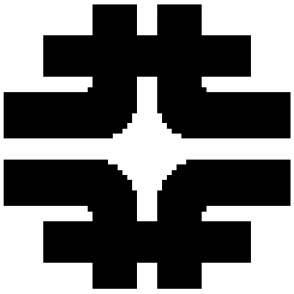
Report to the Director on the Fermilab Environment

Calendar Year 2010



Annual report on environmental monitoring and surveillance activities including compliance with specific environmental requirements.

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1.0 Introduction

Fermilab is not only committed to environmental compliance but also to responsible environmental stewardship. Compliance, which can be defined as conformity to fulfill official requirements affects every aspect of the Fermilab facility. It affects the staff, funding, new technology, productivity, efficiency, and surrounding environment. To be compliant, Fermilab must adhere to environmental statutes and regulations administered by groups such as the U.S. Environmental Protection Agency, Illinois Environmental Protection Agency, U.S. Army Corps of Engineers, and the state Fire Marshal. These regulations ensure clean air and water, safe disposal of hazardous wastes, and the conservation and protection of resources, wildlife, and the surrounding environment. In addition, Fermilab has many programs dedicated to continually improving the Laboratory's current and future impact on the environment.

Fermilab evaluates and manages the environmental impacts of site operations by using an Environmental Management System (EMS). Fermilab made the decision to formalize and validate the EMS by seeking ISO 14001 registration in 2007. The certification is valid for three years and Fermilab chose to re-register to the standard in 2010. ISO 14001 standards require an organization to meet a stringent set of criteria. The organization must have an infrastructure and management plan that facilitates meeting measurable environmental objectives. An important purpose of this report is to present the current status of these objectives.

Fermilab's comprehensive environmental monitoring and surveillance program provides for the measurement and interpretation of the impact of Fermilab operations on the public and the environment.[1] Surveillance and monitoring tasks are conducted to confirm compliance with standards and permit limits as well as ensure early detection of an unplanned pollutant release. The location and frequency of sampling are based on established routines, operational considerations and process assessments as well as historic levels of pollutants found in each location. Sampling points are selected based on the potential for adverse impacts. Additionally, samples of effluents and environmental media such as soil and groundwater are collected on the site and at the site boundary. These samples are analyzed and results are compared to applicable guidelines and standards.

Discussed in this report are the results of Fermilab's environmental monitoring and surveillance activities, compliance with all specific environmental regulations, and our progress on environmental restoration, waste management and corrective action activities. The report is arranged by environmental topic and specific environmental compliance requirement.

2.0 Summary of Significant Environmental Issues

Federal Sustainability Goals

In October 2009 Executive Order (E.O.) 13514 Federal Leadership in Environmental, Energy and Economic Performance went into effect. The Order builds on environmental sustainability initiatives initially outlined in previous directives. This Order also commits the federal government to measure, manage and develop a strategy to reduce its own greenhouse gas (GHG) emissions. In addition Federal agencies must increase energy efficiencies; reduce fleet petroleum consumption; conserve water and reduce waste. In response DOE has created a Strategic Sustainability Performance Plan (SSPP) in which the Department describes its approach to meeting goals outlined in the Executive Order. The GHG emission reduction goals have long term targets that mature in 2020.

DOE sites, such as Fermilab, have been asked in turn to develop annual site sustainably plans that describe how they will work towards achieving DOE's goals. Fermilab has written a plan that was submitted to DOE in December 2010. In addition to the plan, Fermilab has also created a comprehensive inventory of GHG emissions resulting from site operations. A summary of the inventory is provided in Section 6.2.

Tritium in Surface Water

In 2005 measureable tritium was detected for the first time in surface water discharges from the site at our permitted outfall locations (specifically Indian Creek). Subsequently Fermilab instituted measures to reduce the levels in accordance with our ALARA (as low as reasonably achievable) policy. Fermilab continues to monitor the surface water system and the outfalls for the presence of tritium. Fermilab's recently re-issued, site specific NPDES permit includes monitoring requirements for tritium at all six of our outfalls. Monitoring for radioactivity in on-site surface water continues to be a primary component of Fermilab's routine environmental surveillance program. Additional information concerning levels of tritium in surface water is posted at a link from the Laboratory's home page.

3.0 Ecological Issues

Eight National Environmental Research Park (NERP) projects were in differing stages of progress during 2010. The projects along with the name of the sponsoring institution are listed below:

- Bird Surveys at Fermilab, Fermilab
- Feedbacks between Plants, Mycorrhizal Fungi, and Soil Nutrient Dynamics, Argonne National Laboratory
- Investigation of Carbon Dioxide and Nitrogen Fluxes in Terrestrial Ecosystems at Fermilab, Argonne National Laboratory
- Bioenergy Experimental Plots at Fermilab, Argonne National Laboratory
- Evaluation of Biological and Chemical Management Practices for Emerald Ash Borer, Morton Arboretum
- Reintroduction of Barn Owls at Fermilab, Forest Preserve District of DuPage County, Illinois
- Restoration Activities by Fermilab Natural Areas Intern, Fermilab Natural Areas
- Assessment of the Mammalian Community across an Urban to Rural Gradient, Lincoln Park Zoo, Chicago Illinois.

The Laboratory's Ecological Land Management Plan[2] was updated in 2010. Existing prairie tracts were enriched with forbs and burned or mowed to discourage intrusion of brush, trees and exotic plants.

Fermilab carries out wildlife management to the extent necessary to protect the primary mission of the Laboratory and to preserve the Fermilab ecosystem. The Lab has a "nuisance animal" permit issued by the Illinois Department of Natural Resources (IDNR) that allows for the trapping and elimination of these nuisance animals. During 2010, 15 complaints were received, resulting in the transfer and re-release of 14 animals on site. One animal was euthanized. Fermilab intensively manages the population of whitetail deer on site to preserve the ecosystem. DOE Fermi Site Office contracts with the U.S. Department of Agriculture Wildlife Services Group to reduce the herd to an optimum number annually. This activity requires approval and permitting from IDNR; during 2010, 68 whitetail deer were removed.

4.0 Environmental Management System (EMS)

Fermilab recognizes the importance of maintaining an Environmental Management System (EMS). The EMS is a set of processes and practices that enable Fermilab to reduce its environmental impacts and increase its operating efficiency. The system functions via an ongoing cycle that focuses on planning, implementing, evaluating and improving environmental performance. This process is used as means to continuously focus on the environmental aspects of Laboratory operations to ensure compliance with regulations, and that the Laboratory is functioning in an environmentally responsible a manner. In addition, the elements of the EMS have been coordinated with the principles of Fermilab's Integrated Safety Management System (ISMS) to form a combined ES&H Management System that address facility operational liabilities that have the potential to impact individuals and/or the environment.

