FERMILAB

Report to the Director on the Fermilab Environment

CY1999 Final

1.0 Introduction

Monitoring and surveillance are critical elements of an effective environmental protection program. Fermilab has established and implemented comprehensive environmental monitoring and surveillance programs[1] to ensure compliance with legal and regulatory requirements imposed by Federal, State and local agencies and to provide for the measurement and interpretation of the impact of Fermilab operations on the public and the environment. The surveillance and monitoring activities are selected to be responsive to both routine and unplanned releases of penetrating radiation and liquid or airborne effluents. The location and frequency of sampling are based on established routines, operational considerations and historic levels of pollutants found in each location. Sampling points are selected based on potential for adverse impacts.

To evaluate the effects of Fermilab operations on the environment, 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. The status of environmental protection activities and the progress on environmental restoration, waste management and corrective action activities are discussed in this report. There were no abnormal occurrences that had an impact on the public, the environment, the facility or its operation in CY1999[2].

2.0 1999 Laboratory Highlights

The Fermilab Main Injector (FMI) was dedicated on June 1, 1999. Beam was again delivered to the MT, MC and KTeV beamlines beginning in mid-June. The 800 GeV fixed target program at Fermilab drew to a close in January 2000. Michael Witherell became Fermilab's fourth director in July 1999. Construction of the MiniBooNE detector facility began in October 1999. Site preparation for the NuMI project was completed in November 1999.

2.1 Significant Environmental Accomplishments

Fermilab was honored with a 1999 DOE Energy Management Award for the Laboratory's efforts to enhance energy management and efficiency. These efforts included the upgrading of the centralized cooling system. This new system, installed in April 1999, is expected to use about 60% of the energy required by the previous system and is also free of ozone-depleting chlorofluorocarbons (CFCs). Fermilab was one of the first DOE sites to comply with the DOE directive to replace all pre-1984 chillers using Class I CFCs such as R-11.

The U.S. Department of Agriculture Wildlife Service group conducted deer removals at Fermilab from November 1998 until March 1999, bringing the herd closer to the target population density of 10 animals

per square mile. The ensuing growing season showed some plant species to be more noticeably abundant. Browse lines have become less defined than in years past. Deer management activities were also carried out during the last quarter of 1999.

The Fermilab Environmental Protection Subcommittee and the ES&H Section developed a system of peer reviews in the distribution of funds earmarked for waste minimization efforts. Projects awarded funding included the replacement of existing fixtures with low mercury lamps, the refurbishment of used magnets from the Fixed Target Areas for use in the MiniBooNE experiment and more than 200 chambers from the CDF hall.

An Environmental Assessment was approved and a Finding of No Significant Impact (FONSI) was issued April 1999 for the MiniBooNE experiment.

The Corp of Engineers (COE) approved the completion of the Fermilab Main Injector Wetland Mitigation Area project, which included a plan to install shallow piezometers to monitor the water table.

Heightened construction activity brought an ES&H focus on erosion control measures. The ES&H Section has provided regular environmental oversight for the larger onsite construction projects and has assisted in task manager and contractor training on soil erosion control.

Fermilab's sitewide and open burning air pollution permits were renewed. The sitewide NPDES permit that covers discharges to surface water was reissued and a new NPDES permit was obtained from the IEPA to allow the construction of the NuMI tunnel. Plans to control soil erosion during the construction of NuMI and MiniBooNE were developed and are being implemented.

Significant improvements were made to the groundwater monitoring program in 1999. A number of new monitoring wells and piezometers were installed based on findings of the shielding assessments and groundwater characterization studies. All of the old farm wells have now been removed and replaced by monitoring wells designed for providing representative samples of groundwater from designated portions of the regulated groundwater or modified to monitor only water levels. Piezometer installation has allowed for monitoring of water levels.

2.2 Other Environmental Issues

The Laboratory's long-range land management plan was updated in 1999. Existing prairie tracts were enriched with forbs and burned or mowed to discourage intrusion of brush, trees and exotic plants. About 18 acres of new prairie and 2 acres of little bluestem were planted.

The water was pumped out of the Village Oxidation Pond and the piping and spray equipment removed. The pond was allowed to dry out temporarily over the summer so that several relief features could be added to provide small islands once the area refilled with water. Various sedge seeds were planted in the fall.

