Report to the Director on the Fermilab Environment

Calendar Year 2012

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

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1.0 Introduction

The purpose of this report is to document Fermilab's active environmental protection program and its performance in 2012. Fermilab evaluates and manages the environmental impacts of site operations by using an Environmental Management System (EMS). Since 2007, the Laboratory has maintained registration for the EMS to International Standards Organization (ISO) 14001 requirements. 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 certain 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. 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 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 the Department of Energy (DOE) has developed a Strategic Sustainability Performance Plan (SSPP) to describe its approach to meeting goals outlined in the Executive Order. The GHG emission reduction goals have long term targets that mature in 2020, with other related goals having shorter time frames.

In 2010 Fermilab first developed a Site Sustainability Plan (SSP). This plan outlines Laboratory initiatives that assist the DOE in meeting its goals in the SSPP. DOE requires that the SSP be updated annually. In 2012 Fermilab updated its plan. A summary of plan highlights is presented in Section 4.0, Sustainability. Additionally details of Fermilab's GHG inventory are presented in section 7.2, Greenhouse Gas Emissions.

Tritium Discharges

The generation of tritium is an expected outcome of operating the accelerator complex and it has been monitored throughout the history of the laboratory. In 2005 measureable tritium was detected for the first time in surface water discharges from the site at the permitted outfall locations (specifically Indian Creek). Additionally Fermilab monitors the sanitary effluent discharged from the site to the municipal waste water treatment plants of Batavia and Warrenville/Naperville for tritium. Fermilab began observing consistent measurable concentrations of tritium in the discharge to Batavia in 2005. From 2006 through 2009 tritium was observed intermittently just above the detection limit of 1 pCi/ml. Beginning in 2010, consistent tritium concentrations again were observed in the discharge and levels began to rise. Levels have fluctuated in 2012 between 5-8 pCi/ml.

In response to the persistence of observable tritium and the expectation that future operations will generate additional tritium, the Fermilab Director formed a Tritium Working Group in July 2012. The charge to the working group consisted of four primary tasks: 1) identification of tritium sources at Fermilab, with particular

attention to those that could lead to tritium within the sanitary sewers; 2) projection of tritium sources into the upcoming era in which beam power delivered to the neutrino production targets will rise from the current 400 kW to 700 kW in the current decade and 2300 kW in the decade of 2020; 3) preparation and execution of a public communications plan; and 4) establishment of longer term goals for tritium concentration in surface and sanitary sewer waters, and accompanying mitigation strategies and monitoring programs.

Progress was made during 2012 on these tasks. Most notably a significant source to the sewer system was identified and mitigative measures were undertaken. A report summarizing activities from the task force will be issued in 2013. Monitoring for radioactivity in water systems continues to be a significant component of Fermilab's routine environmental surveillance program. Additional information concerning levels of tritium is posted at a web link from the Laboratory's home page.

3.0 Ecological Issues

The Laboratory's Ecological Land Management Plan was implemented during 2012. 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 2012, 27 complaints were received, resulting in the transfer and re-release of 4 animals on site. Two animals were 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 2012, 46 whitetail deer were removed.

4.0 Sustainability

Fermilab is committed to minimizing the environmental impact of site operations. In response to goals established by the Department of Energy to improve its environmental footprint, the Laboratory has developed a Site Sustainability Plan that documents Fermilab's contribution towards meeting departmental goals. The primary emphasis of the plan is on the reduction of greenhouse gas emissions. The plan also addresses more broad ranging goals that include operating buildings more efficiently, reducing water consumption, reduced fossil fuel consumption for vehicle fleets and improved power efficiency of computer data centers. An outline of the primary goals and Fermilab's status in 2012 is provided below.

