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NATIONAL ENERGY TECHNOLOGY LABORATORY

2021 Annual Site

Environmental Report

August 22, 2022

U.S. DEPARTMENT OF ENERGY | NATIONAL ENERGY TECHNOLOGY LABORATORY

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2021 Annual Site Environmental Report

U.S. Department of Energy

National Energy Technology Laboratory

Albany, Oregon

Anchorage, Alaska

Houston, Texas

Morgantown, West Virginia

Pittsburgh, Pennsylvania

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EXECUTIVE SUMMARY

The U.S. Department of Energy's (DOE) National Energy Technology Laboratory (NETL) develops the Annual Site Environment Report (ASER) to provide a comprehensive status of its environmental compliance in five states. This annual report verifies and documents NETL's mission to drive innovation and deliver solutions for an environmentally sustainable and prosperous energy future: ensuring affordable, abundant, and reliable energy that drives a robust economy and national security, while developing technologies to manage carbon across the full life cycle and enabling environmental sustainability for all Americans.

The Laboratory implements a wide range of energy and environmental research and development (R&D) programs that enable domestic coal, natural gas and oil to economically power our nation's homes, industries, businesses and transportation sources. To meet this goal, NETL applies its expertise to coal, natural gas and oil technologies; contract and project management; analyses of energy systems; and international energy issues. In addition to research conducted on site, professional support includes R&D conducted through partnerships, cooperative research and development agreements, financial assistance and contractual arrangements with universities and the private sector. These efforts focus a wealth of scientific and engineering skills to create commercially viable solutions to national energy and environmental problems.

Throughout 2021, NETL continued to implement its Environmental, Safety and Health (ES&H) programs at the Albany, Oregon; Anchorage, Alaska; Houston, Texas; Morgantown, West Virginia; and Pittsburgh, Pennsylvania locations. As part of these programs, NETL continues to maintain its certification to the International Organization for Standardization (ISO) 14001:2015, Environmental Management System Series, and the ISO 45001:2018, Occupational Health and Safety Management System Series. Surveillance audits to the ISO 14001:2015 and ISO 45001:2018 standards were conducted in April and October for the Albany, Morgantown and Pittsburgh sites. Certification to these standards demonstrates NETL's commitment to continual improvement and conformance to its ES&H Management System.

NETL continues to demonstrate to its workforce, the surrounding community, DOE, and other stakeholders that it is committed to responsible environmental stewardship. NETL's Environmental Operating Experience and Performance Measure programs exist as part of its ES&H Management System. Integral to these programs are the Safety Analysis and Review System (SARS) programs, which focus on research and development activities, support operations activities, construction permits and facility use. NETL tracks its performance measures through individual programs, such as Groundwater and Air Quality, and through its ES&H Management System objectives and targets. More information on each of the areas covered above and details on other NETL ES&H programs can be found in this document. This report seeks to address questions the public may have about NETL's efforts to protect the environment at its locations. Comments and concerns are always welcome and should be addressed, in writing to Jamie Brown, U.S. Department of Energy—NETL, M/S P04D, 3610 Collins Ferry Road, Box 880, Morgantown, WV 26507; or by email to Jamie.Brown@netl.doe.gov.

1.0 INTRODUCTION

1.1 SITE LOCATIONS

Part of the U.S. Department of Energy's (DOE's) national laboratory system, the National Energy Technology Laboratory (NETL) has laboratory sites in Albany, Oregon; Pittsburgh, Pennsylvania; and Morgantown, West Virginia; and program office sites in Anchorage, Alaska, and Houston, Texas.

1.2 GENERAL ENVIRONMENTAL SETTING

NETL's Arctic Energy Office is leased office space located in Anchorage, Alaska, in the south-central portion. The office space is located at the terminus of Cook Inlet on a peninsula formed by the Knik Arm to the north and the Turnagain Arm to the south. The Anchorage city limits span 1,961.1 square miles, encompassing the urban core, a joint military base, several outlying communities and most of Chugach State Park.

The Albany site is located in Linn County, Oregon, in the western portion of the state. The facility is located in the Willamette Valley, which is a structural and erosional lowland between the uplifted marine rocks of the Coast Range and the volcanic rocks of the Cascade Range. The Albany site covers approximately 42 acres, with about 248,000 square feet of building working area. The site is relatively flat, located on a higher section of town and away from floodplains. The Calapooia River is located one half-mile west of the laboratory.

The Pittsburgh site lies within Allegheny County, Pennsylvania, at the Bruceton Research Center. The site comprises 237 acres located approximately 13 miles south of Pittsburgh, in South Park Township. The facilities sit within rolling hills and steeply incised stream valleys that are tributaries of the Monongahela River. The site is a partially wooded tract, divided into two subsites (the administrative plateau and the R&D plateau) with scattered industrial and office buildings. The immediate vicinity was completely rural when the Pittsburgh site was first developed; however, the nearby population and housing densities have increased dramatically in recent years.

NETL's Houston Office is also leased office space. It is located at 1011 Highway 6 South in Houston, Texas. This program office is located within the energy corridor of Houston and serves both onshore and offshore drilling research operations. This leased office space is 2,083 square feet and has 6 enclosed offices and 3 cubicles.

The Morgantown, West Virginia, site lies within Monongalia County, on the northern end of the city of Morgantown. The site sits within the rolling hills of the Appalachian Plateau, about 1,000 feet east of the Monongahela River and about 10 miles west of Chestnut Ridge, the westernmost ridge of the Allegheny Mountains. The site covers approximately 135 acres, 33 of which are developed for industrial use. Two small streams border the site on the east and northeast sides. The Monongahela River is on the northwest side of the site. All surface water drains into these two streams and river. Land use immediately surrounding the Morgantown site is a combination of residential, commercial, deciduous forest and pasture.

1.3 LABORATORY MISSION

For more than 100 years, the U.S. Department of Energy's National Energy Technology Laboratory has advanced the development of innovative technologies to ensure affordable, abundant and reliable energy that drives a robust economy and national security. Today, NETL research laboratories in Albany, Oregon; Morgantown, West Virginia; and Pittsburgh, Pennsylvania develop advanced energy technologies and accelerate their maturation from discovery through demonstration in the United States and around the world. This approach is exemplified through impactful research partnerships with industry, academia, and other national laboratories and government organizations to enhance and further develop the Laboratory's energy research and analysis portfolios while enabling environmental sustainability for all Americans. NETL applies its technical project management expertise to productive collaborations nationwide.

NETL innovates solutions for a carbon-managed tomorrow through its world-class competencies — geological and environmental systems, materials engineering and manufacturing, energy conversion engineering, strategic systems analysis and engineering and computational science and engineering — to drive innovation and deliver solutions across the energy ecosystem.

The Lab's research portfolio supports critical domestic energy initiatives that touch the lives of virtually all Americans. Our innovations support decarbonization and responsible stewardship of our environment; create valuable products from domestic resources; and inform energy strategies that work toward achieving net-zero CO_2 emissions by mid-century while supporting a clean energy economy that creates good-paying jobs, spurs economic revitalization, advances environmental justice, remediates environmental degradation and supports energy workers in communities across the country.

The nation realizes an effective return on research investment when energy solutions transfer to the commercial marketplace and support economic activity and workforce development. Licensing agreements with large and small American companies bring viable solutions to market, while internships and other educational programs allow renowned researchers to interact and inspire students who will become tomorrow's scientists. Further, NETL-sponsored papers, presentations, publications, websites and conferences ensure that Laboratory breakthroughs are shared openly with decision-makers, stakeholders and other researchers around the globe.

Most importantly, all NETL's activities support the DOE mission to ensure America's security and prosperity by addressing its energy and environmental challenges through transformative science and technology solutions. NETL is committed to fostering an environment of inclusivity where diversity strengthens the organization and energy equality guides our mission.

1.4 PRIMARY OPERATIONS AND ACTIVITIES AT THE SITES

NETL is organized into six functional areas to accomplish its mission and to provide flexible, dynamic expertise and capabilities to its public and private sector customers throughout the nation. With sites in Albany, Oregon; Morgantown, West Virginia; and Pittsburgh, Pennsylvania, the Laboratory's over 1,300 employees are focused on the following areas.

OFFICE OF THE DIRECTOR

Mission: The Office of the Director has span, control and authority, including delegated authority, over the complete NETL complex. This includes responsibility and authority for delivery and execution of NETL's mission: to drive innovation and deliver solutions for an environmentally sustainable and prosperous energy future. In continuous pursuit of this mission and to sustain NETL as a world-class research and development enterprise, the Office of the Director promotes organizational direction and vigor toward sustainability, consistency, effectiveness and efficiency in research efforts and business practices by:

- Promoting NETL efficiency and effectiveness by establishing and maintaining organizational standards and metrics for quality, productivity, employee development and workforce utilization.
- Overseeing the preparation, justification and execution of NET's institutional budget under guidance provided by the Assistant Secretary for Fossil Energy and Carbon Management and DOE's Chief Financial Officer.
- Exemplifying and promoting the highest level of safety, scientific integrity, public accountability and social responsibility in conducting R&D programs.

Function: The Office of the Director provides management guidance and oversight for the following functional areas:

- Communications & Public Affairs.
- Research & Innovation Center.
- Science & Technology Strategic Plans & Programs.
- Technology Development Center.
- Laboratory Operations Center, including Facility Operations, Information Technology and Strategic Support.
- Finance & Acquisition Center, including Accounting, Budget & Analysis and Acquisition.

OFFICE OF CHIEF COUNSEL

Mission: The Office of the Chief Counsel (OCC) has broad oversight of the complete NETL legal and National Environmental Policy Act (NEPA) portfolios. Through management of the NETL Legal Division, the Office of Chief Counsel provides services in the nature of legal advice and counsel to personnel across the NETL complex, at all levels of the organization, with appropriate engagement with DOE General Counsel. Through management of the NEPA Division, the Office manages NETL compliance with the National Environmental Policy Act (NEPA) and related environmental statutes, regulations and policies in connection with NETL's major projects.

Function: OCC's scope of services include interpreting state and federal statutory and regulatory requirements; oversight of drafting, review and negotiation of legal contracts, decisions and documentation that operates to bind or represent the policies of the NETL or DOE organization, provision of litigation support, processing requests for information submitted pursuant to the Privacy Act and the Freedom of Information Acts; and management of all other Legal and NEPA activities. The OCC has oversight of two divisions: Legal and Environmental Compliance.

OFFICE OF CHIEF COUNSEL - LEGAL

Mission: The Legal division is responsible for supporting the Office of Chief Counsel in its mission to provide full spectrum legal support services to the NETL organization. The organization is responsible for providing expert legal advice and support services on all matters arising within the scope of NETL activities.

Function: The Legal division provides legal advice and counsel to the NETL organization as directed by the Office of Chief Counsel on the full NETL legal portfolio. Conducts reviews and provides advice and litigation support on all legal matters involving the NETL organization, including, but not limited to the following practice areas: financial assistance; procurement; appropriations; contract negotiations; employment and labor law; patent and intellectual property; FOIA; Privacy Act; and ethics. The Chief Counsel and the attorneys in Legal represent the Laboratory and DOE and take appropriate action to protect the interests of the Laboratory and the Department in negotiations, litigation and administrative proceedings.

OFFICE OF CHIEF COUNSEL - NATIONAL ENVIRONMENTAL POLICY ACT

Mission: The National Environmental Policy Act (NEPA) division manages NETL's compliance with NEPA and related environmental statutes, regulations and policies in connection with activities undertaken or funded by NETL and DOE.

Function:

- Prepares NEPA analyses and related documents.
- Conducts studies of environmental issues associated with the citing, permitting and integration of power plants, carbon dioxide pipelines, transmission and related activities.
- Works closely with NETL project sponsors (e.g., Coal, Natural Gas and Oil, Energy Technology Development and the Research & Innovation Center) and with subject-matter experts within and external to NETL on issues identified as critical to a particular project's implementation and compliance.
- Supports NEPA compliance activities on behalf of other organizations within the Department as requested by the Offices of Fossil Energy and Carbon Management, Energy Efficiency and Renewable Energy, and Electricity Delivery and Energy Reliability.

COMMUNICATIONS & PUBLIC AFFAIRS

Mission: The Communications & Public Affairs Team manages all NETL-wide communications and public affairs functions in support of the Lab, the Office of Fossil Energy and Carbon Management, and the U.S. Department of Energy. The Communications & Public Affairs Team is responsible for developing and implementing an NETL communications and public affairs strategy that elevates the NETL brand. The team develops high-level messages, manages development of NETL external communication products and is responsible for the Laboratory's internal communications efforts.

