Categorical Exclusion Posting No.: DOE-ID-INL-26-014

Project Title: LOTUS 2.0

Project Description and Purpose:

LOTUS 2.0 (MFC-1765) is the next development phase of the Laboratory for Operation and Testing in the United States. LOTUS 2.0 will be designed and constructed at the current location of MFC-1727. MFC-1727 will be excessed or disposed of in the CFA landfill. The objective is to design and construct a flexible, secure, and general-purpose research facility to support advanced reactor experiments up to a steady state power of 500 kWt that will utilize Safeguards Category I materials. LOTUS 2.0 will feature a large, flexible Experiment Area (EA) and supporting spaces, and shall meet NDC-3 structural requirements to ensure resilience and enable potential future nuclear applications.

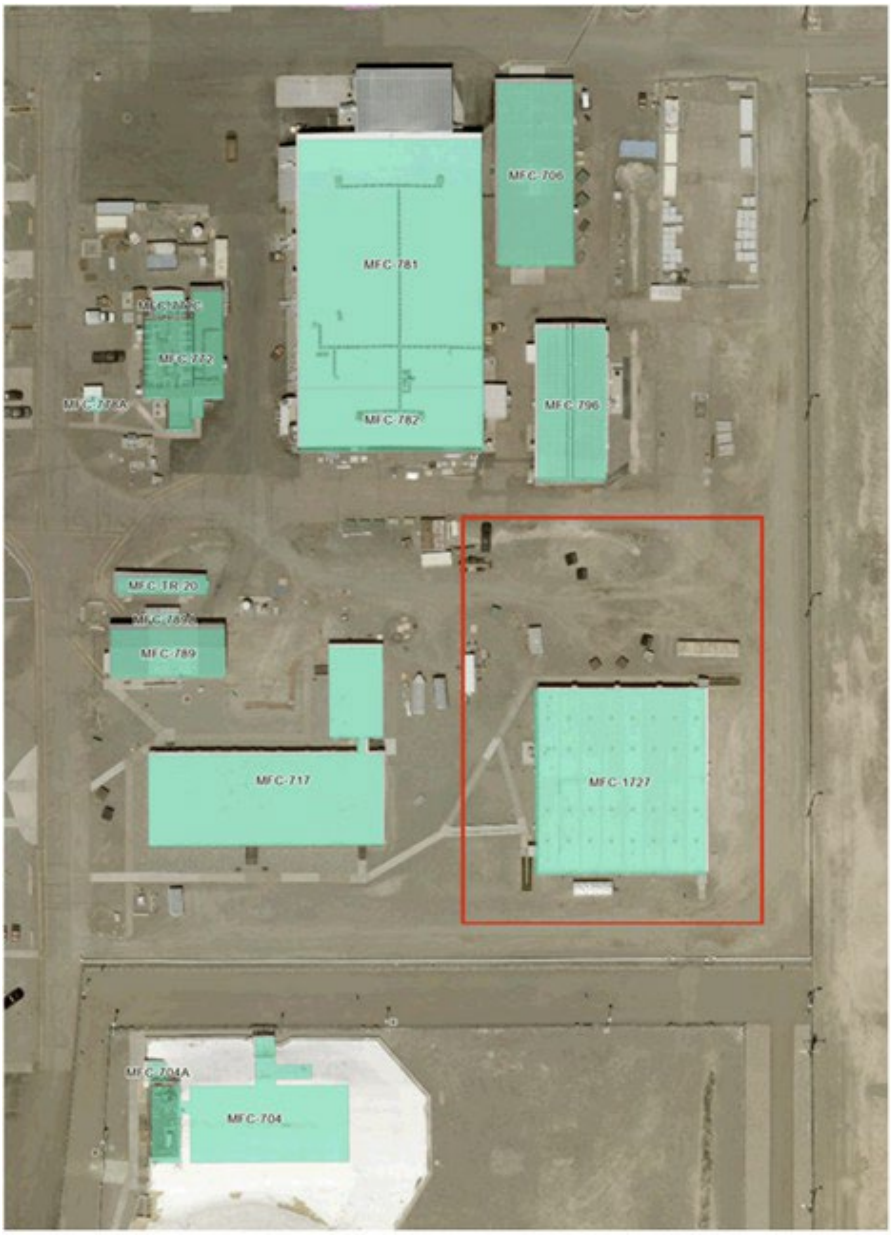

Figure 1. Approximate outline of LOTUS project boundary (utility tie-ins may extend passed boundaries)

Facility Location and Security

LOTUS 2.0 will be constructed at the current MFC-1727 location, north of the ZPPR. The building will have access-controlled and monitored exterior doors, security conduit and power for access control and motion detection, evacuation sirens and alarms, and voice paging systems in key areas.