DOE / Office of Science Goal	Fermilab Performance Status	Planned Actions & Contribution
Greenhouse Gas Reduction and Comprehensive Greenhouse Gas Inventory		
Energy Intensity Reduction 30% by FY 2015 from FY 2003 baseline	Exceeded goal	Use new energy savings performance contracts (ESPC)
7.5% of annual electricity consumption from renewable sources by FY 2013 and thereafter (5% FY 2010 – 2012)	Exceeded goal	Must use credit for RECs to meet this goal while investigating renewables with ESPC
SF_6 Reduction	>75% reduction from baseline year	Reduce remaining inventory Employ recovery practices

DOE / Office of Science Goal	Fermilab Performance Status	Planned Actions & Contribution
Individual buildings metering for 90% of electricity (by October 1, 2012); for 90% of steam, natural gas, and chilled water (recommended) (by October 1, 2015.)	Electric metering dropped to 82.8% with the Tevatron shutdown & new project delays	Will exceed 90% of electricity again with new project facilities and ESPC
Cool roofs, unless uneconomical, for roof replacements unless project already has CD-2 approval. New roofs must have thermal resistance of at least R-30.	9,989 square feet new cool roof retro-fit	Continue program
Training	Met goal for site energy manager	Certified Energy Manager
Net Zero energy in new or major renovation facilities	Not implemented	Use Renewable Energy Certificates (RECs) to offset future carbon deficits
Evaluate 25% of 75% of Facility Energy Use over 4-Year Cycle	Exceeded the DOE goal for the last 4-Year Cycle	Use ESPC PAs
13% Scope 3 GHG energy intensity reduction by FY 2020 from a FY 2008 baseline	Met goal for T&D losses using RECs	Must use credit for RECs to meet T&D portion of this goal
28% Scope 1 & 2 GHG Reduction by FY 2020 from a FY 2008 baseline	59% reduction in FY2012 due to Accelerator shutdown	Use RECs to meet this goal after shutdown ends in FY2014
Buildings HPSB, ESPC Initiative, Regional and Local Planning		
15% of existing buildings greater than 5,000 gross square feet (gsf) are compliant with the Guiding Principles (GPs) for HPSB by FY 2015	No compliant buildings as of FY12	Commitment to achieve at least 4 buildings by 2015
All new construction, major renovations, and alterations of buildings greater than 5,000 gsf must comply with GPs	OTE building designed to LEED-NC Gold	Apply Guiding Principles as far as possible for industrial facilities
ESPC Initiative	Implementing a new ESPC	Continue to develop new ESPC initiative
Regional & Local Planning	Fully engaged with communities	Continue our programs
Fleet Management		
10% annual increase in fleet alternative fuel consumption by FY 2015 relative to a FY 2005 baseline	77% increase in 7 years	Continue toward a goal of 100%
2% annual reduction in fleet petroleum consumption by FY 2020 relative to a FY 2005 baseline	Reduced by 10% from 2011; 52% from baseline year	Continue to replace petroleum fueled vehicles
75% of light duty vehicle purchases must consist of alternative fuel vehicles (AFV) by FY 2000 and thereafter	100% in FY2012	Continue to seek AFVs

DOE / Office of Science Goal	Fermilab Performance Status	Planned Actions & Contribution
Submit Right-Sizing the Fleet Management Plan for approval by Dec 31, 2012 .Identify mission critical/non-mission critical vehicles by Dec 31, 2012	Draft Plan submitted as of 12/14/2012 35% goal reached	Continue scrutiny of vehicles and usage
Water Use Efficiency and Management		
26% water intensity reduction by FY 2020 from a FY 2007 baseline	Exceeded goal	Maintain less usage than 2020 goal
20% water consumption reduction of industrial, landscaping, and agricultural (ILA) water by FY 2020 from a FY 2010 baseline	Used 13.5% more than the baseline year	Use ESPC to investigate pumping more storm water
Pollution Prevention and Waste Reduction		
Divert at least 50% of non-hazardous solid waste, excluding construction and demolition debris, by FY 2015	63.3% for FY2012	Continue robust programs
Divert at least 50% of construction and demolition (C&D) materials and debris by FY 2015	91% for FY2012	Continue C&D Waste Recycling program
Sustainable Acquisition		
Procurements meet sustainability requirements and include sustainable acquisition clause (95% each year)	Implementing new sub-contract terms, design guides, specs	Continue to develop programs
Electronic Stewardship and Data Centers		
All data centers are metered to measure a monthly PUE (100% by FY 2015)	Goal is met	Continue measurements
Maximum annual weighted average Power Utilization Effectiveness (PUE) of 1.4 by FY 2015	Current PUE between 1.4 and 1.7	Plans underway to improve efficiency
Electronic Stewardship - 100% of eligible PCs, laptops, and monitors with power management actively implemented and in use by FY 2012	80% compliant	Continue replacing operating systems to allow active PM
Agency Innovation & Government-Wide Support		
Site Innovation and Government-Wide Support	No such research supported at HEP Lab	Unfunded or informal measures