One NERP research project, *Measurement of Infiltration Rates on Midwestern Prairie Restorations in the Chicago Region* was completed in 1999. Five projects remain underway, while two additional projects have been approved but have not yet started work in the field.[3]

3.0 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. The Environmental Monitoring Program consists of effluent monitoring to confirm

compliance with permits, generally at a particular point and environmental surveillance conducted at various locations to intercept the pathway of potential pollutants to receptors such as plants, animals or members of the public. We collect 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 radioactive materials and chemicals from Fermilab operations to the public are the atmosphere, surface water and groundwater. Environmental surveillance consists of collecting and analyzing samples of various media and measuring penetrating radiation. Samples are collected and radiation is measured from areas within and outside 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 monitored for radionuclide concentrations. Surface waters are also monitored for potential chemical constituents. While levels of penetrating radiation are measurable near operational areas on the site, the levels decrease rapidly with distance from the sources. External penetrating radiation and airborne emissions are normally 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.

3.1 Air

The potential for public exposure to air pollution from Fermilab is very low. We have a Lifetime Operating Air Pollution permit issued by the Illinois Environmental Protection Agency (IEPA) under the Clean Air Act, including a “National Emissions Standards for Hazardous Air Pollutants” or NESHAPs element, which covers airborne radionuclides.

Airborne radionuclides are normally released to the atmosphere from operating target stations. Monitoring is conducted at targeting areas where air emissions are considered a significant contributor to the overall transport of radioactive materials offsite. The Magnet Debonding Oven at the Industrial Complex also contributes a small quantity of airborne radionuclides when operating. Our permit application states that total releases will average no greater than 100 Ci/year with a maximum of 900 Ci/year.

The radiation doses potentially received offsite by the public are calculated from data gathered through environmental surveillance of the onsite sources. The dose for the air pathway is calculated using a Gaussian plume computer simulation model called CAP-88PC. This model was created by USEPA to predict the movement of airborne radionuclides and its use is required by regulations governing hazardous air pollutants at 40CFR61. Maximum calculated concentrations offsite are predicted to be below the level that could be detected by monitoring.

Fermilab is not a significant source of chemical air pollution. Our permits cover emissions caused by open burning conducted for prairie management and fire extinguisher training, a magnet debonding oven, a fuel dispensing facility and the operation of several natural gas-fired boilers. 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.

3.1.1 Radioactive Air Emissions

Low intensity beams were delivered for FMI commissioning in the first half of the year, with the Fixed Target Area not seeing beam again until midyear. The Debonding Oven, a potential source of tritium only while radioactive components are being burned, was not used in CY1999. The releases from the FMI, Anti-Proton and Fixed Target Area stacks are estimated to have released a total of 7.44 Curies in 1999. These radioactive air emissions were less than 10% of the limits of our 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 CY1999 continued to be well below the Environmental Protection Agency (EPA) standard of 10 mrem/year to a member of the public and also much less than the EPA's continuous monitoring threshold of 0.1mrem/year.

Fermilab's CY1999 Radionuclide Air Emissions Annual Report was submitted to DOE in June 2000.

3.1.2 Non-Radioactive Air Emissions

The IEPA decided in late 1996 that the level of air emissions at the Laboratory did not warrant the issuance of a Federally Enforceable State Operating Permit (FESOP). In 1999, the Agency issued us a Lifetime Operating Permit for our air pollution sources. Several small boilers, one grit blaster, the diesel fuel storage tank, and eight HVAC units previously covered have now been exempted from permit requirements pursuant to 35 IAC 201.146. The new permit covers the Magnet Debonding Oven, three boilers at CUB, a 12,000-gallon tank of gasohol, and accelerator tunnel ventilation stacks. Permit conditions require the monthly logging of fuel consumption for covered fuel combustion sources. 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 estimated concentrations of pollutants emitted were slightly increased as compared to last year due to increased fuel consumption by boilers. The degreasers, small sources of non-volatile organic material (non-VOM) emissions, have been removed from service. All source emissions were compliant in CY1999. The Annual Air Emission Report for CY1999, an estimate of criteria pollutant emissions, was submitted to the Illinois Environmental Protection Agency (IEPA) by May 1, 2000.

3.2 Penetrating Radiation

Operation of the Fermilab accelerator and associated beamlines produces ionizing radiation such as muons. Beamlines and experiments are designed so that most of the muons are stopped before reaching the ground surface. However, some emerge above the surface and present a small potential for radiation dose. Though small muon fields were measured in conjunction with the operation of the TeV Abort and the MT, MC, and KTeV beamlines, the effective dose equivalent to a member of the public due to Fermilab operations remained less than 0.1mrem/year and was small compared to doses due to natural causes (i.e., cosmic rays, terrestrial sources and indoor radon, etc.) which average approximately 300 mrem/year.

