Fermilab Annual Site Environmental Report Calendar Year 2020

Fermilab

U.S. DEPARTMENT OF ENERGY | Office of Science

TABLE OF CONTENTS

COVER: BALD EAGLE BY OFFICE OF COMMUNICATIONS.

1.0 Introduction

Fermi National Accelerator Laboratory (Fermilab) is located in Kane and DuPage counties in the greater Chicago area. It covers roughly 10.6 square miles (27.5 square kilometers) in an area, which has rapidly changed from agricultural to residential use. Approximately eight million people reside within 50 miles (80 kilometers) of the site. The communities of Batavia (population 27,701), Warrenville (population 13,363), and West Chicago (population 26,475) are within 2 miles (3 kilometers) of Fermilab. The primary features on the site include the accelerator complex and associated building infrastructure, an interconnected industrial cooling water system, a housing complex for visiting researchers (the Village), row crop agriculture, and natural areas in various states of restoration. The natural areas consist primarily of tall grass prairie, forest, and wetlands. Fermilab is America's premier particle physics laboratory with a mission to drive discovery in particle physics, encouraging pioneering research by operating world-class accelerators and detector facilities. The laboratory takes pride in the ongoing stewardship of the site and works diligently to minimize the environmental footprint associated with operating the facility.

This Annual Site Environmental Report documents the performance of Fermilab's environmental protection program. The report presents the status of environmental objectives for the laboratory and documents the compliance status of environmental requirements under the scope of Fermilab's Environmental Management System (EMS). Fermilab's EMS conforms to the core set of standards described in ISO 14001 (International Organization for Standardization). The EMS structure provides Fermilab a practical framework from which to assess and manage the environmental impacts of site operations.

A core component of the EMS is the environmental monitoring and surveillance program. This program provides for the measurement and interpretation of the impact of Fermilab operations on the environment. Surveillance and monitoring tasks are conducted to confirm compliance with established standards and specific 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 at a particular location. Sampling points are selected based on the potential for adverse impacts. Additionally, effluent samples 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, progress on environmental restoration, and waste management and corrective action activities. The report is arranged by environmental topic and specific environmental compliance requirements.

2.0 Summary of Significant Environmental Issues

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. Detectable amounts of tritium have been observed in surface water discharges from the site since 2005 and Fermilab maintains permits to release tritium from regulated points. Additionally, Fermilab monitors the sanitary effluent discharged from the site to the municipal wastewater treatment plants of

Batavia and Warrenville/Naperville. Low concentrations of tritium are regularly recorded in the discharge to Batavia. 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 beginning in 2012. This body has evolved into the Tritium Task Force and is chaired by the Deputy Chief Safety Officer. The task force continues the work to identify, manage and mitigate to the extent possible tritium generated as a result of laboratory operations. Additional details concerning the management of tritium can be found in various sections of this report.

Reduction in Overall Environmental Emissions
Overall environmental emissions were reduced at Fermilab during 2020 due to the COVID-19 pandemic and the subsequent need for most of the employees to work from home. Details of the impacts of COVID-19 on environmental emissions are discussed throughout this report.

3.0 Ecological Stewardship

The director of Fermilab established the Ecological Land Management (ELM) Committee to recommend management practices based on sound ecological principles that enhance the natural resources of the laboratory. The ELM committee provides an ELM plan to deliver these recommendations to Fermilab. Facilities Engineering Services Section (FESS) Site Services and Roads & Grounds oversee the management of nearly 4,000 acres of natural areas, over half of which are being restored. These habitat communities include tallgrass prairie, oak savanna, open-water marsh, sedge meadow, buttonbush swamp, and floodplain forest, among others. The primary goal of ecological land management is to increase biodiversity of native flora and fauna while enhancing functional services of these ecological systems. This type of site stewardship includes prescribed burning, controlling invasive species, monitoring threatened & endangered species, surveying plants and wildlife and collecting seed from over 200 native species to spread into recently restored areas. Some of this work is carried out by trained natural areas volunteers that are provided by Fermilab Natural Areas, a 501(c)(3) not-for-profit corporation.

Fermilab has a Nuisance Animal permit issued by the Illinois Department of Natural Resources (IDNR) that allows for the trapping and elimination of nuisance animals. During 2020, 72 reports of nuisance wildlife were received. One coyote was taken to a rehabilitation center. Two beavers, nine raccoons, and one skunk were euthanized onsite.

Fermilab manages the population of whitetail deer on site by contracting annually with the U.S. Department of Agriculture Wildlife Services group. Population modeling using data from vegetation surveys, vehicle accident reports and aerial surveillance indicated that reducing the herd in 2020 was required. Fifty-seven deer were taken in March of 2020.

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, Fermilab has developed a Site Sustainability Plan that documents the laboratory's contribution towards meeting the goals. The primary emphasis of the plan is on the reduction of GHG emissions. A summary of GHG emissions is further described in section 7.2. The plan also addresses more broad ranging goals that include operating buildings more efficiently,

reducing water consumption, waste reduction and recycling, reducing fossil fuel consumption for vehicle fleets, and improved energy efficiency.

The operation of Fermilab was different in 2020 than from any other in its 53-year history because of the novel COVID-19 pandemic crisis. Beginning in early March, measures were taken to help control the spread of the virus by drastically reducing staff on site for work. The reduction in staff remained in effect at various levels for the balance of the year as result of the pandemic.

The laboratory consumed just 66% of anticipated electricity in FY2020. The near complete closure of the facility in late winter forced a suspension of experimental physics as the pandemic unfolded. Fermilab adjusted by using the opportunity to begin on site preparation work for LBNF earlier than planned, providing the project an early springtime start to civil construction ahead of schedule.

Fermilab's vehicle fleet consumed 15,000 gallons less fuel than the previous year due to dramatically reduced transportation needs across the site. Similarly, as working remotely became the new norm for virtually all staff, telework employees drove 5.28 million fewer miles commuting to and from work. This is the lowest recorded commuter mileage since Fermilab has tracked this metric. The reduction in travel produced an associated decrease in greenhouse gas tailpipe emissions of 35%. Emissions associated with business airline travel similarly decreased due to pandemic restrictions, with laboratory staff flying 8.2 million fewer miles in 2020. Greatly reduced staff on site produced significantly less waste, generating 40% less municipal waste from the previous year.

