Tennessee Ecological Services Field Office

FWS Log No: 2023-0026864

The Service concurs with your effect determination(s) for resources protected by the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.). This finding fulfills the requirements of the Act. If project design changes are made or new information becomes available, please submit new plans for review.

DANIEL ELBERT

Digitally signed by DANIEL ELBERT
Date: 2023.01.27 09:11:03 -06'00'

Field Supervisor

Date

U.S.NRC

United States Nuclear Regulatory Commission

Protecting People and the Environment

NUREG-2263

Environmental Impact Statement for the Construction Permit for the Kairos Hermes Test Reactor

Draft Report for Comment

Office of Nuclear Material Safety and Safeguards

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United States Nuclear Regulatory Commission

Protecting People and the Environment

NUREG-2263

Environmental Impact Statement for the Construction Permit for the Kairos Hermes Test Reactor

Draft Report for Comment

Manuscript Completed: September 2022
Date Published: September 2022

Office of Nuclear Material Safety and Safeguards

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Addresses: You may submit comments by any one of the following methods. Please include Docket ID NRC-2021-0193 in the subject line of your comments. Comments submitted in writing or in electronic form will be posted on the NRC website and on the Federal rulemaking website http://www.regulations.gov.

NRC project e-mail address: Electronic comments may be sent by email to the NRC at KairosHermes-CPEIS@nrc.gov.

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COVER PAGE

Responsible Agency: U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards

Title: *Environmental Impact Statement for the Construction Permit for the Kairos Hermes Test Reactor, Draft Report for Comment*

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ABSTRACT

The U.S Nuclear Regulatory Commission (NRC) has prepared this draft environmental impact statement (EIS) in response to an application submitted by Kairos Power, LLC (Kairos) for a construction permit (CP) for a non-power test reactor termed Hermes at a site in Oak Ridge, Tennessee. Kairos plans to build and operate Hermes to demonstrate key elements of the Kairos Power Fluoride Salt-Cooled, High Temperature Reactor technology for possible future commercial deployment. This draft EIS includes the analysis that evaluates the environmental impacts of the proposed action and considers the following two alternatives to the proposed action: (1) the no-action alternative (i.e., the CP is denied) and (2) building the proposed Hermes non-power test reactor at a site near Idaho Falls, Idaho.

After weighing the environmental, economic, technical, and other benefits against environmental and other costs, and considering reasonable alternatives, the NRC staff recommends, unless safety issues mandate otherwise, that the NRC issue the CP to Kairos. The NRC staff based its recommendation on the following factors:

- the NRC staff's review of Kairos' environmental report (included as part of the CP application) and associated responses from Kairos to requests from the NRC staff for clarifying information;
- the NRC staff's review of comments received as part of the scoping process;
- the NRC staff's communications with, and scoping comments received from, Federal, State, and local agencies, as well as Tribal officials; and
- the NRC staff's independent environmental review.

The NRC's staff's recommendation in this draft EIS is tentative. Before identifying a final recommendation in the final EIS, the NRC staff will also consider comments received on the draft EIS from Federal, State, local, and Tribal officials, and members of the public.

undergoing construction approximately 2 mi west of the site; and other land use features of a suburban or semi-rural landscape. Construction, operation, and decommissioning actions for the proposed Hermes facilities or the planned Atlas facility adjacent to the Hermes site would not directly use groundwater or surface water. The Atlas facility is anticipated to use the same BMPs in compliance with Federal, State and local environmental laws, rules, regulations and statutes in coordination with the DOE. Therefore, the staff finds that the proposed action would implement appropriate stormwater management, spill prevention and response plans, an environmental monitoring program, and comply with stormwater permit requirements including the SWPP. Further, because the proposed action would be built and operated within an existing industrial park, the NRC staff finds it would not contribute to the adverse cumulative impacts on groundwater or surface water resources in Poplar Creek or in the Clinch River arm of the Watts Bar Reservoir.

