FERMILAB

Report to the Director on the Fermilab Environment

CY1998

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 CY1998. [2]

2.0 1998 Laboratory Highlights

Fermilab concluded an extensive 800 GeV fixed target run, reaching record-setting intensities in the accelerator before shutting down the historic Main Ring in mid-September 1997. Fermilab Main Injector (FMI) construction and commissioning activities progressed through 1998, culminating in September 1998 when the first beam was introduced to the Main Injector. The first accelerated beam was delivered in mid-November 1998.

2.1 Significant Environmental Accomplishments

Fermilab received a commendation award from the Department of Energy indicating that it was the only laboratory to meet its Affirmative Procurement goals for purchase of recycled products in 1998.

The Laboratory's long-range land management plan was updated in 1998. Approximately sixty acres of new prairie were planted in three tracts.

After nearly six years of study, Fermilab's program to control the deer population is underway. This step was necessary in order to reduce the size of the herd that was causing extensive damage to the ecosystem and an increase in car accidents onsite. Based on a United States Department of

Agriculture (USDA) proposal that considered numerous alternatives, the Lab initiated a program of management that included lethal removal. Deer management activities were carried out during the first and last quarter of 1998.

Fermilab began a program to recycle fluorescent and high intensity discharge bulbs. Regular fluorescent lamps are also being replaced with low mercury, low energy bulbs.

Environmental Assessments were approved and Findings of No Significant Impact (FONSI) were issued in early 1998 for the proposed NuMI experiment and the Deer Management Program.

Fermilab hosted the second annual Environmental Monitoring Workshop in May 1998. Representatives from fourteen Department of Energy (DOE) laboratories and offices attended this two-day meeting.

The Lab hired a consultant to perform an environmental database assessment of the neighboring industrial properties. The purpose of the assessment was to identify those offsite facilities that could represent a potential environmental risk or impact to Fermilab property. Six facilities were discovered that were worthy of further observation.

Two of the four National Environmental Research Park (NERP) projects listed as ongoing in 1997 are still underway: *Soil and Mycorrhizal Fungi Response to Prairie Restoration* and *Successional Dynamics in a Prairie Reconstruction*.

2.2 Other Environmental Issues

A Switchyard Review Committee identified the need to drain tritiated water from the Switchyard Beam Absorber and to dispose of it as radioactive waste. Approximately 3600 gallons of cooling water were emptied from the system in October 1998. The water was pumped into drums and an absorbent media was added to the water before it was transported to the Low Level Waste (LLW) Handling Facility. The waste was shipped to Hanford for disposal in December 1998.

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 Strategy, 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 an 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 grit blaster, a magnet debonding oven, and the operation of various 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

Except for the very low intensity FMI commissioning in the fourth quarter of the year, the accelerator did not operate in CY1998. The Debonding Oven, a potential source of tritium only while radioactive components are being burned, was used twice in CY1998. Items burned included slightly radioactive material and therefore made a very small contribution to our airborne radionuclide emissions. The releases from the FMI and Anti-Proton Area stacks were not measurable this year and there were no

longer any emissions from the stacks in the Fixed Target Area as this area did not operate. Consequently, radioactive air emission levels were well within the limits of our current air pollution permit application on file with the Illinois Environmental Protection Agency (IEPA) and no detectable levels of radionuclides reached the site boundaries. Doses to the public from emissions in CY1998 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 0.1 mrem/year.

Fermilab's CY1998 Radionuclide Air Emissions Annual Report will be submitted to DOE in May 1999.

3.1.2 Non-Radioactive Air Emissions

The IEPA decided in late 1996 that the level of air emissions at the Laboratory do not warrant the issuance of a Federally Enforceable State Operating Permit (FESOP). 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 comparable to last year except for a marked decrease in nitrogen oxide emissions due to less fuel consumption by the boilers. The degreasers, small sources of non-volatile organic material (non-VOM) emissions, have been removed from service. An internal assessment of the Technical Division's permitted Magnet Debonding Oven and Grit Blaster identified no issues of concern. There were no instances of non-compliant emissions in CY1998. The 1998 Annual Air Emission Report on criteria pollutants was submitted to the Illinois Environmental Protection Agency (IEPA) in April 1999.

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.