The EA will be a large, open highbay with overhead cranes, large equipment doors, robust flooring, utility trenches, and racks for experiment setup and removal. It will be serviced by two 25-ton cranes reaching at least 70% of the EA at a minimum height of 30 ft. One bid option includes the installation of a 25-ft deep and 40-ft wide x 60-ft long pit in the center of the Experiment Area 3 floor for reactor demonstrations.

Support spaces will include a control room (CR) with independent HVAC and pressurization; an Electrical Equipment Area (EER) and Mechanical Equipment Room (MER) for electrical and mechanical systems; a telecommunications area with dedicated HVAC; ADA-compatible restrooms, a janitor closet, and drinking fountains accessible without entering the EA.

Security fences and features will include barbed wire anti-climb fencing and PTZ cameras. The outdoor infrastructure will include a minimum 900 ft² experiment equipment pad, drainage features, location for a portable diesel generator and exhaust stack, and infrastructure for future experiment equipment.

The building will be designed to NDC-3 requirements, following STD-168 (Campus and Building Aesthetic and Functionality Standards) and STD-140 (Office Space and Common Space Standards) for aesthetics and functionality.

Anticipated Utilities & Tie-Ins

Utilities will include instrument air, argon, HVAC, potable water, power, standby power (emergency diesel generator), and access to MFC networks.

Instrument air and argon are critical for anticipated experiments and nuclear operations.

Facility HVAC includes all heating, cooling, and ventilating and filtration systems in experiment, equipment, and personnel areas.

Potable Water will be routed from MFC-1727 and will be used for restrooms, drinking fountains, fire suppression, and other operational needs. Occupancy areas will be designed for at least 15 people. The CR, EER, and MER will be equipped with fire detection and suppression systems, supplied from the potable water line.

Wastewater drainage is required for disposal. A grinder pump ejector or sewage pump and vented sump will be provided to lift waste to the sanitary sewer for drainage.

Waste

Conservative estimates:

- Excavation of the site area (no pit) will be about 10,000 square feet by 10 feet deep (100,000 cubic feet). Contaminated soil/rock is not expected.
- There is an option of a pit that will be about 40,000 cubic feet (40'x40'x25' depth). Contaminated soil/rock is not expected.
- There will be utility re-routing, but minimal waste for electrical, mechanical, etc. because these utilities will be utilized in the new facility.

Air Quality—HVAC, Stack, Diesel Generator

Cascading air will flow from normally occupied areas to those with experiments and industrial settings.

The Experiment Heat Removal (EHR) will include two redundant air handling units (AHUs) that will provide up to 100 kWth of cooling (50 kWth each) for experiments, with a chilled water system as the preferred method.

The facility must passively dissipate 40 kW of heat from the equipment isolation slab at startup, decreasing to 4 kW after three days, without exceeding concrete degradation temperature limits (212°F). Air temperatures can reach higher temperatures during a heat dissipation event as long as concrete temperatures are maintained below 212°F.

The EER shall have a minimum cooling capacity of 1.8 tons plus cooling for environmental and facility loads, to maintain the room below 75°F.

A telecommunication area shall be supplied with dedicated HVAC 24 hours a day, 365 days per year. The telecommunications area shall maintain an ambient temperature of 72 +/- 5°F.

The CR shall be a minimum of 30 ft x 18 ft with a minimum height of 10 ft and have an independently controlled HVAC system to control room condition.