3.3.2.6 Conclusions

The NRC staff concludes that the potential direct, indirect, and cumulative water resource impacts of the proposed action would be SMALL. This conclusion is based primarily on the fact that the water demands of the Hermes facilities would be met through municipal or commercial suppliers, there would be no direct groundwater or surface or water use, and that disturbances to groundwater from potential dewatering would be temporary and localized to the hydrologically isolated onsite shallow aquifer in accordance with BMPs and the required permits. The NRC staff recognizes that there could be minor impacts on the municipal water supply due to the relatively small increased daily demand of the facility (0.07 mgd); however, the planned increases in the City of Oak Ridge's municipal water supply and existing wastewater treatment capacity would be adequate to service the facility and the future water treatment plant would create additional reserve capacity. Given the municipal water supply source and the low water demands of the Hermes project, the proposed facilities would result in minimal effects on aquifers and surface water bodies.

3.4 Ecological Resources

3.4.1 Affected Environment

The site is situated in the Southern Limestone/Dolomite Valley and Low Rolling Hills ecoregion, which is characterized by limestone and cherty dolomite with rolling ridges and valleys with soils of varying productivity (Kairos 2021-TN7880 │ Sec 3.5.1). Section 3.5.7.1 of the ER describes terrestrial habitats on the site (Kairos 2021-TN7880). The 185 ac site consists of 88 ac of developed land, 72 ac of herbaceous grassland, 19 ac of deciduous forest, and 6 ac of mixed evergreen/deciduous forest. As seen in Figure 3.1-1 of the ER (Kairos 2021-TN7880), the developed land and herbaceous grassland correspond mostly to lands previously occupied by former DOE Buildings K-31 and K-33, while the forested land occurs only in perimeter areas on riparian lands separating the previously developed lands from Poplar Creek. The ER notes that the only wetland on the site occurs in the forested perimeter lands adjoining Poplar Creek, and that none occurs in the previously disturbed lands that formerly accommodated DOE Buildings K-31 and K-33 (Kairos 2021-TN7880 │ Sec 3.5.6 and Figure 3.5-2). The NRC staff accessed the online National Wetlands Inventory mapper maintained by the U.S. Fish and Wildlife Service (FWS) on March 9, 2022; and the mapper showed only one wetland on or adjacent to the site, the channel of Poplar Creek, but it did not show the wetlands mentioned in the ER (FWS 2022-TN5327). There are no aquatic habitats on the site, although the site adjoins Poplar Creek, a tributary to the Clinch River arm of Watts Bar Reservoir (Kairos 2021-TN7880 │ Sec 3.5.5).

A 17 ac holding pond (K-901-A Holding Pond) is approximately 700 ft west-southwest of the site (Kairos 2021-TN7880 │ Sec 3.5.5.3).

Given its industrial history, the site can be expected to provide poor quality ecological habitat (Kairos 2021-TN7880 │ Sec 3.5.2). The developed and grassland areas on the site consist of grasses and forbs typical of previously disturbed soils, as characterized in Section 3.5.7.1 of the ER (Kairos 2021-TN7880). Terrestrial wildlife expected to occur on the site—including mammals, birds, reptiles, and amphibians—is described in Section 3.5.7.2 of the ER (Kairos 2021-TN7880). Species of wildlife expected in the previously developed lands formerly occupied by DOE Buildings K-31 and K-33 are the regionally abundant species typical of open field habitats. The applicant characterizes the aquatic biota of the Clinch River arm of the Watts Bar Reservoir; including fish, benthic macroinvertebrates, and plankton; in Section 3.5.5.1 of the ER. Because the reach of Poplar Creek adjoining the site is influenced by water levels in the reservoir, the applicant posits in Section 3.5.5.2 of the ER that the aquatic habitat in that part of the creek can be expected to be similar. Due to the history of disturbance on the site and surrounding areas, and in the adjoining reach of Poplar Creek, the terrestrial and aquatic biota in the area has been substantially influenced by invasive species (Kairos 2021-TN7880 │ Sec 3.5.8). The applicant also describes aquatic biota in the K-901 Holding Pond in Section 3.5.5.3 of the ER, but the Hermes project is unlikely to affect this pond, which is located approximately 700 ft away from the site. The applicant summarizes the history of ecological monitoring by DOE under the ORR Biological Monitoring and Abatement Program in Section 3.5.10 of the ER.