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 Strategy. Dose estimates are calculated under the extremely conservative assumption that a single individual is exposed for an entire year at the site boundary. The effective dose equivalent to a member of the public due to Fermilab operations is less than 0.1mrem/year, small as compared to doses due to natural causes (i.e., cosmic rays, terrestrial sources and indoor radon, etc.) which average approximately 300 mrem/year.

There were no muon fields either onsite or offsite due to the lack of beamline operations in CY1998. Radioactive material stored at the Railhead accounted for no measurable dose equivalent rate at the site boundary in CY1998. This is due to the continued reduction of radioactive material storage and improved shielding of remaining radioactive items. Consequently, the maximum radiation dose to an individual at the nearest offsite house was not measurable in CY1998.

3.3 Surface Waters

Fermilab discharges liquid effluent to surface water bodies and to publicly owned treatment works in Batavia and Warrenville. We hold a National Pollutant Discharge Elimination System (NPDES)

permit to discharge 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). A Stormwater Pollution Prevention Plan is frequently modified to reflect changes that occur as part of the RCRA Facility Investigation (RFI) of the SWMU sites. The Lab also continues to maintain a Stormwater Pollution Prevention Plan (SWPPP) in conjunction with our NPDES permit to construct the Fermilab Main Injector. An annual inspection to verify that all elements of the SWPPP were in effect was conducted in September 1998. There were no findings.

An NPDES pre-treatment permit allows us to release a treated effluent from the Central Utility Building regeneration process to the City of Batavia sanitary sewer system. In addition to the monitoring required by our 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 located throughout the site collect and drain water from building footings and from under beamline tunnels in the Tevatron enclosure 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. Surface water monitoring conducted during CY1998 showed tritium concentrations to be well within the Department of Energy Derived Concentration Guides for allowable radionuclide releases to surface waters (2000 pCi/ml). Ten of eighty-six samples taken from onsite ditches, ponds and creeks in 1998 showed a detectable level of tritium, the highest of which was 109 pCi/ml.

The effluent from the Central Utility Building regeneration process was sampled before each discharge and analyzed for accelerator-produced radionuclides. Approximately 0.11 mCi of tritium was released to the sanitary sewer during 1998. This is a decrease in activity released as compared to 1997 when activated deionization bottles from the Fixed Target Area were being regenerated.

3.3.2 Non-Radioactive Releases to Surface Water

Monitoring for non-radiological chemical constituents in surface water were limited to NPDES permit parameters this year. The Discharge Monitoring Reports for all three outfalls were submitted monthly to the IEPA. There were no excursions above the permitted discharge limits.

3.3.2.1 Cooling Water System

Our NPDES permit requires that water temperature and pH be monitored at all three outfalls and reported to the IEPA on a monthly basis. Chlorine concentration[3] is reported for the Kress and Indian Creek outfalls. During 1998, the permit limits for total chlorine (0.05 mg/l), pH, and temperatures were never exceeded.

Routine maintenance projects for the LCW systems were reviewed to ensure NPDES compliance. These projects required the intermittent discharge of cooling waters from the beamline enclosures to surface waters. Effluents from these areas discharged to surface water onsite and ultimately left the site via Ferry and Indian Creek outfalls. The annual cumulative volume to be routinely discharged from these systems is expected to be a few thousand gallons. Less than once per year, a major maintenance could require a discharge of up to 50,000 gallons. In March 1998, the IEPA determined that an NPDES permit modification is not required for these discharges.

3.3.2.2 Releases to Sanitary Sewers

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. Heavy metal 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.

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 two exceedances of the iron discharge limit (5.0 mg/l). One sample yielded an iron concentration of 8.15 mg/l and the second, 12 mg/l. The Warrenville/Naperville sanitary effluent at the site boundary had an iron concentration of 8.4 mg/l. These excursions did not present a health concern and are thought to be due to the aging of the pipes.

3.4 Groundwater

Fifty-one of one hundred and three onsite groundwater monitoring locations were sampled during the year for radionuclide or chemical parameters. Groundwater quality standards are published by the State[4]. 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.[5] Water in the overlying till has been demonstrated to be Class II water and therefore has less stringent standards.

Four new background monitoring wells that had been installed 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. Four new wells that were installed last year at the Central Utility Building (CUB) Tile Field continued to be sampled as part of an ongoing RCRA Facility Investigation (RFI) at that site. Forty piezometers constructed onsite were used to gather information on the direction of groundwater flow. The information collected will be used in modeling the transport of potential contaminants. Piezometers that were 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. Seven monitoring wells no longer providing valuable information were properly abandoned in January 1999.