The Ventilation System (VS) exhaust path is equipped with multi-stage HEPA filters for normal exhaust flows from the experiment area, maintaining negative pressure and allowing for optional gas adsorption as needed. An independent suspect exhaust system, designed per DOE standards, connects upstream of the main building exhaust and provides at least four experiment effluent connection points, which route through a shared header and preliminary HEPA filter before joining the main exhaust ducting. The system is designed for flexibility, isolation capability, and redundancy. The system supports dispersed oil particulate (DOP) testing, ensures proper supply and exhaust duct placement, allows for radiation monitoring installation, and uses electric heat for HVAC air.

To provide flexibility for testing reactors, an ANSI/HPS H13.1-2011 compliant stack and monitoring system will be required. The EA VS filtered exhaust shall be through a filter with a minimum particle removal efficiency of no less than 99.97% for nongaseous material when tested with an aerosol of 0.3 micrometer diameter. The VS exhaust stack shall have an effluent monitoring system compliant with ANSI N13.1. Continuous monitoring of stack flow rate and radionuclide levels is transmitted to the ICS.

A 700 kW diesel generator with a 48-hour fuel tank supports backup power for the experiment power panels, EER, MER, the yard, and CR. The generator will meet EPA tier 2 standards and operate less than 100 hours/year. A manual transfer switch will enable the use of a portable generator during extended outages. The standby generator engine will be equipped with a non-resettable hour meter.

Water

Potable water shall be routed from existing MFC-1727 supply to points of utilization. Water shall be supplied for fire suppression systems in the CR, EER, and MER. Drainage shall be provided for disposal of wastewater.

No water lines will be permitted in the Experiment Area (EA) due to restrictions tied to experimental work. The CR, EER, and MER must be designed to prevent water ingress into the EA, especially during fire suppression activation or leaks.

The yard and concrete surfaces will have a minimum slope of 2% to ensure positive drainage, prevent standing water, and meet campus standards (Section 5.2.C of STD-139-01 1011).

The facility shall include at least one unisex ADA compatible restroom accessible from the CR without entering the EA. Each restroom shall include a minimum of one water closet and one lavatory. There shall be a minimum of one dual level drinking fountain within 10 ft of each restroom. The facility shall include one janitor closet accessible without entering EA. There shall be one utility sink (mop sink) per janitor closet. The CR is planned for 24/7 occupancy and must be designed for a minimum of 15 people.

Flood Protection

The facility shall incorporate design features to prevent flooding and water ingress, including elevations above the 10,000-year flood level, protective barriers, and flood detection system.

Level switches for the purpose of flood detection shall be installed in the CR and EER if these rooms are below the 10,000 year flood elevation. In a 10,000 year flood, level switches should activate before equipment is exposed to water.

Environmental Monitoring

Oxygen monitors (detecting O2 below 19.5%) will be installed in critical areas.

Hydrogen monitoring in the EER is required for battery system safety. The ICS shall provide an alarm in the CR and EA when the hydrogen level in the EER is at or above 1% of the lower explosive limit (LEL).

The EER shall provide the utilities and space for a contractor-furnished Criticality Alarm System (CAS).

Continuous stack monitoring and alarms for unmitigated emissions using ANSI/HPS standards. Radiation monitoring of the ventilation exhaust prior to HEPA filtration.

The types of future work anticipated in this facility are expected to necessitate moderator controls or exclusion (e.g. fuel fabrication).

Safety

The CR, EER, and MER shall be equipped with a fire detection and suppression system. The EA will be equipped with a Very Early Smoke Detection Apparatus (VESDA) smoke detection system (or equivalent advanced smoke detection system).

All hazardous energy systems/components will be equipped with isolation devices for Lock Out/Tag Out (LOTO).

Outdoor equipment will be rated for environmental extremes (-19°F to 95°F, and down to -47°F ambient), with a 20-year operational lifetime.

The EER and restroom shall be accessible from the CR without entering the EA or leaving the building.

Fall Protection for maintenance shall be included.

The crane shall be equipped with safety devices such as overload protection, emergency stop buttons, and audible alarms. Hazardous features of the crane shall be safety color coded in accordance with OSHA standards.

The facility and equipment shall be protected from lightning.