Fermilab's EMS was formally established in 2005 in accordance with DOE and Executive Order requirements. The EMS has also been certified to ISO 14001 standards since August 2007. ISO requires re-registration to the standard every three years. Fermilab successfully went through a comprehensive third party audit of the entire facility and became re-registered to 14001 in in June 2010.

To maintain certification the Laboratory also undertakes semi-annual independent audits to demonstrate continuous conformance with the standard. These audits focus on segments of Fermilab operations to ensure that EMS elements are being properly addressed across the facility and have occurred every year since becoming registered. In 2010 no semi-annual audits were performed due to the timing of the re-registration audit.

As part of the EMS, Fermilab routinely evaluates its operations and seeks to improve environmental performance. The Laboratory's significant environmental aspects have been identified and are annually reviewed. In areas were change is desired, goals are established with measureable targets that seek to improve a particular aspect of operations. The goals are formalized into specific Environmental Management Program (EMP) plans and are developed with input from divisions and sections having the greatest influence over plan. In 2010 eighteen EMPs were active and included goals that ranged from reducing institutional energy consumption to ecological stewardship activities.

5.0 Environmental Monitoring and Surveillance

The goal of the Fermilab Environmental Monitoring Program is to assist Laboratory management in decision-making by providing data relevant to impacts that Fermilab operations have on the surrounding environment. This program includes effluent monitoring which is used to confirm compliance with permits, generally at a particular point. Environmental surveillance is conducted at various locations to intercept the pathway of potential pollutants to receptors such as plants, animals or members of the public. Fermilab collects environmental data for reporting purposes or whenever it is necessary or useful in conducting the business of the Laboratory. Line organizations have the responsibility to recognize and understand the environmental aspects of their operations and to conduct their work in an environmentally sound manner.

The pathways available for movement of chemical and radioactive materials from Fermilab operations to the public are the atmosphere, surface water, groundwater, and via the roadways (transportation of materials to and from the site). Environmental surveillance consists of collecting and analyzing samples of various media and by measuring penetrating radiation (e.g. muons) within and at the site boundaries.

Ground and surface waters are sampled at locations near operating areas, potential contamination sources and along potential transport pathways. In addition to air and water surveillance, samples of soil are collected and analyzed for radioactivity to ascertain whether there is build-up of radioactive materials in the environment due to long-term operations.

Surface water, air, groundwater, soil and sediment samples are analyzed for radionuclide concentrations. Surface waters are also monitored for potential chemical constituents. While levels of penetrating radiation are in some places measurable near operational areas on the site, the levels decrease rapidly with distance from the sources. External penetrating radiation and airborne emissions are commonly below instrument detection levels at the site boundary and must be estimated to provide information about the maximum potential radiation doses to offsite populations. The results of the environmental surveillance program are interpreted and compared with environmental standards where applicable. The Fermilab Environmental Monitoring Plan, which is maintained by the ES&H Section, provides more details.

5.1 Air Quality

Fermilab's Lifetime Operating Air Pollution permit issued by the Illinois Environmental Protection Agency (IEPA) under the Clean Air Act includes a *National Emissions Standards for Hazardous Air Pollutants* or NESHAPs element, which covers airborne radionuclides. In addition, the permit takes into account those criteria pollutants such as particulate matter, nitrogen oxides, carbon monoxide, volatile organic materials and sulfur oxides associated with the operation of various pieces of equipment.

Airborne radionuclides are normally released to the atmosphere from operating target stations. Measures to keep these releases as low as reasonably achievable (ALARA) are incorporated into the operating processes and procedures at these facilities. Monitoring is conducted at targeting areas where air emissions are considered a significant contributor to the overall transport of radioactive materials offsite. In addition, a small quantity of airborne radionuclides is contributed by the operation of the Magnet Debonding Oven when operating. The air permit application stated that total activity released from the Lab would average no greater than 2000 Curies in a year with a maximum of 9000 Curies in a year; current and planned operations are far below these levels.

The radiation doses potentially received by the offsite public due to Fermilab operations are calculated from data gathered through environmental surveillance of the onsite sources. Selected vent stacks are monitored directly with stack monitors and indirectly by taking soil samples in the vicinity of the stacks. The dose for the air pathway is calculated using a Gaussian plume computer simulation model called Clean Air Assessment Package-1988 (CAP-88PC2). This model was created by the USEPA to predict the movement of airborne radionuclides and its use is dictated by regulations governing hazardous air pollutants at 40 CFR 61. Maximum calculated concentrations off-site are predicted to be below the level that could be detected by direct monitoring.

Fermilab is not a significant source of chemical air pollution. The permits cover emissions caused by open burning conducted for prairie/land management and fire extinguisher and firefighter training, a magnet debonding oven, a fuel dispensing facility, a vapor degreaser, radionuclide emission stacks, a 2200 horsepower emergency standby diesel fuel fired generator, the Collider Detector at Fermilab (CDF) and the Main Injector Particle Production (MIPP) gas circulating systems, the operation of two natural gas-fired boilers, and in 2009 the permit was reissued to include one new natural gas-fired boiler at CUB and the Integrated Cavity Processing Facility (ICPA). Pollutant levels are estimated based on the knowledge of the processes that generate them and the characteristics of individual pollutants. The results are submitted to the Illinois Environmental Protection Agency in an annual air emissions report.

5.1.1 Radioactive Air Emissions

Operation of the debonding oven, when radioactive components are being burned, is a potential source of tritium. In 2010 the debonding oven did not burn any radioactive magnets The Anti-Proton Area stack, used in Colliding Beam operations, and the MiniBooNE and NuMI stacks are estimated to have released a total of approximately 142.5 Curies in 2010. These radioactive air emissions were approximately 1% of the annual average (2000 Curies) expected from operations as acknowledged in the current air pollution permit application on file with the Illinois Environmental Protection Agency (IEPA). No detectable levels of radionuclides reached the site boundaries. Doses to the public from emissions in 2010 continued to be well below the Environmental Protection Agency (EPA) standard of 10 mrem/year and also much less than the EPA's continuous monitoring threshold of 0.1 mrem/year. Using the CAP-88PC2 gaussian dispersion model, the highest dose equivalent to any member of the public was estimated to be 0.0411 mrem.