Monitoring wells were also installed at MI-40. This opportunity to install wells in a beam area before the beam is delivered will give us a much better picture of the subsurface and will provide pre-operational baseline data on groundwater quality.

3.4.1 Radionuclides

The Department of Energy groundwater concentration guide and the Illinois Class I groundwater standard for tritium is 20 pCi/ml. Monitoring of four Central Utility Building Tile Field monitoring wells in CY1998 showed tritium levels in all four wells to be less than the detection limit of 0.19 pCi/ml.

During 1998, Fermilab made great progress on a comprehensive program to identify areas where contamination of the soil and groundwater by accelerator operations might be possible. The Fermilab Director appointed a number of multi-disciplinary review committees chartered to analyze radiological and hydrogeological conditions. Various work groups were commissioned to investigate the potential for groundwater contamination at AP0, C0, Neutrino, Switchyard, and PE. The Head of the Beams Division extended this study by appointing several committees to review the design of additional target stations (Booster, MI-40, M-Center, KTeV, and P-West areas) that are planned for physics research in the near future. The committees used theoretical evaluations, collection and analysis of radiological and hydrogeological data, and reviews of historical data and design details to characterize each area and to recommend further empirical studies or monitoring actions.

The information collected by the various review committees is complete and recommendations for improvements to the design of the accelerator shielding to prevent environmental contamination by activation and for upgrades to our monitoring program to assess potential environmental impacts have been considered. Several of the recommendations of these committees are already in the implementation stage. An *ad hoc* group has been established to further evaluate the present groundwater concentration model for estimating downward migration of tritium.

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 H-3 and Na-22 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.

In 1998, samples from five 45^{o} angled monitoring wells drilled into the Neutrino berm (four grouped closely in the vicinity of the Neutrino Target Area and one farther upstream) contained tritium in measurable concentrations, though most remained less than the Illinois Class I groundwater standard of 20 pCi/ml for tritium. These wells are finished in the till, at elevations varying from approximately 30 to 50 feet above the level of the Class I groundwater. Tritium levels in groundwater samples from one of the monitoring wells (S-1087) that was screened below the bathtub area of the Neutrino Fixed Target Beamline ran as high as 23 pCi/ml in 1998. This well is located midway between the bottom of the bathtub and the Class I groundwater located approximately 70 feet below ground surface. Concentrations of tritium have fluctuated at this well since an abrupt increase was first noted in April 1995. Well recharge studies and other evidence are consistent with the hypothesis that well construction causes the transport of contamination from activated soil near the beamline to lower elevations, where it results in the observed increase and fluctuation.

This year saw the completion of a study to characterize the hydrogeology at two areas along the Neutrino Fixed Target Beamline in order to determine the source of the increased tritium levels in the samples from S-1087. The purpose of this project was to gain a better understanding of the underlying glacial deposits and the upper bedrock. It also extended our monitoring network beyond its current capabilities from within the glacial deposits to the Class I groundwater near this area of soil activation. Piezometers installed at NS1 and NS2 Service Buildings were used to determine the vertical and horizontal groundwater flow gradients. Once the horizontal gradient was established, three monitoring wells were installed in the upper dolomite down-gradient of NS1 and NS2. A new technology in drilling was utilized in this project to provide undisturbed core material for better characterization and analysis of the geological environment beneath these locations[6]. Water samples from the new wells were analyzed, and the levels of tritium in all were below 1 pCi/ml, the detection limit of our onsite Activation Analysis Lab. This new information will be provided to the IEPA as part of an ongoing RCRA Facility Investigation into the activated soil areas along the Neutrino beamline.

Continued monitoring of groundwater flow parameters (gradient and direction) indicates that they are very stable. As a result of this project, the remaining 45^{o} angled wells were removed from the routine sampling schedule. The four angled wells near the Neutrino Target Area will be removed and closed according to State guidelines. Closing these wells will eliminate a potential pathway for groundwater contamination in the activated areas adjacent to beamlines.

A number of new boreholes were drilled and piezometers installed in 1998 to aid in characterizing the geology and the hydrogeology at various sites. Three boreholes were drilled and later new piezometers were installed at MI40. One boring hole was added to investigate the BooNE area and two boreholes were drilled and piezometers installed in the C0 area.