Section 3.5.11 of the ER identifies and characterizes species protected under Federal and State regulations based on a review of databases maintained by the FWS and TDEC (Kairos 2021-TN7880). Species addressed include those listed as threatened or endangered under the Federal Endangered Species Act (ESA) (TN1010) (or designated with another special Federal status), species designated with a State protected status, migratory birds protected under the Migratory Bird Treaty Act, and eagles protected under the Bald and Golden Eagle Protection Act. Each species with a Federal or State protected status is listed in Table 3.5-2 of the ER (Kairos 2021-TN7880). The applicant accessed the FWS Information for Planning and Consultation (IPaC) database on May 24, 2021, to identify Federally listed species and habitats for purposes of preparing the ER. The NRC staff accessed the database independently on February 24, 2022, and received similar results. Both the applicant and NRC staff used the 185 ac site as the action area for the IPaC search because the site is a large lot within an established industrial park (the Heritage Center within the East Tennessee Technology Park). The action area therefore encompasses the lands previously distributed by former DOE operations, but for conservatism also includes the slivers of riparian forested land on the site bordering Poplar Creek that might be affected by project-related noise. Neither the applicant nor the NRC staff extended the action area beyond the site boundary because it would then encompass areas distinctly different from those actually affected by the Hermes project.

The IPaC searches indicate that four Federally listed endangered species, four Federally listed threatened species, and one Federal candidate species could potentially occur at the site. The endangered species include two mammal species, the gray bat (*Myotis grisescens*) and Indiana bat (*M. soldalis*); and two freshwater clam species, the finerayed pigtoe (*Fusconaia cuneolus*) and shiny pigtoe (*F. cor*). The threatened species include one bat species, the northern long-eared bat (*M. septentrionalis*); one fish species, the spotfin chub (*Erimonax monachus*); and two plant species, the Virginia spiraea (*Spiraea virginiana*) and white fringeless orchid (*Platanthera integrilabia*).

A biological assessment (BA) recently completed for the nearby CRN site (NRC 2019-TN6136 │ Appendix M), approximately 2 mi south of the Hermes site, addresses the gray bat, Indiana bat, and northern long-eared bat. For each of the three bat species, the BA characterizes the range, status and threats, life history, and baseline data from past field surveys in the region. According to the BA, gray bats hibernate in deep caves during the winter but disperse within the protection of forest canopy to a broader variety of caves during the rest of the year to form maternity colonies. Indiana and northern long-eared bats also hibernate in caves (the latter also in mines or human-made structures) and disperse to forested areas to form maternity roosts in trees. The BA reports the results of past field studies, including mist netting studies and acoustic studies, for the three bat species in the Oak Ridge area. Based on information in the BA, the NRC staff expects that each of the three bat species may potentially forage, and thus could be transiently present anywhere in the Oak Ridge area. However, the absence of trees or vegetation other than ruderal vegetation in the area where the Hermes facilities would be sited suggests that even transient presence in the affected area is unlikely. The 135 ac of land potentially subject to temporary or permanent disturbance for building, operating, and decommissioning the Hermes facilities contains trees and thus lacks any potential roost or maternity trees.

The NRC staff recognizes that the subject bat and plant species would be unlikely to occur anywhere in the action area other than in the forest and other riparian vegetation separating the project lands from Poplar Creek, and that the only part of the action area where the clam and fish species could occur is the channel of Poplar Creek. The searches did not indicate the presence of critical habitat identified under the ESA.

The NRC staff initiated its own informal consultation under ESA Section 7 through written correspondence with the FWS dated March 10, 2022 (NRC 2022-TN7918). The staff received an E-mail from FWS dated April 15, 2022 (FWS 2022-TN7956) requesting that NRC include in this draft EIS a biological evaluation addressing the potential impacts from the Hermes project to potentially affected resources covered by the Endangered Species Act. Table 3-4, together with information included in the subsections below, constitute the NRC staff's biological evaluation. The staff is presently working with FWS to close the consultation process.