5.0 Environmental Management System (EMS)

Fermilab recognizes the importance of maintaining an Environmental Management System (EMS). The EMS is the organizational framework that enables Fermilab to minimize its environmental impacts. The system functions via an ongoing cycle that focuses on planning, implementing, evaluating and improving environmental performance. This process is used to continuously focus on the environmental aspects of Laboratory operations to ensure compliance with regulations and to demonstrate that the Laboratory is functioning in an environmentally responsible manner. In addition, the elements of the EMS have been coordinated with the principles of Fermilab's ESH&Q Management System to form a combined 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 completed a comprehensive third party audit of the entire facility and became re-registered to the standard 14001 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. In 2012,audits were performed on Accelerator Division and the Computing Sector in February, and WDRS and FESS in August.

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 where change is desired or required, goals are established with measureable targets that seek to improve a particular aspect of operations. The goals outlined in our Site Sustainably Plan document areas of significant emphasis where the Laboratory is pursuing change. Additionally, goals that fall outside of the scope of the Sustainability Plan may be documented in specific Environmental Management Initiatives.

6.0 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 ESH&Q Section, provides more details.

6.1 Air Quality

Fermilab is not a significant source of chemical air pollution. For most of 2012 the facility operated under a Lifetime Operating Air Pollution permit issued by the Illinois Environmental Protection Agency (IEPA) under the Clean Air Act. The permit took 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. The permit also includes a National Emissions Standards for Hazardous Air Pollutants or NESHAPs element for airborne radionuclides. In August 2012, IEPA confirmed that Fermilab's application was accepted in the Registration of Smaller Sources (ROSS) Program. This is a new program from IEPA and is available to facilities that emit only minor sources of pollution.

6.1.1 Radioactive Air Emissions

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 and in design efforts for new projects. 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 88PC3). 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.

In 2012 the accelerators and the experiments operated only during the first quarter of the calendar year. Operation of the debonding oven, when radioactive components are being burned, is a potential source of tritium. In 2012 the debonding oven burned fourteen radioactive cones, removed from the Booster Radio-Frequency (RF) Cavities. The Muon-Ring (formerly the Anti-Proton Area) stack, used in occasional muon production tests, Main Injector, and the MiniBooNE and NuMI stacks are estimated to have released a total of approximately 52.2 Curies in 2012. These radioactive air emissions were approximately 2.6% 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 2012 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-88PC3 Gaussian dispersion model, the highest dose equivalent to any member of the public was estimated to be 0.0104 mrem.

Fermilab's 2012 Radionuclide Air Emissions Annual Report was submitted to the DOE FSO in May 2013. The report is distributed by the DOE FSO to the USEPA and IEPA.

6.1.2 Non-Radioactive Air Emissions

In 2012 IEPA transitioned Fermilab from a Lifetime Operating Permit to the ROSS program. The ROSS program is available to facilities such as Fermilab that emit air pollution in minor amounts. Even though Fermilab no longer operates under the Lifetime Operating Permit it continues to monitor the sources named under this permit. Managing the sources according to the former permit allows Fermilab to demonstrate compliance with the conditions under the ROSS program. This also allows for continuity in the event that Fermilab returns to a permitted source. The sources Fermilab continues to monitor include the following:

1. Magnet debonding oven;
2. One 15 mmBTU and one 11.55 mmBTU natural gas-fired boilers at the Central Utility Building (CUB);
3. One 12,000-gallon gasoline storage tank with a stage 1 and stage 2 vapor balance system;
4. Various radionuclide emission stacks;
5. 2,200 horsepower standby diesel generator;
6. MIPP gas circulating systems Cavity Processing Lab (CPL).

6.2 Penetrating Radiation

Operation of the Fermilab accelerator and associated beamlines produces 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. Only the Meson Test beamline (MTest) and Neutrino Muon beamline (E906) operated in a limited configuration in 2012. The maximum muon dose offsite due to the operation of MTest and E-906 was 0.026 mrems. 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 2012 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 2012, it is estimated that radioactive materials stored at the Railhead contributed no directly measureable equivalent dose at the site boundary in 2012. The maximum penetrating radiation equivalent dose in 2012 to an individual at the nearest offsite house was thus estimated to be less than 0.026 mrems, and not directly measureable.