Storage of radioactive materials onsite results in another potential exposure to ionizing radiation. These sources of penetrating radiation are monitored throughout the site at locations based on criteria outlined in the Fermilab Monitoring Plan. Dose estimates are calculated under the extremely conservative assumption that a single individual is exposed for an entire year at the site boundary. Radioactive material stored at the Railhead accounted for no measurable dose equivalent rate at the site boundary in CY1999. This is due to the continued reduction of radioactive material storage and improved shielding of remaining radioactive items.

The maximum radiation dose to an individual at the nearest offsite house was significantly less than 1 mrem in CY1999.

3.3 Surface Waters

Fermilab discharges liquid effluent to surface water bodies and to publicly owned treatment works in Batavia and Warrenville. We hold National Pollutant Discharge Elimination System (NPDES) permits covering these discharges and those from various construction projects onsite.

In addition to the monitoring required by NPDES permits, samples of surface water are taken annually from selected bodies of water onsite and analyzed for radionuclides. We sample surface waters based on their potential for contamination. Chemical and physical parameters are not normally monitored in surface waters because Laboratory policies are designed to direct effluents into the sanitary sewers. Maximizing allowable discharges to the sanitary systems directs contaminants to the publicly owned treatment works (POTW) and minimizes environmental contamination. Chemical discharges are controlled by criteria set forth in Fermilab Environment, Safety, and Health Manual Chapter 8025.

3.3.1 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 from beamline cooling water systems. These sumps discharge to ditches and ponds onsite. Surface water monitoring conducted during CY1999 showed tritium concentrations to be well within the Department of Energy Derived Concentration Guides for allowable radionuclide releases to surface waters (2000 pCi/ml). Nine of the twenty samples taken from onsite ditches, ponds and creeks in 1999 showed a detectable level of tritium[4], the highest of which was 83.1 pCi/ml. No radionuclides were detected in samples taken at the site boundary.

3.3.2 Non-Radioactive Releases to Surface Water

Monitoring for non-radiological chemical constituents in surface water was limited to NPDES permit parameters (temperature, flow, and chlorine) this year. Discharge Monitoring Reports for all three outfalls were submitted monthly to the IEPA. There were no excursions above the permitted discharge limits in 1999.

3.3.2.1 Cooling Water System

An NPDES permit authorizes the discharge of commingled cooling water and stormwater 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 onsite, the permit also regulates stormwater discharges from designated solid waste management units (SWMUs). The Stormwater Pollution Prevention Plan required by this permit is periodically modified to reflect changes that occur as part of the RCRA Facility Investigation (RFI) of the SWMU sites. In August 1999, when this permit was renewed, the Indian Creek outfall was permanently moved downstream to a location where the creek leaves the site in order to allow for monitoring of potential contaminants from the Main Injector complex and from the construction and operation of NuMI. Our NPDES permit requires that water temperature and flow be monitored at all three outfalls. The results are reported to the IEPA on a monthly basis. Chlorine concentration[5] is reported for the Kress and Indian Creek outfalls. During 1999, the permit limits were never exceeded.

3.3.2.2 Releases to Sanitary Sewers

Another NPDES permit allows us to pretreat and release effluent from the Central Utility Building regeneration process to the City of Batavia sanitary sewer system. Quarterly monitoring reports are submitted to the IEPA as a condition of this permit. The pretreatment permit for the Central Utility Building regeneration effluent requires the collection and analysis of composite process effluent samples for specified metals. Samples are also analyzed for radionuclides in order to confirm that amounts of radioactivity released are minimal. In order to provide information on the process, these samples are taken quarterly at the process release point rather than at the site boundary where Fermilab actually discharges to the Batavia municipal sewers. Concentrations in the process effluent would actually be greatly diluted by other wastewaters before reaching the site boundary where the Batavia City ordinance on sewer discharges is applicable. Analytical results are submitted quarterly to the IEPA. Analyzed samples from the process effluent have never been in exceedance of the Batavia Sanitary Sewage Ordinance or the Department of Energy Derived Concentration Guide, which specify discharge limits. Effluent from the Central Utility Building regeneration process was sampled before each discharge and analyzed for accelerator-produced radionuclides. Approximately 0.37 mCi of tritium was released to the sanitary sewer during 1999. This is slight increase in activity released as compared to 1998 when fewer activated deionization bottles from the Fixed Target Area were regenerated.