Function:

- Serves as primary liaison with the Office of Fossil Energy and Carbon Management (FECM) Communications Office, the DOE Public Affairs Office, the news media, governmental agencies, universities and the National Laboratory Chief Communications Officers (NLCCO) group.

- Develops, implements and coordinates communication tools, strategies and campaigns to increase public awareness of NETL programs, research, technologies, accomplishments and events.
- Develops and coordinates dissemination of media plans to support NETL program areas using a variety of communications platforms targeting a wide array of strategic audiences.
- Elevates the NETL brand by managing the standardization of communications including publication standards, logos, presentation templates and guidelines.
- Provides design and message framework for NETL communications and public affairs activities.
- Provides a public online repository of non-copyrighted NETL images (Flickr) and videos (NETL YouTube).
- Manages the NETL website and analyzes its effectiveness.
- Manages NETL's social media presence.
- Manages and coordinates NETL media relations and serves as a portal for all NETL media inquiries.
- Oversees preparation of the NETL Weekly Media Report.
- Manages, edits, and publishes NETL's magazine (Edge), NETL's quarterly employee newsletter (Inside NETL) and NETL's quarterly accomplishments reports.
- Manages public relations and public inquiries.
- Plans, develops, and implements NETL's internal employee communication strategy.
- Provides multimedia product development.
- Provides technical writing and editing services.
- Manages logistics for NETL conferences, events, and exhibits.
- Provides spokesperson guidance and training for NETL staff.
- Manages NETL's Emergency Public Information (EPI) Program and provides trained staff to serve as EPI team members at all NETL research sites.
- Manages NETL crisis communication activities.

RESEARCH & INNOVATION CENTER

Mission: The Research & Innovation Center (RIC) develops, nurtures and exercises the core technical competencies that enable NETL to be an international resource for Fossil Energy Technology Discovery, Development and Deployment. These technical core competencies, which combine world-class expertise with mission-relevant laboratory facilities, include Computational Science & Engineering, Energy Conversion Engineering, Geological & Environmental Systems, Materials & Manufacturing Engineering, and Strategic Systems Analysis & Engineering.

Function: RIC drives technology innovation and delivers technical solutions while advancing knowledge within the community through effective leveraging of its technical core competencies and in collaboration with partners from industry, academia and other government laboratories. RIC is responsible for safe and efficient research operations at its Albany, Morgantown, and Pittsburgh sites and for implementation of an R&D portfolio that effectively leverages core technical competencies to exceed customer needs. Research projects effectively combine science-based large-laboratory scales, to accelerate the technology development process. Research conducted by RIC in its laboratories will typically focus on concepts with technology readiness levels (TRL) between two and four. For higher TRL-level concepts, research is coordinated with extramural partners as appropriate, to enable eventual commercial deployment more effectively. The R&ID Center is also responsible for nurturing the human capital and designing and implementing the laboratory capabilities necessary to assure the world-class stature of its technical core competencies.

ENERGY CONVERSION ENGINEERING

Mission: Energy Conversion Engineering maintains the human capital and mission-relevant laboratory facilities necessary to support a world-class energy conversion engineering core competency under the technical guidance of the senior fellows and the direction of the associate laboratory director of RIC. The capabilities maintained enable the development and evaluation of new concepts for advanced energy conversion devices and systems that exceed DOE and NETL goals for efficiency, sustainability and affordability,

Function: Energy Conversion Engineering conceives, plans, manages and conducts exploratory and applied research via multidisciplinary teams in the areas of thermal sciences, advanced systems integration, and reaction engineering, with a focus on experiments at scales and conditions of relevance to maturing technology. They develop and maintain technical competency in these areas by building and implementing mission-relevant, state-of-the-art laboratory facilities and by creating and nurturing a critical mass of federal technical experts. They provide access to this technical expertise as needed to support the organization and its customers.

GEOLOGICAL & ENVIRONMENTAL SYSTEMS

Mission: Geological & Environmental Systems maintains the human capital and mission-relevant laboratory facilities necessary to support a world-class geological and environmental systems core competency under the technical guidance of the senior fellows and the direction of the associate laboratory director of the RIC. The capabilities maintained enable a better understanding of the behavior of engineered natural systems and the development of the science and technologies that will enable safe, sustainable production and utilization of domestic energy resources in support of the DOE and NETL missions.

Function: Geological & Environmental Systems conceives, plans, manages and conducts exploratory and applied research via multidisciplinary research in the areas of geochemistry, reservoir engineering, and geo-analysis and field monitoring. They develop and maintain technical competency in these areas by building and implementing mission-relevant, state-of-the-art laboratory facilities and simulation tools and by creating and nurturing a critical mass of federal technical experts. They are responsible for providing access to this technical expertise as needed to support the organization and its customers,

MATERIALS & MANUFACTURING ENGINEERING

Mission: Materials & Manufacturing Engineering maintains the human capital and mission-relevant laboratory facilities necessary to support a world class functional and structural materials core competency under the technical guidance of the senior fellows and the direction of the associate laboratory director of RIC. The capabilities maintained enable the discovery and development of affordable, high-performance materials that can endure the harsh service environments typical of advanced energy systems in support of the DOE and NETL missions. Capabilities include the ability to translate lab-scale materials concepts to affordable industrial practice using advanced manufacturing methodologies.

Function: Materials & Manufacturing Engineering conceives, plans, manages and conducts exploratory and applied research via multidisciplinary teams in the areas of functional materials, structural materials, and materials characterization. They are responsible for developing and maintaining technical competency in these areas by building and implementing mission-relevant, state-of-the-art laboratory facilities and simulation tools and by creating and nurturing a critical mass of federal technical experts. They provide access to this technical expertise as needed to support the organization and its customers.

STRATEGIC SYSTEMS ANALYSIS & ENGINEERING

Mission: Strategic Systems Analysis & Engineering maintains the human capital and mission-relevant laboratory facilities and expertise to drive technology advancement at NETL under the technical guidance of the senior fellows and the direction of the associate laboratory director of the RIC. The capabilities maintained enable the utilization of models, simulations and optimizations to guide and support NETL's existing research portfolio; provide insight on the potential of new technology ideas; identify new energy concepts; and analyze interactions between energy systems at plant, regional, national and global scales.

Function: Strategic Systems Analysis & Engineering conceives, plans, manages and conducts research in the areas of energy process analysis via multidisciplinary research in the areas of energy process analysis, process systems engineering research, energy systems analysis and energy markets analysis. The directorate is responsible for developing and maintaining technical competency in these areas by building and implementing mission-relevant, state-of-the-art laboratory facilities and simulation tools and by creating and nurturing a critical mass of federal technical experts. They provide access to this technical expertise as needed to support the organization and its customers.

COMPUTATIONAL SCIENCE & ENGINEERING

Mission: Computational Science & Engineering maintains the human capital and mission-relevant laboratory facilities necessary to deliver a world-class computational science and engineering core competency at NETL under the technical guidance of the senior research fellows and the direction of the associate laboratory director of the RIC. In support of the DOE and NETL missions, the computing capabilities coupled with mission-unique computational tools enable the effective application of high-performance computing and data analytics to enhance the NETL research effort. This competency generates information and understanding beyond the reach of experiments alone and across time and length scales.

Function: Computational Science & Engineering conceives, plans, manages and conducts exploratory and applied research via multi-disciplinary teams on computational materials engineering, computational device engineering, and advanced computing and artificial intelligence. The directorate develops and maintain technical competency in these areas, and provide technical expertise as needed to support the organization and its customers.

RESEARCH PLANNING & DELIVERY

Mission: Research Planning and Delivery maintains and exercises the critical business functions required to plan and deliver quality, impactful and relevant research products exceeding the expectations of FECM and effectively and efficiently executes these duties under the guidance of the senior fellows and direction of the associate laboratory director of RIC.

Function: Research Planning & Delivery manages and supports the proposal, planning, execution and completion of research activities conducted solely by RIC or by RIC in partnership with academia, other national labs and industry. The directorate leverages expertise and tools within project management, business management and agreements, and administrative support.

RESEARCH PARTNERSHIPS & TECH TRANSFER

Mission: Research Partnerships & Tech Transfer nurtures relationships to advance the mission of NETL as a premier research organization while also exercising the Laboratory's intellectual property to national benefit and executes these duties under the guidance of the senior Fellows and direction of the associate laboratory director of RIC,

Function: Research Partnerships & Tech Transfer nurtures and manages outreach to strategic partners to engage in multidisciplinary, partnered research with RIC in support of FECM; identify strategic opportunities to leverage RIC's world-class research staff and facilities to the most pressing technical challenges facing the nation; and pursue transfer of RIC intellectual property for the greatest national benefit.

SCIENCE AND TECHNOLOGY (S&T) STRATEGIC PLANS AND PROGRAMS

Mission: Science and Technology Strategic Plans and Programs develop strategic direction for programs and activities within NETL and identify future competencies required so that NETL can best use existing capabilities (reposition and redeploy as needed) and invest in new capabilities to sustain and grow NETL.

Function: Science and Technology Strategic Plans and Programs leads the planning and integration of current existing capabilities and develops the strategic plans with an understanding of the existing environment (technology needs, regulatory, political) and the anticipation of the future environment. This includes:

- Leading the development of the NETL Strategic Plan, including identifying future competencies required.
- Defining technical capabilities to invest in for long-term strength of NETL including any budgetary requirements needed to achieve these capabilities.
- Coordinating across NETL for a collective strategy and engagement plan for external stakeholders.

The Science and Technology Strategic Plans and Programs performs the above functions in conjunction with and through RIC and the Technology Development Center (TDC). This will include senior fellows, IPAs , and other leads identified for: University and Laboratory Partnerships, Industrial Partnerships, and Global Partnerships. Strategic planning efforts are led and centered on NETL enduring missions in effective resource development, efficient energy conversion, and environmental sustainability.

TECHNOLOGY DEVELOPMENT CENTER

Mission: TDC implements FECM national research, development and demonstration (RD&D) programs and other DOE programs with industry, institutes of higher education, nonprofit organizations, small businesses, other federal agencies and national laboratories to develop and mature technologies that will accomplish the goals and objectives of those programs,

Function: TDC leads integrated technical and business teams to define, solicit, negotiate, manage and deliver federally sponsored energy RD&D benefits to the nation. These include:

- Defining project technical and budgetary requirements to achieve program goals and objectives.
- Leading program/project teams to prepare and issue competitive solicitations (e.g., Funding Opportunity Announcements [FOAs]) and sole-source actions to access the best research capabilities in the nation that will develop and mature technologies to accomplish program goals and objectives.
- Negotiating and managing projects with industry, institutions of higher education, nonprofit organizations, small businesses and other federal agencies and national laboratories.
- Coordinating and communicating project results and accomplishments.
- Maintaining a qualified and experienced workforce through training and job assignments.
- Supporting DOE and NETL program planning, development, analysis, outreach and communication efforts,

The Technical Development Center performs the above functions through four organizational elements: (1) Natural Gas & Oil, (2) Advanced Coal & Carbon Management, (3) Energy Efficiency and (4) Energy Delivery & Security.

NATURAL GAS & OIL

Mission: Natural Gas and Oil implements national RD&D programs in the FECM Oil and Natural Gas program to maximize the value of U.S. natural gas and oil resources and facilitate responsible development and delivery through research, technology development and outreach,

Function: Natural Gas and Oil leads integrated technical and business teams to define, solicit, negotiate, manage and deliver federally sponsored RD&D benefits for natural gas and oil. These include:

- Defining project technical and budgetary requirements to achieve program goals and objectives.

- Leading project teams to prepare and issue competitive solicitations (e.g., FOAs) and sole-source actions to access the best research capabilities in the nation that will develop and mature technologies to accomplish program goals and objectives.
- Negotiating and manage projects with industry, institutions of higher education, nonprofit organizations, small businesses and other federal agencies and national laboratories.
- Coordinating and communicate project results and accomplishments.
- Maintaining a qualified and experienced workforce through training and job assignments.
- Supporting DOE and NETL program planning, development, analysis, outreach and communication efforts,

Natural Gas & Oil performs the above functions through technology management teams,

ADVANCED COAL & CARBON MANAGEMENT

Mission: Advanced Coal & Carbon Management retains the economic and security benefit of using the nation's abundant coal resources in an environmentally acceptable manner. The organization also implement national RD&D programs in FECM's Office of Clean Coal and Carbon Management to advance technologies that increase the socio-economic value of coal, while avoiding adverse impacts on health, climate and the environment.