Fermilab's 2010 Radionuclide Air Emissions Annual Report was submitted to the DOE FSO in May 2011. The report is distributed by the DOE FSO to the USEPA and IEPA.

5.1.2 Non-Radioactive Air Emissions

Fermilab operates its air pollution sources under a Lifetime Operating Permit issued by the Illinois Environmental Protection Agency (IEPA). The most recent permit, issued in September 2009, includes the following air pollution sources: the magnet debonding oven, two 15 mmBTU and one 11.55 mmBTU natural gas-fired boilers at the Central Utility Building (CUB), a 12,000-gallon gasoline storage tank with a stage 1 and stage 2 vapor balance system, radionuclide emission stacks, a vapor degreaser at Industrial Building 3, a 2,200 horsepower standby diesel generator, the CDF and MIPP gas circulating systems, and the ICPA. Permit conditions require the monthly logging of fuel consumption for covered fuel combustion sources, solvent usage at the degreaser, and hours of operation at ICPA. Source operations were reviewed by Fermilab personnel again this year to ensure that permitted equipment continued to operate and be maintained in accordance with permit conditions. The Annual Air Emission Report for 2010, which provides an estimate of criteria pollutant emissions, was submitted to the IEPA in March 2011.

5.2 Penetrating Radiation

Operation of the Fermilab accelerator and associated beamlines produce ionizing radiation such as neutrons and muons. Beamlines and experiments are designed so that most of the radiation is absorbed before reaching the ground surface and outdoor areas. The neutrons are absorbed by shielding. The remaining radiation that emerges above the surface presents a very small potential for radiation dose. Small muon fields have been measured in conjunction with the operation of the Fixed Target beamlines in the past. These beamlines were operated in a limited configuration in 2010. Since the removal of most of the Main Ring magnets from the Tevatron tunnel, the A0 beam absorber replaced the C0 beam absorber as the primary absorber. Unlike the C0 absorber, the Tevatron beam has to be bent down into the earth to be directed to the A0 absorber. Due to this beamline feature, the ground absorbs the muons emerging from the A0 absorber. Therefore, no muons are detected from its operation. Both the MiniBooNE and NuMI experiments have the potential to produce measurable muon flux; however, the 8 GeV energy protons used in MiniBooNE are too low in energy to produce muons that can escape the bulk shielding surrounding the experiment. The NuMI beamline bends the beam down so that the muons produced are absorbed deep underground as part of the beamline design.

Another potential source of exposure to ionizing radiation is the centralized radioactive materials storage area referred to as the Railhead. This source of penetrating radiation was monitored continuously in 2010 by a large ionization chamber located in the Railhead colloquially called a 'Hippo.' The Hippo measurements are supplemented by periodic onsite surveys. Based on measurements made in 2010, it is estimated that radioactive materials stored at the Railhead contributed no directly measureable dose equivalent at the site

boundary in 2010. The maximum radiation dose equivalent to an individual at the nearest offsite house was thus estimated to not be directly measureable in 2010 either.

5.3 Surface Water Quality

Fermilab discharges liquid effluent to surface water bodies and to sanitary sewers. The Lab holds National Pollutant Discharge Elimination System (NPDES) permits that govern discharges to surface water from stormwater runoff, cooling water, and effluents from various onsite construction projects. In addition to monitoring for the physical and chemical parameters required by NPDES permits, samples of surface water are taken monthly from selected water bodies and analyzed for radionuclides. These surface waters are sampled for radionuclides based upon their potential for contamination. Aqueous process wastewaters are directed to sanitary sewers and ultimately discharged to publicly owned treatment works (POTWs) in Batavia and Warrenville. Wastewater discharges are controlled by criteria set forth in the Fermilab Environment, Safety, and Health Manual Chapter 8025.

5.3.1 Radioactive Releases to Surface Water

Numerous sumps collect and drain water from building footings and from under beamline tunnels in the Tevatron, Main Injector, and the Experimental Areas. Water collected by these sumps often contains detectable concentrations of radionuclides (primarily tritium, ^{3}H) that have been leached by rainwater from radioactive soil near beam targets and absorbers or released accidentally to sumps due to losses from beamline cooling water systems. These sumps discharge to ditches and ponds onsite.

In addition, water is also collected from the NuMI tunnel system. NuMI water contains measurable concentrations of tritium and the primary source of the tritium comes from components within the tunnel. The water that is collected consists primarily of groundwater that has infiltrated into the tunnel. This high-quality water is pumped from the tunnel and directed into the ICW system where it is used primarily for make-up water for the CUB cooling towers. Excess NuMI water and effluent from the towers is directed to the ICW pond system.

In 2005 measureable tritium was detected in surface water discharges from the site at our permitted outfall locations (specifically Indian Creek). Subsequently Fermilab instituted measures to reduce the levels in accordance with our ALARA (as low as reasonably achievable) policy. Fermilab continues to monitor the surface water system and the outfalls for the presence of tritium. Fermilab's recently re-issued, site specific NPDES permit includes monitoring requirements for tritium at all six of our outfalls. Monitoring for radioactivity in on-site surface water continues to be a primary component of Fermilab's routine environmental surveillance program.

5.3.2 Non-Radioactive Releases to Surface Water

Monitoring for non-radiological chemical constituents in surface water was limited to NPDES permit parameters (temperature, flow, pH, and chlorine) this year. Discharge Monitoring Reports for six different outfalls were submitted monthly to the IEPA. In 2010 there were no exceedances of discharge limits to waters of the state.

5.3.2.1 Cooling Water System

Fermilab's individual site specific NPDES permit authorizes the discharge of commingled cooling water and storm water runoff to surface waters through outfalls to Kress, Indian and Ferry Creeks. Due to the presence of the RCRA-permitted (Resource Conservation and Recovery Act) Hazardous Waste Storage Facility on-site, the NPDES permit also regulates storm water discharges from designated solid waste management units (SWMUs). The Storm Water Pollution Prevention Plan required by this NPDES permit is periodically modified to reflect changes that occur as part of the RCRA Facility Investigation (RFI) of the SWMU sites. The NPDES permit dictates that water temperature, pH, flow, and tritium is to be monitored at all six outfalls; chlorine

concentration is monitored at the Kress and Indian Creek outfalls. The monitoring results are reported to the IEPA on a monthly basis.