6.3 Surface Water Quality

Fermilab releases minor amounts of contaminants to surface water bodies. To manage these discharges the laboratory holds National Pollutant Discharge Elimination System (NPDES) permits that govern releases to surface water from stormwater runoff, cooling water, effluents from various onsite construction projects, and pesticide applications. 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 described in the Fermilab Environment, Safety, and Health Manual Chapter 8025.

6.3.1 Cooling Water System

Fermilab requires large amounts of non-contact cooling water that is circulated through various surface water bodies to evaporate heat. Fermilab's individual site specific NPDES permit authorizes the treatment of the Industrial Cooling Water system (ICW) and the discharge of commingled cooling water and storm water runoff to surface waters through outfalls to Kress, Indian and Ferry Creeks. The outfalls are points that designate the location at which cooling water becomes Waters of the State. The Storm Water Pollution Prevention Plan required by this NPDES permit covers storm water discharges into cooling waters from designated solid waste management units (SWMUs), industrial activity areas, and services support areas. (Also see Section 7.12 National Pollutant Discharge Elimination System.)

In 2012 Fermilab contracted a state-licensed applicator to treat a limited number of cooling ponds for algae and pond weeds by applying herbicide. An ongoing zebra mussel infestation of the industrial cooling water system pipes and pumping infrastructure was managed by FESS using a continuous feed of NaClO (sodium hypochlorite) solution at the Casey's Pond intake to the ICW system.

6.3.2 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 2012 there were no exceedances of discharge limits to Waters of the State.

6.3.3 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 2012 Fermilab continued to discharge measureable concentrations of tritium to surface waters off site. The concentrations measured were well below the DOE Order 458.1 Derived Concentration Standard of 1,900 pCi/ml. Releases depend on pond levels and the operational mode of the accelerator complex. Fermilab's site specific NPDES permit includes monitoring requirements for tritium at all six outfalls. Monthly data from measurements taken at site boundary locations are made available through Fermilab's Tritium Website (see Section 2). Monitoring for radioactivity in surface water continues to be a primary component of Fermilab's routine environmental surveillance program.

6.3.4 Releases to Sanitary Sewers

Fermilab maintains an onsite piping system for the conveyance of sanitary effluent. Collected effluent is directed to the cities of Batavia and Warrenville/Naperville for treatment. In addition Fermilab operates three systems that require pretreatment prior to release to the sewers. These operations require wastewater pretreatment permits issued by IEPA. The permits are as follows.

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

2. 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.

3. 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. Discharges covered under this permit have not occurred since the permit was issued in 2011.

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 for metals are compared to municipal discharge limits to track compliance. Fermilab exceeded the limits for iron released to both Batavia and Warrenville. Aging pipes are suspected to be the source of the occasional exceedances. These exceedances have been discussed with the municipalities.

Low levels of tritium have been detected in effluent discharged to the Batavia treatment works since August 2005. All discharges in 2012 were well below DOE Order 458.1 Derived Concentration Standards (total tritium 5 curies, concentration less than 9,500 pCi/ml) and are summarized below. No other isotopes were detected.

Total Tritium	**0.445 Curies**
Average Concentration	4.6 pCi/ml
Highest Concentration	6.8 pCi/ml
Total Sanitary Volume	25,511 kGal

In 2012 a focused effort was undertaken by the Tritium Working Group (see Section 2.0) to identify tritium sources discharging to the Batavia sanitary sewer system. These efforts resulted in the identification of a previously unidentified source that contributed a constant supply of ICW water containing tritium to the sewers at the Central Utilities Building. A plan was implemented in late fall to reroute this source away from the sewers. Testing continues to determine the impact of these changes to the system.

6.4 Groundwater Quality

The Illinois Environmental Protection Agency (IEPA) publishes groundwater quality standards (35 IAC 620) 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 80 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 (35 IAC 620.210). Water in the Quaternary deposits overlying the Batestown has been demonstrated to be Class II water requiring less-stringent standards.

In 2012 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 2012 to analyze groundwater associated with this project that resides within the Silurian dolomite aquifer.