Function: Advanced Coal & Carbon Management leads integrated technical and business teams to define, solicit, negotiate, manage and deliver federally sponsored RD&D benefits for the advanced coal and carbon management program. These include:

- Defining project technical and budgetary requirements to achieve program goals and objectives.
- Leading project teams to prepare and issue competitive solicitations (e.g., FOAs) and sole-source actions to access the best research capabilities in the nation that will develop and mature technologies to accomplish program goals and objectives.
- Negotiating and managing projects with industry, institutions of higher education, nonprofit organizations, small businesses and other federal agencies and national laboratories and coordinating and communicating project results and accomplishments.
- Maintaining a qualified and experienced workforce through training and job assignments.
- Supporting DOE and NETL program planning, development, analysis, outreach and communication efforts,

The Advanced Coal & Carbon Management organization performs the above functions through technology development teams,

ENERGY EFFICIENCY

Mission: Energy Efficiency implements national RD&D programs in the Office of Energy Efficiency & Renewable Energy (EERE) that support the Vehicle Technologies Office to provide low cost, secure and clean energy technologies to move people and goods across America and the Buildings Technologies Office to develop innovative, cost-effective energy saving solutions for buildings,

Function: Energy Efficiency leads integrated technical and business teams to define, solicit, negotiate, manage and deliver federally sponsored R&D benefits for EERE. These include:

- Defining project technical and budgetary requirements to achieve program goals and objectives.
- Leading project teams to prepare and issue competitive solicitations (e.g., FOAs) and sole-source actions to access the best research capabilities in the nation that will develop and mature technologies to accomplish program goals and objectives.
- Negotiating and managing projects with industry, institutions of higher education, nonprofit organizations, small businesses and other federal agencies and national laboratories;
- Coordinating and communicating project results and accomplishments.
- Maintaining a qualified and experienced workforce through training and job assignments.
- Supporting DOE and NETL program planning, development, analysis, outreach and communication efforts,

Energy Efficiency performs the above functions through technology management teams.

ENERGY DELIVERY & SECURITY

Mission: Energy Delivery & Security implements national RD&D and outreach programs in the Office of Electricity (OE) and the Office of Cybersecurity, Energy Security, and Emergency Response (CESER) with industry, institutions of higher education, nonprofit organizations, utilities and other federal agencies and national laboratories to develop and mature technologies and support outreach efforts that will accomplish the goals and objectives of those programs. The organization also provides emergency response support and National Special Security Events (NSSEs) representing Critical Infrastructure support,

Function: Energy Delivery & Security leads integrated technical and business teams to define, solicit, negotiate, manage and deliver federally sponsored energy infrastructure technology development benefits for OE and CESER. These include:

- Defining project technical and budgetary requirements to achieve program goals and objectives.
- Leading project teams to prepare and issue competitive solicitations (e.g., FOAs) and sole-source actions to access the best capabilities in the nation that will develop and mature technologies and support outreach efforts to accomplish program goals and objectives.
- Negotiating and manage projects with industry, institutions of higher education, nonprofit organizations, utilities and other federal agencies and national laboratories.
- Coordinating and communicating project results and accomplishments.
- Maintaining a qualified and experienced workforce through training and job assignments.
- Supporting DOE and NETL program planning, development, analysis, outreach and communication efforts.

Energy Delivery & Security also leads and coordinates NETL efforts in support of DOE's responsibility as the Sector Specific Agency for the energy sector, including:

- Leading Regional Coordinator (RC) and Emergency Support Function #12 (Energy) efforts in assigned regions and events, serving as regional energy advisors to support steady-state operations and preparedness efforts, and providing all-hazards analysis during ESF#12 activations.
- Coordinating and support National Special Security Events (NSSEs) representing Critical Infrastructure,

LABORATORY OPERATIONS CENTER

Mission: The Laboratory Operations Center (LOC) delivers an effective, efficient and quality work environment and support services that advance the NETL mission.

Function: LOC is responsible for development, implementation, integration and monitoring as well as the continuous improvement of products and services necessary to support NETL business and laboratory functions. LOC accomplishes the above functions through five organizational elements:(1) Business Integration, (2) Office of Career Management and Education Programs, (3) Information Technology, (4) Facility Operations, and (5) Security.

BUSINESS INTEGRATION

Mission: Business Integration support the efforts of the Office of the Chief Operating Officer in assuring adherence to applicable law and policy while proactively exploring opportunities for improvement, enhanced integration of NETL operations services consistent with best practices and the NETL mission and vision,

Function: Business Integration organizational functions include, but are not limited to, Site Support Services, Strategic Planning and Enterprise Performance Assessments, Directives, Continuous Process Improvement Program, Internal Controls & Assessments, and External Audit Functions, as detailed in the following principal roles:

- Coordinating NETL's site support services program, including contract administration, analysis and financial reporting, standard operating procedures, site support contract management system business owner, and participation in the development of support service strategies,
- Facilitating the development of quantifiable and specific measures that support the strategic plans of DOE, FECM, NETL; administering strategic planning processes; ensuring long-term organizational goals are identified and documented; and managing NETL's enterprise-wide performance assessment system designed to record, measure and report progress in meeting NETL objectives.
- Administering the NETL Directives Program.
- Developing and implementing a Continuous Process Improvement Program that includes the utilization of internal reviews, management review of projects, departmental quality assurance management requirements and best practices.

- Conducting assessments of NETL's Internal Controls and Risk Profile to ensure accountability with requirements mandated by the Office of Management and Budget circular A-123 and the Federal Managers Financial Integrity Act.
- Coordinating NETL external audits; serving as the primary point of contact for activities, coordinating scheduling, and information requests with SMEs; and tracking responses and compiling a quarterly report of activities,

CAREER MANAGEMENT AND EDUCATION PROGRAMS

Mission: Career Management and Education Programs inspires, attracts, develops and retains a skilled, motivated workforce to fulfil the scientific, technical, professional and administrative functions of the laboratory, including the development of a talent pipeline via educating the next generation through STEM outreach and internship programs.

Function: Career Management and Education Programs is responsible for the development, implementation, integration and monitoring of a comprehensive career path management program that includes the current and prospective NETL workforce. This includes:

- Strategic Human Capital Management (human capital planning, career, and talent management, recruiting strategies, training, performance management, awards and recognition, onboarding and out processing of federal staff and implementation of human capital policies and procedures).
- Research Associate and Internship Management (undergraduate and graduate student, postgraduate and faculty education/internship programs).
- STEM Education & Outreach (K-12 education outreach programs, Science Bowl, career education events, digital outreach, teacher workshops and STEM education for the general public).

INFORMATION TECHNOLOGY

Mission: Information Technology maintains a comprehensive information technology and cybersecurity program that provides fully integrated, enterprise-wide systems in support of the NETL mission.

Function: Information Technology is responsible for management, oversight and delivery of integrated, secure, reliable and quality systems to support the information technology needs of NETL. This includes:

- Serving as liaison between DOE CIO and Information Technology offices.
- Serving as the information technology liaison with FECM leadership for assistance with information technology matters.
- Managing and supporting enterprise architecture.
- Operating Information technology.
- Managing records.
- Leveraging existing technology and expertise to maximize mission delivery.

- Identifying and fostering new and emerging technologies to maximize mission delivery.
- Providing information technology governance, policy and oversight processes to ensure secure, efficient and cost-effective use of information technology resources.
- Ensuring acceptable risk-based cybersecurity through enhanced enterprise situational awareness, development of near real-time risk management and combating advanced persistent threats.

FACILITY OPERATIONS

Mission: Facility Operations assures safe, environmentally friendly, and reliable operations at all NETL sites consistent with the NETL mission and in accordance with applicable law, federal policy and best practices under direction of the executive director and chief operating officer. The directorate includes the following Teams at the Albany, Morgantown and Pittsburgh sites: R&D Engineering and Facility Operations and Environmental, Safety and Health.

Function: Facility Operations manages real property assets, including daycares, fitness centers and cafeterias and facility-related operations, ensuring they are maintained in a manner that promotes operational readiness, personnel and environmental safety and health, property preservation and life-cycle cost-effectiveness through the following competencies:

R&D Engineering oversees and conducts engineering design, specification development, procurement, construction and operation through all phases of the project lifecycle of NETL's on-site innovative research facilities and related infrastructure.

Facility Operations oversees the planning, design and construction of all facility-related projects, including buildings and structures, roads and sidewalks, utilities and services, real estate development, site-related Environment, Safety and Health (ES&H) projects, physical security systems, and provide facility operations and maintenance, grounds maintenance and janitorial services, on-site and off-site real property assets and space utilization management.

Safety and Health oversees the development and maintenance of a safe and healthy work environment, including: safety analysis and review, chemical and industrial hygiene, hazard communications, chemical inventory maintenance, Occupational Safety and Health Administration (OSHA) and facilities compliance, laser and radiation safety, and ergonomics.

Environmental oversees and coordinates on-site environmental compliance activities, including environmental monitoring activities; groundwater, air (ambient air and meteorological), storm water, wastewater, soil, and biota sampling; hazardous waste management and waste disposal program; waste minimization and pollution prevention awareness program. Environmental also coordinates, monitors, and evaluates NETL's performance in meeting emission requirements established at the local, state and federal levels.

Comprehensive Emergency Management oversees the elements of an emergency management system, including coordinating with security counterpart and providing analysis of laboratory safety and risks.

SECURITY

Mission: Security establishes, develops, and maintains a security operation that includes the separate programs of safeguards and security, personnel security, foreign access review and approval management, counterintelligence, controlled unclassified information management, operational security and continuity of operations.

Function: Security provides oversight of on-site security program execution, such as the countermeasures implemented through the physical protective force, and access programs, such as badging and access authorization. This oversight includes the continuity program, which provides support to HQ program offices that identifies NETL personnel or facilities as devolution receivers and provides for the development of the program requirements for an NETL COOP program. Through the security programs, risk assessments are performed, levels of protection are established and countermeasures are developed and instituted. The role of the standards issued by the Interagency Security Committee and DOE orders are incorporated into a comprehensive threat, risk and countermeasures program. Security programs include oversight and management of the NETL SCIF and classified operations.

FINANCE & ACQUISITION CENTER

Mission: The Finance & Acquisition Center (FAC) plans, directs and coordinates NETL's chief financial officer (CFO), procurement, and financial assistance (financial award and grant) functions, ensuring effective oversight and stewardship of the Laboratory's financial resources,

Function: FAC performs the following major roles:

- Develops and implements the Laboratory's financial policies.
- Serves as liaison with DOE CFO and Procurement offices.
- Serves as the financial liaison with FECM leadership for budget and financial assistance matters.
- Serves as the principal advisor to the NETL director and other senior NETL officials on matters related to the Laboratory's financial resources, procurements and financial assistance activities.

ACCOUNTING

Mission: Accounting ensures the financial integrity of NETL's books and records while providing effective financial management support to all customers.

Function: Accounting performs the following major roles:

- Ensures that NETL's accounting and reporting activities are accomplished in a manner consistent with applicable statutes, regulations and other central government agency guidance.
- Establishes and interprets accounting and financial policies and general procedural requirements for general accounting and reporting activities that are applicable to all components of NETL.

- Supports the implementation of the CFO Act requirements in accordance with DOE directives.
- Maintains an administrative reporting relationship with the DOE's CFO's Office, FECM and other DOE-related organizations on matters pertaining to financial reporting.
- Develops and maintains integrated accounting and financial reporting information systems, including systems documentation and training materials.
- Develops NETL's indirect rates charged for work performed for other organizations, ensuring full cost recovery.
- Develops NETL travel policy and implementation procedures consistent with HQ policies for both individual temporary duty travel and permanent change of station travel.
- Maintains liaison with audit organizations, central government agencies and standards-setting bodies, including the Federal Accounting Standards Advisory Board.
- Serves as the liaison to and develops financial systems policy that is consistent with the Office of Corporate Information Systems.
- Represents NETL at various forums and on intra- and inter-agency working groups.

BUDGET & ANALYSIS

Mission: Budget & Analysis ensures the financial integrity of the Laboratory's funds control process, directs the budgetary processes and performs financial analysis in support of strategic initiatives while providing effective financial management support to all customers.