Monitoring stations located at the site boundary sample sewer discharges to each municipality. 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. This year, the Batavia sewer sampler showed an exceedance of the iron discharge limit (5.0 mg/l). The sample yielded an iron concentration of 27.6 mg/l. This excursion did not present a health concern and is thought to be due to the aging of the pipes and ongoing work to upgrade that infrastructure.

3.3.2.2 Stormwater Discharges Related to Construction Activities

In 1999, the Lab continued to maintain a Stormwater Pollution Prevention Plan (SWPPP) in conjunction with an NPDES permit to construct the Fermilab Main Injector. An annual inspection to verify that all elements of the SWPPP were in place was conducted in September 1999. There were no findings.

A Notice of Intent (NOI) to discharge storm water associated with 8GeV Fixed Target and Booster Neutrino Detectors (BooNE) construction site activities was submitted in July 1999. The IEPA determined that the stormwater discharges associated with these sites are covered by a General NPDES permit. A project-specific SWPPP is maintained to ensure compliance with this permit.

The NuMI construction project-was issued a General NPDES permit by the IEPA covering construction related to mining activities. -This permit is primarily concerned with ensuring the safe discharge of effluents from the mining of dolomite in digging the new tunnel and providing erosion controls for construction areas and associated stockpiles. In association with this project, several new outfalls to onsite waterways have been identified for monitoring. Monitoring for Total Suspended Solids (TSS) will be performed at NuMI-specific outfalls.

3.4 Groundwater

Groundwater quality standards are published by the State[6]. Class I groundwater is considered to be a non-degradable resource and is highly protected. The water that is located in or near the dolomite aquifer 50 to 70 feet below ground surface of Fermilab is Class I groundwater according to criteria published by the State[7]. Water in the overlying till has been demonstrated to be Class II water and therefore has less stringent standards.

Four background monitoring wells in locations upgradient to Fermilab operations continued to be utilized to obtain representative samples of the upper Class I groundwaters for either chemical and/or

radiochemical analysis. Ten wells at the Central Utility Building (CUB) Tile Field were sampled as part of an ongoing RCRA Facility Investigation (RFI) at that site. Forty piezometers were used to gather information on the direction of groundwater flow sitewide. The information collected will be used in modeling the transport of potential contaminants. Piezometers that had been installed as part of the NuMI (Neutrinos at Main Injector) site characterization were monitored to assist the Lab in planning for groundwater protection at that facility. Fermilab continues to analyze groundwater issues associated with this proposed construction project that involves construction within the dolomite aquifer.

Thirty-seven of ninety-eight onsite groundwater monitoring locations were sampled during the year for radionuclide or chemical parameters, the remainder were available for water level monitoring.

3.4.1 Groundwater Characterizations

Piezometers installed at MI40 are providing pre-operational baseline data on groundwater quantity. In February 1999, characterization of the glacial and upper bedrock geology was conducted at three locations along the Main Injector (MI30, MI52, and MI62). Information from the investigations was used to assess shielding requirements at these locations. A nest of three piezometers was installed in September, near an existing piezometer at MI40. While the previously installed piezometer is screened in the upper bedrock, the three new piezometers were installed with screens at different elevations through the lower glacial units in order to facilitate investigation of vertical movement through the coarse-grained unit above the bedrock.

Geologic characterization at the C0 Area, the site of a beam absorber, was completed in February 1999. This included the installation of another piezometer. Three piezometers will be used to monitor hydrogeologic conditions in this area so that the location for the future installation of a monitoring well can be determined.

In April, nine of the proposed 12 piezometers were installed to monitor effects of the construction and operation of the NuMI tunnel. This network will allow observation of water levels throughout the upper bedrock aquifer and the upper portion of the confining unit below.

Concerns about a potential contaminant pathway from an old caisson, constructed to support the target within the M01 beam enclosure, led to a characterization study of the glacial and upper bedrock deposits in the vicinity of the MS1 service building. A downgradient monitoring well has been installed.

3.4.2 Monitoring Well Modification and Abandonment Activities

During 1999, eight old farm site groundwater monitoring wells were abandoned and the pumps were removed from nine others so that they could be utilized as piezometers.