3.4.2 Environmental Consequences of Construction

Building the proposed facilities would involve temporary disturbance of approximately 138 ac on the site, of which 58 ac consist of herbaceous grassland and the remainder consists of existing developed land (Kairos 2021-TN7880 │ Table 4.5-1). As depicted in Figure 2.2-1 of the ER (Kairos 2021-TN7880), no naturally vegetated land would be disturbed, including the deciduous and mixed evergreen/deciduous forest on the site. Approximately 30 ac of the temporarily disturbed herbaceous grassland would be permanently converted to industrial land cover. Because all of the disturbed vegetation occupies previously disturbed soils, the disturbances would not further promote establishment of invasive species. The applicant plans to restore herbaceous grassland to the remaining temporarily disturbed land (Kairos 2021-TN7880 │ Sec 4.5.1.3). No wetlands or aquatic habitats would be disturbed (Kairos 2021-TN7880 │ Sec 4.5.1.2). The applicant proposes to manage stormwater on the site using BMPs as required by the TDEC (Kairos 2021-TN7880 │ Sec 4.5.1.2). Common BMPs for managing stormwater runoff into aquatic habitats near construction sites include the use of silt fences, vegetative stabilization of exposed soils, and stormwater ponds. Because of the historical disturbance of the affected land and the lack of disturbance to forest and other natural vegetation, wetlands, or aquatic habitat, the NRC staff expects that effects on terrestrial wildlife habitats would be minimal.

Mobile terrestrial wildlife can be expected to avoid areas where construction equipment is in use (Kairos 2021-TN7880 │ Sec 4.5.1.3). Less mobile wildlife could be injured or killed by equipment, but because of the low-quality of the affected habitat, any losses are unlikely to be ecologically substantial. Birds might be injured or killed by collision with tall structures or equipment such as construction cranes (Kairos 2021-TN7880 │ Sec 4.5.1.3), but a recent literature review by the NRC staff indicates that bird collisions with structures at nuclear power sites are generally not substantive (NRC 2013-TN2654 │ Sec 4.6.1.1). That review focused on structures such as natural draft cooling towers, communications towers, or electric transmission lines that are taller or pose a greater risk to birds than the structures proposed for the Hermes project. The proposed Hermes project would not include any cooling towers or transmission lines. The NRC staff also recognizes that vehicles using roads to access and traverse the site could injure or kill wildlife; but considering the low number of projected site workers and the already disturbed character of the habitats on the site and nearby portions of the East Tennessee Technology Park, vehicular collisions with wildlife would likely be too infrequent to noticeably affect regional populations. Overall, the NRC staff recognizes that the ecological quality of habitat affected by the Hermes project is low and that the potential effects on wildlife are likewise low.

The applicant indicated that excavation to build the Hermes reactor would necessitate temporary dewatering of the excavation pit (Kairos 2021-TN7880 │ Sec 4.4.1.1.1). The applicant confirmed that the dewatering would involve no more than 2.2 million gal over a period of approximately 30 days (Kairos 2022-TN7902). The applicant confirmed that the dewatered groundwater would be transported offsite for disposal or would be treated onsite and returned to the groundwater in accordance with applicable EPA, DOE, and State of Tennessee requirements (TN7902). The dewatering could temporarily reduce water levels in wetlands in nearby forested riparian lands bordering Poplar Creek, but any effects would be temporary. These brief and temporary effects on water levels in the wetlands would be less severe than expected from short droughts that commonly occur as part of the natural hydroperiod of the wetlands. Because of the brevity of the effects, the functional characteristics and habitat quality of the affected wetlands are unlikely to be changed.

The applicant acknowledges that building the Hermes facilities would result in a localized, minor, and temporary increase in noise that may be noticeable to wildlife on or close to the site (Kairos 2021-TN7880 │ Sec 4.5.2.3). The applicant describes most noise as being within 3 dbA of ambient noise 1 mi from the site (Kairos 2021-TN7880 │ Table 4.2-3), but recognizes that temporary periods of greater noise would occur even at that distance when some construction equipment such as pile drivers are in use, or when multiple pieces of construction equipment are in use simultaneously (Kairos 2021-TN7880 │ Sec 4.2.2). The NRC staff recognizes that wildlife using the fragments of forested habitat remaining within the East Tennessee Technology Park might experience occasional periods of elevated noise that could cause startle responses or cause wildlife to avoid some areas for brief periods of time. But the staff also recognizes that the habitat quality within the East Tennessee Technology Park, including within the remaining fragments of forested habitat within the East Tennessee Technology Park, is not of high-quality and that large areas of superior habitat are available outside of the East Tennessee Technology Park for displaced wildlife. Furthermore, the affected wildlife is likely already acclimated to noise from other ongoing industrial and urban activity within the East Tennessee Technology Park.