Budget & Analysis accomplishes this by producing, maintaining, analyzing and forecasting accurate, impartial and comprehensive information about the Laboratory's financial past, present and future. Budget & Analysis communicates that information in a clear, useful and timely manner to stakeholders inside and outside of the Laboratory, so they may make the best possible planning, financial policy, and resource allocation decisions. The organization's goal is to ensure that budgetary decisions are equitable, implemented properly and consistently, and achieve their desired ends. This service is provided in a professional and personal spirit of respect, honesty, fairness, cooperation and goodwill. The office strives to maintain a high standard of knowledge, expertise, service, ethics and professional integrity while providing sound counsel in the financial planning and decision-making process of the Laboratory.

Function: Budget & Analysis performs the following major roles:

- Develop annual operating budgets.
- Maintain long-range financial planning models.
- Perform ongoing maintenance of decentralized budgeting through the monitoring of these budgets with emphasis on maintaining good fiscal management with reasonable controls.
- Enforce policy decisions regarding use of funds.
- Provide reports and data to assist management in making sound fiscal decisions.
- Perform budget analyses and consult with staff/managers throughout the Laboratory.

- Respond to numerous internal and external requests for institutional data.
- Conduct numerous special studies drawing on an array of financial and non-financial information at its disposal.
- Support the Laboratory's many academic and administrative operations on financial matters.
- Ensure that all budget activities adhere to statutory and policy requirements.
- Coordinate and prepare the annual institutional budget request to the Laboratory's Executive Board.
- Provide central communications to the Laboratory about various financial and budgetary information.
- Develop budget forecasts, revisions, reports and analyses to support Laboratory-wide resource allocation and decision-making.
- Provide financial management and budget training.
- Develop various financial policies and procedures and monitor compliance.

ACQUISITION

Mission: Acquisition provides business and financial expertise in all areas of procurement and business management to support the mission of NETL,FECM and other government agencies as appropriate. Acquisition is divided into three teams: Procurement, Financial Assistance, and Policy & Analysis.

Function: Acquisition performs the following major roles:

- Develops and coordinates a comprehensive procurement plan to support program plans.
- Leads the development of strategic plans for internal site support contracting activities.
- Performs solicitation, evaluation, negotiation, execution and administration of contracts, financial assistance instruments and interagency agreements for R&D, demonstration and commercialization projects, information technology, support services, construction, architect-engineer, supply requirements and simplified acquisitions,
- Performs property-related internal control activities for property purchased through financial assistance vehicles.
- Provides business and financial expertise in all areas of procurement to other field activities within the Department and/or other governmental agencies.
- Implements and coordinates federal acquisition policies and procedures and contract reform.
- Maintains and enhances socioeconomic programs.
- Maintains and enhances procurement information systems.

- Negotiates and distributes provisional and final indirect cost rates on a Departmental and federal agency basis.
- Administers closeout of all completed instruments.
- Coordinates unsolicited proposal review, evaluation and communications.

PROCUREMENT TEAM

Mission: The Procurement Team has primary responsibility for the solicitation, negotiation, placement, award and administration of contracts, delivery orders, purchase orders and other instruments necessary to accomplish the NETL mission and support other agencies as appropriate.

Function: The Procurement Team performs the following major roles:

- Leads the development of strategic plans for internal site support contracting activities, including evaluation of contract structure, tenor and other key terms.
- Solicits, negotiates, places, awards and administers contracts, delivery orders, purchase orders and other instruments necessary to accomplish the NETL mission, and support other agencies as appropriate.
- Performs all Procurement Card administrative activities for NETL.
- Facilitates communications between internal and external customers and Acquisition, leading to a better understanding of project needs and the ability to tailor procurement techniques and instruments to best fulfill those needs and ensure consistency in operations.
- Provides business and financial expertise in all areas of procurement to other field activities within the Department and/or other governmental agencies.
- Implements and coordinates federal acquisition policies and procedures and contract reform.
- Administers closeout of all completed instruments.

FINANCIAL ASSISTANCE TEAM

Mission: The Financial Assistance Team has primary responsibility responsible for the solicitation, negotiation, placement and administration of awards primarily in support of the RD&D activities necessary to accomplish the NETL mission and for other agencies as appropriate,

Function: The Financial Assistance Team performs the following major roles:

- Develops and coordinates a comprehensive procurement plan to support program plans.
- Performs solicitation, evaluation, negotiation, execution and administration of financial assistance instruments and interagency agreements for R&D, demonstration, and commercialization projects,

- Facilitates communications between internal and external customers and Acquisition, leading to a better understanding of project needs and the ability to tailor procurement techniques and instruments to best fulfill those needs and ensure consistency in operations.
- Manages the resolution of contentious award terms ensuring compliance with all 2CFR, FAR, DEAR and other DOE regulations.
- Performs property-related internal control activities for property purchased through financial assistance vehicles.
- Provides business and financial expertise in all areas of grant and award execution and administration to other field activities within the Department and/or other governmental agencies.
- Administers closeout of all completed instruments.

POLICY & ANALYSIS TEAM

Mission: The Policy & Analysis Team has responsibility for the implementation and coordination of Federal acquisition and assistance policies and procedures, acquisition and financial assistance reform, coordination of unsolicited proposals, maintenance and enhancement of socioeconomic programs, maintenance and enhancement of procurement information systems, performing detailed cost analysis, and the negotiation and distribution of provisional and final indirect cost rates on a Departmental and federal agency basis.

Function: The Policy & Analysis Team performs the following major roles:

- Implements and coordinates federal acquisition and assistance policies and procedures.
- Performs detailed cost and price analysis on competitive proposals, recommending revision to ensure consistency with RFP or FOA terms.
- Negotiates and distributes provisional and final indirect cost rates on a Departmental and federal agency basis.
- Maintains and enhances small business engagement programs consistent with Departmental goals and targets.
- Maintains and enhances socioeconomic programs.
- Maintains and enhances procurement information systems.
- As unsolicited program manager for DOE, coordinates all unsolicited proposal reviews, evaluations and communications.

1.5 RELEVANT DEMOGRAPHIC INFORMATION

With locations in Albany, Oregon; Morgantown, West Virginia; Pittsburgh, Pennsylvania; Anchorage, Alaska; and Houston, Texas, NETL comprises 98 buildings and 14 major research facilities covering over 240 acres. As of December 31, 2021, NETL had 1,344 employees at its five locations – 489 were federal employees and 855 were site-support contractors.

1.6 ACCOMPLISHMENTS

NETL achieved the following technology-related accomplishments in 2021.

AWARDS

- American Institute of Chemical Engineers — AIChE is the world's leading organization for chemical engineering professionals, with more than 60,000 members from more than 110 countries,
  - NETL senior researcher Sofiane Benyahia was selected by the Particle Technology Forum to receive this year's prestigious Lectureship in Fluidization Award during the 2021 AIChE annual meeting. This award recognizes an individual's outstanding scientific/technical research contributions with impact in the field of fluidization and fluid-particle flow systems.
- ASM International — The world's largest and most established materials information society, ASM connects a global network of peers and provides access to trusted materials information through reference content, data and research, education courses and international events, helping to solve problems and improve materials related outcomes.
  - A paper by NETL authors was selected as The Editor's Choice Article: "Long-Term Creep Behavior of a CoCrFeNiMn High-Entropy Alloy" by Kyle Rozman, Martin Detrois, Tao Liu, Michael Gao, Paul Jablonski, Jeff Hawk,
- College of Earth and Mineral Sciences at Penn State University — Creating leaders in earth, energy, and material sciences and engineering and preparing a diverse and talented workforce, as well as providing new knowledge that will drive the economic vitality of the state and the nation.
  - Christina Lopano and Larry Shadle were both named 125 Anniversary Fellows. The college bestows this significant honor on "graduates who are at the prime of their careers in academia, the private sector, government, and public service. Of particular attention are those graduates who have demonstrated strong leadership in their respective communities, who have been pioneers in diversity, and who have contributed substantially to the welfare of humanity using the skills and knowledge the college equipped them with upon graduation."
- The National Federal Laboratory Consortium Excellence in Technology Transfer Award — Recognizes employees of FLC member laboratories and non-laboratory staff who have accomplished outstanding work in the process of transferring federally developed technology.
  - Laboratory Director Brian Anderson was named Lab Director of the Year. Since Anderson was named NETL director in 2018, his leadership has significantly advanced the Laboratory's partnerships and technology transfer. He has eagerly and effectively communicated to industry stakeholders with clear and compelling messages of NETL's vision for technology development and transfer and NETL's technical research capabilities. In addition, Anderson's leadership and advocacy led to increased production of NETL intellectual property and related request for licenses and other development agreements.
- Great Minds in STEM — For over 30 years, GMiS has implemented innovative programs and partnerships focused on the continuous expansion of STEM education opportunities for our nation's underserved communities.
  - José Figueroa was named as a GMiS Luminary. Honorees represent professionals in science, technology, engineering, and mathematics who initiate, collaborate, and lead key programs and research within their companies. These individuals have made significant contributions to the Hispanic technical community as leaders and role models. Figueroa,

Carbon Capture Team Supervisor, was awarded for promoting the integration of research and business needs in the Lab's valiant efforts to mitigate the effects of carbon emissions for the global climate emergency.

- International Gas Turbine Institute — Dedicated to supporting the international exchange and development of information to improve the design, application, manufacture, operation and maintenance, and environmental impact of all types of gas turbines turbomachinery and related equipment.
  - Richard Dennis received the IGTI Industrial Gas Turbine Award for his contributions and continued commitment in advocating for gas turbine research and development. He has shown tremendous leadership in the only sustained, federally funded program in gas turbines. As a program manager, Dennis oversees NETL's Advanced Turbines Program which encompasses research, development and demonstration of advanced turbine technologies. Millions of people around the globe are receiving clean, reliable power using technologies that Dennis has supported. He has also dedicated a great deal of his time to ASME's Gas Turbine Segment including being the executive chair for the 2021 TurboExpo.
- NACE International and the Association for Materials Protection and Performance — Focused on the protection of assets and the performance of industrial and natural materials. AMPP was created when NACE International and the Society for Protective Coatings united after more than 145 combined years of expertise and service to industry and individual members worldwide. AMPP is the world's largest corrosion control and protective coatings organization serving more than 40,000 members in 130 countries.
  - Margaret Ziomek-Moroz was selected to receive the 2021 NACE Fellows honor, becoming a member of the class of NACE Fellows, for her sustained and widely recognized contributions to corrosion control. She acts as a mentor and educator for those interested in STEM activities. Her mentoring work has guided several graduate students into the field of corrosion and corrosion control, where their subsequent work earned them recognition through NACE student awards.
- Pittsburgh Federal Executive Board Excellence in Government Awards — These awards honor area federal employees whose service demonstrates deep personal and professional commitment.
  - Anthony Burgard received the Gold Award for Outstanding Contribution to Science (Non-Medical) for leading the development of an innovative suite of new science-based computational modeling tools by a diverse team of researchers from across DOE's laboratory complex. These first-of-a-kind modeling tools are capable of significantly increasing the efficiency and flexibility of power plants, and they were demonstrated under a cooperative research and development agreement with Tri-State Generation and Transmission Association Inc.'s Escalante Power Plant, enabling it to improve its minimum operating load by 44% and significantly reducing fuel cost and CO_2 emissions. Additionally, the new computational tools identified an innovative opportunity to improve overall plant efficiency through a new sliding pressure approach to flexible operations while simultaneously balancing equipment degradation resulting from highly dynamic operations. Through Burgard's technical leadership and scientific advancement, these new computational modeling tools and capabilities can now be applied to other power plants, significantly reducing greenhouse gas emissions and operating costs while improving flexibility and resiliency,
  - Patricia Rawls received the Bronze Award for Outstanding Supervisor in a Professional Series for expertly managing a large group of engineers and scientists with diverse backgrounds and areas of expertise to drive the next generation of energy advancements. Rawls is responsible for implementing a large programmatic research and development portfolio with key departmental stakeholders, which includes NETL research programs

in crosscutting, rare earth elements, advanced coal processing, university training, water management, modeling and simulation, and sensors and controls. Commitment to the program and her ability to use her employees' strengths effectively allow her team to successfully produce high-quality advancements in technology.