Greenhouse gas emissions associated with operations in FY2020 were correspondingly at very low levels, with Scope 1 and 2 emissions showing a 72% reduction from the recorded 2008 baseline, and Scope 3 emissions 78% below baseline. A new facility was completed in FY 2019. The Industrial Center Building Addition includes a high-bay space, adjacent workspaces, and offices and achieved High Performance Sustainable Building status.

5.0 Environmental Management System (EMS)

Fermilab's EMS is the organizational framework that enables the laboratory to minimize environmental impacts due to operations. The system functions via an ongoing cycle that focuses on planning, implementing, evaluating and improving environmental performance. This process is used as means to continuously focus on the environmental aspects of laboratory operations to ensure compliance with regulations and to demonstrate that the facility is operating in an environmentally responsible manner. In addition, the elements of the EMS have been aligned with the principles of Fermilab's ES&H management system to form a combined management system that addresses facility operational liabilities that have the potential to impact individuals and/or the environment.

Fermilab routinely evaluates operations and seeks to improve environmental performance. The laboratory's significant environmental aspects have been identified and are reviewed annually. In areas where change is desired or required, goals are established with measurable targets that seek to improve a particular aspect of operations. The goals outlined in the laboratory's Site Sustainably Plan document areas of significant emphasis where the laboratory is pursuing change.

Fermilab first received certification to the ISO 14001 standard for environmental management in 2007. During 2017, the laboratory transitioned towards EMS self-declaration to the standard. Self-declaration ensures full compliance to the standard through internal assessments and third-party audits. It is an allowable option granted by DOE. The laboratory's EMS was audited against the elements of the ISO 14001 standard in November 2017. The audit resulted in zero major nonconformances, three minor nonconformances, and six opportunities for improvement. A corrective action plan addressing the minor nonconformances was formulated and submitted to the DOE Fermi Site Office (FSO) in March 2018, with the FSO acceptance of that plan in April 2018. A Memorandum of Conformance was received from FSO on August 15, 2018.

In Spring of 2020, an internal EMS assessment was performed in preparation for the pending third-party audit in 2021. The internal assessment resulted in one non-conformance, one management concern, and four opportunities for improvement, all of which were addressed and closed out.

6.0 Environmental Monitoring and Surveillance

The goal of Fermilab's Environmental Monitoring Program is to assist laboratory management in decision-making by providing data relevant to impacts that facility operations have on the surrounding environment. This program includes effluent monitoring which is used to confirm compliance with permits from various discharge points from the facility.

Environmental surveillance is typically conducted at 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 for the most likely movement of chemical and radioactive materials resulting from Fermilab operations to the environment include the atmosphere, surface water (including sewer systems), 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 routinely analyzed for radionuclide concentrations. Surface waters are also monitored for potential chemical constituents. While levels of penetrating radiation are in some places measurable near operational areas on the site, the levels decrease rapidly with distance from the sources. External penetrating radiation and airborne emissions are commonly below instrument detection levels at the site boundary and must be estimated to provide information about the maximum potential radiation doses to offsite populations. The results of the environmental surveillance program are interpreted and compared with environmental standards where

applicable. The Fermilab Environmental Monitoring Plan, which is maintained by the ES&H Section, provides more details.

6.1 Air Quality

Fermilab is not a significant source of chemical air pollution and is registered with the IEPA Registration of Smaller Sources (ROSS) program. This program is administered by IEPA and is available to facilities that emit only minor amounts of air pollution.

In addition, Fermilab monitors radioactive air emissions associated with operations. These emissions are kept as low as reasonably achievable (ALARA) and fall well below U.S. Environmental Protection Agency (EPA) emission standards.

6.1.1 Non-Radioactive Air Emissions

In 2020, Fermilab continued to operate under the ROSS program. Registration for ROSS is required for facilities such as Fermilab that emit air pollution in very minor amounts. Even though Fermilab no longer operates under a Lifetime Operating Permit it continues to monitor the sources named in 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 being a permitted source. The sources Fermilab continues to monitor include the following:

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

6.1.2 Radioactive Air Emissions

Airborne radionuclides are normally released to the atmosphere from operating target stations, accelerators and beamlines. Measures to keep these releases ALARA are incorporated into the operating processes and procedures at these facilities and in design efforts for new projects. Monitoring is conducted at areas where air emissions are considered a significant contributor to the overall transport of radioactive materials offsite. A small quantity of airborne radionuclides is emitted by the Magnet Debonding Oven when operating.

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 near the stacks. The dose for the air pathway is calculated using a Gaussian plume computer simulation model called Clean Air Act Assessment Package-1988 (CAP88PC Version 4.1). 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 (40 CFR 61). Maximum calculated concentrations off-site are predicted to be below the level that could be detected by direct monitoring.

In 2020, due to the COVID-19 pandemic, all accelerators, beam lines and experiments stopped operations on March 23rd. Linac and Booster returned to operation in October. The rest of the accelerators, and beam lines started operations in late November. In 2020, the debonding oven did not operate. The Muon Campus used 8 GeV protons for muon production for the g-2 experiment. The Main Injector, g-2, the Booster Neutrino Beam and NuMI stacks are estimated to have released a total of 46.6 Curies in 2020. These cumulative radioactive air emissions were approximately 2.3% of the annual average (2000 Curies) expected from operations as acknowledged in the air pollution permit application on file with the IEPA. Doses to the public from emissions in 2020 continued to be well below the USEPA standard of 10 mrem in a year and less than the USEPA's continuous monitoring threshold of 0.1 mrem in a year. Using the CAP88-PC Version 4.1, Gaussian dispersion model, the highest dose equivalent to any member of the public offsite was estimated to be 0.0142 mrem. Fermilab's 2020 Radionuclide Air Emissions Annual Report was submitted to the DOE FSO in May 2021. The report is distributed by the DOE FSO to the USEPA and IEPA.

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 (MTest) and Meson Center (MCenter) beamlines operated in 2020. The maximum muon dose offsite due to the operation of Mtest and MCenter was 0.011 mrem. Both the BNB and NuMI experiments have the potential to produce measurable muon flux; however, the 8 GeV energy protons used in BNB 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 2020 by a large ionization chamber located in the Railhead colloquially called a 'Hippo.' The Hippo measurements are supplemented by several of environmental dosimeters placed around the storage area and by periodic onsite surveys. Based on measurements made, it is estimated that radioactive materials stored at the Railhead contributed no directly measurable equivalent dose at the site boundary in 2020. The maximum total penetrating radiation equivalent dose in 2020 to an individual at the nearest offsite house was thus estimated to be 0.011 mrem, and not directly measurable.