In 2007 Fermilab contracted services to treat cooling ponds for algae and pond weeds using a state licensed applicator which continued through 2010. The ongoing zebra mussel infestation of the industrial cooling water system pipes and pumping infrastructure is managed by FESS using a water treatment specialty company.

5.3.2.2 Releases to Sanitary Sewers

An Individual NPDES permit allows Fermilab to pre-treat and release effluent from the Central Utility Building (CUB) regeneration process to the City of Batavia sanitary sewer system. The pretreatment permit requires the collection and analysis of composite process effluent samples for specified metals on a quarterly basis. Samples are also collected and analyzed from each discharge for accelerator-produced radionuclides to confirm released radioactivity meet DOE guidelines. In 2010, 75,600 gallons of process wastewater were discharged to the Batavia sewer system. In 2010, all effluent discharges were in compliance with the pre-treatment permit as well as specified levels in the Department of Energy Derived Concentration Guide for radionuclides. Effluents are also analyzed for tritium and other radionuclides. A total of 611.72µCi of tritium and 108.37µCi of ^{7}Be were released to the sanitary sewer from the CUB during 2010. No other radionuclides were detected.

Monitoring stations, located at the site boundary, sample sewer discharges to the municipalities of Batavia and Warrenville. The discharge at these locations is a mixture of all effluents contributing to that sanitary sewer system. Analytical results are compared to municipal discharge limits to track compliance. The monitoring stations were not operated continuously in 2010. The Batavia sewer sampler took monthly composite samples for 10 months as did the Warrenville sampler.

Beginning with the August sample of 2005, composited during the month of July, tritium was first detected at the Batavia monitoring station. Detections continued for the remainder of 2005 with a maximum activity of 4.1 pCi/ml measured from a grab sample collected in September of that year. Tritium was intermittently detected just above the minimum detection limit of 1.0 pCi/ml from samples in subsequent years, and again in 2010.

5.4 Groundwater Quality

The Illinois Environmental Protection Agency (IEPA) publishes groundwater quality standards[3] and defines Class I groundwater as a non-degradable resource, which is to be highly protected. Water residing in or near the Silurian dolomite bedrock aquifer, the upper surface of which is 50 to 70 feet below the ground surface at Fermilab, as well as water in the overlying Quaternary Batestown Member, is classified as Class I groundwater according to criteria published by the IEPA[4]. Water in the Quaternary deposits overlying the Batestown has been demonstrated to be Class II water requiring less-stringent standards.

In 2010, four background monitoring wells, up-gradient to Fermilab operations, provided samples representative of the upper Class I aquifer, for chemical and radionuclide analyses. Ten monitoring wells at the Central Utility Building (CUB) Pipe and Clay Tile Field and eight at Meson Hill were sampled as part of ongoing RCRA Facility Investigation (RFI) corrective actions at these locations. During 2006, the Meson and Neutrino Soil Activation Areas were removed from the RFI as a Solid Waste Management Unit; however, under the lab's environmental surveillance program, monitoring continues in the five wells in this region. For informational purposes, and as a courtesy, the results are reported to the IEPA annually. Additionally, seventy-eight piezometers (pore-water pressure measuring apparatus), and three site-specific monitoring wells, are employed to gather information on groundwater flow directions site-wide. These data are used in modeling the transport of potential contaminants from past and present operational areas of concern. The piezometers installed as part of the NuMI site characterization were monitored to assist Fermilab in planning for groundwater protection at that facility. One well is used to monitor for NuMI operational impacts to the Class I aquifer. Fermilab continued in 2010 to analyze groundwater associated with this project that resides within the Silurian dolomite aquifer.

Thirty of 108 on-site groundwater monitoring locations were sampled during the year for radionuclide and/or chemical parameters. The remaining locations were available exclusively for piezometric head (water level) monitoring.

5.4.1 Groundwater Characterizations

No groundwater characterizations were conducted in 2010.

5.4.2 Monitoring Well Modification and Abandonment Activities

There were no monitoring well modifications or abandonment activities during 2010.

5.4.3 Radionuclides in Groundwater

The Department of Energy groundwater concentration guide and the Illinois Class I groundwater standard for tritium is 20 pCi/ml. Thirty samples were collected from twelve locations for radionuclide analysis. Tritium and accelerator-produced radionuclides were not detected in any Class I groundwater samples during 2010.

5.4.4 Chemicals in Groundwater

In 2010, semi-annual groundwater sampling events were conducted at two Solid Waste Management Units (SWMUs). Chemical analyses were performed on these samples as required by the Resource Conservation and Recovery Act Facility Investigation (RFI). (See Section 6.12.1 RFI Activities.)

6.0 Compliance with Specific Environmental Requirements

The sections below are a summary of Fermilab compliance with key environmental requirements.

6.1 Clean Air Act

Open burn permits to allow prairie/land management burning, maintenance of Meson Hill, and fire extinguisher training were renewed by the IEPA in 2010. The annual air emissions report for 2010 was submitted to the IEPA in March 2011 and the annual radionuclide emissions report was submitted to the USEPA in June 2011.

In 2010, the annual air emissions for Criteria Air Pollutants (carbon monoxide, nitrogen oxides, particulate matter, sulfur dioxide, and volatile organic materials), were all less than 10% of the emissions allowed by Fermilab's Lifetime Operating Permit.

In 2010 an estimated 142.5 Curies were released in conjunction with the operation of the Fermilab Anti-Proton Source stack and the MiniBooNE and NuMI stacks. The magnet debonding oven, a potential source of tritium, did not operate in 2010. The CAP-88PC2 dispersion model calculated the maximum dose equivalent delivered to a member of the public (at the boundary of the lab) to be 0.0411 mrem/year due to 2010 Fermilab operations.

Fermilab is registered with the Clean Fuel Fleet Program (CFFP); one of several programs the IEPA has implemented to help improve air quality in the Chicago ozone non-attainment area.

6.2 Greenhouse Gas Emissions

40 CFR Part 98 is the Greenhouse Gas Mandatory Reporting Rule (MRR) and was originally published in October 2009. Certain source categories (of which Fermilab is not one) and facilities that emit >25,000 metric tons of carbon dioxide equivalent (CO2e) must report emissions to US EPA annually. Fermilab emitted just over 5,000 MT CO2e in 2010, and therefore was not required to report. NOTE: Emissions are calculated based on the MRR, and many of Fermilab's greenhouse gas emission sources are exempt from reporting (such as emergency back-up power generators).