- R&D 100 Awards — This is the only science and technology awards competition that recognizes new commercial products, technologies and materials available for sale or license for their technological significance.
  - NETL's Multi-Functional Sorbent Technology (MUST) received this prestigious award for its game-changing suite of low-cost, versatile sorbents that's highly effective at cleaning contaminated waterways and removing metals from electronic and pharmaceutical production processes. According to inventor McMahan Gray, MUST is a groundbreaking product that offers a practical, affordable and green approach to recover critical materials such as aluminum, cobalt and rare earth elements and removes the threat of selenium, lead and other heavy metals that contaminate water supplies.
- SME Society for Mining, Metallurgy & Exploration — SME and all its leadership value and seek diverse and inclusive participation within the mining and minerals community. SME champions the issues and perception of the mining industry for the greater good.
  - Mary Anne Alvin, NETL Acting Technology Manager for FECM's Critical Minerals Sustainability Program, accepted a nomination from the society as Henry Krumb Lecturer for her paper titled "Rare Earth Elements (REE) and Critical Materials (CM)." Alvin is a nationally renowned expert and is internationally recognized in the areas of REEs and CMs and will be called upon to present her findings at local SME section meetings. REEs and CMs are vital to the increasingly high-tech economies of the modern world. They are used in the production of medical equipment, clean energy components, electric vehicles, electronics, military technology and a wide variety of consumer goods. However, most of the world's REE supplies are controlled overseas. NETL and DOE are dedicated to establishing a domestic supply of REEs and other economically vital CMs, which has been the focus of NETL's research.
- DOE Secretary's Honor Awards — This excellence award is given to individuals whose achievements were substantial and outside the normal course of duty and significantly benefited the Department's mission and the nation. The achievement award is given to groups of employees and contractors who together accomplished significant achievements on behalf of the Department,
  - Christina Lopano, a research physical scientist, received the Excellence Award. Lopano's research is advancing efforts to end reliance on offshore suppliers and to establish a reliable domestic source of REEs and CMs, which are needed to manufacture valuable consumer products such as computer hard drives as well as medical equipment, energy components and defense systems. Development of this research also will stimulate economic growth and recovery in regions with coal resources and a legacy of coal production so that no communities are left behind as the U.S. transitions to a clean energy future.
  - Energy Data eXchange (EDX) Development and Operations Team received the Achievement Award. Developed and maintained by NETL, EDX is a data laboratory built to find, connect, curate, use and re-use data to advance fossil energy and environmental R&D. Recognizing the need to incorporate big data capabilities within DOE for the benefit of keeping up with the speed of modern research, the EDX Team worked for a decade to create EDX and update it to its current form. By providing a platform from which data from more than 20,000 research projects can be accessed, EDX has helped streamline R&D projects that will address some of the greatest energy, environmental and technological challenges of the 21st century.

  - MUST Team also received the Achievement Award. The team developed a suite of sorbents that offers a practical, affordable and green approach to remove selenium and other metals that contaminate water supplies across America and jeopardize the health of millions of people, wildlife and fragile ecosystems. MUST is the only sorbent-based technology known to NETL that effectively reduces selenium to consistently meet federal discharge limits. MUST is regenerable and reusable, providing a recycling advantage that reduces waste, lowers costs and makes the product accessible to a wide range of consumers and industries. NETL partners in the development of MUST products will use MUST to treat acid mine discharges, and plans call for using MUST in pharmaceutical and electronic production processes.

- Woman of Color Magazine and Women of Color STEM Conference — A multicultural event produced by Career Communications Group Inc., a leader in workforce diversity. For 26 years, the Women of Color STEM Conference has been a leading event for professional development and networking. The group works with big and small employers to promote multiculturalism and equity in STEM fields.

  - Nor Farida Harun was selected for the 2021 Woman of Color STEM Award because she is among an extraordinary group of forward-thinking people in STEM. This year, the nominees were noted as representing the most diverse collection of executive professionals the award committee evaluated: "From managers to vice presidents, they stand out as superior authorities in their respective fields."

- XPRIZE — XPRIZE Carbon Removal is aimed at tackling the biggest threat facing humanity, namely fighting climate change and rebalancing Earth's carbon cycle. Funded by Elon Musk and the Musk Foundation, this $100M competition is the largest incentive prize in history, an extraordinary milestone.

  - An NETL-supported technology from the University of California, Los Angeles (UCLA) won the grand prize in the prestigious NRG COSIA Carbon XPRIZE global competition for the development of an eco-friendly process that infuses a revolutionary concrete with CO_2 emissions directly captured from power plants and other industrial facilities. The team was recognized for having the best demonstration project, as well as for the product's technology and market advantages. In the competition's final demonstration at the Wyoming Integrated Test Center, the team successfully sequestered nearly three tonnes of CO_2 into more than 10,000 concrete blocks as they cured. According to researchers, each concrete block stores about three-quarters of a pound of CO_2, a significant amount considering an estimated 1 trillion concrete blocks will be produced annually by the year 2027.

2.0 COMPLIANCE SUMMARY

NETL is committed to ensuring compliance with all the environmental requirements impacting its locations. This includes requirements found in (DOE) departmental directives; executive orders (E.O.s); federal, state, and local codes and regulations; acquisition letters; negotiated agreements; and consensus standards.

Standards and requirements that subject matter experts (SMEs) determine to be applicable to ES&H activities are incorporated into one or more directives, which provide the NETL policies, programs, and procedures used at the Laboratory. ES&H directives include orders and procedures. The ES&H team also provides specific guidance through subject-related manuals. Assigned SMEs review their directives every three years and update as appropriate.

Implementation of the standards and requirements is verified by a number of methods, including:

- A rigorous Safety Analysis and Review System (SARS) designed to review the details of a project before authorizing any significant activities to proceed. Checklists have been developed for SARS to facilitate verification of the standards and requirements covered during the review. ES&H SMEs provide support to the SARS process and ensure that all applicable ES&H standards and requirements are being addressed.
- Regular walk-through inspections to ensure that all NETL facilities are inspected on an annual basis. Various ES&H SMEs visually verify that NETL follows applicable standards and requirements.
- Preparation of this ASER, which requires a complete review of compliance with all major environmental standards and requirements. Numerous SMEs participate in this effort, reviewing the past year's performance.

2.1 MAJOR ENVIRONMENTAL STATUTES

Numerous inspections and audits are performed each year to verify compliance with environmental regulations, standards, and existing permits. The inspections and audits are then documented in inspection reports and audit reports, ensuring no instances of environmental noncompliance have been identified. Examples of the major environmental statutes include, but are not limited to: Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); Superfund Amendments and Reauthorization Act (SARA); Resource Conservation and Recovery Act (RCRA); Federal Facilities Compliance Act (FFCA); National Environmental Policy Act (NEPA); Toxic Substances Control Act (TSCA); Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA); Clean Air Act (CAA); Clean Water Act (CWA); and the Atomic Energy Act of 1954 (AEA). Statutes that are addressed across all five locations are addressed below. However, if more compliance is appropriate for a particular site, it is included in the site-specific discussions.

2.1.1 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

The CERCLA Section 120 (40 CFR 300-310; 43 CFR 11) requires federal facilities to comply with the provisions of the act. This section imposes additional regulations related to site studies and notices for the sale and other transfers of federal real property. Section 120 of CERCLA requires all CERCLA guidelines, rules, regulations and criteria are applicable to federally owned or operated facilities, including requirements for: (1) preliminary assessments for facilities at which hazardous

substances are located; (2) possible inclusion of such facilities on the National Priority List (NPL); and (3) remedial actions at these sites. However, federal facilities are not required to comply with CERCLA provisions regarding financial responsibility and removal/remediation contracts with state governments. While federal facilities that are not on the NPL may be subject to state laws concerning removal and remediation actions, these state laws and regulations may not impose provisions more stringent than those applicable to non-federal facilities. NETL did not have any CERCLA compliance obligations or violations in 2021 at any of its sites.

2.1.2 Superfund Amendments and Reauthorization Acct (SARA) and Emergency Planning and Community Right-to-Know (EPCRA)

The SARA Title III requires reporting of hazardous chemicals that were present at a facility and that exceeded certain established quantities during the preceding year. SARA Title III requires reporting of all hazardous chemicals present at the facility during the preceding calendar year in amounts equal to or greater than 10,000 pounds. Additionally, the reporting also includes gaseous, liquid, and solid chemicals designated as extremely hazardous substances in amounts greater than or equal to 500 pounds, liquids in amounts greater than or equal to 55 gallons or amounts greater than or equal to the threshold planning quantity (TPQ). NETL did not have any hazardous chemicals in excess of the reporting thresholds in 2021 at any of its sites.

2.1.3 Resource Conservation and Recovery Act (RCRA)

The RCRA is the public law that creates the framework for the proper management of hazardous and non-hazardous solid waste. The law describes the waste management program mandated by Congress that gave EPA authority to develop the RCRA program. Under RCRA, EPA has the authority to control hazardous waste from the "cradle-to-grave," including generation, transportation, treatment, storage and disposal of hazardous waste. Sites that produce, manage, transport, or dispose of hazardous wastes are designated as generators; transporters; or treatment, storage, and/or disposal (TSD) facilities.

At NETL, on-site hazardous waste handling is governed by NETL Procedure 436.1-02.09, RCRA Hazardous Waste Management. This procedure addresses requirements for NETL's RCRA Hazardous Waste Management Program, including: (a) general RCRA hazardous waste management; (b) identification, characterization, and classification of RCRA hazardous waste; (c) management of satellite accumulation areas (SAAs); (d) operation of designated central accumulation areas; (e) container management; (f) elementary neutralization of corrosive wastes; (g) waste collection/transportation; (h) record keeping; (i) personnel training; and (j) personal protective equipment (PPE).

All 2021 hazardous waste management activities were performed in a safe and environmentally sound manner and in compliance with Title 40 Part 262, Standards Applicable to Generators of Hazardous Waste and all applicable federal, state, and local laws and regulations, as well as, DOE/ NETL policies. NETL complied with all of the recordkeeping and reporting requirements specified in 40 CFR 262 Subpart D — Recordkeeping and Reporting Applicable to Small and Large Quantity Generators.

Per 40 CFR 262.11, determinations were made as to whether waste was a hazardous waste to ensure compliance with applicable RCRA regulations. When unidentified wastes were provided for disposal, NETL sent samples to a contracted, certified laboratory to test for hazardous characteristics (i.e., toxicity, ignitability, reactivity, and corrosiveness) and to ensure proper handling. NETL did not have any RCRA violations in 2021 at any of its sites.

2.1.4 Federal Facilities Compliance Act (FFCA)

The FFCA of 1992, Pub. Law No. 102-386, became law October 6, 1992. This law amended the waiver of sovereign immunity with respect to RCRA compliance. As a result, FFCA ensures that federal facilities are treated in the same way as private parties regarding compliance with RCRA. Prior to FFCA, EPA did not have the statutory authority to issue administrative compliance orders pursuant to RCRA section 3008(a). Currently, Federal Facility Compliance Agreements are negotiated with federal facilities to bring them into compliance. Under section 103 of FFCA, Congress further clarified that federal agencies are considered persons for purposes of RCRA. NETL has not had any violations regarding FFCA compliance.

2.1.5 National Environmental Policy Act (NEPA)

NEPA, 42 U.S.C. 4321 et seq., 1969, establishes federal policy for protecting the quality of the environment. The act establishes three levels of review for federal actions: environmental impact statements (EISs), environmental assessments (EAs) and categorical exclusions (CXs). Under the highest level of review, an EIS is prepared to evaluate the environmental consequences of any major federal action that might have significant impact on the quality of the human environment. The EIS must include a comparative analysis of those realistically available alternatives that would accomplish the same goals that the federal action is expected to address. Based on the EIS, a record of decision (ROD) is prepared to document which alternative will be pursued.

If the scope of the federal action does not clarify that an EIS is necessary, or if the potential for environmental impacts from the proposed action is uncertain, the second-tier level of review, an EA, is prepared. Based on the analysis in the EA, a determination is made that either the potential environmental impacts warrant preparation of an EIS, or the impacts are not significant, and a finding of no significant impact (FONSI) can be issued.

If the federal action does not have a significant effect on the environment, either individually or cumulatively, then the third level of review, a CX, is warranted. These types of federal actions can be excluded from an in-depth NEPA review. DOE has determined that certain classes of actions do not individually or cumulatively have a significant effect on the human environment and, therefore, can be covered by a CX. A list of the CXs and the eligibility criteria for their application are identified in DOE's NEPA implementing procedures (10 CFR 1021).