Although Federally and State-listed protected species are present in forested and other naturally vegetated lands and in water bodies near the site (Kairos 2021-TN7880 │ Sec 4.5.2.1), no habitat potentially suitable for those species would be disturbed. All of the protected species

noted as occurring in Roane County in Table 3.5-2 of the ER (Kairos 2021-TN7880) require aquatic, wetland, or other naturally vegetated habitats that would not be disturbed by building the proposed new facilities. The applicant states that no Federally protected plant species has been observed on the site and that only one Federally listed species has a greater than low potential to occur on the site, the endangered Indiana bat; but the applicant explains that there are no trees of species favorable to the Indiana bat in the adjoining riparian lands along Poplar Creek (Kairos 2021-TN7880 │ Sec 4.5.1.5).

Based on its review of the project, the NRC staff expects that building the proposed facilities may affect, but is not likely to adversely affect, certain species listed as threatened or endangered under the ESA (Table 3-4). Preparing the site and building the Hermes facilities would not disturb any trees, forest cover, or natural vegetation and therefore would have little potential to adversely affect the three Federally-listed bats or two listed plants identified in the IPaC searches. The three bat species all hibernate in caves and when dispersing from the caves move, roost, breed, and forage in forested and semi-forested areas, not in large, developed areas without trees (NRC 2019-TN6136 │ Appendix M) such as the area where the Hermes facilities would be built and operated (see Table 3-4 for more information). Noise from building the Hermes facilities could be audible to bats transiently present while foraging in forested areas along Poplar Creek, but those thin fragments of habitat are unlikely to attract bats for extended time periods. The project would also have little potential to adversely affect the monarch butterfly, an insect species identified in the IPaC searches as a Federally listed candidate species that could potentially be transiently present in the area. Because the project would not withdraw or discharge cooling water or industrial process water (see Section 3.3 of this draft EIS) or disturb surface water or shoreline habitats, it would have no potential to adversely affect the two listed clam species or the listed fish species. As indicated above, the NRC staff initiated informal consultation under Section 7 of the ESA through written correspondence with the FWS dated March 10, 2022 (NRC 2022-TN7918). The NRC staff is working with FWS as appropriate to close the consultation process.

3.4.3 Environmental Consequences of Operation

Impacts on ecological resources from the proposed 4 years of operation of the completed facilities would be less than those described above for the construction period. Only about 30 ac of former terrestrial habitat, all presently supporting herbaceous grassland within the former footprint of DOE Building K-33, would remain occupied by the Hermes facilities during the operational period. No additional land, and hence no additional habitat, would be physically disturbed by operation. Noise generation would affect wildlife in the same way as described above for construction but would not include brief periods of higher noise generation using exceptionally noisy equipment such as pile drivers. The potential for bird collisions with structures would be as described above for construction. The applicant would use occasional applications of herbicides in developed areas on the site for lawn maintenance and to control weeds (Kairos 2021-TN7880 │ Sec 4.5.2.3). Use of properly labeled herbicides in developed areas in accordance with instructions on the label is unlikely to adversely affect nearby habitats. The applicant does not propose any mitigation measures (Kairos 2021-TN7880 │ Sec 4.5.2.5), and the NRC staff expects the effects from operation to be minimal, so no mitigation would be necessary to minimize adverse ecological impacts. Because operations would not disturb natural terrestrial or aquatic habitats and would have little potential to affect wildlife through noise or collisions, they would have little potential to adversely affect threatened or endangered species.

