



Department of Energy

Chicago Operations Office
9800 South Cass Avenue
Argonne, Illinois 60439

JUN 21 2010

Mark E. Bollinger, Acting Manager
Fermi Site Office

SUBJECT: NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) DETERMINATION FOR
THE LONG BASELINE NEUTRINO EXPERIMENT (LBNE) AT FERMI
NATIONAL ACCELERATOR LABORATORY (FERMILAB), BATAVIA, ILLINOIS

On several occasions between January 21, 2010 and present, I met with you and members of your staff at the Fermi Site Office (FSO) to discuss NEPA compliance for the LBNE. Among other things, we discussed the Environmental Evaluation Notification Form (EENF) for the project. The EENF is Fermilab's disclosure of environmental data associated with the proposed action, which is an experiment to study the nature of neutrinos. As neutrinos travel through the earth, they oscillate. In other words, the relative proportions of the three types of neutrinos (electron, muon, and tau) changes. Through use of neutrino detectors, scientists will obtain the most precise measurements of the mixing angles, look for charge parity (CP)-violating effects and compare them to CP violation observed in quarks and antiquarks.

The LBNE would use the Main Injector Accelerator at Fermilab to produce a pure beam of muon neutrinos. The neutrinos would be examined at a "near detector" proposed to be constructed at Fermilab, and at a "far detector." The LBNE's preferred approach to the far detector is to locate it at the National Science Foundation's (NSF's) Deep Underground Science and Engineering Laboratory (DUSEL), a separate project planned to be constructed in Lead, South Dakota.

LBNE activities which could occur at DUSEL would be addressed in a separate environmental impact statement (EIS) on that project, led by NSF. The Department of Energy (DOE) intends to cooperate with NSF on the DUSEL EIS, and NSF will likewise cooperate with DOE on its LBNE NEPA document. Since the DUSEL EIS is dependent upon information and analysis that would be in the LBNE NEPA document, the LBNE NEPA process would need to be completed first.

Based on the information provided in the LBNE EENF, a consensus was reached among FSO and Chicago Office staff that the LBNE has the potential to impact human health and the environment. Most notably, the LBNE project could have an effect on wetlands and would likely result in some limited activation of air and groundwater.

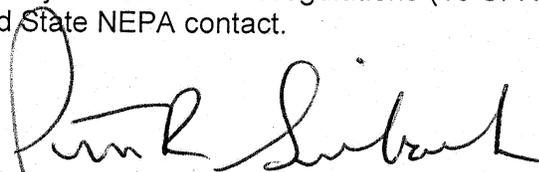
The proposed action does not fall within any of the classes of actions described in Appendices A through D of Subpart D of the DOE NEPA Regulations, 10 Code of Federal Regulations (CFR) Part 1021. The classes of action identified there are those that normally require preparation of an environmental assessment (EA) or EIS, or that can be categorically excluded from NEPA. In cases where a proposed action is outside the identified classes of action, DOE, and Council on Environmental Quality NEPA regulations (10 CFR § 1021.321 and 40 CFR § 1508.9(a), respectively) advise the preparation of an EA to assist agency planning and decision-making and specifically to provide sufficient evidence to enable DOE to decide whether to prepare an EIS or issue a "Finding of No Significant Impact."

JUN 21 2010

My recommendation is that an EA be prepared on the LBNE. Preparing an EA would be consistent both with DOE NEPA regulations and FSO's experience with similar neutrino experiments, i.e., the Neutrinos at the Main Injector (NuMI) and the NuMI Off-axis ν Appearance experiments (NOvA).

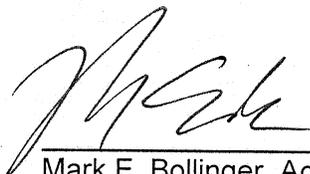
Per DOE Order 451.1B, Section 5a(8), you have the responsibility and authority to determine that preparation of an EA is appropriate. You also have the responsibility, per Section 5a(2) to designate a "Document Manager" to take the lead in managing the EA process for the FSO. You have recommended me for that role, with Rick Hersemann providing substantial support, and my Chicago Office management has concurred. Since you are the authority responsible for this determination and designation, your signature on the approval line below is requested.