In 2015, NETL's process for issuing CXs was modified, wherein a single cumulative CX can be issued per award for the same activities conducted at multiple locations by multiple project recipients and sub-recipients. The result of this procedural change has generally led to NETL issuing a reduced number of CXs. However, it has not necessarily reduced the number of environmental questionnaires (EQ) evaluated to process these CX determinations. For these reasons, both CXs approved, and EQs reviewed to support these CX determinations are included below.

NETL conducts NEPA reviews for both on-site and off-site actions proposed for funding by the federal government. These include actions planned in cooperation with other governmental organizations, educational institutions, and private industry.

The following EIS activities took place in 2021:

DOE/EIS-0512-S1: ALASKA LNG PROJECT

On April 15, 2021, DOE-FECM granted a request for rehearing of a final order issued to Alaska LNG Project LLC (Alaska LNG) for the export of liquefied natural gas (LNG) produced from Alaskan sources to non-free trade agreement countries, pursuant to the Natural Gas Act (NGA). In the Rehearing Order, DOE stated that it was granting rehearing for the purpose of conducting two Alaska-specific environmental studies (collectively, the Alaska environmental study proceeding). On July 2, 2021, DOE announced its intent to prepare a supplemental environmental impact statement (SEIS) for the Alaska environmental study proceeding (DOE/EIS–0512–S1), consistent with NEPA. The SEIS will include analysis of potential environmental impacts associated with natural gas production on the North Slope of Alaska and a life cycle analysis calculating the greenhouse gas emissions for LNG exported from the proposed Alaska LNG Project. NETL's NEPA Office is supporting development of the SEIS.

The following EA activities took place in 2021

DOE/EA-2070: FORGE, MILFORD UTAH

DOE's Office of Energy Efficiency and Renewable Energy established the Frontier Observatory for Research into Geothermal Energy (FORGE) program to create a dedicated field laboratory site where the subsurface scientific and engineering community would develop, test and improve technologies and techniques for the creation of cost-effective and sustainable enhanced geothermal systems (EGS) in a controlled, ideal environment. There were two potential FORGE project locations, with a down-select expected in early 2018. The proposed Utah FORGE site is approximately 10 miles northeast of Milford in Beaver County, Utah, on private, state of Utah, and U.S. Bureau of Land Management lands. DOE's proposed action is to provide cost-shared funding to the Energy and Geoscience Institute (EGI) at the University of Utah and its partners for the proposed Utah FORGE site. The project consists of multiple phases, including project planning, site characterization and preparation, and technology testing and evaluation.

Project planning and portions of the site characterization and preparation have been completed or are ongoing. If selected to continue this project, EGI will construct a geothermal observatory and supporting infrastructure to conduct EGS field research and development activities. The project would include one or more deep geothermal research wells, monitoring wells, groundwater wells, a modular office structure, utility tie-ins, and monitoring equipment. The Final EA and FONSI for the Utah site were issued in April 2018.

During the operational phase of FORGE, applicants will propose and be selected by a panel to test geothermal methods and equipment at the site. The FORGE site has received the first round of research and development project proposals, which NETL's NEPA office reviewed for compliance with the existing EA and FONSI. Additionally, the FORGE site has been conducting archaeological surveys within and around the perimeter of the site, in consultation with the State Historic Preservation Office. A supplemental analysis memo is expected to discuss the results of those surveys.

DOE/EA-2127 FLAMELESS PRESSURIZED OXY-COMBUSTION LARGE PILOT

DOE proposes to provide cost-shared funding to the Southwest Research Institute (SwRI) to construct and operate a 25-MWth flameless pressurized oxy-combustion pilot plant. An EA Determination was issued in October 2019 for the original site.

In 2021, SwRI proposed a new site for the pilot plant. The pilot would be constructed at the Wyodak Resources Development Corporation (WDRC) property, which was previously part of the Wyodak Coal Mine, a surface mine. The WDRC is currently a mixture of undisturbed land and land used for industrial purposes. The pilot plant would be constructed adjacent to an existing building (currently office and warehouse space) on approximately 2 acres. This land is currently undeveloped but has been previously disturbed by grading and the construction of the original adjoining building. The proposed plant site is currently covered with crushed stone. Trenching would occur to supply utilities to the pilot from the existing tie-ins. Construction would include concrete foundation piers, with some modular and skid-mounted equipment. The pilot plant would be subject to New Source Review and require a new air permit.

A draft EA was issued for public review and comment in December 2021. The EA is currently on-hold, due to lack of funding for the project. If funding applicable to this project becomes available in the future, the EA would be completed.

DOE/EA-2128: LARGE PILOT TESTING OF LINDE-BASF ADVANCED POST-COMBUSTION CO_2 CAPTURE TECHNOLOGY

DOE proposes to provide cost-shared funding to the University of Illinois, Urbana-Champaign to design, construct, and operate a 10 MWe capture system based on the Linde/BASF advanced amine-based post-combustion CO_2 capture technology at the coal-fired City Water, Light, and Power (CWLP) Dallman Power Plant in Springfield, Illinois.

The proposed plant would be constructed on the west side of the existing CWLP facility on land currently used for equipment and materials storage. The pilot plant will be constructed in an area of approximately 120 feet by 425 feet (51,000 square feet). This project will use 24,000 gallons of amine compounds, which will be stored on-site. The pilot will receive a slipstream from the CWLP plant and return captured CO_2 to the stack for venting. CWLP is located on a peninsula and the proposed location for the pilot unit is within approximately 75 feet of Lake Springfield, a freshwater reservoir that is used as a potable water source for the City of Springfield.

The Final EA and FONSI were released in June 2020. Subsequent to the Final EA, a Native American tribe requested an Inadvertent Discovery Plan. A draft of the plan was submitted to the interested tribes in October 2020, and DOE incorporated the tribe's comments. The final version is pending approval of a Tribal Historic Preservation Officer.

DOE/EA-2057: BUILDING 2 DEMOLITION, ALBANY, Oregon

NETL proposes to demolish B-2 at the Albany site. This action is proposed because the condition of the building is rapidly declining, it poses a significant safety hazard to site personnel, and there is no existing or anticipated future mission need for the building. The demolition is to eliminate the current unsafe condition of B-2 and to reduce DOE/NETL's inventory of obsolete and unused buildings. DOE/NETL is incurring annual maintenance costs for B-2, which has been secured and abandoned since the early 1990s. By demolishing B-2, total expenditures for facilities sustainment would be reduced and safety would be increased.

Since the Oregon State Historic Preservation Office (SHPO) determined that B-2 contributes (SHPO letter dated October 9, 1997) to the eligibility of the Albany site for listing as a historic district, demolition of this structure would have an adverse effect. An environmental assessment (EA) was determined to be the appropriate level of analysis under DOE's NEPA Implementing Procedures.

It is DOE's intention to coordinate its responsibilities for compliance with Section 106 of the National Historic Preservation Act with related activities associated with the NEPA process (e.g., public notification). As part of the decision-making process, public participation will be solicited during development of the EA. Currently, funding for the building demolition is not available. The EA has not commenced, and demolition was put on hold per direction of management due to the budget constraints. The NEPA office requested a thorough structural analysis to be incorporated into the EA to determine if the reconstruction of B-2 could be considered a viable alternative in the EA. Delays occurred with the structural analysis when asbestos concerns were revealed. Asbestos mitigations were completed. The structural analysis and the report were delayed due to the COVID-19 pandemic. The report was completed September 2020; a revision to the report was made in October 2020. The Draft EA has not commenced.

DOE/EA-2134: MAKING COAL RELEVANT FOR SMALL-SCALE APPLICATIONS: MODULAR GASIFICATION FOR SYNGAS/ENGINE CHP APPLICATIONS IN CHALLENGING ENVIRONMENTS

The proposed action is for DOE to provide cost-shared funding to the University of Alaska (University). DOE proposes to provide approximately $40 million of the project's $50 million total cost. The University's proposed project is to construct and operate a large pilot-scale modular gasification system for solid fuels, including coal and woody biomass generating a clean syngas for firing in a suitable heat engine.

The plant would be configured to co-produce several saleable products including electricity, pyrolysis liquids (oils and tars), and low-pressure steam. The initial plans were to add the pilot system to the existing combined heat and power (CHP) plant on the campus. Additionally, a small structure of approximately 180 square feet was expected to be added to the existing building with tanks of ammonium hydroxide placed outside of the building. The project team has revised their decision against siting the project at the power plant campus site.

The preliminary design phase of this project has been completed. The EA has not commenced; it was put on hold by direction of project recipient due to site selection delays. The project has been given a time extension to complete the planned Phase II activities which does include completing the EA and the NEPA requirements.

These CX activities and no cost time extensions were approved in 2021:

NO COST TIME EXTENSIONS GRANTED: 64

INTERNAL CXs TO NETL

Morgantown, WV Site	55	
Pittsburgh, PA Site	11	
Albany, OR Site	9	
Total CXs	25	*[Supporting EQ's reviewed: 25]*

NETL PARTNERED PROJECTS (EXTERNAL TO MGN-PGH-ALB)

Continental U.S.	339	
Non-Continental U.S.	4	
Total CXs	343	*[Supporting EQs reviewed: 822, of these, 31 covered work in international or non-continental U.S. locations]*

GRAND TOTAL CXs FOR 2021: 368

GRAND TOTAL EQs REVIEWED FOR 2021: 847

2.1.6 Toxic Substances Control Act (TSCA)

The Toxic Substances Control Act of 1976 gives EPA the authority to require reporting, record-keeping and testing requirements, and restrictions relating to chemical substances and/or mixtures. Specifically, TSCA addresses the production, importation, use, and disposal of chemicals including polychlorinated biphenyls (PCBs), asbestos, radon, and lead-based paint. In most cases, TSCA compliance at NETL relates to asbestos and lead-based paint. Given the unique history (related to construction and maintenance activities) and infrastructure at each NETL facility, the activities at each site related to TSCA compliance in 2021 are addressed in the site-specific sections.

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

The Federal Insecticide, Fungicide, and Rodenticide Act requires federal regulation of pesticide distribution, sale, and use. This means that all pesticides distributed or sold in the United States must be registered by EPA. However, before a pesticide can be registered, it needs to be demonstrated that using the pesticide according to specifications "will not generally cause unreasonable adverse effects on the environment." NETL does not typically utilize pesticides at its facilities; however, each site has a pest control subcontractor who manages specific landscaping concerns per the appropriate regulatory requirements, as needs arise.

2.1.8 Clean Air Act (CAA) and Ambient Air Quality

The Clean Air Act regulates air emissions from both stationary and mobile sources. It includes establishment of National Ambient Air Quality Standards (NAAQS) to protect public health and public welfare and regulates emissions of hazardous air pollutants. Each NETL site tracks its emissions via a quarterly air emissions inventory. Specific air quality compliance requirements are addressed in the site-specific sections. While no air quality violations were identified at any of the sites in 2021, site-specific compliance is addressed in the site-specific sections.

Significant requirements and responsibilities of the Ambient Air Quality Program are described in Procedure 436.1-03.01, NETL Ambient Air Quality Management. Under this program, the Air Quality Manager (AQM) ensures compliance with all federal, state and local regulations, as well as DOE Directives. The AQM also oversees monitoring programs, permitting and reporting. Several previous ES&H management plans (EMPs) were created focusing on various emission categories or sources where NETL can make the most improvement. To maintain quality control, NETL selects and subcontracts analytical work only to certified laboratories. These laboratories must submit their quality assurance/quality control (QA/QC) manuals to NETL for inspection, and NETL submits quality control samples (duplicates, blanks and spikes) to the laboratories to verify the quality of the analyses. Air emissions data for the site is calculated and maintained to ensure compliance with regulatory requirements.

Additionally, several ES&H Management Plans (EMPs) have been developed to direct continuous improvement efforts in air-quality protection and to reduce greenhouse gas (GHG) emissions. One EMP tracks an NETL comprehensive GHG inventory for FY2021, along with executing renewable energy generation projects at the NETL sites and purchasing renewable energy credits (to make up any differences). Another EMP requires the reduction of energy usage/square foot (Btu/ft^2) by 1% annually on a year-over-year basis. This EMP will reduce energy intensity in buildings to achieve GHG reductions. In addition, NETL also has other EMPs that call for reducing petroleum-based fuels and increasing the use of alternative fuels and renewable energy to reduce NETL's impact on ambient air quality.