In October 2009, Executive Order (EO) 13514 took effect and directed Federal agencies to account, report and reduce greenhouse gas (GHG) emissions using 2008 as the baseline year. In support of the Department of Energy's (DOE's) effort to comply, EO 13514 was added to the Fermilab contract. As a result, in 2010 efforts to collect GHG data for fiscal years 2008, 2009 and 2010 were underway. The EO requires annual reporting, and therefore so does DOE. However, since 2010 was the first reporting year, double reporting was required to submit FY2008 and FY2010 data.

There are no exempt sources for EO 13514 as in the MRR. GHGs are divided up into three categories: Scope 1, Scope 2, and Scope 3. Scope 1 emissions are direct emissions from activities directly controlled by Fermilab (boilers, emergency generators, fleet vehicles, and fugitive emissions). Scope 2 emissions are indirect emissions, and, for Fermilab, include only purchased electricity. Scope 3 emissions are other indirect emissions such as employee air travel, wastewater treatment, transmission and distribution losses, waste, ground travel, and employee commuting. Fermilab's baseline data is shown in the table below (units are metric tons of carbon dioxide equivalent).

FNAL GREENHOUSE GAS EMISSION SUMMARY - 2008

GHG Scope	Emission Source	CO2e MT
SCOPE 1	STATIONARY SOURCES	5007.75
	MOBILE COMBUSTION - CNG, Diesel	655.12
	MOBILE COMBUSTION - E85, E10, Biodiesel	649.44
	FUGITIVE EMISSIONS	36425.74
SCOPE 2	PURCHASED ELECTRICITY	418987.19
SCOPE 3	AIR TRAVEL - Employees	2215.82
	CONTRACTED WASTEWATER TREATMENT	221.72
	T&D LOSSES	14328.61
	WASTE	158.08
	GROUND TRAVEL	168.94
	COMMUTING	5016.14
TOTAL		**483,835**

DOE has set goals to reduce Scopes 1 and 2 emissions by 28% by 2020, and Scope 3 emissions by 13% by 2020. In 2010, Fermilab's total GHG emissions were 462,205 MT CO2e. The reduction is coincidental with Fermilab operations.

6.3 Underground Storage Tanks

The three Underground storage tanks (USTs) in use at Site 38 were operated and maintained per current UST standards established by the USEPA (40 CFR 280); per the Illinois State Fire Marshal (Illinois Administrative Code, Title 41, Sections 170.510(a),170.510(b), 170.450, and 170.460); and per the conditions specified in the IEPA Lifetime Operating Permit-NESHAPs. The UST tanks and system continue to be inspected on a semi-annual basis by a qualified subcontracted vendor. The inspection activity ensures that the internal and external leak detection and sensors are functioning properly. There were no compliance issues identified in 2010.

6.4 The Endangered Species Act of 1973

No compliance issues were identified in 2010.

6.5 Executive Order 11988, "Floodplain Management"

No flood plain issues were encountered during 2010.

6.6 Clean Water Act Section 404 (and Executive Order 11990, "Protection of Wetlands")

Pre-evaluation of Fermilab activities in wetlands continued to be accomplished through the NEPA and construction design review processes. The Lab continued to use task manager/construction coordinator training to instruct participants in how to ensure that potential work areas are screened for the presence of wetlands and to be aware of all aspects of environmental compliance management.

During 2010, six projects (MI-8 Expansion, ICW Sectionalization, Cryo-Module Test Facility, DWS Loop to Wilson Hall, Main Injector Neutrino Upgrade, and New Muon Expansion Project) required coverage under the NPDES General Storm Water Permit for Construction Activities. Storm Water Pollution Prevention Plans (SWPPP) were prepared and submitted to IEPA for all projects.

6.7 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

In 2010, the use of pesticides and herbicides at Fermilab was handled in accordance with FIFRA.

6.8 Illinois Department of Natural Resources "Rules for Construction and Maintenance of Dams"

Fermilab holds an Illinois Department of Natural Resources (IDNR) issued permit that classifies the Main Injector berm as a small *Class III* dam. The dam provides limited flood control to areas downstream from the Lab in the Indian Creek watershed. On a five-year cycle Fermilab is required to perform a comprehensive inspection and file a detailed report on the condition of this structure. The last comprehensive inspection was conducted in April of 2008. An inspection of the dam was conducted in April of 2010 and an "Owners Maintenance Report was transmitted to the IDNR by DOE. No non-routine action items were identified during the 2010 inspection.

6.9 The Migratory Bird Treaty Act

Fermilab possesses a permit (Class C Nuisance Wildlife Control Permit) issued by the IDNR (acting for U.S. Fish and Wildlife Service) that allows for the destruction of Canada geese nests in the vicinity of the Children's Center, if they become a safety hazard. The permit allows the Lab to destroy up to ten nests each year. During 2010, two nests containing a total of 3 eggs were destroyed.

During 2008, in response to a number of injuries due to aggressive Canada Geese, Fermilab contracted with a firm to use dogs to harass geese in order to displace them from populated areas on the site. This contract was extended during 2010, and the goose clearing activities were carried out during April and May. The firm holds a valid permit from the Illinois Department of Natural Resources to pursue the activity.

6.10 National Environmental Policy Act (NEPA)

The National Environmental Policy Act (NEPA) require federal agencies to evaluate the environmental effects of proposed federal activities and the regulations prescribe an evaluation process to ensure that the proper level of environmental review is performed before a commitment of resources is made. During 2010, Fermilab met the requirements of this Act by continuing to implement a program for reviewing all activities and this program is set forth in the *Fermilab Environment, Safety and Health Manual* (FESHM) Chapter 8060 – *National Environmental Policy Review.* Most of the reviewed activities were considered minor actions requiring no additional documentation or fit within the list of DOE preapproved categorically excluded routine maintenance activities; however, 8 projects did need to be addressed by submitting written notifications to DOE, which then formally determined that the projects were 'Categorically Excluded' (see definition below) per 10 CFR 1021 or was within the scope of a previous environmental assessment. These determinations are posted on both the ES&H Section website and the DOE Fermi Site Office website.