I will notify the DOE Office of General Counsel, Safety and Health, Office of NEPA Policy and Compliance (GC-54) and the DOE Office of Science, Environment, Safety and Health Division (SC-31.1) of your determination. As required by the DOE NEPA regulations (10 CFR 1021.301(c)), I will also notify the designated State NEPA contact.



Peter R. Siebach
NEPA Compliance Officer

Approve:



Mark E. Bollinger, Acting
Fermi Site Office Manager

6/21/10

Date

Enclosure:
LBNE EENF

cc: T. Dykhuis, Fermilab, w/encl.
N. Grossman, Fermilab, w/encl.
J. Strait, Fermilab, w/encl.
S. Meador, NSF, w/encl.
M. Procaro, SC-25.2, w/encl.
C. Polanish, BHSO, w/encl.

FERMILAB ENVIRONMENTAL EVALUATION NOTIFICATION FORM

Project/Activity Title: Long Baseline Neutrino Experiment (LBNE)

ES&H Tracking Number: 01080

Funding Source: Initially R&D and then Operating

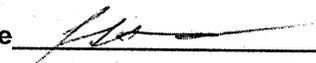
Fermilab Civil/Conventional Engineer: Timothy Wyman (X4714)

Fermilab Project Engineer: Elaine McCluskey (X2193)

Fermilab Project Manager: James Strait (X2826)

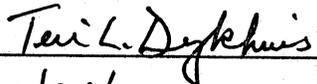
I hereby certify via my signature that every effort would be made throughout this project to comply with the commitments made in this document and to pursue cost-effective pollution prevention opportunities. Pollution prevention (source reduction and other practices that eliminate or reduce the creation of pollutants) is recognized as a good business practice which would enhance site operations thereby enabling Fermilab to accomplish its mission, achieve environmental compliance, reduce risks to health and the environment, and prevent or minimize future DOE legacy wastes.

Fermilab Project Manager: James Strait

Signature 

Date 23 Feb 10

Fermilab NEPA Reviewer: Teri L. Dykhuis

Signature 

Date 02/24/10

I. Description of the Proposed Action and Need

Purpose and Need:

The purpose of the proposed Long Baseline (distance between the detector and the neutrino source) Neutrino Experiment (LBNE) is to increase research capabilities that would enable a world-class neutrino physics program. This program is needed to measure fundamental physical parameters, explore physics beyond the Standard Model, and better elucidate the nature of matter and antimatter and, therefore, the very structure of our universe.

The goal of the proposed LBNE is to meet the above purpose and need by constructing an experiment comprised of a large detector illuminated by a distant, intense neutrino source and a smaller detector located close to the source. The far detector must be at a long distance from the neutrino source to increase sensitivity to neutrino oscillations and have sufficient sensitivity (through increased size and technological innovation or both) to improve neutrino detection. An intense neutrino source, pointing towards the far detector, is needed along with a nearby detector to measure the initial composition of the neutrino beam.

Proposed Action:

To fulfill this goal, the following activities are proposed for the Fermi National Accelerator Laboratory (Fermilab) in Batavia, Illinois. The Fermilab Main Injector accelerator would produce protons that collide with a fixed target to generate an intense beam of muon neutrinos. This neutrino beam would pass through a small near detector on the Fermilab site and then travel through the earth to strike a proposed underground far detector.

A potential location for the proposed far detector is the anticipated Deep Underground Science and Engineering Laboratory (DUSEL) that is planned to be housed in the former Homestake gold mine of Lead, South Dakota. The Homestake Mine is owned by the South Dakota Science and Technology Authority (SDSTA) and the proposed future steward is the National Science Foundation. DUSEL would be the world's deepest underground laboratory and therefore have the ability to shield the LBNE neutrino detectors from cosmic particles. An underground detector thus shielded from cosmic rays could also be sensitive to proton decay, a phenomenon as yet unobserved but predicted by grand unified theories which are natural extensions of the Standard Model. Furthermore, an underground detector could serve as an observatory for neutrinos generated by supernovae since the beginning of time and for neutrinos generated more recently by supernovae in our galactic neighborhood, yielding new information on the collapse mechanism of stars.