2.1.9 Clean Water Act (CWA)

The Clean Water Act regulates the discharge of pollutants into the waters of the United States. The regulations include setting wastewater standards for industry, as well as national water quality criteria recommendations for pollutants in surface waters. Under the CWA, it is unlawful to discharge any pollutant from a point source into navigable waters, unless a National Pollutant Discharge Elimination System (NPDES) permit was obtained, Currently only the Morgantown site holds an NPDES permit, although the Pittsburgh site is required to comply with the NPDES permit for the Bruceton Research Center (currently held by CDC/NIOSH, which is co-located with NETL). The Albany site does not have an NPDES permit. Compliance with the CWA for 2021, as well as other water quality requirements is detailed under the site-specific discussions.

2.2 DOE INTERNAL ENVIRONMENTAL AND RADIATION PROTECTION ORDERS

2.2.1 DOE Order 436.1, Departmental Sustainability

NETL was in full conformance with DOE Order 436.1, Departmental Sustainability. This order addresses the requirements and responsibilities for managing sustainability and includes an emphasis on greenhouse gas reductions and achieving the goals established in applicable laws, regulations, and executive orders. This order serves as the Department's primary internal environmental protection order.

2.2.2 DOE Order 458.1, Radiation Protection of the Public and Environment

NETL operates a compliant radiation protection program in accordance with DOE Order 458.1, Radiation Protection of the Public and Environment; however, NETL's programs are minimal when compared to other DOE national laboratories or sites administered under the control of the National Nuclear Security Administration. The radiation protection program at NETL focuses on radiation generating devices (RGDs), sealed radioactive sources, naturally occurring radioactive materials/ technologically enhanced naturally occurring radioactive materials (NORM/TE-NORM) and legacy radioactive materials. These are discussed, as necessary, in this document based on their location.

2.2.3 DOE Order 231.1 B, Environment, Safety, and Health Reporting

In accordance with DOE Order 231.1, Environment, Safety, and Health Reporting, NETL has established an internal directive to ensure the collection and reporting of environmental, safety, and health (ES&H) information. NETL's procedure addresses reports, required on a scheduled basis by DOE or by regulation, and are essential for evaluating NETL operations and identifying opportunities for improvement for planning purposes. NETL's internal procedure applies to all NETL employees and research associates at the NETL sites. Reports must be compiled and submitted for the Albany, Morgantown, and Pittsburgh sites, as well as the Anchorage and Houston offices, as warranted. The directive requires that reports, documents, and other submissions listed in this procedure detail roles, responsibilities, recordkeeping, and required timelines for reporting, and are prepared and submitted in accordance with DOE Order 231.1.

2.2.4 DOE Order 435.1, Radioactive Waste Management

The objective of DOE Order 435.1, Radioactive Waste Management, is to ensure that all DOE radioactive waste is managed in a manner that is managed to: (1) protect the public from exposure to radiation from radioactive materials; (2) protect the environment; (3) protect workers; and (4) comply with applicable federal, state, and local laws and regulations. NETL ensures that such activities comply with DOE Order 435.1, as well as any other applicable executive orders and DOE directives.

2.3 ATOMIC ENERGY ACT OF 1954

The Atomic Energy Act of 1954 (AEA) and its amendments require federal control of radiation source materials for the protection of the public and workers. DOE orders, EPA regulations, and Nuclear Regulatory Commission regulations are then developed based on the AEA. To fulfill its obligations, DOE has implemented radiation protection programs at its facilities that process, produce, handle, use or dispose of radiation source or other radioactive materials. NETL's activities are limited based on research activities/priorities and minimal when compared to other DOE national laboratories or sites administered under the control of the National Nuclear Security Administration national laboratories.

Radiation exposure at NETL is managed based on the "as low as reasonably achievable" (ALARA) principle. Specific information is provided within each of the site-specific sections of this report, as necessary. Primary radiation exposure monitoring at the Albany, Morgantown, and Pittsburgh sites consists of personal dosimeter badges. Leak testing of radiation-generating devices is also completed on a semi-annual basis. Source integrity testing is completed on all sealed sources every six months as well. NETL also maintains a listing of radioactive sources and their respective custodians at each site.

Photo 2.3: Whole body dosimetry and ring dosimetry.

2.3.1 Environmental Radiological Protection Program and Dose Assessment

The cumulative annual dose for all personnel performing all operations at the Albany, Morgantown, and Pittsburgh sites during 2021 was less than 500 millirem (roentgen equivalent man, <5 millisievert), with an average annual dose of less than 10 millirem (<0.1 millisievert) per person working in the radiation monitoring program (see Table 2.3). NETL does not monitor for any specific radionuclides at this time.

Table 2.3: 2021 Annual Exposure Rate		
Exposure Range (mrem)	**Count**	**TED**
No measurable exposure	92	0
Measurable < 100	0	0
100 - 250	0	0
250 -500	0	0
500 - 750	0	0
750 - 1000	0	0
1000 - 2000	0	0
2000 - 3000	0	0
3000 - 4000	0	0
4000 - 5000	0	0
5000 - 6000	0	0
6000 - 7000	0	0
7000 - 8000	0	0
8000 - 9000	0	0
9000 - 10000	0	0
10000 - 11000	0	0
11000 - 12000	0	0
>= 12000	0	0
Number with Measurable TED:	0	0
Total Monitored:	92	0
Total Collective TED (mrem):	0	0
Total CED:	0	0
Total CEqD:	0	0
Num Individuals with Uptake:	0	0
Validation Status Errors:	0	0
Warnings:	0	0

This table is from the REMS data summary report that is provide by Oak Ridge Institute for Science and Education

Total Effective Dose (TED) Committed Equivalent Dose (CED)

2.3.2 Radiological Discharges

NETL does not discharge any radiological materials to the environment. This includes:

- No doses to humans based on releases or potential releases.
- No radiological material releases to air or water.
- No groundwater radiological monitoring is required.

2.3.3 Clearance of Property containing Residual Radioactive Materials

No property at NETL was excessed that required a residual radioactive material clearance in 2021.

2.3.4 Unplanned Radiological Releases

NETL did not experience any unplanned radiological releases in 2021.

2.3.5 Environmental Radiological Monitoring

NETL did not conduct any environmental radiological monitoring in 2021.

2.3.6 Future Radiological Monitoring

NETL is not planning to conduct any radiological monitoring in the future.

2.3.7 RESRAD-BIOTA

No radiation protection at NETL requires biota. RESAD (RESidual RADioactvity)-Biota code is not used at NETL. No radionuclide air emissions (under National Emissions Standards for Hazardous Air Pollutants — NESHAPs; no reporting required).

2.4 COMPLIANCE AND/OR CLEANUP AGREEMENTS

NETL's existing cleanup agreements are with the State of Wyoming's Department of Environmental Quality (WYDEQ) and are the result of experimental R&D research that began in the 1960s.Specifically, the agreements include efforts for groundwater and surface remediation at Rock Springs Oil Shale Retort Site in Sweetwater County, Wyoming. In the 1960's and 1970's, these sites were experimental R&D field sites for in situ oil shale retorting experiments.

From 1965 to 1979, the DOE's Laramie Energy Research Center conducted in situ oil shale retorting experiments at a facility located seven miles west of the town of Rock Springs, Wyoming. After the research activities ended, DOE performed a site-wide surface reclamation in 1982. In 1997, DOE completed a site-wide groundwater characterization identifying benzene as the contaminant of concern. Based on the results of this characterization, WYDEQ is requiring groundwater remediation of benzene with a restoration goal of <5 ug/l benzene at six of the 13 retort sites (Sites 4, 5, 6, 7, 9 and 12). Beginning in 1998, a variety of groundwater remediation technologies were implemented at these six sites, including pump and treat, bioremediation, and air sparging. Once the restoration goal is reached, or WYDEQ approves groundwater remediation at each retort site, DOE will implement surface revegetation and decommissioning prior to closure of each site.

2.5 ENVIRONMENTAL VIOLATIONS CITED BY REGULATORS/ NOTICES ISSUED

Regulators cited no environmental violations in calendar year 2021 at the Albany, Morgantown, or Pittsburgh Sites.

2.6 NOTICES OF VIOLATION NOTICES OF DEFICIENCY, NOTICES OF INTENT TO SUE, AND OTHER ENFORCEMENT ACTIONS

NETL had no Notices of Violation (NOVs), no notices of deficiency, no notices of intent to sue, and no other enforcement actions during calendar year 2021.

2.7 REPORTABLE ENVIRONMENTAL OCCURRENCES THAT REQUIRE NOTIFICATION TO AN OUTSIDE REGULATORY AGENCY

The Department's Occurrence Reporting and Processing System (ORPS) provides timely notification to the DOE complex of events that could adversely affect public or DOE worker health and safety, the environment, national security, DOE's safeguards and security interests, functioning of DOE facilities, or the Department's reputation. NETL had six ORPS reportable items in 2021. These are discussed in more detail in the site-specific sections.

2.8 MAJOR ISSUES, INSTANCES OF NON-COMPLIANCE, AND CORRECTIVE ACTIONS

No major issues or instances of noncompliance were reported at NETL in 2021.

NETL underwent surveillance audits for all three facilities with respect to the ISO 14001:2015 and ISO 45001:2018 standards in April 2021 and in October 2021 with Government and Military Certification Systems, Inc. During the April audits, NETL received four minor nonconformities dealing with document control, internal auditing, corrective action, and Management Review. During the October audits NETL received two minor nonconformities related to document control and training requirements. These minor nonconformities are being addressed prior to the 2022 surveillance audits. The external auditor recommended that NETL continue to maintain its certifications.

2.9 STATUS OF ONGOING THIRD-PARTY INSPECTIONS, SELF-ASSESSMENTS AND ENVIRONMENTAL AUDITS

The Pittsburgh and Morgantown sites originally received certification to the ISO 14001:1996 standard on August 31, 2003. The Albany site received certification to the ISO 14001:2004 standard June 9, 2005. All three sites were recertified to the same scope by Orion Registrar, Inc., in 2010. External recertification and surveillance audits continued to be conducted at all three sites to demonstrate continual improvement in the ES&H Management System and conformance to the ISO 14001:2004 standard. Subsequently, all three sites were also certified to the OHSAS 18001:2007 standard.

NETL underwent external recertification audits in 2016 to demonstrate conformance to the ISO 14001:2004/ OHSAS 18001:2007 standards. In 2018, NETL upgraded to the ISO 14001:2015 version of the standard and continued to maintain its certification to the OHSAS 18001:2007 standard. That involved upgrade audits in Morgantown (April 24, 2018); Pittsburgh (April 25, 2018); and Albany (July 17-18, 2018). Over the course of the upgrade audits, auditors identified two nonconformities and seven strengths.

In addition, external surveillance audits took place at Morgantown (November 14, 2018) and Pittsburgh (November 15, 2018). The auditors did not identify any nonconformances but identified three opportunities for improvement (OFIs) and one strength.

In 2019, all three sites underwent external recertification audits to ISO 14001:2015 and certification audits to ISO 45001:2018 (which specifies requirements for an occupational health and safety, OH&S, management system), with the certification being maintained by the same external auditor, Orion Registrar, Inc.

Audits were delayed in 2020 while NETL re-competed its external auditing contract and audits were limited due to the COVID-19 pandemic. However, in October 2020, NETL held a virtual surveillance audit with a new external auditor, Government and Military Systems, Inc. of Washington, DC (G&MCS). During this audit, the auditor identified two minor nonconformities and 20 observations for NETL to consider during the upcoming year.

External audits in 2021 returned to regular frequency using G&MCS and included three surveillance audits: a virtual audit in April 2021 at all three sites, an on-site audit in October 2021 at the Morgantown and Pittsburgh sites, and a special virtual audit concerning corrective actions at all three sites in December 2021. Results of the audits were as follows:

- The April 2021 surveillance audit identified four minor nonconformities and three observations, with the nonconformities including: the NETL Scope and Targets and Objectives are not controlled as documents; NETL has not conducted internal audits evidencing that the planned requirements were assessed; NETL has failed to ensure that one corrective action was recorded along with the root cause and corrective action plan; and NETL has failed to ensure that all required inputs in ISO 14001 and ISO 45001 were covered as part of NETL's Management Review process.
- The October 2021 surveillance audit identified two minor nonconformities and four observations, with the nonconformities including: the use of uncontrolled documents and inadequate construction contractor training.
- An observation during the October 2021 audit noting that corrective actions associated with prior NETL audits were not being completed, necessitating a special audit in December 2021 to review closure of the audit findings from October 2020 and April 2021. This special surveillance audit was completed virtually and resulted in the closing of the first six external audit findings from G&MCS with no further actions.

