are purely designed for navigation purposes, and accordingly they have no flood control or water storage purpose. Given the small elevation changes that these dams impart to the natural level of the river, the staff does not anticipate the dams would contribute to cumulative surface water impacts when elevation changes are considered together with the potential surface water impacts of the proposed action.

5.4 Conclusion

The NRC staff has assessed the potential incremental impacts of the proposed action in consideration with the past, present, and reasonably foreseeable future actions discussed above and has determined that the incremental impacts from the proposed action would not contribute significantly to cumulative impacts.
6 AGENCIES AND PERSONS CONSULTED

The NRC staff consulted with the Illinois State Historic Preservation Officer and potentially affected American Indian Tribes to comply with the requirements of Section 106 of the NHPA. As part of the ESA Section 7 consultation process, the NRC staff contacted the USFWS to discuss the federally listed species that may occur near the MTW. The NRC staff also consulted with State of Illinois (IEPA staff) and with local officials. Table 6-1 provides a list of the documentation associated with these various contacts. The sections below summarize the consultation efforts with state agencies and Tribes under Section 106 of the NHPA.

6.1 State Historic Preservation Offices

The NRC notified the Illinois SHPO of the proposed Honeywell license renewal in a letter dated July 11, 2018 (ADAMS Accession No. ML18187A232), indicating the NRC’s preliminary determination that the proposed license renewal would not affect cultural and historic resources. The Illinois SHPO has not expressed any concerns regarding the NRC’s preliminary determination.

In addition, because the Honeywell MTW site is located along the Ohio River, which serves as the Illinois-Kentucky border, the NRC staff notified the Kentucky Heritage Council (KHC) of the proposed license renewal. The NRC staff discussed via telephone conversation the proposed license renewal with KHC staff on September 7, 2018. The KHC staff advised the NRC staff to document the staff’s determination that the proposed action would not affect historic properties located in Kentucky and to submit the finding to the KHC.

6.2 American Indian Tribes

The NRC staff initiated consultation with seven federally recognized American Indian Tribes by telephone in May and June of 2018, as indicated in Table 6-1. By letters dated July 3, 2018, the staff invited these seven Tribes to consult on the project. The staff sent project update letters to the seven tribes on August 23, 2018. Subsequently, the NRC initiated consultation by telephone in August and September and by letter dated September 7, 2018, with four additional Tribes, as shown in Table 6-1. The staff sent verifying e-mails to all of the Tribes as follow-up to the formal letters. As of the publication of this draft EA, the NRC received responses to its letters or e-mails from four Tribes indicating their desire to consult with the NRC on the proposed action. The four tribes are the Osage Nation, Kaw Nation, Miami Tribe of Oklahoma, and Ponca Tribe of Oklahoma. The NRC had received responses from two Tribes—the Chickasaw Nation and the Shawnee Tribe of Oklahoma—indicating that consultation is not necessary. The Tribes providing responses are listed in Table 6-1. Consultation with American Indian Tribes is ongoing, and the NRC will provide further information regarding consultation in the final EA.
Table 6-1 Documentation—Agencies and Persons Consulted

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<td>April 23, 2018 and May 14, 2018</td>
<td>ML18177A062</td>
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<td>Illinois Environmental Protection Agency</td>
<td>June 26, 2018</td>
<td>ML18185A168</td>
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<td>Mayor of the city of Metropolis and Chair of the Massac County Commission</td>
<td>May 31, 2017</td>
<td>ML17194B085</td>
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<td>Kentucky Heritage Council</td>
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**Telephone Calls to 7 Initially Identified Tribes**

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All call logs in package ML18218A521

**Invitation letters to 7 Initially Identified Tribes**

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All letters in package ML18134A139

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All letters in package ML18227A094

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**Invitation Letters to 4 Additional Tribes**

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All letters in package ML18240A038

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All responses in package ML18221A120
7 CONCLUSION

In this EA, the NRC staff evaluated the potential environmental impacts of the proposed action and the alternatives to the proposed action in accordance with the requirements presented in 10 CFR Part 51. Based on the information provided in this draft EA, the NRC staff preliminarily concludes that the proposed action—the renewal of Honeywell’s license for operations at the MTW for a period of 40 years—would not significantly affect the quality of the human environment.

Specifically, the proposed action would not have significant impacts on land use, transportation, geology and soils, surface water and groundwater resources, air quality, historic and cultural resources, scenic and visual resources, and waste management resources. Existing groundwater contamination is limited to the MTW site and is being managed under the conditions of Honeywell’s RCRA permit. The NRC staff preliminarily concludes that the proposed action would have a beneficial impact on the socioeconomic aspects of the area. Further, the staff preliminarily concludes that there would be no disproportionately high and adverse impacts on minority or low-income populations. The staff also preliminarily concludes that the proposed action is not likely to adversely affect federally listed species or federally designated critical habitat, because no expansion or significant changes to the facility are planned, and facility wastewater discharges would improve. Airborne effluents released through stacks and liquid effluents released in the Ohio River are below regulatory limits for nonradiological and radiological. The radiological dose associated with the exposure to these effluents for the maximally exposed individual is less than the NRC’s 1.0 mSv (100 mrem) annual limit, as specified in 10 CFR 20.1301. Occupational doses are also well below regulatory limits. The NRC expects that Honeywell would continue to meet applicable local, State, and Federal requirements, including the requirements specified in its air and wastewater discharge permits.

The NRC staff preliminarily concludes that the continuation of operations at the MTW under the proposed action would not contribute significantly to cumulative impacts, when added to the impacts of past, present, and reasonably foreseeable future actions. Honeywell’s environmental monitoring programs are expected to provide information about existing contamination on the MTW site and in the surrounding area. Continued monitoring, which is required, will help identify future unintended releases into the environment. Honeywell would be required to implement corrective actions to address the impacts of such releases should they occur. The NRC expects that Honeywell will continue to meet all local, State, and Federal requirements.

The NRC staff evaluated the potential environmental impacts of the alternatives to the proposed action and preliminarily concludes that potential impacts will be bound by the environmental impacts under the reduced duration alternative (see Section 4.2 of this EA). In addition, the staff preliminarily concludes that no significant environmental impacts are anticipated under the no-action alternative (see Section 4.3 of this EA). Under the no-action alternative, the cessation of operations at the MTW would result in the closure of the only facility within the United States that converts uranium ore to uranium hexafluoride. The closure of the MTW would have the potential to significantly impact the commercial nuclear fuel industry in the United States.

Based on the analyses in this EA, in accordance with 10 CFR 51.31, “Determinations Based on Environmental Assessment,” the NRC preliminarily concludes that preparation of an environmental impact statement is not required for the proposed action, and in accordance with 10 CFR 51.32, “Finding of No Significant Impact,” a finding of no significant impact is appropriate.
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9 REFERENCES²


² References that include an ADAMS Accession Number are also available electronically through the NRC’s ADAMS Web site at http://www.nrc.gov/reading-rm/adams.html. The documents can be viewed online or printed for a fee in the NRC’s Public Document Room (PDR) at 11555 Rockville Pike, Rockville, MD. For problems with ADAMS, contact the PDR staff at 301-415-4737 or (800) 397-4209; fax (301) 415-3548; or e-mail pdr.resource@nrc.gov.
Draft EA for the Proposed License Renewal of the Metropolis Works Uranium Conversion Facility


Draft EA for the Proposed License Renewal of the Metropolis Works Uranium Conversion Facility


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