6.3 Surface Water Quality

Fermilab releases minor amounts of contaminants to surface water bodies. As part of the management of these discharges, the laboratory holds National Pollutant Discharge Elimination System (NPDES) permits that govern releases to surface water from storm water 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. The Fermilab Environment, Safety, and Health Manual (FESHM) Chapter 8026 Surface Water Protection describes regulatory aspects and

responsibilities of the surface water program. Aqueous process wastewaters are directed to sanitary sewers and ultimately discharged to publicly owned treatment works (POTWs) in the municipalities of Batavia and Warrenville/Naperville. Wastewater discharges are controlled by criteria described in FESHM 8025, Wastewater Discharge to Sanitary Sewers. There were no unplanned releases to sewer systems in 2020.

6.3.1 Cooling Water System

Fermilab requires large amounts of non-contact cooling water that is circulated through various surface water bodies designed to dissipate heat. Fermilab's site-specific NPDES permit authorizes the treatment of Industrial Cooling Water (ICW) and the discharge of commingled cooling water and storm water runoff through outfalls into Kress, Indian and Ferry Creeks. The outfalls designate the location at which point Fermilab's surface water system becomes Waters of the State. A Storm Water Pollution Prevention Plan is required by the site-specific NPDES permit. It addresses storm water discharges associated with Resource Conservation and Recovery Act Solid Waste Management Units (SWMUs), certain industrial activity areas and services support areas. (Also see Section 7.12 National Pollutant Discharge Elimination System.) An inspection report was completed in March and filed with the IEPA.

In 2020, Fermilab contracted with a state-licensed pesticide applicator to treat a limited number of ponds with aquatic herbicide to minimize plant growth. Additionally, an ongoing zebra mussel infestation occurring in the ICW system infrastructure was managed by using a continuous feed of sodium hypochlorite solution at the Casey's Pond pumphouse.

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. One discharge exceedance of the pH limit occurred in May at an outfall associated with the Main Injector cooling ponds (limit 9.0, May discharge 9.49). The possible cause was investigated; however, the exceedance could not be attributed to any operational activities.

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 tunnel water contains measurable concentrations of tritium and the primary source of the tritium comes from water contact with 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 Central Utility Building cooling towers. Excess NuMI water and effluent from the towers is directed to the ICW pond system.

Fermilab continued to discharge measurable 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. In 2020, no detectable levels of tritium discharged to Kress Creek. Indian Creek had tritium discharges eight months of the year (highest concentration was 5.2 pCi/ml in April). In 2020, the Ferry Creek outfall had detectible levels of tritium in March and April (1.1 and 1.0 pCi/ml respectively).

Monthly data from measurements taken at outfall and site boundary locations are made publicly available through the *Tritium at Fermilab* website. 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. This effluent is directed to the cities of Batavia and Warrenville/Naperville for treatment. In addition, Fermilab operated two systems in 2020 that require pretreatment prior to release to the sewers. These operations require wastewater pretreatment permits issued by IEPA. The permits are as follows:

- Individual industrial wastewater pre-treatment permit that allows Fermilab to discharge wastewater effluent from deionized water regeneration operations occurring at the CUB to the City of Batavia sanitary sewer treatment works.
- Individual industrial wastewater pretreatment permit that allows for metal finishing wastewater from the Applied Physics and Superconducting Technology Division's (APS-TD) CPL at Industrial Building 4 (IB4) to be discharged to the city of Batavia sanitary sewage treatment works.

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 occasionally exceeds the limit for iron (5.0 mg/l) released to Warrenville. This did not occur in 2020. Aging pipes are suspected to be the source of the exceedances and their cause has 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 2020 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. Total tritium discharges to the Batavia treatment works in 2020 were approximately 10% or those of 2019, primarily due to the January 2020 administrative shut down of the NuMI evaporator at MI-65 and the longer beam shut down associated with the COVID-19 pandemic. No other isotopes were detected.

Total Tritium	**0.13 Curies**
Average Concentration	1.1 pCi/ml
Highest Concentration	2.7 pCi/ml
Total Sanitary Volume	29,988 kGal

Fermilab's Tritium Task Force Working Group continued to investigate sources of tritium into both the sanitary sewer system and the ICW system. As part of this, a concerted effort is being undertaken to investigate sources of tritium in the sanitary system in the southern sections of the system.

6.4 Groundwater Quality

The 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 dolostone bedrock aquifer, the upper surface of which is 50 to 80 feet below the ground surface in the Joliet Formation at Fermilab (Figure 6.4-1), as well as water in the overlying Batestown Member or Henry Formation, is classified as the top of Class I groundwater. Water in the glacial deposits overlying the Batestown or lowermost Henry has been demonstrated to be Class II water requiring less-stringent standards.

The locations of groundwater monitoring wells are shown in Figure 6.4-2, with approximate screen depth intervals for wells related to sampling programs illustrated in Figure 6.4-1. In 2020 nine glacial and Silurian dolostone (Joliet Formation) monitoring wells at the CUB Pipe and Clay Tile Field (Solid Waste Management Unit, or SWMU 12) were sampled as part of ongoing RCRA Facility Investigation (RFI) corrective actions at this location. Due to changes in the depths of chloride concentrations since wells were installed, Illinois EPA required the installation of four new wells at SWMU 12 in 2019.

During 2006, the Meson and Neutrino Soil Activation Areas were removed from the RFI as a SWMU; however, under the laboratory's environmental surveillance program, sampling continues in the five Joliet Formation wells in this region. For informational purposes, and as a courtesy, the results are reported to the IEPA annually. Four background wells (Joliet Formation) were sampled to assess base-line tritium levels at the up gradient (north) edge of the laboratory property (BMW-1 through BMW-4) and one Elwood Formation well was sampled to assess tritium levels near the NuMI Target Hall (S-1426-2). An additional 124 wells with various screen depth intervals (Figure 6.4-2) are used as piezometers (pore-water pressure measuring apparatus) to gather information on groundwater flow directions site-wide. These data are used in conceptualizing the horizontal and vertical transport of potential contaminants from past and present operational areas of concern.