3.4.2 Chemicals

Four rounds of groundwater samples were collected during CY1998 from the monitoring wells installed at the Meson Hill, a Solid Waste Management Unit (SWMU) under our RCRA RFI.

Water samples from the wells used to monitor the old perforated pipe field within the Main Ring continued to yield measurable levels of chloride, chromium and other metals. Metal concentrations were generally less than the IEPA Class II groundwater standards. One sample exceeded the limit for manganese and another slightly exceeded the nickel limit. Chloride concentrations near the Central Utility Building Tile Field continued to exceed the chloride standard for Class II groundwater. Samples for these analyses were collected from seven monitoring wells finished in the glacial till (from 15 to 40 feet below ground level and 20 to 45 feet above the aquifer). The CUB tile field and chromium-contaminated soils were removed in the latter part of this year as part of the RFI (RCRA Facility Investigation) Phase II Workplan for this area. Groundwater monitoring continues.

4.0 A Summary of Compliance with Specific Environmental Regulations

4.1 Clean Air Act

Open burn permits to allow prairie management burning and fire extinguisher training were renewed in 1998. Annual air emissions reports for CY1998 were submitted to the IEPA and EPA in the spring of 1999.

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.

4.3 The Endangered Species Act of 1973

No compliance issues were identified in CY1998.

4.4 Executive Order 11988, "Floodplain Management"

No compliance issues were identified in CY1998.

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

The US Army Corps of Engineers visited the FMI wetland mitigation area in May 1998 to inspect the condition of the mitigation before releasing Fermilab from the Section 404 permit now that the five-year monitoring period has elapsed. The inspector verbally approved release from the permit. 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. This activity involved the cutting and backfilling of approximately 0.03 acres of wetland along Indian Creek for installing a 24" pipe. Pipe installation began in early 1999 and will be only a temporary impact. No wetland compliance issues were identified in CY1998.

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

In CY1998, 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, accompanied by registered professional engineers inspected the permitted Fermilab Main Injector Class III Dam (the FMI berm) in April 1998 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 CY1998.

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. Findings Of No Significant Impact (FONSIs) on the environment were issued for both the NuMI project and the deer management program in January 1998. Other NEPA reviews completed in

1998 included an EA written for the Booster Neutrino (BooNE) project. Categorical Exclusions (CXs) included determinations for a plan to breach the Village Oxidation Pond and for the decommissioning and replacement of the 45-degree wells along the Neutrino beamline. DOE approved eight CXs for Fermilab in 1998.

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 CY1998 to assess any potential impacts on historic resources. No compliance issues were identified in CY1998.

4.11 National Pollutant Discharge Elimination System (NPDES)

An application for a renewal of our sitewide permit was submitted to the Illinois EPA in December 1998. A Notice of Intent to discharge stormwater from construction activities associated with the closure plan for the Meson Hill Landfill was sent to the IEPA.

4.12 Resource Conservation and Recovery Act of 1976 (RCRA)

4.12.1 Non-RFI Activities

The USEPA conducted an inspection of the Fermilab RCRA facilities on September 17-18, 1998. It included a review of waste manifests, annual reports, training records, the contingency plan, the closure plans, the Part B permit and operating records. Satellite waste accumulation areas and the Hazardous Waste Storage Facility were also visited. No deficiencies were cited.

The Illinois Department of Transportation conducted an audit of Fermilab's Waste Management Team in July 1998. The program was commended and there were no findings.

The volume of regulated chemical waste collected in CY1998, 934 metric tons, was up from last year’s total. The increase was due to waste generated in removal of chromium contaminated soil in the CUB Tile Field RFI cleanup and increased accelerator maintenance operations.

The Annual Hazardous Waste and Illinois Generator Non-Hazardous Special Waste Reports for CY1998 were submitted to the DOE FermiGroup in January and February 1999 respectively. DOE subsequently submitted these reports to IEPA.

4.12.2 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.

In 1997, the State asked for Phase II studies for the CUB tile field and the Village Machine Shop. Phase II reports have been submitted to the State for these sites and the projects are near completion.