3.4.4 Environmental Consequences of Decommissioning

The applicant reports that ecological impacts from decommissioning would be similar to those from construction (Kairos 2021-TN7880 │ Sec 4.5.3). The NRC staff expects that land disturbance during decommissioning would take place mostly within already developed areas within the 30 ac area permanently occupied by the proposed new facilities but may require exterior storage of debris or equipment in adjoining exterior areas of previously disturbed soils on the 185 ac site. The NRC staff also expects that noise generated during decommissioning may involve intermittent generation of higher noise levels than during operation as buildings and structures are demolished, with effects on wildlife as described above for construction. Additionally, the NRC staff expects that decommissioning impacts on ecological resources on the site would be bounded by the analyses in the decommissioning generic EIS (NRC 2002-TN7254 │ Supplement 1). Although the generic conclusion does not extend to offsite ecological impacts from decommissioning, the offsite impacts would be minimal for the reasons indicated above. The applicant does not propose any mitigation measures (Kairos 2021-TN7880 │ Sec 4.5.3), and the NRC staff feels that the effects from operations would be so minimal that no mitigation is necessary to minimize adverse ecological impacts. Decommissioning would have no more potential than construction to affect threatened or endangered species.

3.4.5 Cumulative Impacts

Table 4.13-1 of the ER identifies past, present, and reasonably foreseeable future projects that could cumulatively contribute to the environmental impacts of the proposed action (Kairos 2021-TN7880). Key past and present actions affecting ecological resources in the affected area include the Federal nuclear and energy development facilities on the ORR such as the Y-12 Plant, ORNL, and other energy research facilities; the residential and commercial areas in the original townsite of the City of Oak Ridge; multiple energy and industrial park projects; a large housing development presently undergoing construction approximately 2 mi west of the site (called “the Preserve at Clinch River”); and other land use features of a suburban or semi-rural landscape. Key reasonably foreseeable proposed projects in the region include the Horizon Center on former ORR forest land approximately 2.3 mi northeast of the site (for which DOE has excessed land to the City of Oak Ridge and roadways have been built), anticipated industrial development of other previously developed land in the Heritage Center, and a proposed general aviation airport approximately 1.1 mi south and east of the site. If the applicant were to build the Atlas facility on the site, it would only affect the herbaceous grassland and developed land formerly disturbed by DOE Buildings K-31 and K-33 and therefore would not further contribute to loss or degradation of ecological habitats. Because of the close proximity of the Hermes and Atlas facilities, the addition of the Atlas facility would not likely alter the patterns of noise and physical obstructions experienced by wildlife.

Past and present urban and industrial development in the surrounding area has already resulted in a landscape of fragmented areas of forest and other terrestrial habitats. The proposed action would not further contribute to this fragmentation because it would be sited entirely within an existing developed area. The new facilities, especially the proposed airport (DOE 2016-TN7903), would contribute noise, artificial light, and wildlife hazards to some natural habitats to the south of the site but would not result in substantial decreases in the overall quality of nearby habitats. Building the airport would also result in the loss of approximately 132 ac of forested, riparian, shrub, and grassy areas, but DOE notes that the losses would constitute only a small percentage of similar habitats in the surrounding area and would affect mostly areas already influenced by development in the East Tennessee Technology Park. Because the proposed action would not involve physical disturbance of aquatic, wetland, or riparian habitats and not

involve withdrawals or discharges of water to aquatic habitats, it would not cumulatively contribute to degradation of aquatic habitats in Poplar Creek, the Clinch River arm of the Watts Bar Reservoir, or other water bodies in the area.

3.4.6 Conclusions

The NRC staff concludes that the potential direct, indirect, and cumulative ecological impacts of the proposed action would be SMALL. This conclusion is based primarily on the proposed action not physically disturbing aquatic, shoreline, or wetland habitats or natural terrestrial vegetation; the location of the site within an existing industrial park; and disturbances being limited to herbaceous grassland in previously disturbed industrial lands of low value as wildlife habitat. Reuse of former industrial land within an existing industrial park setting provides the economic benefits of the test reactor without requiring the disturbance of sensitive terrestrial or aquatic habitats that have not been previously disturbed. The staff recognizes that there could be minor effects from noise and lighting on terrestrial wildlife in habitats elsewhere surrounding the site, but the affected habitats are of low quality because of their proximity to other industrial activity and the affected wildlife can be expected to acclimate to the noise and lighting conditions. In particular, the staff recognizes the anticipated effects on surrounding habitats from future construction and operation of a new regional airport but does not expect the proposed action to substantially contribute to those effects. The staff recognizes that because no naturally vegetated areas would be disturbed, no special maintenance or conservation practices or mitigation measures (beyond BMPs typically employed for soil erosion and sediment control and for stormwater management) would be necessary to protect ecological resources.