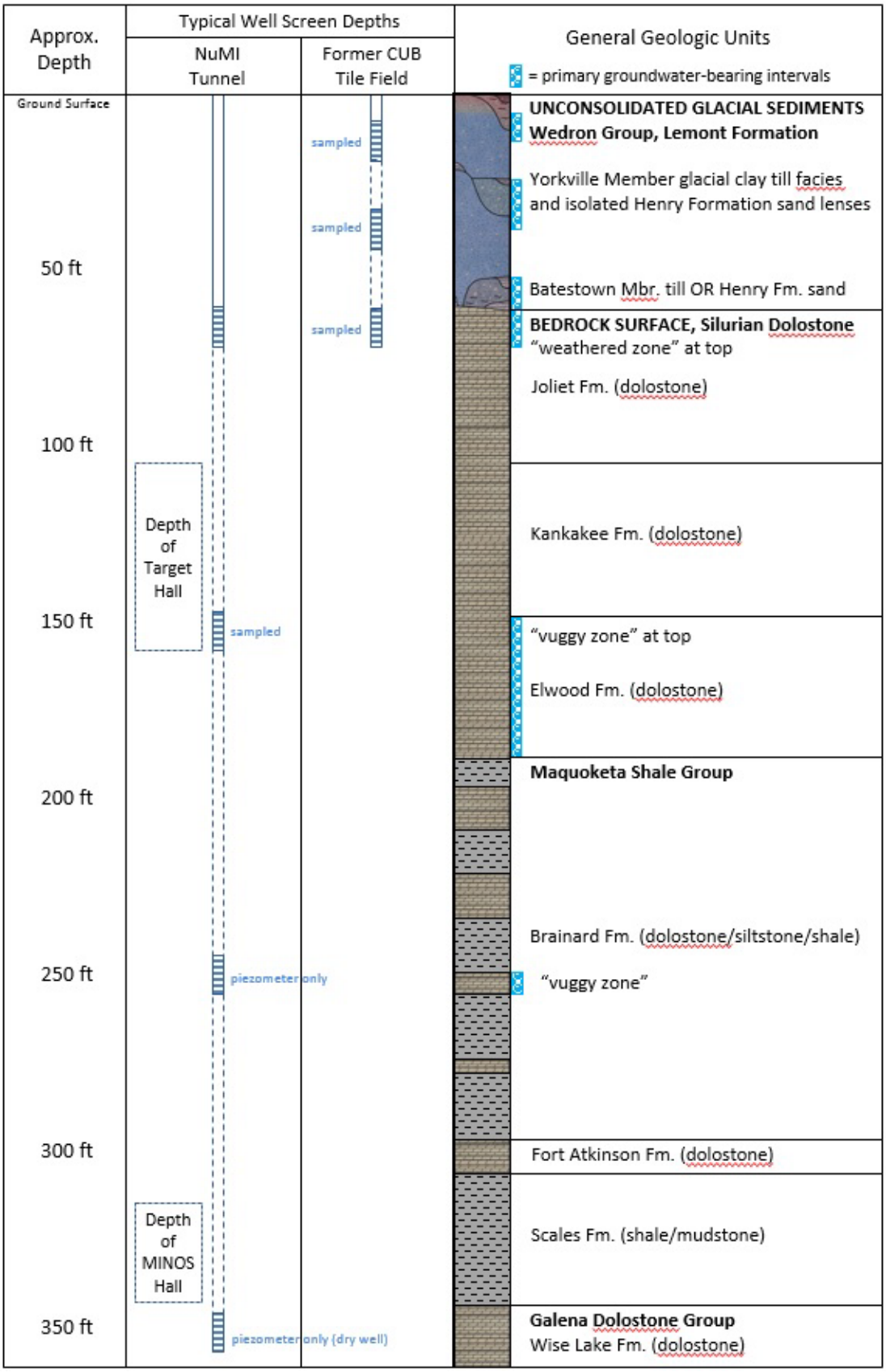

Figure 6.4-1. General Fermilab geologic section (based on the NuMI tunnel), with groundwater monitoring well screen depths and groundwater-bearing intervals. Sampling/piezometer status is for 2020.