Fermilab has constructed many neutrino beamlines, most recently the NuMI/MINOS project, and is recognized for its expertise in this. In addition, the NOvA project incorporated an upgrade of the Fermilab proton source to 700kW, which offers a platform from which to launch a new neutrino beam for a long baseline detector. Fermilab's expertise, infrastructure, and an existing accelerator facility that is capable of delivering an intense neutrino beam that is essential for the desired science, precludes an alternative neutrino source location. Consequently, there are no alternatives to positioning the near detector at Fermilab because the neutrino source is there.

The 'No Action' alternative would not meet the above stated purpose and need.

II. Description of the Affected Environment

The Fermilab site is located 38 miles west of downtown Chicago, Illinois. Its 6,800 acres straddle the boundary between eastern Kane and western DuPage Counties in an area of mixed residential, commercial, and agricultural land use. Immediately to the east is the town of Warrenville (13,363 population), to the west is Batavia (23,866 population), to the north is West Chicago (23,469 population), and to the south and southwest is Aurora (142,990 population). Figure 1, below, shows the location of the proposed LBNE conventional facilities within Fermilab and in relation to major transportation resources (Interstate 88, Route 59 and the Railhead) and the surrounding communities (Geneva, Batavia, North Aurora, Aurora, West Chicago, and Warrenville).

The proposed LBNE conventional facilities would be located in an area west of Kautz Road and south of Giese Road within the Fermilab site boundary. In general terms, a proton beam would be extracted from the existing Main Injector, directed north and west toward new below grade enclosures housing the LBNE Target Hall, Absorber Hall, and LBNE near Detector. This location is based on programmatic requirements for extraction from the existing Main Injector and the assumed location of the far detector.

Detailed and specific definitions of the wetland area, floodplain and stormwater management, archaeological concerns and ecological resources would be identified by environmental consultants resulting in the preparation, submittal, and approval of a Floodplain/Wetland Assessment Report. All required environmental permits would be obtained prior to the start of construction. It is anticipated that limited wetlands would be encountered in the area of the proposed Absorber surface structures and therefore wetland credits may be purchased.

Environmental impacts of the proposed far detector would be evaluated and the appropriate NEPA documentation prepared by the steward of this facility. A NEPA Environmental Impact Statement is being initiated by the National Science Foundation for the DUSEL, which is the most likely site of the proposed far detector.



Figure 1, above, shows the location of the proposed LBNE conventional facilities within Fermilab and in relation to major transportation resources (Interstate 88, Route 59 and the Railhead) and the surrounding communities (Geneva, Batavia, North Aurora, Aurora, West Chicago, and Warrenville).

Non-attainment areas

B. Regulated Substances/Activities: Would the proposed action involve any of the following regulated substances or activities?

- Clearing or Excavation
- Demolition or decommissioning
- Asbestos removal
- PCBs
- Chemical use or storage
- Pesticides
- Air emissions
- Liquid effluents
- Underground storage tanks
- Hazardous or other regulated waste (including radioactive or mixed)
- Radioactive exposures or radioactive emissions
- Radioactivation of soil or groundwater

C. Other relevant Disclosures

- Threatened violation of ES&H permit requirements
- Siting/construction/major modification of waste recovery or TSD facilities
- Disturbance of pre-existing contamination
- New or modified permits
- Public controversy
- Action/involvement of another federal agency
- Public utilities/services
- Depletion of a non-renewable resource

IV. NEPA Recommendation

Fermilab has reviewed this proposed action and determined that it does not fit in the classes of actions, predetermined by DOE in 10 CFR Part 1021, Subpart D, Appendix A and B, that do not individually or cumulatively have a significant effect on the human environment (categorical exclusion). Therefore, this project would require a NEPA determination from DOE at the Environmental Assessment (EA) level and all aspects of the project would be thoroughly evaluated during that process and subsequent development of Preliminary Safety Assessment Documents (PSAD) and SAD. Therefore, this EENF is conceptual, and is intended only to provide the formal notification that an EA would be prepared.

V. DOE/CH-FAO NEPA Coordinator Review

Concurrence with the recommendation for determination:

NEPA Coordinator Reviewer, U.S. DOE FSO: Rick Hersemann

Signature *Rick Hersemann*

Date 03/02/10

VI. Comments on checked items in section III.

Wetland/Floodplains

Wetland delineation would be conducted for LBNE as past projects have indicated the likely presence of wetlands in the area of the proposed Absorber Service Building and near the potential Near Detector

Service Building and Target Facilities Support Buildings. If wetlands would be disturbed, mitigation may be required by the Army Corps of Engineers and Fermilab would, of course, comply. All required permits would be obtained and necessary public notifications made prior to the start of construction.