Three of four cased boreholes (S-1266 through S-1274) that had been constructed for geologic characterization of the NuMI tunnel during the early phase of design were properly abandoned.

Five shallow, angled monitoring wells near NS1 were also appropriately abandoned. These angled wells had been replaced in 1998 by a network of monitoring wells and piezometers installed in upper bedrock. This new network provides a more effective means of monitoring potential operational effects to the environment in this area.

A monitoring well that had been screened to sample water from middle glacial deposits under the CUB Tile Field (SWMU#12) was abandoned. It was determined that well construction problems prevent the well from yielding representative samples. The IEPA agreed that this well (MWD-2) could be removed without replacement.

3.4.3 Radionuclides

The Department of Energy groundwater concentration guide and the Illinois Class I groundwater standard for tritium is 20 pCi/ml. Monitoring of all Central Utility Building Tile Field monitoring wells in CY1999 showed tritium levels in those wells to be less than the detection limit of 0.1 pCi/ml.

A need to upgrade shielding beneath the Booster West Tower resulted in a project to characterize the geology and hydrogeology in that area in order to investigate the environmental impacts of the project. The South Booster area was characterized with eight shallow borings placed around the area outside of the southwest tunnel and with six borings made through the floor of the tunnel. Soil samples were taken from the shallow borings and analyzed for radionuclides. Very low levels of ^{3}H and ^{22}Na were measured. Four piezometers were installed into bedrock just southeast and southwest of the Booster area to determine the flow direction in the Class I groundwater.

3.4.4 Chemicals

Four rounds of groundwater samples were collected in 1999 at several Solid Waste Management Units (SWMUs) under our RCRA RFI. (See Section *4.12.1 RFI Activities)*

4.0 Compliance with Specific Environmental Regulations

Below is a summary of Fermilab compliance with key environmental regulations.

4.1 Clean Air Act

Open burn permits to allow prairie management burning and fire extinguisher training were renewed in 1999. A permit was also obtained to burn the old farmhouse at Site 68 as part of a firefighting training exercise. Annual air emissions reports for CY1999 were submitted to the IEPA and EPA in the spring of 2000.

An estimated 7.44 Curies were released in conjunction with the operation of the Fermilab Main Injector, Anti-Proton, and the Fixed Target Areas stack in CY1999. The Magnet Debonding Oven did not release any airborne radionuclides this year. The CAP-88PC dispersion model calculated the maximum dose equivalent delivered to a member of the public (at the boundary of the lab) to be 2.74×10^{-3} mrem due to 1999 Fermilab operations. The collective effective does equivalent for CY1999 was estimated to be 6.61×10^{-3} mrem.

Fermilab has 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.

4.2 Underground Storage Tanks

Fermilab met the December 22, 1998 deadline for compliance with the EPA underground storage tank (UST) regulations 40 CFR 280.80. All pre-existing USTs installed prior to 1988 have been properly closed. The only two remaining underground storage tanks (USTs) were installed in 1994 and are currently in use at the Fermilab Fuel Dispensing Facility. They comply with the new UST standards. Two enforcement individuals from the USEPA RCRA Office of USTs/LUSTs visited Fermilab on January 22, 1999 to confirm that the two remaining USTs on site met the required codes. No concerns were identified.

4.3 The Endangered Species Act of 1973

No compliance issues were identified in CY1999.

4.4 Executive Order 11988, "Floodplain Management"

No compliance issues were identified in CY1999.

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

Evaluation of Fermilab activities in wetlands continues to be accomplished through the NEPA review process. The Lab submitted a pre-discharge notification of involvement of Waters of the State for the FMI Recycler Cooling Project. The Corps of Engineers (COE) issued a nationwide permit for Fermilab in January 1999 for that project, which involved the cutting and backfilling of approximately 0.03 acres of wetland along Indian Creek to install a 24" pipe. Pipe installation began in early 1999 and had only a temporary impact. In August 1999, the COE authorized the discharge of materials into 0.33 acres of jurisdictional wetlands for the installation of an access road and an air vent structure for NuMI with the issuance of another nationwide permit. No wetland compliance issues were identified in CY1999.

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

In CY1999, the use of pesticides and herbicides at Fermilab was handled in accordance with FIFRA.