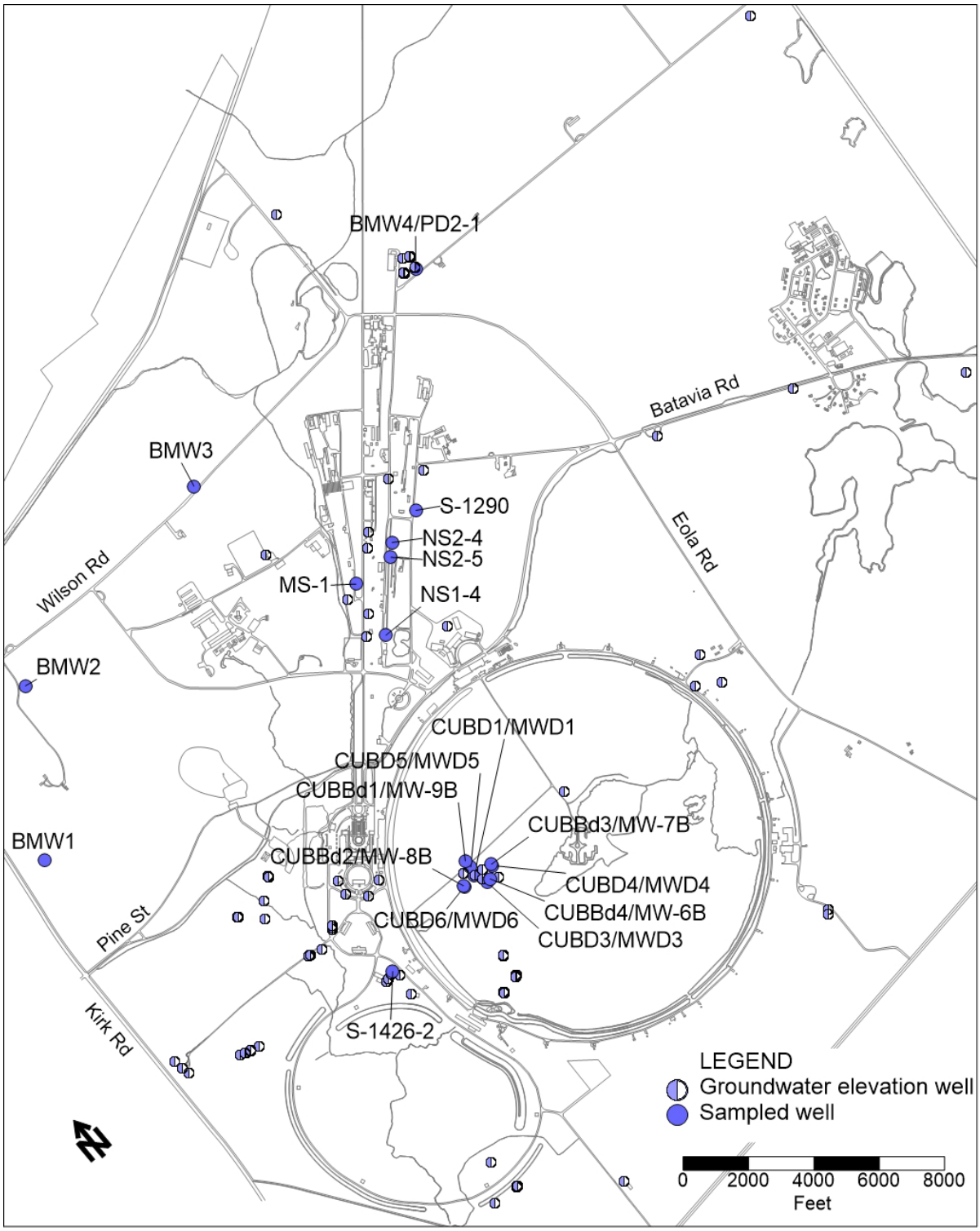

Figure 6.4-2. Groundwater monitoring well locations in 2020. Sampled wells represented by labeled, filled circles. Wells used only for groundwater elevations represented by half-open circles. (Original DUSAF projection)

6.4.1 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. Samples were collected from ten locations for radionuclide analysis. Tritium and accelerator-produced radionuclides were not detected in any Class I groundwater samples during 2020.

There are six “sump” wells at the Booster Neutrino Beam that are routinely sampled for tritium. They are not true groundwater wells, but rather drain the north and south ends of the interior, interstitial space and exterior of the dual-liner system around the decay pipe via lateral pipes. Water in the interior and interstitial sump wells originates from surface infiltration that makes its way through the damaged liner system near the north end, adjacent to MI-13A. Most of the water in the exterior wells originates from surface and lateral infiltration that makes its way to the sides and underside of the liner system, and some water in these wells leaks from the laterals leading to the interior and interstitial sump wells. Tritium results in these wells in 2020 ranged between 1.2 and 3200 pCi/ml and was either routed to MI Pond F or Casey’s Pond, or it was contained and shipped for disposal if the concentration exceeded 1,900 pCi/ml. Further measures to redirect water away from the MI-12/BNB area (a canopy and surface liner) were implemented in 2018-2019. Tritium concentrations and infiltrating water volumes in the BNB sump wells decreased during the second half of 2019 and throughout 2020 and will continue to be monitored to evaluate the potential impact to groundwater.

6.4.2 Chemicals in Groundwater

In 2020, quarterly and semi-annual groundwater sampling events were conducted at one SWMU. Chemical analyses were performed on these samples as required by the Resource Conservation and Recovery Act Facility Investigation (RFI). (See Section 7.14.1 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 2020. The annual air emissions report for 2020 was not required due to Fermilab’s registration as a ROSS source. Fermilab’s 2020 Radionuclide Air Emissions Annual Report was submitted to the DOE FSO in May 2021. The report is distributed by the DOE FSO to the USEPA and IEPA.

In 2020, the actual annual air emissions for Criteria Air Pollutants (carbon monoxide, nitrogen oxides, particulate matter, sulfur dioxide, and volatile organic materials), were 3.8286 tons per year, much less than the maximum allowed for a ROSS site.

Doses to the public from radioactive emissions in 2020 continued to be well below the USEPA standard of 10 mrem/year, and also much less than the EPA’s continuous monitoring threshold of 0.1 mrem/year. In 2020, an estimated 46.6 Curies were released from various sources (see section 6.1.2 Radioactive Emissions). 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 0.0142 mrem/year in 2020.

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.

7.2 Greenhouse Gas Emissions Reporting

Fermilab supports the Department of Energy's effort to advance GHG reduction at its facilities. In 2020 the laboratory submitted GHG emissions data to the department via DOE's Sustainability Dashboard. GHGs are divided into three categories: Scope 1, 2, and 3. Scope 1 emissions are direct emissions from activities controlled by Fermilab (e.g., boilers, emergency generators, fleet vehicles, and fugitive emissions). Scope 2 emissions are indirect emissions and for Fermilab involve only purchased electricity. Scope 3 emissions are other indirect emissions such as employee air travel, electrical transmission and distribution losses, waste generation, ground travel, and employee commuting.

A summary of Fermilab's emissions, including the 2008 baseline, are shown below. The performance status indicates that Fermilab has reduced Scope 1 and 2 emissions by 72.2% over the baseline year. The consumption of electricity is Fermilab's dominant source of Scope 1 and 2 emissions. Scope 3 emissions were reduced by 77.9%.

Fermilab is committed to assist DOE in meeting reduction goals for Scopes 1, 2 and 3. Fermilab intends to use Renewable Energy Certificates (RECs) based on our purchased power consumption as a primary mechanism to reduce Scope 2 emissions.

Scope 1 & 2 Greenhouse Gas Emissions

Goal: YOY scope 1 & 2 GHG emissions reduction from a FY 2008 baseline.
Interim Target (FY 2020): 0.0%

Current Performance: -72.2%

	FY 2008	FY 2019 (PY)	FY 2020	% Change from Baseline	% Change from Last Year
Facility Energy	343,366.8	161,122.7	120,825.4	-64.8%	-25.0%
Non-Fleet V&E Fuel	142.6	186.6	46.3	-67.5%	-75.2%
Fleet Fuel	691.6	27.9	0.0	-100.0%	-100.0%
Fugitive Emissions	40,165.1	139.1	708.3	-98.2%	409.2%
On-Site Landfills	0.0	0.0	0.0	N/A%	N/A%
On-Site WWT	0.0	0.0	0.0	N/A%	N/A%
Renewables	0.0	0.0	0.0	N/A%	N/A%
RECs	0.0	-17,435.4	-14,619.3	N/A	-16.2%
Total (MtCO2e)	**384,366.1**	**144,040.9**	**106,960.6**	**-72.2%**	**-25.7%**