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

6.4.1 Groundwater Characterizations

No groundwater characterizations were conducted in 2012.

6.4.2 Monitoring Well Modification and Abandonment Activities

There were no monitoring well modifications or abandonment activities during 2012.

6.4.3 Radionuclides in Groundwater

U.S. Department of Energy policy on groundwater protection as expressed in DOE O458.1 is consistent with the Illinois Class I groundwater standard of 20 pCi/ml. Twenty six samples were collected from ten locations for radionuclide analysis. Tritium and accelerator-produced radionuclides were not detected in any Class I groundwater samples during 2012.

6.4.4 Chemicals in Groundwater

In 2012, 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 7.13.2 RFI Activities.)

7.0 Compliance with Specific Environmental Requirements

The following sections are a summary of Fermilab's compliance with key environmental requirements.

7.1 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 2012. The annual air emissions report for 2012 was not required due to Fermilab changing to a ROSS source. The annual radionuclide emissions report was submitted to the USEPA in June 2013.

In 2012 the actual annual air emissions for Criteria Air Pollutants (carbon monoxide, nitrogen oxides, particulate matter, sulfur dioxide, and volatile organic materials), were 2.13 tons per year, less than half of the maximum allowed for a ROSS site.

In 2012 an estimated 52.2 Curies were released from the Fermilab Anti-Proton Source stack and the MiniBooNE and NuMI stacks. The magnet debonding oven, a potential source of tritium, only operated in October 2012. 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 0.0104 mrem/year in 2012.

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.

In 2012 Fermilab did not exceed reporting thresholds under the U.S EPA's Mandatory Greenhouse Gas Reporting Rule.

7.2 Greenhouse Gas Emissions Reporting under Executive Order 13514

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, GHG data for fiscal year 2012 was collected and submitted to DOE via the Consolidated Energy Data Report. GHGs are divided up into three categories: Scope 1, 2, and 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, electrical transmission and distribution losses, waste, ground travel, and employee commuting. Fermilab's baseline data is shown in Table 1 and 2012 data in Table 2 below (units are metric tons of carbon dioxide equivalent).

TABLE 1: GREENHOUSE GAS EMISSION SUMMARY – 2008 (baseline)

GHG Scope	Emission Source	CO2e MT
SCOPE 1	STATIONARY SOURCES	5007.75
	MOBILE COMBUSTION	721.78
	FUGITIVE EMISSIONS	36425.74
SCOPE 2	PURCHASED ELECTRICITY	418987.19
SCOPE 3	AIR TRAVEL - Employees	2188.739
	CONTRACTED WASTEWATER TREATMENT	4.78
	T&D LOSSES	7564.07
	WASTE	202.99
	GROUND TRAVEL	168.94
	COMMUTING	4633.31
TOTAL		**475,905**

TABLE 2: GREENHOUSE GAS EMISSION SUMMARY - 2012

GHG Scope	Emission Source	CO2e MT
SCOPE 1	STATIONARY SOURCES	4319.64
	MOBILE COMBUSTION	470.47
	FUGITIVE EMISSIONS	4061.459
SCOPE 2	PURCHASED ELECTRICITY	177268.4
SCOPE 3	AIR TRAVEL - Employees	2395.00
	CONTRACTED WASTEWATER TREATMENT	4.408
	T&D LOSSES	4149.58
	WASTE	192.68
	GROUND TRAVEL	179.49
	COMMUTING	4286.12
TOTAL		**197,327**

Fermilab is committed to assist DOE in meeting reduction goals of 28% for Scopes 1 and 2, and 13% for Scope 3 by 2020. Fermilab intends to use renewable energy certificates based on our purchased power consumption as a primary mechanism to reduce Scope 2 emissions. In 2012, Fermilab's total GHG emissions were 197,327 MT CO2e. The reduction in 2012 is partially a result of Fermilab's upgrade and maintenance operational shutdown.