In addition, the ES&H Section hosted a one day 'NEPA Executive Level Training' workshop in December that was taught by an experienced and highly respected NEPA practitioner and instructor (teaches NEPA courses throughout the country for PlanIt^2) who has developed over 500 Environmental Assessments and a dozen Environmental Impact Statements for various Federal agencies. The training was well attended by Fermilab management, project managers, project engineers, environmental officers, and DOE personnel (who are the NEPA Decision makers). The training focused on the fundamentals of compliance with the NEPA, the Council on Environmental Quality Regulations for Implementing NEPA, and the DOE NEPA Implementing Regulations. This training helped to further inform and prepare the Lab regarding NEPA compliance for proposed future projects such as Long Baseline Neutrino Project, Project X, Mu2e, etc.

Categorical exclusions (CXs) are categories of actions that do not individually or cumulatively have a significant effect on the human environment and for which, therefore, neither an *Environmental Assessment* nor an *Environmental Impact Statement* is required; DOE's CXs are listed in Appendices A and B to Subpart D of its NEPA regulations found at 10 CFR Part 1021. In applying one of these CXs to a specific proposed action, DOE must determine that: (1) the proposed action fits within a class of actions listed in the regulations, (2) there are no extraordinary circumstances related to the proposal that may affect the significance of its environmental effects, and (3) the proposal is not connected to other actions with potentially significant impacts, related to other proposals with cumulatively significant actions, or an improper interim action. An Environmental Assessment is a concise public document for which a Federal agency is responsible that includes brief discussions of the need for the proposal, possible alternatives, environmental impacts of the proposal and alternatives, and a listing of agencies and persons consulted that serves to: (1) briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact; (2) aid an agency's compliance with the Act when no environmental impact statement is necessary; and (3) facilitate preparation of a statement when one is necessary.

6.11 National Historic Preservation Act (NHPA), Archaeological Resources Protection Act, Native American Graves Protection and Repatriation Act (NAGPRA) of 1990

Compliance with these Acts was accomplished through the NEPA review process that included an evaluation of all proposed land-disturbing projects in 2010 to assess any potential impacts on historic resources. No compliance issues were identified in 2010.

A DOE requested Cultural Resources Management Plan (CRMP) following guidelines outlined in DOE Publication DOE/EH-0501, was prepared and completed for Fermilab in 2002. The CRMP assures continued compliance with the above listed Acts by providing a comprehensive overview for the locations and status of all archaeological resources within the Fermilab site boundaries thereby facilitating future NEPA reviews.

Annually, a questionnaire on Federal archaeological activities is requested by the Department of the Interior. Fermilab submitted its responses in December of 2010.

6.12 National Pollutant Discharge Elimination System (NPDES)

The IEPA has issued Fermilab two National Pollutant Discharge Elimination System (NPDES) permits that were active in 2010. In addition, Fermilab holds three industrial wastewater pretreatment operating permits. The permits are as follows:

1. General NPDES Storm Water Permits for Construction Activities covers several facilities that have the same type of discharge and are located in a specific geographic area: the Domestic Water System Loop to Wilson Hall project, MINu project, Batavia Road Guardhouse, and New Muon Laboratory Expansion. During 2010, the permits for the Domestic Water System Loop to Wilson Hall project, MINu project, and the Batavia Road Guardhouse project were terminated. Additional general storm water permits were obtained for the Cryo Module Test Facility, the ICW Sectionalization project, Industrial Area Site Upgrade project, and the Feynmann Computing Center Sanitary Upgrade project.
2. Individual (specifically tailored to an individual facility) NPDES permit for combined storm water and non-contact cooling water discharges associated with industrial activities, there are six outfalls associated with this permit: Outfall 001 to Ferry Creek, Outfall 002 to Kress Creek, and Outfalls 003, 004, 005, and 006 to Indian Creek. Outfalls 004, 005 and 006 were added to the permit during the last permit renewal. Outfall 004 covers potential discharges from the MINOS pond and Outfalls 005 and 006 cover discharges from the Main Injector pond system.

3. Individual industrial wastewater pre-treatment permit that allows Fermilab to discharge wastewater effluent from operations occurring at the Central Utilities Building (CUB) to the city of Batavia sanitary sewer treatment works.

4. Individual industrial wastewater pretreatment permit that allows for wastewater from the Technical Division's Integrated Cavity Processing Apparatus in IB4 to be discharged to the City of Batavia sanitary sewer treatment works.

5. Individual industrial wastewater pretreatment permit that allows for metal finishing wastewater from the Technical Division's village operations to be discharged to the City of Naperville Reclamation Plant.

6.13 Resource Conservation and Recovery Act of 1976 (RCRA)

The Annual Hazardous Waste and Illinois Generator Non-Hazardous Special Waste Reports for 2010 were transmitted to the DOE Fermi Site Office in January and February 2011 respectively. DOE subsequently submitted these reports to IEPA.

6.13.1 Regulated Waste Disposal and Reclamation

The following volumes of regulated waste including radioactive waste, mixed waste and non-radioactive waste were managed for disposal by Fermilab's Hazard Control Technology Team (HCTT) of the Environmental Protection Group in 2010**.**

Waste Material	Cubic Meters
Non-Routine Hazardous Waste (RCRA + TSCA)	59.8
Routine Hazardous Waste (RCRA + TSCA)	7.6
Non-Routine Non-Hazardous Special Waste	0.8
Routine Non-Hazardous Special Waste	59.1
De-Classified Special Wastes	5.6
Dumpster/Landfill Waste	7,235
Radioactive Waste (DOE regulated)	104.2
Mixed Waste (Radioactive + RCRA)	0.04

In addition the following volumes of waste were generated by Fermilab and managed for reclamation by the Hazard Control Technology Team (HCTT) of the Environmental Protection Group in 2010.

Waste Material	Kilograms
Lead Acid Batteries	6,575
Mercury Containing Lamps	6,400
Used Oil	5,300
Ethylene Glycol and Water	4,517
Petroleum Based Parts Washer Solution	3,000
Non PCB Fluorescent Light Ballasts	1,387
Lead Plates	1,360
Automotive Auto Filters	408
Universal Waste Batteries	142
Mercury Containing Equipment	11

6.13.2 RCRA Facility Investigation (RFI) Activities

As a condition of Fermilab's RCRA Hazardous Waste Management Part B permit, initially issued in September 1991, the IEPA required Fermilab to undertake a RCRA Facility Investigation (RFI). The purpose of the RFI was to investigate whether hazardous constituents had been released to the environment from identified solid waste management units (SWMUs) located onsite. In addition to requiring the reporting of newly identified SWMUs, RCRA also required that IEPA be notified of any changes to previously identified SWMUs. A total of two SWMUs continue to be addressed in accordance with the corrective action requirements of Fermilab's RCRA permit: the CUB Pipe and Clay Tile Field and Meson Hill. The Meson and Neutrino Soil Activation Areas was removed from the RFI as a SWMU as part of the RCRA Part B permit renewal process. Further investigation is not required at the Village Machine Shop, the Railhead Storage Yard, or the IB2 Industrial Building so long as institutional controls remain in place.