Scope 3 Greenhouse Gas Emissions

Goal: YOY scope 3 GHG emissions reduction from a FY 2008 baseline.
Interim Target (FY 2020): 0.0%

Current Performance: -77.9%

	FY 2008	FY 2019 (PY)	FY 2020	% Change from Baseline	% Change from Last Year
T&D Losses*	22,287.8	7,306.8	2,654.0	-88.1%	-63.7%
T&D RECs Credit	0.0	-1,148.5	-963.0	N/A	-16.2%
Air Travel	2,215.8	2,530.1	1,061.9	-52.1%	-58.0%
Ground Travel	168.9	128.5	78.7	-53.4%	-38.8%
Commute	4,633.3	5,392.5	3,493.0	-24.6%	-35.2%
Off-Site MSW	191.8	247.7	180.4	-5.9%	-27.2%
Off-Site WWT	4.8	11.0	10.8	125.0%	-1.8%
Total (MtCO2e)	**29,502.4**	**14,468.1**	**6,515.8**	**-77.9%**	**-55.0%**

* Includes T&D losses for purchased renewable electricity

7.3 Underground Storage Tanks and Fuels

There are three underground storage tanks (USTs) in use at Site 38 Fuel Dispensing Facility. These were operated and maintained per current UST standards. An Illinois State Fire Marshall compliance inspection was conducted in April 2021 and our Underground Storage Tank Motor Fuel Dispensing Permit was approved in April 2021 and is valid until December 31st, 2023. The Illinois State Fire Marshall conducts an inspection every two years. The UST system continues to be inspected on a semi-annual basis by a qualified subcontracted vendor, and on a daily, monthly, and quarterly basis by a Class A Certified Underground Storage Tank operator. The inspection activity ensures that the internal and external leak detection systems are functioning properly.

7.4 The Endangered Species Act of 1973

Impact to endangered species are considered as part of Fermilab's formal Environmental Review process for all projects, as required by the National Environmental Policy Act (NEPA). Questions that must be answered during the review process include defining a project's area and scope. If warranted the review will identifying any threatened or endangered species within the area and the potential to impact protected species and their critical habitat. No compliance issues were identified in 2020.

7.5 Executive Order 11988, "Floodplain Management"

Impact to floodplains are considered as part of Fermilab's environmental review process under NEPA. Project information, such as total project area or if floodplain filling is required are questions asked during a review. No floodplain issues were encountered during 2020. As part of Fermilab's Surface Water Management Program (SWaMP), on-site streams have been surveyed and mapped to collect data on sediment depth, field tile invert depths and in-stream structures. Hydrologic analysis was used to determine runoff from rainfall events of return frequencies ranging from 1-year to 100-years and durations of 1-hour to 48-hours. Hydraulic analysis has been completed to create flood profiles and inundation maps for 2, 5, 10, and 100-year floods. Executive Order 11988, "Floodplain Management"

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

Evaluation of potential wetland impacts due to Fermilab activities continued to be accomplished through the NEPA, FESS Design, and FESS Comment and Compliance review processes. The laboratory 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. In July 2018, the U.S. Army Corps of Engineers issued a site-wide jurisdictional wetland determination for Fermilab. This determination allows the laboratory to perform work within non-jurisdictional exempt or isolated wetlands on site. The determination is valid for five years.

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

In 2020 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 (IDNR) "Rules for Construction and Maintenance of Dams"

The Department of Energy 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 Fermilab in the Indian Creek watershed. Fermilab reports to IDNR annually on the condition of the dam, and on a five-year cycle is required to perform a comprehensive inspection and file a detailed report on the condition of this structure. The comprehensive inspection was last conducted in April of 2018 and an "Owners Maintenance Report" was transmitted to the IDNR by DOE. The dam was again inspected in September 2020 and no non-routine action items were identified. A maintenance report was subsequently transmitted to IDNR.

7.9 The Migratory Bird Treaty Act

A DOE memorandum of understanding (MOU) with the U.S. Fish and Wildlife Service (2013) provides a number of measures designed to "protect and conserve" migratory bird habitat to the fullest extent practicable. Fermilab addresses this MOU by evaluating migratory bird impacts during the normal course of conducting environmental reviews under NEPA to avoid or minimize impacts to even the most common birds as much as reasonable. Ecological land management across the Fermilab site continues to provide ample habitat communities and stopover resources for migratory birds. Additionally, Fermilab maintains a proactive approach to protecting the Canada goose population onsite while ensuring the safety of employees and visitors. Fermilab contracts with a firm to use dogs to harass geese to displace them from more heavily used operational areas on the site. The firm holds a valid permit from the IDNR to pursue this activity, which was carried out during the spring nesting season. Fermilab also possesses a Nuisance Wildlife Control Permit issued by the IDNR that allows for the destruction of Canada goose nests if they become a safety hazard. The permit allows the laboratory to destroy up to seven nests each year. During 2020, two nests were destroyed.

7.10 National Environmental Policy Act (NEPA)

Compliance with this Act 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 prior to carrying out those actions.

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 2020, 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 FESHM Chapter 8060 – National Environmental Policy Review. Most of the reviewed activities were considered categorically

excluded 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 or small-scale research and development projects and conventional laboratory operations. In 2020 two projects/actions needed to be addressed by submitting environmental evaluation notification forms to DOE.

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 (EA) nor an Environmental Impact Statement (EIS) is required.

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, as well as with DOE Order 450.1 was accomplished through the NEPA review process that included an evaluation of all proposed land-disturbing projects in 2020 to assess any potential impacts on historic resources. Fermilab follows a site-specific, DOE required Cultural Resources Management Plan (CRMP), following guidelines outlined in DOE Publication DOE/EH-0501. The CRMP assures continued compliance with the above listed Acts by providing a comprehensive overview for the locations and status of all cultural 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 2020.

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 2020. These permits are as follows:

1. Individual NPDES permit for Non-Contact Cooling Water and Storm Water

This permit addresses combined storm water and non-contact cooling water discharges associated with industrial activities. Six outfalls are associated with this permit:

- Outfall 001 discharging to Ferry Creek,
- Outfall 002 discharging to Kress Creek,
- Outfalls 003, 004, 005, and 006 discharging to Indian Creek.