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

Fermilab personnel inspected the permitted Fermilab Main Injector Class III Dam (the FMI berm) in April 1999 to ascertain that the dam was being maintained in accordance with the maintenance plan associated with the permit. The Main Injector berm is permitted by the Illinois Department of Natural Resources as a small Class III dam. The need for some minor remedial actions and routine maintenance was discovered and actions were taken. There were no compliance issues identified. The annual report was submitted to the State on time.

4.8 The Migratory Bird Treaty Act

There were no compliance issues identified in CY1999.

4.9 National Environmental Policy Act (NEPA)

Fermilab met these requirements by continuing to implement a program of reviewing all of its activities for compliance as set forth in the Fermilab Environment, Safety and Health Manual Chapter 8060. DOE approved nine projects for Fermilab as being categorically excluded (CXs) from further review in 1999. A Finding of No Significant Impact (FONSIs) on the environment was issued for the MiniBooNE project in April 1999.

4.10 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 CY1999 to assess any potential impacts on historic resources. The Illinois Historic Preservation Agency (IHPA) was consulted regarding the FMI Recycler Cooling project, the demolition of a silo at Site 3, and the plans to burn an old farmhouse at Site 68. The consultation included an IHPA review of existing documentation. No compliance issues were identified in CY1999.

4.11 National Pollutant Discharge Elimination System (NPDES)

Our NPDES permit to discharge non-contact cooling water and stormwater into waters of the state was renewed and then reissued in December 1999. An NOI was also filed for the BooNE construction activities. See *Section 3.3.2.1* and *3.3.2.2* for further discussion.
An application was filed for a NPDES General Permit for Non-Coal Mines, for the NuMI construction project.

The IEPA visited Fermilab November 16-17 1999 to assess compliance with the NPDES program and our permits. The visit included field inspections of outfalls, cooling ponds, erosion control measures for ongoing construction activities and a review of related documentation. There were no findings.

4.12 Resource Conservation and Recovery Act of 1976 (RCRA)

The USEPA conducted an inspection of the Fermilab RCRA facilities on September 14-15 1999. This included a review of waste manifests, annual reports, training records, the contingency plan, the closure plans, and the Part B permit and operating records. Satellite waste accumulation areas and the Hazardous Waste Storage Facility were visited. No deficiencies were cited.

The following volumes of non-radioactive waste were generated by Fermilab and managed for disposal by the Hazard Control Technology (HCT) Team of the Environmental Protection in Fiscal Year 1999:

61 cubic meters of Non-Routine Hazardous Waste (RCRA + TSCA);
6.1 cubic meters of Routine Hazardous Waste (RCRA + TSCA);
503 cubic meters of Non-Routine Non-Hazardous (Special) Waste;
38.5 cubic meters of Routine Non-Hazardous (Special) Waste;
11,186 cubic meters of Dumpster/Landfill Waste.

Another 11.5 cubic meters of Special waste was de-classified and shipped to a landfill as non-regulated waste.

The Annual Hazardous Waste and Illinois Generator Non-Hazardous Special Waste Reports for CY1999 were submitted to the DOE FermiGroup in January and February 1999 respectively. DOE subsequently submitted these reports to IEPA.

4.12.1 RFI Activities

As a condition of our RCRA Part B permit, the IEPA has required Fermilab to undertake a RCRA Facility Investigation (RFI). The purpose of the RFI is to investigate whether hazardous constituents have 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 requires that IEPA be notified of any changes to a previously identified SWMU. A total of five SWMUs are still being addressed in accordance with the corrective action requirements of Fermilab's RCRA permit: the Village Machine Shop, the CUB Pipe and Clay Tile Field, the Railhead Storage Yard, the Meson and Neutrino Experimental Areas, and the Meson Hill Landfill.

Village Machine Shop (SWMU# 5)

The final report on sampling at the Village Machine Shop has been completed and submitted to the IEPA. Conditions required by the IEPA have been met and documentation was submitted in March 1999. No further remediation is required.

CUB Tile Field SWMU# 12)

The CUB Tile Field has been removed along with all contaminated soil and gravel. The soil was properly disposed and the surrounding soil sampled and analyzed. Soil samples were taken from the floor and walls of the trenches after the excavation of the backfill and clay tile pipe in the CUB Tile Field. At the request of the IEPA, these samples were analyzed for gross alpha, gross beta and tritium. The results indicated radioactivity levels comparable to those found locally in soil due to naturally occurring radionuclides. At these concentrations they present no significant threat to public health.