7.3 Underground Storage Tanks

The three underground storage tanks (USTs) in use at Site 38 Fuel Dispensing Facility were operated and maintained per current UST standards established by the USEPA (40 CFR 280); per the Illinois Office of the State Fire Marshal (OSFM Illinois Administrative Code, Title 41, Sections 170.510(a), 170.510(b), 170.450, 170.460; and 176); and per the conditions specified in the IEPA Lifetime Operating Permit-NESHAPs. There were two new requirements for the operations of the facility. The OSFM adopted requirements for the training and certification of fuel dispensing operators and the EPA and OSFM issued clarification regarding the compatibility requirements of UST systems storing ethanol-blended fuels and biobased fuels. Fermilab complied with the new requirements by having the operators complete the required training/certification and by obtaining documents that demonstrate that the UST system is compatible with the type of fuels that are stored and dispensed. Compliance inspections were not conducted in 2012 by the US EPA or the Illinois Office of the State Fire Marshall. The UST system continues 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 2012.

7.4 The Endangered Species Act of 1973

No compliance issues were identified in 2012.

7.5 Executive Order 11988, "Floodplain Management"

No flood plain issues were encountered during 2012.

7.6 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.

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

In 2012, the use of pesticides and herbicides at Fermilab were handled in accordance with FIFRA. Fermilab adheres to the principles of Integrated Pest Management in order to minimize pollution and adverse environmental impacts

7.8 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 2012 and an "Owners Maintenance Report was transmitted to the IDNR by DOE. No non-routine action items were identified during the 2012 inspection.

7.9 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 goose nests if they become a safety hazard. The permit allows the Lab to destroy up to ten nests each year. During 2012, only one nest containing a total of 6 eggs was destroyed.

Fermilab maintains a contract 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 2012, and the goose clearing activities were carried out during March and April. The firm holds a valid permit from the Illinois Department of Natural Resources to pursue the activity.

7.10 National Environmental Policy Act (NEPA)

The National Environmental Policy Act (NEPA) requires federal agencies to evaluate their proposed actions to determine the potential effects on the quality of the human environment, which includes many different aspects of the natural environment, the built environment, and human health (see examples below).

Natural environment

- water resources
- air quality
- biological resources
- soils, geology, and mineral resources
- visual, scenic, or aesthetic resources

Built environment

- traffic and transportation
- noise
- historic and cultural resources
- land use conflicts
- agricultural resources
- population and housing impacts
- recreation
- utilities and public services

Human health

- risk of damage from natural disasters
- risk of exposure to hazardous materials, wastes, and activities
- risk of contracting diseases

In addition, the Council on Environmental Quality and DOE NEPA regulations as well as DOE Order 451.1 prescribe an evaluation process to ensure that the proper level of review is performed before a commitment of resources is made. During 2012, Fermilab met the NEPA requirements by continuing to implement a program to review all proposed activities and evaluate their potential effects; 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 administrative actions requiring no formal documentation (found in 10 CFR 1021 Appendix A) or those fitting within the list of DOE preapproved Fermilab site wide categorically excluded routine maintenance activities. However, five projects/actions did need to be addressed by submitting environmental evaluation notification forms to DOE; DOE then formally determined that four of the projects were 'Categorically Excluded' (see definition below) per 10 CFR 1021 Appendix B or were within the scope of a previous environmental assessment. The fifth project, the Long Baseline Neutrino Experiment (LBNE), was determined to require an Environmental Assessment. These determinations are posted on the DOE Fermi Site Office website.

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 (EA)* 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. An EA is conducted to determine whether the proposed Federal action would have a significant effect. An *Environmental Impact Statement*, which is a detailed public document, is necessary for those actions which are assumed to significantly affect the human environment.

7.11 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 2012 to assess any potential impacts on historic resources. No compliance issues were identified in 2012.

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 February of 2013.

7.12 National Pollutant Discharge Elimination System (NPDES)

The IEPA has issued Fermilab three National Pollutant Discharge Elimination System (NPDES) permits that were active in 2012. In addition, Fermilab holds three industrial wastewater pretreatment operating permits

issued by IEPA (also covered under NPDES regulations and are described under Releases to Sanitary Sewers). The permits are listed below.

1. Illinois General NPDES Storm Water Permit for Construction Activities is required for all projects that disturb greater than one acre. In 2012 there were ten projects requiring such a permit to be in place:

    - New Muon Lab Expansion*
    - MI-8 Expansion*
    - Cryo-module Test Facility (CMTF)*
    - ICW Sectionalization Project*
    - FCC and IASU Sanitary Sewer Project*
    - A1 to CDF Paving Project*
    - NoVA Near Detector
    - Liquid Argon Test Facility
    - Muon Campus Project
    - OTE IARC Building

    The permits indicated by an asterisk have been terminated. The projects without an asterisk received their permits in CY2012.