Village Machine Shop (SWMU 5)

No new information was requested or generated at this unit during 2010.

IB2 Industrial Building

No new information was requested or generated at this unit during 2010.

CUB Pipe and Clay Tile Field (SWMU 12)

At SWMU 12, the pipes and clay tiles, along with all chromate-contaminated soil and gravel, have previously been removed. Contaminated soil was disposed of properly and the surrounding soil was sampled and analyzed. On a semi-annual frequency, Fermilab continues to sample monitoring wells installed at this unit. All ten monitoring wells at SWMU 12 were sampled during the 2nd and 4th quarters of 2010.

Meson Hill (SWMU 13)

Closure activities for Meson Hill were completed in 1998. This included moving concrete, grading, installing a clay cap and a layer of topsoil, hydro-seeding, and a site inspection. Fermilab continues sampling all monitoring wells installed at this unit on a semi-annual frequency. Analysis of groundwater from the monitoring wells screened within the upper Quaternary deposits has shown elevated concentrations of total dissolved sulfate and associated total dissolved solids above the 99% confidence level and Class II groundwater standards.

An Assessment Monitoring Plan was developed, reviewed and accepted by the IEPA in 2001 as a result of the continued monitoring results of elevated concentrations of total dissolved sulfates and associated total dissolved solids, and implemented and reported to the IEPA during 2002. The plan was developed to determine the source of the increase, concentrations and extent of sulfate migration, and assess any potential threat to human health and the environment. Results from the study indicated natural conditions were the source of the detected sulfate concentrations and that there was no potential threat to human health and the environment.

A directive was received from IEPA in August 2002 requiring the replacement of the background monitoring well at the RCRA unit. A post closure modification request was developed and forwarded to IEPA detailing the investigation, installation and sample process

for the proposed background-monitoring well. IEPA responded in January 2003 approving the post closure modification request with conditions and modifications. The new background monitoring well was installed on May 22, 2003. Sampling of this monitoring point began with the 2nd quarter 2003 semi-annual monitoring and continued through the 4th quarter 2004. New 99% confidence levels were proposed in a modification request for Fermilab's post-closure care plan during 2005. New 99% confidence levels were received from IEPA in a directive to Fermilab during 2006.

Monitoring wells at SWMU 13 were sampled during the 2nd and 4th quarters of 2010. Statistical analyses demonstrated no concentrations above the 99% confidence level during either the 2nd or 4th quarters. During 4th quarter sampling, well G101 produced a sample in which 410 mg/L of dissolved sulfate was measured. This is in excess of the Class II groundwater standard of 400 mg/L for dissolved sulfate.

Railhead Storage Yard (SWMU 14)

No information was requested or generated at this unit during 2010.

Meson and Neutrino Soil Activation Areas

This region was removed from the RFI as a SWMU during 2006 as part of the RFI Part B permit renewal. On a quarterly schedule, Fermilab continues to sample five monitoring wells in this region for accelerator-produced radionuclides. The results of samples from the Class I groundwater along with flow directions in the upper dolomite bedrock are reported annually to IEPA for informational purposes. No radionuclides above detection levels were reported from these monitoring wells during 2010

6.13 Safe Drinking Water Act

During September 2005, Fermilab discontinued the use of onsite wells for domestic drinking water and secured a connection to the City of Warrenville public water supply. Fermilab retains four private wells at three sites (Site 29 [two wells], Site 53 [Buffalo Barn], and Site56). Private wells do not require any water treatment, sampling, or reporting.

6.14 Superfund Amendments and Reauthorization Act (SARA) TITLE III or Emergency Planning and Community Right-To-Know Act of 1986 (EPCRA)

Under these regulations Fermilab is required to provide the EPA, State, and local officials with an annual accounting of hazardous, toxic, and extremely hazardous chemicals used or stored onsite in quantities greater than a given threshold. In 2010, Fermilab prepared a Toxic Chemical Release Inventory Report (TRI) for the release of copper and ethylene glycol. The report will be filed with the USEPA and IEPA in June 2011. Copper and ethylene glycol were the only chemicals that breached the reporting thresholds. Fermilab released 130,865 pounds of copper in 2010. 106,635 pounds of copper (from 49 Main Ring Magnets) were released as radioactive waste, and shipped to Energy Solutions in Clive, Utah. 24,985 pounds of copper was released as scrap metal for recycling. A very small amount of copper is released through the sanitary sewers, and this amount was also reported to EPA through the TRI report.

As required by Section 312 of SARA Title III, Fermilab submitted a Tier II Emergency and Hazardous Chemical Inventory (2010) to state and local emergency services and disaster agencies in February 2011.

6.15 Oil Spill Prevention

Fermilab's Spill Prevention Control and Countermeasures Plan (SPCC) is in compliance with 40 CFR 112 – Oil Pollution Prevention, and the upcoming final amendments to the regulation (November 2011). This US EPA regulation states that any facility that has the capacity to use or store more than 1,320 gallons of oil (petroleum,

plant or animal oils and fats) must write and implement a SPCC Plan that encompasses every oil source with the capacity of 55 gallons or more. A FESHM chapter and SPCC training for oil handling employees describe the SPCC Plan. FESHM 8031 – Oil Pollution Prevention was approved in March 2010. 180 individuals were trained in 2010. Training must be repeated annually according to the regulation.

Fermilab has more than 600,000 gallons of oil on site including more than 350 oil-filled transformers. All the Division/Section/Center Environmental Officers work to ensure the oil sources owned by their organizations are in compliance (provided with secondary containment, inspected as required, etc.). In 2010, only a few oil sources were not in compliance with the secondary containment requirements. They were three emergency back-up generators, one at each of the following locations: D0 Assembly Building, C4 Pump House, and AP50. Being more than twenty years old, these generators had single-walled diesel fuel tanks, and did not comply with the SPCC regulations. In September 2010 the fuel tanks at D0 and C4 were swapped out with double-walled tanks which comply with the regulation. The entire AP50 generator (engine and fuel tank) was scheduled for replacement at the end of 2010. The generator was eventually replaced in March 2011 and complies with the SPCC regulations.