Table 3-4 below presents the NRC staff's biological evaluation, prepared for review by the FWS under Section 7 of the ESA, of the possible effects of the Hermes project on Federally listed species potentially occurring in an action area consisting of the 185 ac Hermes site. For conservatism, the action area for the biological evaluation encompasses the entire site, including strips of riparian forest on the site that would not be physically disturbed by the project. All project work would be confined to lands previously disturbed by former DOE Buildings K-31 and K-33 and currently being used for exterior industrial storage or herbaceous grasslands planted to stabilize previously disturbed soils. The NRC staff used the same conclusion terminology used by the FWS when responding to consultation requests under Section 7 of the ESA. The NRC staff concluded that the Hermes project may affect, but is not likely to adversely affect, or would have no effect, on each of the species considered.

Table 3-4 Biological Evaluation of Federally Listed Species from Proposed Kairos Hermes Project

Species	Federal Status	NRC Staff Evaluation	Conclusion
Gray bat (*Myotis grisescens*)	Endangered	Baseline information: Flying mammal. Hibernates and breeds in caves, such as those that occur in undeveloped lands in the karst landscape located in the Oak Ridge area (NRC 2019-TN6136 | Sec M.6.1.1). Moves and forages under forest cover (NRC 2019-TN6136 | Sec M.6.1.1). Factors contributing to population declines include human disturbance of the hibernacula, flooding, and use of pesticides (NRC 2019-	May affect, but not likely to adversely affect (MA-NLAA)

Species	Federal Status	NRC Staff Evaluation	Conclusion
		TN6136 │ Sec M.6.1.1). May be susceptible to white nose disease, a fatal fungal disease that infects hibernating bats (NRC 2019-TN6136 │ Sec M.6.1.1) and observed through frequent mist net and acoustic study-based observations conducted in Oak Ridge area from 2000–2015 (NRC 2019-TN6136 │ Sec M.6.1.1). Impacts: May forage transiently in riparian forest along Poplar Creek. Unlikely to enter lands where the Hermes facilities would be built, operated, and decommissioned, because those lands are not currently forested (or contain trees) and would not be forested or contain trees for the duration of the Hermes life cycle. Bats are expected to avoid areas of human activity, so the potential for injuries is minimal.	
Indiana bat (*M. soldalis*)	Endangered	Baseline information: Flying mammal. Hibernates in caves and mines and forms maternity roosts in mature trees over 5-in diameter at breast height, especially trees with exfoliating barks (NRC 2019-TN6136 │ Sec M.6.1.2). Roosts and forages in forested or semi-forested areas (NRC 2019-TN6136 │ Sec M.6.1.2). Threats include disturbance to the hibernacula, loss and fragmentation of forested swarming and staging habitat, chemical contaminants, collision with wind turbines, and white nose disease (NRC 2019-TN6136 │ Sec M.6.1.2). Closest known maternity roost in Blount County, TN, is roughly 30 mi away (NRC 2019-TN6136 │ Sec M.6.1.2). One or more individuals were detected acoustically in forested areas at CRN site in 2013, but maternal roosting is not suspected (NRC 2019-TN6136 │ Sec M.6.1.2). Impacts: May forage transiently in the riparian forest along Poplar Creek. Expected to avoid lands where the Hermes project would be built, which presently contain only ruderal vegetation of no foraging value.	MA-NLAA
Fine-rayed pigtoe (*Fusconaia cuneolus*)	Endangered	Baseline information: Freshwater mollusk. Prefer substrate in streams with running water. Unlikely to thrive in stream channels influenced by	MA-NLAA