2. An individual (specifically tailored to an individual facility) NPDES permit covers combined storm water and non-contact cooling water discharges associated with industrial activities. Six outfalls are 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. 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. A new permit is expected to be issued in 2013 from the IEPA.

3. Illinois NPDES General Permit for Pesticide Application Point Source Discharges covers pesticide applications performed by Fermilab personnel. This includes any algae or weed control applications near ditches or ponds. This is a new permit for the IEPA and Fermilab received coverage in July 2012.

7.13 Resource Conservation and Recovery Act of 1976 (RCRA)

The Annual Hazardous Waste Report for 2012 was transmitted to the DOE Fermi Site Office in February 2013. DOE subsequently submitted the report to the IEPA.

7.13.1 Regulated Waste Disposal and Reclamation

The following volumes of regulated waste including radioactive waste and non-radioactive waste were managed for disposal by Fermilab's Hazard Control Technology Team (HCTT) in 2012.

Waste Material	Cubic Meters
Non-Routine Hazardous Waste (RCRA + TSCA)	6.2
Routine Hazardous Waste (RCRA + TSCA)	10.4
Non-Routine Non-Hazardous Special Waste	4.3
Routine Non-Hazardous Special Waste	9.9
De-Classified Special Wastes	10.4
Dumpster/Landfill Waste	6,708
Radioactive Waste (DOE regulated)	103.6

In addition the following volumes of waste were generated by Fermilab and managed for reclamation by the HCTT 2012.

Waste Material	Kilograms
Lead Acid Batteries	7,297
Mercury Containing Lamps	7,767
Used Oil	16,380
Ethylene Glycol and Water	2,854
Petroleum Based Parts Washer Solution	1,981
Non PCB Fluorescent Light Ballasts	964
Automotive Auto Filters	340
Universal Waste Batteries	226
Mercury Containing Equipment	18
Propylene Glycol and Water	208
Propane Torch Cylinders	5
Transformer Bushings PCB Contaminated	5,439
Transformer Bushings NON PCB	3,532

7.13.2 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 as long as institutional controls remain in place.

Village Machine Shop (SWMU 5)

No new information was requested or generated at this unit during 2012.

IB2 Industrial Building

No new information was requested or generated at this unit during 2012.

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 2012.

Glacial deposit wells MWS2, MWS3, and MWD1 produced 2nd quarter total chloride results of 80 mg/L, 184 mg/L, and 760 mg/L, respectively. The same three wells produced no 4th quarter total chloride because all of the wells were dry. The Class II Groundwater Quality Standard is 200 mg/L.

Bedrock wells MW6B and MW7B produced 2nd quarter total lead results of 0.010 mg/L and 0.012 mg/L, respectively, and during the 4th quarter, MW6B and MW7B had total lead concentrations of 0.008 mg/L and 0.015 mg/L, respectively. The Class I Groundwater Quality Standard is 0.0075 mg/L.

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. All ten of the monitoring wells at SWMU 13 were sampled during the 2nd and 4th quarters of 2012.

Statistical analyses demonstrated concentrations above the 99% Upper Confidence Limits during the 2nd quarter sampling, well G103 and G108 (background) produced a dissolved N-Ammonia concentration of 0.23 mg/L and 0.23 mg/L respectively. During 4th quarter sampling, wells G101, G102, G105 and G108 produced dissolved N-Ammonia concentrations of 0.22, 1.14, 2.18 and 1.56 mg/L respectively. These are in excess of the 99% Upper Confidence Limit of 0.19 mg/L. The elevated concentration is attributed to agricultural activities. Additionally, during the 2nd quarter well G107 sample had a dissolved chloride concentration of 293 mg/L. This concentration exceeds the Class II Groundwater Standard of 200 mg/L. Road-salt is the accepted origin.

Railhead Storage Yard (SWMU 14)

No information was requested or generated at this unit during 2012.

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 2012.

7.14 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 Site 56 [Horse Barn]). Private wells do not require any water treatment or sampling. Estimates of water withdrawn from these wells are reported annually to the Illinois State Water Survey.