Fermilab continues quarterly monitoring of all the CUB Tile Field wells except for well MWD-2. Groundwater monitoring well MWD-2 was properly abandoned with IEPA permission. Notification of that well abandonment was submitted to IEPA in December 1999. Due to dry weather conditions during the fourth quarter of 1999, the water volumes in CUBS1, CUBS2, CUBS3, CUBS4, and CUBS5 of the CUB Pipe and Clay Tile Field were too low to allow sampling. These wells have

been rescheduled for sampling in the first quarter of 2000. Shallow wells CUBS1-3 and deep well CUBD1 indicated chloride levels above the Class II standard in 1999. (See Section 3.4)

Meson Hill (SWMU# 13)

Closure activities for Meson Hill were completed in 1998. This included moving concrete, grading, installing a clay cap and placing topsoil on the clay cap and hydroseeding of the top of the hill and a site inspection. Quarterly groundwater monitoring commenced in 1998. Statistical evaluations of data are performed quarterly and the results are submitted to IEPA. Water levels in wells G104 and G105 at Meson Hill were insufficient for sampling in the fourth quarter of 1999. Therefore, analysis of groundwater from these wells was not possible. Samples from these wells have been rescheduled for collection during the first quarter of 2000. A Notice of Confirmation of Groundwater Quality Change related to Meson Hill was sent to IEPA, Division of Land Pollution Control, Permit Section in October 1999. An annual assessment of the Meson Hill monitoring program was prepared and submitted to the IEPA.

Railhead Storage Yard (SWMU #14)

It was determined that the low levels of lead remaining at the Railhead Storage Yard do not pose a threat to human health. Conditions required by the IEPA have been met and documentation was submitted in March 1999. No further remediation is required at this time.

Neutrino (SWMU #15)

Additional information acquired through studies at NS1 and NS2 was sent to the IEPA in March 1999. An annual update on groundwater monitoring will be submitted to the IEPA in May 2000.

4.13 Safe Drinking Water Act

Fermilab provides drinking water to its employees through two Fermilab-operated public water supplies and a satellite supply connected to the City of Warrenville public water supply. Full jurisdiction for Fermilab's public water supplies was transferred from the Illinois Environmental Protection Agency (IEPA) to the Illinois Department of Public Health (IDPH) in 1996. Initially, this involved an IDPH review of our existing monitoring program, which determined that our program was compliant with their regulations.

During late CY1998 and CY1999, the action level for lead (Pb) in drinking water was exceeded in samples from the distribution system for the D-Zero and Main Site public water supplies respectively. While not a compliance issue, this required additional sampling; distribution of educational materials describing the hazards of lead in drinking water and the development and revision of corrosion control plans to decrease levels of Pb in the distribution systems. In April 1999 public education was delivered for lead action level exceedances that occurred in samples taken from D-Zero in October 1998. Verification of the distribution of public education was sent to the IDPH in March 2000 for lead action level exceedances in the Main Site water distribution system in February 1999. A Main Site supply corrosion control plan that utilizes an orthophosphate treatment system at the Main Site supply well (W-1) has been installed. Since October 1998, the D-Zero supply has had two successive sampling periods where it has not exceeded the Pb action levels. As a result, the IDPH has reduced the frequency of Pb/Cu monitoring for the D-Zero.

In addition to routine bacteriological analysis, Fermilab completed the required testing for nitrate in both water supplies this year. Onsite semi-private wells were also sampled for nitrates as well and coliform. Results were acceptable.

4.14 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 chemicals and extremely hazardous chemicals used or stored onsite in quantities greater than a given threshold. Fermilab filed a Toxic Chemical Release Inventory Report (TRI) for CY1998 with the USEPA and IEPA in June 1999. The chemicals at Fermilab used or stored at Fermilab in reportable quantities under SARA Title III Section 313 were Freon R-11, 1,2,4-trimethylbenzene, Halon 1301 friable asbestos, and ethylene glycol. The Toxic Release Inventory (TRI) for CY1999 was submitted to the EPA in June 2000. As required by Section 312 of SARA Title III, Fermilab also submitted a Tier II Emergency and Hazardous Chemical Inventory (CY1999) to state and local emergency services and disaster agencies in February 1999.