Due to changes in oil sources (new sources as well as the generator changes mentioned above), the SPCC Plan needed to be re-certified by a Professional Engineer (PE) as meeting the requirements of the regulation (including the upcoming amendments). In the last months of 2010, a PE reviewed the new and corrected oil sources and re-certified the SPCC Plan on December 1, 2010. In January 2011 the plan was approved by the Fermilab Directorate (Chief Operating Officer and ES&H Director) and the DOE-Fermi Site Office Manager.

6.16 Toxic Substance Control Act (TSCA)

Beginning in 1993, the Accelerator Division conducted a phased cleanup of polychlorinated biphenyl (PCB)-contaminated soil resulting from past management practices at the transformer yards associated with various Tevatron service buildings. The soil cleanup activities were completed in 2002. Although the soil at all locations met the applicable cleanup standard, groundwater that had seeped into the excavations after the 2002 remedial activities at B1 and B4 service buildings was found to be above the standard for unrestricted release. Groundwater that could be collected from the excavations was properly disposed of prior to closing them. However, because some contaminated water potentially remained in the ground, these locations could not be declared “clean” at that time. Additional groundwater sampling activities conducted in July 2003 failed to detect groundwater at B1, but confirmed the presence of contamination at levels slightly above the standards at B4.

When PCB-contaminated groundwater is encountered during an owner-conducted cleanup, EPA regulations require the owner to consult with the Agency, which then decides, based upon risk, what further remediation, if any, is necessary. To obtain such a decision, Fermilab prepared a report on the results of its groundwater investigation and DOE transmitted it to the EPA on September 22, 2003. In the report, Fermilab concluded that the remaining contamination was very low-level and sufficiently localized that it did not pose any significant environmental threat. The Lab therefore, requested that the Agency classify the residual PCBs as “disposed in place.” EPA granted this request on February 23, 2010, but attached some conditions to its approval. Fermilab was required to place a notice to the deed identifying the location of the contaminated groundwater and indicating that its use is restricted. Fermilab assisted DOE-FSO in accomplishing this (completed in June). EPA’s approval also requires that the Agency be notified 10 days prior to any excavation in the vicinity of the contaminated groundwater and, if groundwater is encountered, it must be sampled, with results reported to EPA. Several internal mechanisms have been created to ensure that these requirements are met, including placing signs at the affected locations, adding the locations to the Geographic Information System, and modifying ES&H review procedures.

Accelerator Division continued its program to phase out use of PCBs when opportunities arise. Small PCB capacitors were removed from six quadrupole power supplies in the Linac. This reduced the PCB inventory by 115 pounds. Further reductions are planned.

7.0 Pollution Prevention and Waste Minimization

Fermilab continued to make progress minimizing waste prior to generation and reducing pollution in 2010. With the expanded program to recycle comingled glass, plastic and metal containers across 100% of the occupied

buildings on site. In 2010, Fermilab recycled 461 tons of material through a combination of curbside, paper, metals, batteries, and construction waste recycling. In addition, a pilot polystyrene recycling program was initiated in 2010 for three locations.

Approximately 30,125 pounds of electronics and 38,500 pounds of monitors from Fermilab, and 21,210 pounds of electronics and 26,000 pounds of monitors from Argonne National Laboratory were recycled in FY2010. Approximately another 27,100 pounds of computers were sent to DOE's computers for learning programs or otherwise re-utilized.

Permanent dumpsters dedicated to recycling construction and demolition debris were staged on site. This was done to improve the recycling of materials from small-scale construction projects. Fermilab time and materials (T&M) contractors have been directed to use these dumpsters for waste generated from projects. Approximately 57 tons of construction waste was recycled from all projects (large and small) in 2010.

Twelve new fuel efficient vehicles were added to the Fermilab fleet, one of which was gas-hybrid and eleven were E 85 fuel.

A metals moratorium issued by the Secretary of Energy in July 2000 on the recycling of scrap metals from posted radiological or radioactive materials areas remained in effect throughout 2010. Measures were continued throughout the year at Fermilab to separate materials subject to this moratorium. Due to this, materials that were considered non-radioactive according to Fermilab's DOE-approved release criteria and which had been recycled prior to the moratorium continued to be accumulated.

8.0 Metals Release Suspension

On July 13, 2000 and January 19, 2001, the Secretary of Energy established and reaffirmed a suspension on the release of scrap metal for recycling from radiological areas. This suspension was to remain in effect until department elements affected a series of improvements to the management of radiological operations, including clearance from regulatory control. To date, the suspension remains in effect. Additionally, DOE has determined that in implementing the suspension, field sites were afforded inadequate support by responsible headquarters program elements.

In 2010 the Office of Science (SC) decided to conduct evaluations at field locations under its management purview and control. In anticipation and preparation for a site evaluation by DOE of Fermilab, a tri-partite assessment was conducted in July 2010 of the scrap metal program under the management of the Business Services Section. Secured locations are used to store materials for future use, materials that are deemed to be excess to the Lab's requirements, and scrap materials pending sale or other disposition. A major component of the scope of the tri-partite assessment was to assess the impact of the continued suspension in terms of resources. The impact is primarily in terms of required storage space due to the suspension. The current space requirement in order to store approximately 6 million pounds of scrap metal is 10, 000 square feet. However, the quantity of material and space requirement continues to increase. There was one Finding related to 10 CFR 835.104 which requires that all activities that fall under Fermilab's Radiation Protection Program are formally documented. This Finding was corrected by revising a documented program. The assessment team concluded that "the scrap program is by and large very well run, and does not appear to present any hazards to Fermilab employees or the public".

In 2011, DOE Office of Science will conduct a review of the property and material clearance and management programs at various sites including Fermilab; and representatives from Fermilab will participate as an observer at one of the reviews prior to the scheduled visit of Fermilab.

9.0 Conclusion

The operations at Fermilab during 2010 had no significant adverse impact on the environment or on public safety.

[1] Details of the Fermilab Environmental Monitoring Program (FEMP) can be found on the ES&H home page.

[2] Fermilab Annual Ecological Land Management Plan can be found on the Fermilab website by clicking *About Fermilab* and following the link to the Ecological Land Management Committee under *Nature/Ecology*.

[3] 35 IAC 620

[4] 35 IAC 620.210