7.15 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 their respective reporting thresholds as defined in SARA Title III Section 313. Since Fermilab did not exceed any reporting threshold for CY2012, a Toxic Chemical Release Inventory (EPA Form R) was not submitted for Calendar Year 2012.

As required by Section 312 of SARA Title III, Fermilab submitted a Tier II Emergency and Hazardous Chemical Inventory (2012) to state and local emergency services and disaster agencies in February 2013.

7.16 Oil Spill Prevention

Fermilab's Spill Prevention Control and Countermeasures (SPCC) Plan is in compliance with 40 CFR 112 – Oil Pollution Prevention. This US EPA-enforced 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. Training must be repeated annually according to the regulation. Online refresher training was developed and implemented in 2011.

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.).

Due to changes in oil sources, the SPCC Plan needed to be re-certified by a Professional Engineer as meeting the requirements of the regulation. The P.E. certification occurred in July 2012, and was approved by the Fermilab Directorate (Chief Operating Officer and ESH&Q Director) and the DOE-Fermi Site Office Manager the same month. Facilities Engineering Services Section provided the P.E. certification

7.17 Toxic Substance Control Act (TSCA)

As required by the TSCA regulations, 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 in June of 2010. 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 ESH&Q review procedures.

During the shutdown in 2012, Accelerator Division continued its program to phase out the use of PCBs, when opportunities arise. Several small PCB capacitors were removed from Linac quadrupole power supplies and Booster modulators and were replaced with non-PCB capacitors. This reduced the PCB inventory by 1663 pounds. Further reductions are planned.

8.0 Pollution Prevention and Waste Minimization

Fermilab continues to make progress minimizing waste prior to generation and reducing pollution. In 2012, Fermilab recycled 413 tons of material through a combination of office/ residential type recycling and Business Services Section recycling of scrap metals, wood, tires, etc., 63% of waste diverted to recycling. This number does not include electronics. Fermilab recycles or donates for reuse, 100% of used computer equipment. Approximately 2,582 pieces of computing and electronic equipment including servers, printers, laptops, monitors, cellphones, PDAs, TVs etc. were recycled in 2012. Another 693 were donated for reuse through DOE’s Computers For Learning program. Waste numbers are tracked for the DOE’s Pollution Prevention Tracking and Reporting System database.

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 184 tons of construction waste (91% of the waste generated) was recycled from T&M and FESS projects (large and small) in 2012..

Other notable pollution prevention measures include:

- Some of the surrounding municipalities dispose of their fall leaf refuse on Fermilab's agricultural fields. In 2012, 15,000 cubic yards (roughly 750 tons) were spread on the fields as a soil amendment after composting.

- It is common practice at Fermilab for project engineers, technicians, and physicists to reuse or reconfigure old equipment for new experiments. In 2012, Accelerator Division reused 193 metric tons of steel, copper, iron, aluminum, concrete and wood for new purposes. The Superconducting Radiofrequency Test Facility contains about 75% reused equipment (estimated $28 million value). Fermilab also works with other laboratories and agencies to obtain or release items.

- Computers that are connected to the Fermilab network have been set to default duplex printing.

- ESH&Q's Hazard Control Technology Team have replaced most of Fermilab's traditional parts washers with a greener alternative called Bio-Circle, decreasing solvent waste and costs for disposal.

9.0 Metals Release Suspension

In 2011, the DOE Office of Science reviewed the materials and radiological clearance operations at Fermilab. The review was intended to evaluate how Fermilab has implemented the Secretarial policies and review what improvements were made within the recycling program since the suspension went into effect. The overall goal of the review was to determine if Fermilab could make adjustments in its current practices that improve the management of scrap metal, while maintaining compliance with the suspension. The review team found that Fermilab is in compliance with DOE policy relating to the Secretarial mandates dealing with the suspension on metals recycling, and provided Fermilab with a number of helpful recommendations to improve management of the scrap metal program. Fermilab, with concurrence from the Site Office, has instituted a corrective action plan that addressed the recommendations of the team. Fermilab continued to operate its metals recycling program in accordance with DOE policy and regulatory requirements during CY 2012.

10.0 Conclusion

The operations at Fermilab during 2012 had no significant adverse impact on the environment or on public safety.