Clearing and Excavation

Clearing and excavation would be necessary for this project. It is anticipated that there would be approximately 200,000 cubic yards of earth excavation, 150,000 cubic yards of rock excavation, 1900 linear feet of cut and cover Primary Beamline tunnel in glacial till, 6 shafts (equipment handling, components handling, and access/egress), and 5 new surface buildings of an estimated total of 35,000 square feet. Soil erosion and sedimentation control devices and associated maintenance would be implemented, as necessary; all required permits obtained; and necessary public notifications made prior to construction.

Demolition or Decommissioning

After the useful life of the project has ended, there would be a need for D&D. To the extent possible, components would be reused and materials would be evaluated for reuse and recycle. Resultant waste materials would be managed appropriately and according to all applicable rules and regulations for packaging, transporting, disposal, records management and reporting.

Air Emissions

During excavation and construction, the operation of diesel-powered equipment would be expected to introduce SO₂, NO_x, particulates and other criteria pollutants to the atmosphere, typical of similar sized construction projects. These releases would be temporary and would not likely cause an air-quality standard exceedance. Particulates (dust) generated during earthmoving activities and vehicle movement over unpaved areas would be minimized by frequent watering or other dust-control measures. Any necessary modifications to the Fermilab Lifetime Operating Permit (issued by the IEPA Air Bureau) would be obtained prior to beginning work.

Liquid Effluents

Liquid effluents would result from groundwater inflow to the LBNE tunnel that would be pumped to the surface and eventually discharged to streams that flow off site; this water would potentially contain silt (solids) and therefore settling may be necessary to meet National Pollutant Discharge Elimination System permit limits. During future operation, liquid effluents, resulting from groundwater seepage that is pumped to surface ponds and may be discharged to streams that flow offsite, may contain tritium. The tritium would potentially come from condensed activated water vapor in the target hall air and in concrete shielding outside the decay tunnel. This would be planned for and managed to ensure that the tritium concentration in surface ponds is below the Fermilab internal policy established limit and far below the DOE derived concentration guide applicable to surface water releases (2000 pCi/ml).

Radioactive Exposures or Emissions

A safety assessment document (SAD) module would be developed that would address radiation exposures to workers and members of the public due to the operation of LBNE. The SAD would also address the potential radioactive emissions due to the proposed project. Personnel and public exposures would remain well below regulatory limits and within guidelines of the Fermilab Radiological Control Manual including the control of occupational radiation exposures during maintenance activities. Radionuclide emissions would be monitored and reported in accordance with existing practices and regulatory requirements. Cumulative air emissions are expected to remain substantially below the National Emission Standards for Hazardous Air Pollutants (NESHAPs) threshold for continuous monitoring and far below the regulatory limit for effective dose to members of the public.

Radioactivation of Soil or Groundwater

The operation of the LBNE beamline would result in some radioactivation of the soil and rock in the vicinity of this proposed project. Shielding of the components of the beamline would be designed to assure that concentrations of radionuclides in groundwater resources would be less than those specified in applicable regulatory limits.

New or Modified Permits

All work activities would be evaluated to determine the necessity of permits and these would be obtained prior to starting construction.

Public Controversy

The proposed near detector location would be located at the edge of the Fermilab site boundary (see Figures 1 and 2) and would therefore be highly visible to the public. Drill and blast methods or large raise bore drill are proposed for shafts and cavern excavation and the associated noise and vibrations along with the visibility of the near detector construction has the potential to create public controversy.

Action/Involvement of another federal agency

The National Science Foundation is the designated future steward of the anticipated DUSEL where the potential far detector would be housed.

Additional Information

Archaeological site boundaries (identified in the Fermilab Cultural Resources Management Plan) in the general area of the proposed project would be located and flagged to ensure that impact is avoided. If any unexpected potential archaeological/historical/cultural resources are encountered, work would be stopped and the resource would be evaluated as per legal requirement.