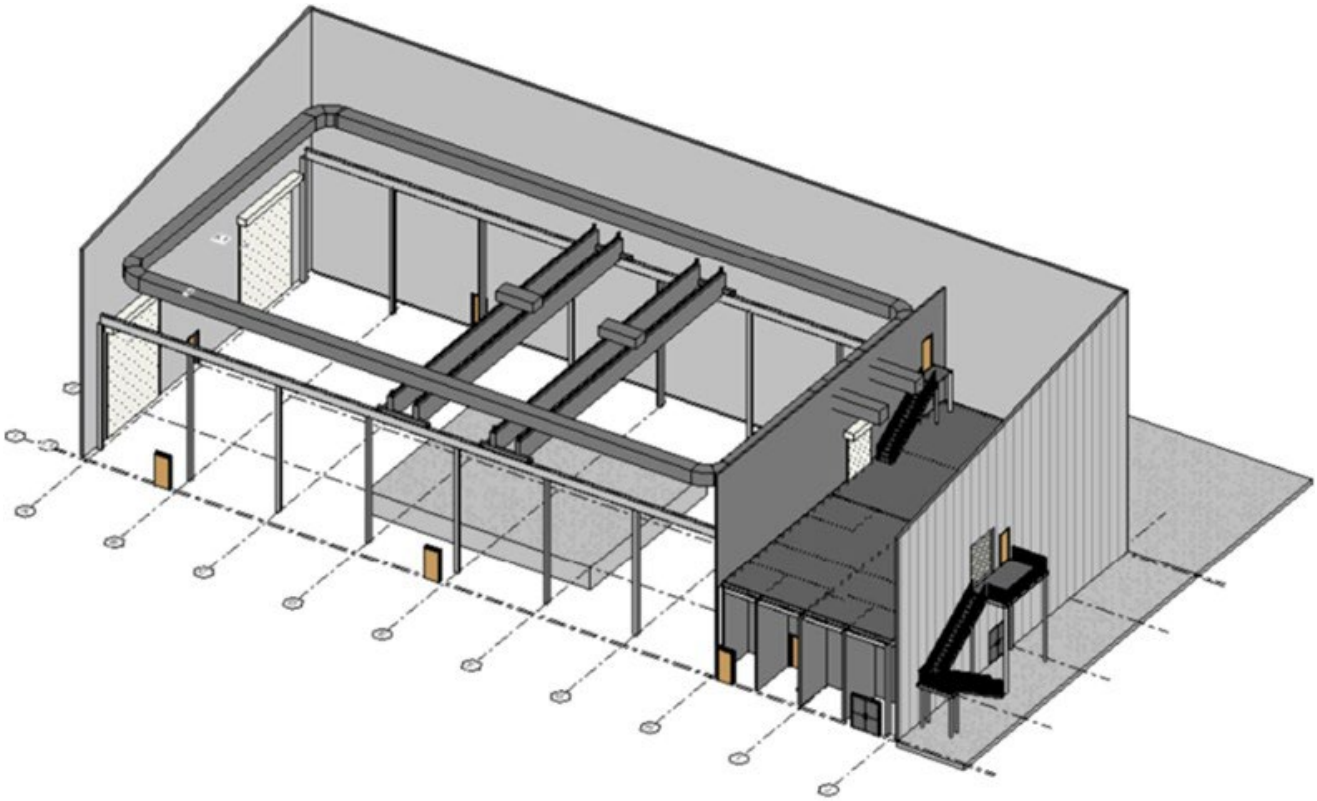

Figure 2. Isometric view of conceptual facility layout with roof and wall removed