The State also provided guidance on permanent closure of the Meson Hill "Landfill." A closure plan was prepared and submitted to the IEPA in the second quarter of 1997. This plan was approved and during the third quarter, closure activities included moving concrete, grading, installing a clay cap and placing topsoil on the clay cap. Hydroseeding of the top of the hill and a site inspection were completed by the end of the year. Six piezometers that had been placed around the perimeter of the hill were properly sealed. This closure is complete. In 1998, the IEPA sent us final security and monitoring requirements for the landfill and monitoring has commenced.

At IEPA's request, additional information was sent to them about the Neutrino SWMU site. This data had been acquired through studies at NS1 and NS2.

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 that determined that our program was compliant with their regulations.

During CY1998, the action level for lead (Pb) in drinking water was exceeded in samples from the distribution system for both the Main Site and D-0 public water supplies. 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. Verification was sent to the IDPH in December 1998 that public education had been distributed for both the Main Site and D-0 supplies for lead action level exceedances that occurred in samples taken from the Main Site water distribution system in February and August 1998 and for D-Zero in the last quarter of 1998. Efforts to remove any remaining potential sources of lead contamination in the system have failed to eliminate the Pb exceedances. A revised Main Site supply corrosion control plan that includes the installation of an orthophosphate treatment system at the Main Site supply well (W-1) was reviewed and approved by IDPH. Installation is in progress.

At the suggestion of the IDPH, we completed the paperwork in September 1997 to defer sampling of unregulated organic chemicals until negotiations between the State and the EPA are complete over the list of parameters applicable to Illinois water supplies. In addition to routine bacteriological analysis, Fermilab completed the required testing for barium, cadmium, chromium, fluoride, mercury, and selenium for both water supplies this year. Onsite semi-private wells, except Well 68 which is slated for decommissioning, 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. Reportable materials present at Fermilab in 1997 were Freon R-11, Trimethylbenzene, Halon and ethylene glycol. The SARA Title III Report for CY1998 will be submitted to the EPA in mid-1999. Our inventory of these materials will also be submitted to state and local emergency services and disaster agencies in CY1999. Kane County has requested more detailed information (Tier II). The extra information will also be provided to DuPage County. The

inventory for the CY1998 report was not available at the time of this report but it is not expected to be significantly different from last year.

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 251,681 gallons. Potential onsite oil spill sources are located (with one exception) such that 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 is located downstream of the Indian Creek spillway and therefore has the potential for spilling directly into State Waters. A project to upgrade the secondary containment for this transformer was finished. Many onsite transformers already employ secondary containment as an added precaution. A Spill Prevention Control and Countermeasures (SPCC) Plan was completed in accordance with 40 CFR 110-112. The original resides with the ES&H Section.

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 1998. We have now completed the cleanup of eight sites out of the twenty-four needing attention. Removal of PCB-contaminated soil and concrete at the four F-sector Main Ring service buildings was initiated in November 1997. The removal of contaminated concrete pads at A3 and the cleanup of a small spill on the truck lane asphalt at B4 were also added to the job. All of these areas were declared clean by early January 1998. Further transformer yard cleanups are planned for FY 1999.

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 1998, Fermilab recycled nearly 100 metric tons of solid waste. Reductions were made in volumes of waste disposed in dumpsters. The installation of a press has 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. Unfortunately, the cardboard recycling services had to be drastically cutback this year due to various factors including the decline in the price of cardboard.

Mercury containing lamps, including fluorescent lamps and high-intensity discharge lamps were added to the *Universal Waste Category* in 35 IAC 733, allowing that these lamps be recycled rather

than being classified as hazardous waste. Fermilab began 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 low-level radioactive waste collected this year was consistently higher than usual due to extensive reconfiguration of the accelerator complex that resulted in large amounts of non-routine wastes during the accelerator shutdown. Approximately 98.3 cubic meters of non-routine radwaste and 31.6 cubic meters of routine radwaste were generated in 1998.

5.0 Conclusion

The operations at Fermilab during CY1998 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 Strategy (FMS).
[2] Supporting data are available upon request from the Fermilab ES&H Section in electronic or paper form.
[3] Total halogen is measured as chlorine.
[4] 35 IAC 620
[5] 35 IAC 620.210
[6]More information about this project is available from "NS1 and NS2 Hydrogeologic Site Characterization and Monitoring Well Installations" and "Aquifer Pumping Test Report" prepared by RUST, September 1996.