Species	Federal Status	NRC Staff Evaluation	Conclusion
		impoundments such as Poplar Creek, adjacent to the Hermes site. Impacts: Hermes project would not involve physical disturbances of aquatic or riparian habitats. Water demands would be met by municipal or commercial suppliers. BMPs to control sedimentation and runoff. Stormwater on the Hermes site would be managed by BMPs throughout the project life cycle.	
Shiny pigtoe (*F. cor*)	Endangered	Baseline information: Freshwater mollusk. Prefer substrate in streams with running water. Unlikely to thrive in stream channels influenced by impoundments such as that of Poplar Creek, adjacent to the Hermes site. Impacts: Hermes project would not involve physical disturbances of aquatic or riparian habitats. Water demands would be met by municipal or commercial suppliers. BMPs to control sedimentation and runoff. Stormwater on the Hermes site would be managed by BMPs throughout the project life cycle.	MA-NLAA
Northern long-eared bat (*M. septentrionalis*)	Threatened	Baseline information: Winged mammal. Hibernates in caves, mines, and human-made structures and forms maternity roosts in trees with exfoliating barks or holes, or that are dead (NRC 2019-TN6136 │ Sec M.6.1.3). Roosts and forages in forested or semi-forested areas (NRC 2019-TN6136 │ Sec M.6.1.3). Prefers to roost in interior of late successional forests (NRC 2019-TN6136 │ Sec M.6.1.3). Listed as threatened in 2015 due to the effects of white nose disease (NRC 2019-TN6136 │ Sec M.6.1.3). Detected acoustically in forested areas at the CRN site in 2013, but maternal roosting is not suspected (NRC 2019-TN6136 │ Sec M.6.1.3). Impacts: May forage transiently in the riparian forest along the Poplar Creek. Expected to avoid lands where the Hermes project would be built, which currently contain only ruderal vegetation of no foraging value.	MA-NLAA
Spotfin chub (*Erimonax monachus*)	Threatened	Baseline information: Fish. Prefer streams with boulders and swift currents (NRC 2019-TN6136 │ Sec M.6.1.7). Unlikely to thrive in impounded stream	MA-NLAA

Species	Federal Status	NRC Staff Evaluation	Conclusion
		channels such as that of Poplar Creek adjacent to the Hermes site. Impacts: Hermes project would not involve physical disturbances of aquatic or riparian habitats. Water demands would be met by municipal or commercial suppliers. Stormwater managed by BMPs. BMPs to control sedimentation and runoff. Stormwater on the Hermes site would be managed by BMPs throughout the project life cycle.	
Virginia spiraea (*Spiraea virginiana*)	Threatened	Baseline information: Shrub. Prefers stream bars and ledges (Kairos 2021-TN7880 │ Table 3.5-2). May occur in riparian forested lands along the Poplar Creek. Impacts: Physical disturbance for the Hermes project would be limited to soils previously disturbed for past industrial development. Plants not affected by noise. BMPs to control sedimentation and runoff. Stormwater on the Hermes site would be managed by BMPs throughout the project life cycle.	MA-NLAA
White fringeless orchid (*Platanthera integrilabia*)	Threatened	Baseline information: Herbaceous wildflower of acidic seeps and stream heads (Kairos 2021-TN7880 │ Table 3.5-2). May occur in riparian forested lands along the Poplar Creek. Impacts: Physical disturbance for Hermes project would be limited to soils previously disturbed for past industrial development. Plants not affected by noise. BMPs to control sedimentation and runoff. Stormwater on the Hermes site would be managed by BMPs throughout the project life cycle.	MA-NLAA

Key: NRC = U.S. Nuclear Regulatory Commission; MA-NLAA = may affect, but is not likely to adversely affect.

- Species identified through IPaC searches conducted by the applicant in May 2021 and the NRC staff in February 2022, for an action area encompassing the entire 185 ac Hermes site.
- Conclusions follow terminology used by the FWS when providing consultations under Section 7 of the ESA.
- Conclusions are inclusive for the Hermes project for construction, operation, decommissioning, and cumulative effects, based on the information available at the time of the NRC staff's environmental review of the CP.