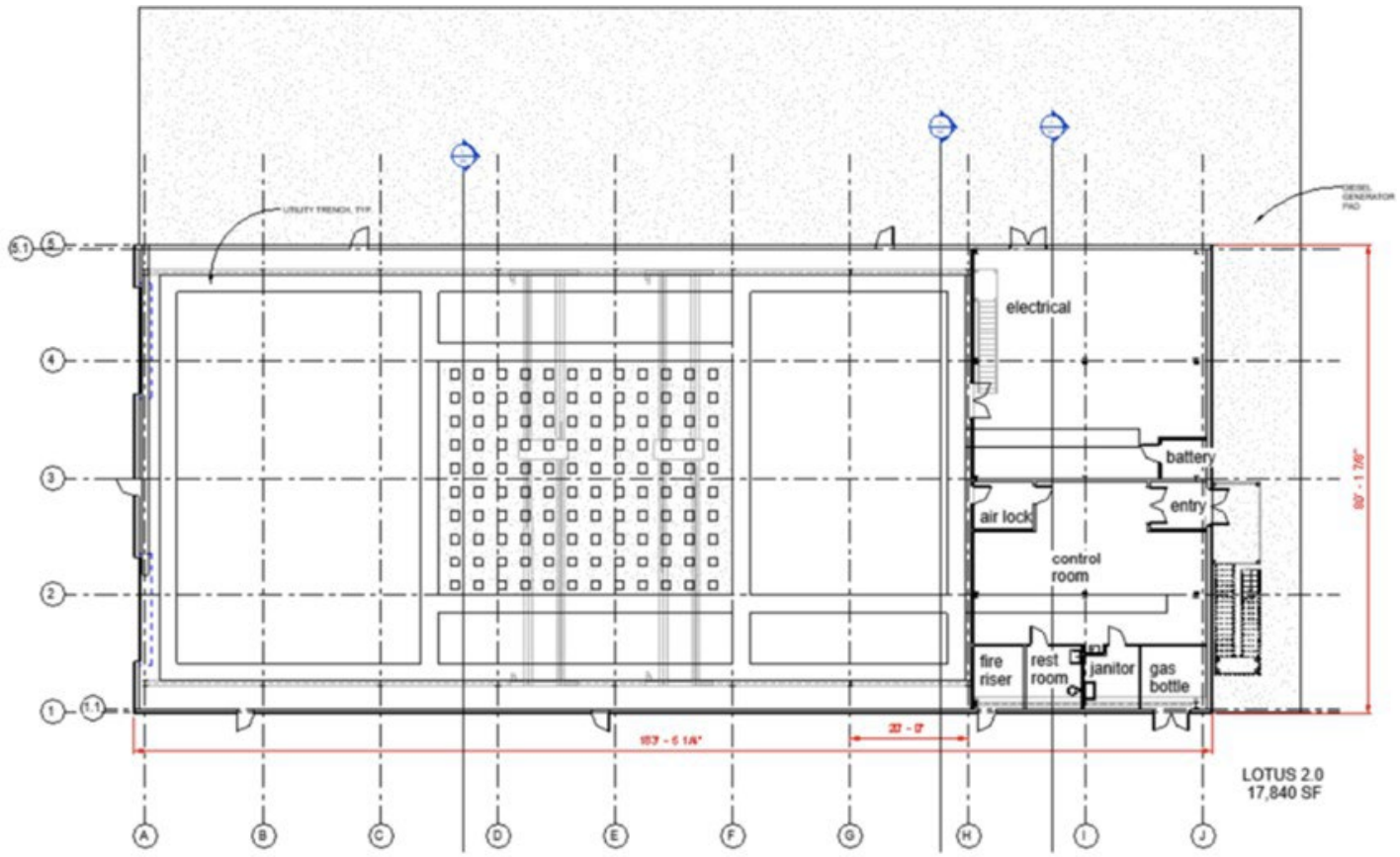

Figure 3. Plan view of conceptual facilty layout (ground floor)

Environmental Aspects or Potential Sources of Impact:

Air Emissions

Project activities have the potential to release ozone depleting substances and greenhouse gases.

Project activities have the potential to emit fugitive dust. The backup diesel generator will emit combustion pollutants. Emissions from demonstrations are not considered in this ECP.

Discharging to Surface-, Storm-, or Ground Water

The proposed action has the potential to change storm water drainage patterns and soil porosity. These changes have the potential to cause soil erosion. However, minor soil erosion and changes in stormwater run-off us unlikely to impact groundwater quality. There are no streams or other bodies of surface water in the project area. The proposed action does not include activities that physically or chemically alter surface water resources.

Disturbing Cultural or Biological Resources

There is the potential for this work to impact vegetation and for project personnel to interact with various wildlife species. A Biological Resource Review will be arranged within two weeks prior to the initiation of any activities that might disturb soil or vegetation and again following completion of project activities. A nesting bird survey is included with the Biological Resource Review for actions occurring between April 1 - October 1 per compliance with the Migratory Bird Treaty Act. Bat surveys are also included with the Biological Resource Review in accordance with the INL Bat Protection Plan.