Outfall 004 addresses potential discharges from the MINOS ICW holding tank. Outfalls 005 and 006 address discharges from the Main Injector pond system. The permit requires Fermilab to record and report to IEPA monthly certain physical and chemical discharge parameters. From all six outfalls water temperature, pH, flow and tritium are reported. Additionally, chlorine concentration is reported from outfalls 001 and 002 discharging to Kress and Indian Creeks.

Permits are effective for 5 years. The most recent permit renewal became effective September 4, 2019. IEPA last conducted a compliance evaluation inspection against elements of the permit in November 2016. No findings were reported.

2. General NPDES Storm Water permit for Construction Activities

This permit is required for all projects that disturb greater than one acre. In 2020 there were three active projects.

- Integrated Engineering Research Center Project
- Proton Improvement Plan (PIP II) Project
- LNBF Near Site Preparation Project

3. General NPDES Permit for Pesticide Application Point Source Discharge

This permit applies to facilities that apply pesticides that may impact waters of the State.

Additionally, Fermilab holds two industrial wastewater pre-treatment operating permits issued by IEPA (also covered under NPDES regulations and are described under Section 6.3.4, Releases to Sanitary Sewers).

7.13 Regulated Waste

Resource Conservation and Recovery Act (RCRA): Federal RCRA regulations govern the management of hazardous waste. Fermilab maintains a permit under RCRA to manage for disposal or reclamation hazardous waste generated at the laboratory. Fermilab does not treat or dispose of regulated waste on site. Radioactive waste is not governed under RCRA and is managed following DOE requirements. All wastes are properly disposed though licensed waste handling, transport or disposal facilities. An annual Hazardous Waste Report is transmitted to IEPA. Upon request, radioactive waste summaries are provided to DOE FSO.

RCRA Investigation Summary: On March 17, 2020, the USEPA performed a RCRA inspection and on November 19, 2020 the IEPA performed a RCRA inspection on Fermilab's Hazardous Waste Storage Facility (HWSF) located at Site 55. The purpose of the inspection was to evaluate Fermilab's compliance with its Part B Permit for the storage of hazardous waste. The inspections resulted in no violations of any of the specific RCRA requirements that were under evaluation.

Radioactive Waste: Fermilab's Hazard Control Technology Team (HCTT) is responsible for the overall management of Low-Level Radioactive Waste (LLRW). This includes all transportation related activities associated with shipping LLRW from Fermilab to designated DOE approved disposal facilities. In 2020 Fermilab disposed of 50.2 cubic meters of radioactive debris and 3.0 cubic meters of mixed waste debris at EnergySolutions in Clive, UT.

Tritiated Water: In 2020 Fermilab disposed of 50,270 gallons of tritiated water. The primary source of tritiated water requiring disposal was accumulated from a below ground collection system used to capture water associated with a compromised liner surrounding the Booster Neutrino Beam Absorber at MI12. Accumulated water is pumped to surface holding tanks where it is sampled for tritium. Water with tritium concentrations above DOE's release criteria of 1,900 picocuries per milliliter is characterized as low-level radioactive waste. Water was sent to EnergySolutions in Clive, UT for treatment and disposal.

Regulated Waste Disposal and Reclamation: The following volumes of regulated waste including radioactive waste and non-radioactive waste were managed by the HCTT in 2020.

Waste Material	Cubic Meters
Hazardous Waste (RCRA + TSCA)	7.9
Non-Hazardous Special Waste	33.2
Radioactive Waste (DOE Regulated)	264.2
"Mixed Waste" Radioactive + RCRA Waste	2.8

The following volumes of waste were generated by Fermilab and managed for reclamation/recycling by the HCTT in 2020.

Recycled/Reclaimed	Kilograms
Lead Acid Batteries	4,536
Universal Waste Batteries	246
Mercury Containing Equipment	11.8
Alkaline Batteries	1,485
Safety Kleen Solvent	1,055
Oil Filters	68

7.14 RCRA Facility Investigation (RFI) Activities

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. As approved by Illinois EPA in 2017, the five shallow water table wells are no longer required to be monitored. Four new wells installed during summer 2019 are being sampled quarterly for a period of at least one year to evaluate any seasonal trends. All results from the deep till wells through 2020 were below Class II Groundwater Quality Standards. Nine monitoring wells at SWMU 12 were sampled during 2020.

The following table summarizes the 2020 results at SWMU 12 from wells with results above either the Class I or Class II Groundwater Quality Standards.

Glacial deposit well MWD1 produced 2nd and 4th quarter total chloride results of 1100 mg/L and 1190 mg/L, respectively. The Class II Groundwater Quality Standard is 200 mg/L.

Glacial Deposit Monitoring Wells				2Q20	4Q20
PARAMETER	Class II GW Quality Standard			Well CUBD1 MWD1	Well CUBD1 MWD1
INORGANIC (mg/L)					
Chloride, Total	200			1,100	1,190
Lead, Total	0.1			U J	U

Grey Shading = Above the Class II GW Quality Standard

U = Undetected
J = Estimated

Bedrock Monitoring Wells		2Q20	2Q20	3Q20	3Q20
PARAMETER	Class I GW Quality Standard	Well CUB6B MW6B	Well CUB8B MW8B	Well CUB6B MW6B	Well CUB8B MW8B
INORGANIC (mg/L)					
Chloride, Total	200	17	U J	16	1
Lead, Total	0.0075	0.012	0.008	0.013	0.012

Grey Shading = Above the Class II GW Quality Standard

U = Undetected
J = Estimated

Bedrock wells in 2020 produced total lead results above the Class I groundwater quality standard of 0.0075 mg/L during the 2nd and 3rd quarters.

7.15 Safe Drinking Water Act

Fermilab's domestic water is purchased from the City of Warrenville. In addition, Fermilab currently retains five private wells at four sites (Site 29 [two wells], Site 52 [Buffalo Barn], Site 56 [Horse Barn] and Site 58). 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.

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

Under SARA Title III Section 313 regulations Fermilab is required to provide U.S. EPA and the State of Illinois with an annual account of toxic chemicals over certain reporting thresholds that were manufactured, processed or otherwise used in a given year. Reporting is accomplished through the Toxic Release Inventory (TRI) reporting system. Fermilab reported one chemical (copper) that exceeded the reporting threshold in calendar year 2020.

Additionally, under Tier II reporting requirements, Fermilab provides annually to state and local officials a description of hazardous, toxic, and extremely hazardous chemicals used or stored onsite in quantities greater than their respective reporting thresholds.