4.15 Oil Spill Prevention

Oil inventory at Fermilab consists of numerous oil-filled electrical transformers ranging in volume from 4 gallons to 17,300 gallons. There are no aboveground oil storage tanks at Fermilab. The total volume of oil in transformers onsite is estimated to be about 250,000 gallons. Potential onsite oil spill sources are located such that surface water discharge spillways can be effectively used to prevent any oil spills from leaving site and entering State Waters. The only exception is the transformer at Giese Road (1695 gallons) near Indian Creek. This transformer was previously located downstream of the Indian Creek outfall to State Waters. Even though the outfall has been moved to a location further downstream in Indian Creek, this transformer still has the potential to spill into regulated waters because there is no in-stream mechanism to prevent a discharge from making it to Waters of the State. The Giese Road transformer and others onsite employ secondary containment as an added precaution. A Spill Prevention Control and Countermeasures plan (SPCC) for the Giese Rd. transformer has been completed in accordance with 40 CFR 110-112.

4.16 Toxic Substance Control Act (TSCA)

The application of TSCA requirements to Fermilab involves the regulation of polychlorinated biphenyls (PCBs) and asbestos. Significant strides in PCB management have been made at Fermilab in the last several years.

An EPA-approved plan is still underway to remediate PCB-contaminated soil at twenty-four transformer sites located at service buildings around the Main Ring. The contamination occurred because of past (pre-TSCA) sampling procedures in which transformer oil containing 2-5% PCBs was drained onto the ground as part of sampling to verify that dielectric properties had not deteriorated. Cleanup efforts at these transformer yards continued in 1999. We have now completed the cleanup of eight sites out of the twenty-four needing attention. Work at four new sites (B2, C3, D2 and D3) is currently underway and completion work at C1, C4, D1, and D4 is planned.

Fermilab no longer has any PCB-containing equipment whose *use* is regulated by TSCA. However, there is still a sizeable inventory of equipment containing small PCB (greater than or equal to 500 ppm) capacitors and large PCB-contaminated (greater than or equal to 50 ppm but less than 500 ppm) capacitors. Disposal of this equipment is regulated. There is a plan to gradually phase out this equipment as funding and the accelerator operating schedule allow.

4.17 Waste Minimization and Pollution Prevention

In 1999, Fermilab recycled nearly 1300 metric tons of solid waste, thus reducing the volumes of waste disposed in dumpsters. Recycling efforts included 83.9 metric tons of paper products; 1156.12 metric tons of scrap metal; 0.7 metric tons of toner cartridges; 10.8 metric tons of shipping pallets; 2.54 metric tons of engine oils; 39.57 metric tons of wood; 7.9 metric tons of batteries; and 2.48 metric tons of tires. The installation of a press allowed four-fold volume reduction of activated metal and has resulted in decreased disposal costs. A baler was obtained to aid in the cardboard recycling effort.

Mercury containing lamps, including fluorescent lamps and high-intensity discharge lamps were added to the *Universal Waste Category* in 35 IAC 733, allowing these lamps to be recycled rather than being classified as hazardous waste. Fermilab continues a program of recycling our spent mercury containing lamps. Low mercury fluorescent tubes were installed in parts of Wilson Hall. These lights provide more light while consuming less energy.

The volume of non-routine radioactive waste generated this year (82 cubic meters) was slightly lower than last year when extensive reconfiguration of the accelerator complex resulted in the generation of larger amounts of non-routine wastes during the accelerator shutdown. The volume of routine radwaste generated (16.8 cubic meters) was also down this year. Process reduction techniques were used to further reduce the volume of radioactive waste shipped for disposal. In various operations, torch and saw cutting reduced the volume of 11.5 cubic meters to 2.1 cubic meters (an 82% reduction) and the operation of a press to crush pipe and other materials with large void spaces reduced 9.9 cubic meters to 2.3 cubic meters (a 77% reduction). Compaction reduced 3.0 cubic meters to 0.4 cubic meters (an 86% reduction).

5.0 Conclusion

The operations at Fermilab during CY1999 had no significant adverse impact on the environment or on public safety.

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[1] Details of the Fermilab environmental program can be found in the Fermilab Environmental Monitoring Plan (FEMP).
[2] Supporting data are available upon request from the Fermilab ES&H Section in electronic or paper form.
[3] Fermilab Annual Ecological Land Management Plan for Calendar Year 2000, Fermilab ELM Committee, 1/13/00
[4] Lower limit of detection for tritium in surface waters is 1.0 pCi/ml.
[5] Total halogen is measured as chlorine.
[6] 35 IAC 620
[7] 35 IAC 620.210

[JR1] Message of memo starts here.