There is the potential for project personnel to interact with wildlife, such as nesting birds or bats.

CULTURAL: A Section 106 review has completed under CRMO project number (BEA-26-040) and resulted in No Adverse Effect. Project-specific consultation is not required for this project. Please refer to Holds Points and Project Specific Instructions of the ECP.

Generating and Managing Waste

When wastes are generated, how they are disposed can adversely affect the environment. Managing wastes appropriately and responsibly and implementing recycling or reuse practices, where feasible, during project activities can reduce the potential impact on the environment.

Releasing Contaminants

When chemicals are used during the project there is the potential for spills that could impact the environment (air, water, soil).

Using, Reusing, and Conserving Natural Resources

Project activities have the opportunity to reduce the impact on our natural resources by recycling or diverting materials from disposal in the landfill.

Determination:

References: B1.15 "Support buildings", B1.23 "Demolition and disposal of buildings"

Justification: The proposal fits within the classes of actions listed in Appendix B to 10 CFR Part 1021 or Appendix B and C of DOE's NEPA Implementing Procedures and satisfies the conditions that are integral elements of the classes of actions therein. The proposal does not: (1) threaten a violation of applicable statutory, regulatory, or permit requirements for environment, safety, and health, or similar requirements of DOE or Executive Orders; (2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment facilities (including incinerators), but the proposal may include categorically excluded waste storage, disposal, recovery, or treatment actions or facilities; (3) disturb hazardous substances, pollutants, contaminants, or CERCLA-excluded petroleum and natural gas products that preexist in the environment such that there would be uncontrolled or unpermitted releases; (4) have the potential to cause significant impacts on environmentally sensitive resources, including, but not limited to, those listed in paragraph B(4) of 10 CFR Part 1021, Appendix B; (5) involve genetically engineered organisms, synthetic biology, governmentally designated noxious weeds, or invasive species, unless the proposed activity would be contained or confined in a manner designed and operated to prevent unauthorized release into the environment and conducted in accordance with applicable requirements, such as those listed in paragraph B(5) of 10 CFR Part 1021, Appendix B.

There is no extraordinary circumstance related to the proposal that is likely to cause a reasonably foreseeable significant adverse effect or for which DOE does not know the environmental effect. Extraordinary circumstances are unique situations presented by specific proposals, including, but not limited to, scientific controversy about the environmental effects of the proposal; uncertain effects or effects involving unique or unknown risks; and unresolved conflicts concerning alternative uses of available resources.

The proposal has not been segmented to meet the definition of a categorical exclusion. Segmentation can occur when a proposal is broken down into small parts in order to avoid the appearance of significance of the total action. However, segmentation does not include proposals that are developed and potentially implemented over multiple phases where each phase results in a decision whether to proceed to the subsequent phase.

B1.15 Support buildings. Siting, construction or modification, and operation of support buildings and support structures (including, but not limited to, trailers and prefabricated and modular buildings) within or contiguous to an already developed area (where active utilities and currently used roads are readily accessible). Covered support buildings and structures include, but are not limited to, those for office purposes; parking; cafeteria services;

education and training; visitor reception; computer and data processing services; health services or recreation activities; routine maintenance activities; storage of supplies and equipment for administrative services and routine maintenance activities; security (such as security posts); fire protection; small-scale fabrication (such as machine shop activities), assembly, and testing of non-nuclear equipment or components; and similar support purposes, but exclude facilities for nuclear weapons activities and waste storage activities, such as activities covered in B1.10, B1.29, B1.35, B2.6, B6.2, B6.4, B6.5, B6.6, and B6.10 of this appendix.

B1.23 Demolition and disposal of buildings. Demolition and subsequent disposal of buildings, equipment, and support structures (including, but not limited to, smokestacks and parking lot surfaces), provided that there would be no potential for release of substances at a level, or in a form, that could pose a threat to public health or the environment.

Based on my review of the proposed action, I have determined that the proposed action fits within the specified class(es) of action, the other regulatory requirements set forth above are met, and the proposed action is hereby categorically excluded from further NEPA review.

Approved by Robert Douglas Herzog, DOE-ID NEPA Compliance Officer on: 6/11/2026