7.17 Oil Spill Prevention

Fermilab's Spill Prevention Control and Countermeasures (SPCC) Plan complies with 40 CFR 112 – Oil Pollution Prevention. This US EPA-enforced regulation requires 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 all oil sources with a capacity of 55 gallons or more. In 2018 Fermilab updated its SPCC Plan to ensure regulatory compliance. The plan was approved by a professional engineer familiar with the regulation and Fermilab operations. A FESHM chapter and SPCC training for oil handling employees describe the Fermilab SPCC Plan. Training is provided annually to affected employees in accordance with the regulation.

Fermilab has more than 700,000 gallons of oil on site including more than 350 oil-filled transformers. In 2015 Fermilab developed a new SPCC database to improve overall management of the inventory. The database has helped to ensure the oil sources owned by each division/section remain in compliance with 40 CFR 112 by cataloging all inspections and the locations of oil sources.

In 2017 Fermilab removed the NOvA Surface Detector containing 14,800 gallons of scintillator oil. 2,800 gallons of oil was disposed, and the remaining 12,000 gallons of oil was placed into a new tank farm at the Meson Detector Building east parking lot.

In 2018, the Lab amended the SPCC plan to reflect changes including the removal of the NOvA Surface Detector. Additionally, responsibilities were updated to reflect changes in the ESH Section due to centralization.

In 2019, a new surface detector was added to the site at MC7 containing 5,500 gallons of oil.

In 2020, the Lab continued compliance with 40 CFR 112. In March 3,200 gallons of scintillator oil in the tanker located at MAB East was emptied and shipped for disposal. No reportable spills occurred in 2020.

7.18 Toxic Substance Control Act (TSCA)

There are no changes to the status of the Groundwater at Main Ring service buildings B1 and B4 since it was determined in 2002 to be PCB-contaminated as a result of seepage of groundwater into the excavations after the completion of the phased cleanup in 2002. These locations could not be declared "clean" so Fermilab requested approval from EPA to classify the residual PCB contamination as "disposed in place." USEPA approved the request with some conditions that included Fermilab placing a notice to the deed that identified the location of the contaminated groundwater and indicate that its use is restricted. This was accomplished in June of 2010. The laboratory was also required to notify the Agency in writing, at least 10 days prior to conducting any excavation activities that involve the removal of soil or other material in the area where the contaminated groundwater exists. If groundwater is encountered, it must be sampled, and all results must be reported to EPA. Several internal mechanisms were created to ensure that these requirements were met, including placing signs at the affected locations, adding the locations to the Geographic Information System (GIS), and modifying ES&H review procedures.

7.19 Emerging Contaminants

The Fermilab Fire Department conducted limited training activities within the last few years with some expired 5-gallon buckets of foam that contained polyfluoroalkyl substances (PFAS). The foam was flowed onto a small section of a seldom-used asphalt road near the center of the Fermilab property. Due to the limited amount of foam used, the high percentage of clay in the subsurface deposits and the variable sorption information on PFAS compounds, there is a low likelihood that even the shallow groundwater zone would be impacted. An Environmental Protection Note is being drafted to document the recommended path forward to address Fermilab's PFAS impact. EPA approved analytical methods for PFAS in soil are expected to be issued in 2022 and a sampling plan is being developed to evaluate Fermilab's PFAS impact at that time.

8.0 Pollution Prevention and Waste Minimization

Fermilab operates an established comingled recycling program that includes the recovery of paper, glass, plastic and metal containers. The laboratory also recycles when possible various non-conventional items such as polystyrene packaging and disposable batteries. Additionally, a scrap metal program is used to divert significant volumes of salvaged metals generated as part of normal operations. In FY2020 Fermilab diverted 151 metric tons (44%) of the municipal waste generated on site.

The diversion rate declined from previous years. It is believed that this was caused in part due to an increased volume of single-use, consumable items disposed of in association with managing the effects of the pandemic. Support staff to manage waste, including janitorial staff, were also less focused on recycling as stepped-up sanitation efforts became the priority. The total volume of waste diverted was comparatively reduced by 40% due to low occupancy of the site beginning in March, when employee access restrictions were put into place related

to the pandemic. Smaller amounts of waste diverted towards composting (1.8 tons) and recycled cooking oils (1.25 tons) also occurred.

Fermilab recycled or donated for reuse 100% of eligible used computer equipment generated in 2020. This includes computing and electronic equipment including servers, printers, laptops, monitors, cellphones, PDAs, TVs etc. Donations for reuse is accomplished through DOE's Computers for Learning program. The total electronic waste amount generated in FY2020 was 10.27 tons, a reduction of 10.2 tons from FY2019 due to COVID- 19 restrictions.

Permanent dumpsters dedicated to recycling construction and demolition debris are staged on site. Fermilab maintains these dumpsters to encourage recycling of materials from small-scale construction projects and general maintenance activities. Fermilab Time and Materials (T&M) contractors have been directed to use these dumpsters for waste generated from projects. In FY2020, these dumpsters and construction dumpsters from large scale fixed price projects collected 309.4 tons of construction waste of which 52.7% was eligible for recycling.

9.0 Radiological Clearance of Property and Metals Release Suspension

Fermilab has operated an active scrap metal recycling program for many years. The program includes policies and procedures to ensure that the DOE secretarial mandates regarding the moratorium and suspension on the release of scrap metals from departmental sites is not violated. Historically, as a general operating principle, Fermilab has not released radioactive metals as scrap. Beginning in 2000, to comply with the suspension directive, the laboratory began holding non-radioactive scrap metals originating from radiological areas (as defined 10CFR 835). This material has been accumulating since the suspension became effective. Direct impacts as a result of the suspension include the loss of scrap revenue, the costs associated with the management and storage of this material and the potential future cost of disposal if it cannot be scrapped.

In 2020 Fermilab continued to operate a metals recycling program that has a rigorous material screening process and has incorporated numerous ongoing improvements that have been made since 2000. An enhanced Material Move Request form (MMR) is used to clearly identify and document which metals are eligible for recycling. These metals are then subjected to multiple hand-held radiation surveys and must pass successfully through the vehicle scrap monitor before leaving the site. In 2020, 133 metric tons of various metals met Fermilab's release requirements and were recycled.

10.0 Conclusion

Fermilab operations during 2020 had no significant adverse impact on the environment or on public safety. An emphasis on compliance with regulations and requirements, and environmental stewardship remains a high priority for the laboratory.