By maintaining its ISO 14001:2015/ISO 45001:2018 certifications and working toward continual improvements to its ES&H Management System, NETL demonstrates to its workforce, the surrounding community, DOE, and other stakeholders that it is committed to responsible environmental, safety, and health stewardship.

In addition to the third-party audits in calendar year 2021, the Albany, Morgantown, and Pittsburgh sites participated in a virtual Site Assistance Visit (SAV) with DOE's Office of Fossil Energy and Carbon Management (FECM). These meetings, held on September 21, 2020, and September 15, 2021, provided an extra review of NETL programs and an opportunity for DOE headquarters staff to gain a better perspective on ES&H activities that occur at NETL.

CONTROLLED

2.10 SUMMARY OF ENVIRONMENTAL PERMITS – INDUSTRIAL HYGIENE

Under Section 112 of the Clean Air Act (CAA), Congress gave the U.S. Environmental Protection Agency (EPA) the responsibility for enforcing regulations relating to asbestos renovation and demolition activities. The CAA allows EPA to delegate authority to State and Local Agencies. However, even after the EPA delegates responsibility to a State or Local Agency, the EPA retains authority to oversee agency performance and to enforce the federal National Emissions Standard for Hazardous Air Pollutants (NESHAP) for asbestos per 40 CFR 61, Subpart M.

A 2021 Summary of Industrial Hygiene Permits (asbestos permits) per site is provided in Tables 2.10a, NETL-Albany; 2.10b, NETL-Pittsburgh; and 2.10c, NETL-Morgantown.

ALBANY

The Oregon Administrative Rule (OAR) 437, Division 2 (OAR 437-002-0360) has adopted by reference OSHA 29§CFR 1910.1001 (Asbestos-General Industry), and Division 3 (OAR 437-0003-0001) has adopted by reference OSHA 29§CFR 1926.1101 (Asbestos-Construction).

Table 2.10a: 2021 Summary of Permits – Industrial Hygiene, NETL-ALBANY
Total Asbestos Removed from NETL-ALBANY = 31,694 square feet (ft²)

Permit No. and Name	Issue Date – Exp. Date	Regulatory Agency	Description
10-21-1001 Pacific Northwest Environmental, LLC. (License #: FSC750)	1/18/2021 – 3/01/2021 (OR DEQ Approved: 12/30/2020) Revision: 02/01/2021 – 04/30/2021	OR-DEQ	B-17 East Wing Renovations (First & Second Floors) ASN 1: DEQ Project Notification for Abatement of Friable ACM Removal: ~ 13,069 ft² Revision: ACM Removal: ~ 4,000 ft² Total: ~ 17,069 ft²
10-21-1001 Pacific Northwest Environmental, LLC. (License #: FSC750)	1/25/2021 – 3/01/2021 (DEQ Approved: 1/13/2021)	OR-DEQ	B-17 East Wing Renovations (First & Second Floors) ASN 6: DEQ Project Notification for Abatement of Non- Friable ACM Removal: ~ 425 ft² Waste disposed of at the Coffin Butte Landfill/ Wasco County Landfill.
N/A	02/09/2021 – 03/09/2021	EXEMPT No Permit Required OAR 340-248-0250	B-29 Room 103, Encapsulation (< 3ft²) Broken Asbestos Floor Tile Repair Class III Work Activity per 40 CFR 763.92(a)(2)
10-21-1017 Pacific Northwest Environmental, LLC.	3/10/2021 – 3/22/2021	OR-DEQ	B-28 Fire Recovery, Emergency ASN 6: DEQ Project Notification for Abatement of Non-Friable ACM Removal: ~ 400 ft²

Table 2.10a: 2021 Summary of Permits – Industrial Hygiene, NETL-ALBANY
Total Asbestos Removed from NETL-ALBANY = 31,694 square feet (ft^2)

Permit No. and Name	Issue Date	Regulatory Agency	Description
10-21-1017 Pacific Northwest Environmental, LLC. (License #: FSC750)	3/22/2021 – 5/07/2021 Revision:	OR-DEQ	B-28 Fire Recovery (South High Bay Area/Main Level) ASN 1: DEQ Project Notification for Abatement of Friable ACM Removal: ~ 3,600 ft^2 Revision 5 (ASN 1): DEQ Project Notification for Abatement of Friable ACM Removal: ~ 8,000 ft^2 Total: ~ 11,600 ft^2
N/A	4/16/2021 – 4/19/2021	EXEMPT No permit required OAR 340-248-0250	B-29 Room 112 (WO# A00027898), Encapulation (< 3 ft^2) Damaged Asbestos Floor Tile Class III Work Activity per 40 CFR 763.92(a)(2)
10-21-2016 Pacific Northwest Environmental, LLC (License #: FSC750)	5/25/2021 – 6/25/2021	OR-DEQ	B-25 Room 112 Laboratory Hood Removal (B25HOOD01 and B25HOOD02) – NON-FRIABLE PACM Removal of transite panels within laboratory hoods. Approximate Quantity = 90ft^2.
21-1001-06 Pacific Northwest Environmental, LLC (License: FSC750)	09/20/2021 – 10/29/2021	OR-DEQ	B-28 Fire Rebuild (Corridor 126) ASN1 – DEQ Project Notification for Abatement of Friable ACM Removal: ~ 192 ft^2 Waste disposed of at the Wasco County Landfill.

PITTSBURGH

The Pennsylvania Department of Environmental Protection (DEP) regulates the removal, collection, transportation, and disposal of asbestos materials. The Pennsylvania Department of Labor and Industry (DLI) is responsible for the enforcement of the Pennsylvania Asbestos Occupations Accreditation and Certification Act of 1990, P.L. 805, No. 194. The DEP's Bureau of Air Quality has adopted and enforces the federal National Emissions Standard for Hazardous Air Pollutants (NESHAP) for asbestos per 40§CFR 61, Subpart M as referenced in PA Code 25§124.3. Additional regulations exist for demolition and renovation of any building containing asbestos-containing material (ACM) in Allegheny County where the Pittsburgh site is located.

Table 2.10b: 2021 Summary of Permits – Industrial Hygiene, NETL-PITTSBURGH
Total Asbestos Removed from NETL-Pittsburgh = 2,158 square feet (ft²)

Permit No. and Name	Issue Date	Regulatory Agency	Description
KLA Roofing & Construction, LLC (License #: ACAL-13-0422, CO578A)	3/15/2021 – 3/31/2021 Revision: 11/15/2021 – 11/23/2021	ACHD	B-923 Demolition/B-920 Renovations (Exterior, Room 102) ACM Removal: ~ 1,313 ft² Revision: ACM Removal: ~ 840 ft² Total: ~ 2,153 ft² Waste disposed of at the Imperial Landfill/ Cumberland County Landfill.
Bristol Environmental (License #: ACAL-21908, C0160A)	10/18/2021 – 12/01/2021	ACHD	B-83 High Bay Electrical Gasket Rope Disposal (Undersized Project Permit) ACM Removal: ~ 5 ft² Waste disposed of at the Imperial Landfill.

MORGANTOWN

The West Virginia Bureau of Public Health, Division of Air Quality, Department of Human and Health Resources (DHHR) enforces the Federal National Emissions Standard for Hazardous Air Pollutants (NESHAP) for asbestos per 40§CFR 61, Subpart M.

Table 2.10c: 2021 Summary of Permits – Industrial Hygiene, NETL-MORGANTOWN
Total Asbestos Removed from NETL-Morgantown = 4 square feet (ft²) and 14 linear feet

Permit No. and Name	Issue Date	Regulatory Agency	Description
Cira and Associates Consulting, LLC (License #: AC002710) Anderson Environmental Services (AES), LLC (License #: LA000158)	3/26/2021 – 3/26/2021	WV DHHR EXEMPT from notifications (WV§16-32-11, Section (c) & 64 CSR 63, Section 10.3)	B-2 CAB Removal ACM Removal: ~ 4 ft² Waste disposed of at the Meadowfill Landfill in Bridgeport, WV.
Easley & Rivers Certificate:	6/7/2021 – 6/7/2021	WV DHHR EXEMPT from notifications (WV§16-32-11, Section (c) & 64 CSR 63, Section 10.3)	B-2 Ceiling Fastener (Screw Installations ~100) ACM Disturbed: < 3 ft² or 3 linear feet Class III Work Activity per 40 CFR 763.92(a)(2) Waste disposed through NETL B-33 Hazardous Waste Facility and sent to a WV Asbestos-accepting landfill.
Cira and Associates Consulting, LLC (License #: AC002710) Anderson Environmental Services (AES), LLC (License #: LA000158)	7/13/2021 – 7/13/2021	WV DHHR EXEMPT from notifications (WV§16-32-11, Section (c) & 64 CSR 63, Section 10.3)	B-2 North Wall, Area 208 (Iron Pipe/Insulation) ACM Disturbed: < 1 ft² or 14 linear feet Class III Work Activity per 40 CFR 763.92(a)(2) Waste disposed through NETL B-33 Hazardous Waste Facility and sent to a WV Asbestos-accepting landfill.

Table 2.10c: 2021 Summary of Permits – Industrial Hygiene, NETL-MORGANTOWN *Total Asbestos Removed from NETL-Morgantown = 4 square feet (ft^2) and 14 linear feet*			
Permit No. and Name	**Issue Date**	**Regulatory Agency**	**Description**
Cira and Associates Consulting, LLC (License #: AC002710)	9/29/2021 – 9/28/2021	WV DHHR EXEMPT from notifications (WV§16-32-11, Section (c) & 64 CSR 63, Section 10.3)	B-2 HVAC Penetrations (Screw Installations ~30) ACM Disturbed: < 3 ft^2 or 3 linear feet Class III Work Activity per 40 CFR 763.92(a)(2) Waste disposed through NETL B-33 Hazardous Waste Facility and sent to a WV Asbestos-accepting landfill.

2.11 EXECUTIVE ORDER 14057

On December 8, 2021, Executive Order (E.O.) 14057, *Catalyzing Clean Energy Industries and Jobs through Federal Sustainability*, was implemented, revoking the requirements of E.O. 13834, ***Efficient Federal Operations***. The purpose of E.O. 14057 is to affirm the policy of the United States that the Federal Government will lead by example to achieve a carbon-free electricity sector by 2035, with net-zero emissions by no later than 2050,

NETL will be expected to meet the following requirements:

- Reduce Scope 1, 2, and 3 greenhouse gas emissions (defined by the Federal Greenhouse Gas Accounting and Reporting Guidance), by establishing targets for fiscal year 2030 using a FY2008 baseline.
- Increase the percentage use of carbon pollution-free electricity, so that it constitutes 100 percent of facility electrical energy use on an annual basis and seek to match use on an hourly basis to achieve 50 percent 24/7 carbon pollution-free electricity, by fiscal year 2030.
- Facilitate new carbon pollution-free electricity generation and energy storage capacity by authorizing use of their real property assets (rooftops, parking structures, and adjoining land, for the development of new carbon pollution-free electricity generation and energy storage through leases, grants, permits, or other mechanisms, to the extent permitted by law.
- Acquire zero-emission light-duty vehicles by the end of fiscal year 2027. Each agency with a fleet comprising at least 20 vehicles must develop and annually update a zero-emission fleet strategy that shall include optimizing fleet size and composition; deploying zero-emission vehicle refueling infrastructure; and maximizing acquisition and deployment of zero emission light-, medium-, and heavy-duty vehicles where the General Services Administration (GSA) offers one or more zero-emission vehicle options for that vehicle class.

- Achieve net-zero emissions across its portfolio of buildings, campuses, and installations by 2045 and reduce greenhouse gas emissions by 50 percent from buildings, campuses, and installations by 2032 from 2008 levels, prioritizing improvement of energy efficiency and the elimination of onsite fossil fuel use.
- Increase facility energy efficiency and water efficiency and establish targets for fiscal year 2030 for agency-wide facility energy use intensity and potable water use intensity.
- Minimize waste, including the generation of wastes requiring treatment and disposal; advance pollution prevention; support markets for recycled products; and promote a transition to a circular economy, as defined in section 2 of the Save Our Seas 2.0 Act (Public Law 116–224), by annually diverting from landfills at least 50 percent of non-hazardous solid waste, including food and compostable material, and construction and demolition waste and debris by fiscal year 2025; and 75 percent by fiscal year 2030.
- Reduce emissions, promote environmental stewardship, support resilient supply chains, drive innovation, and incentivize markets for sustainable products and services by prioritizing products that can be reused, refurbished, or recycled; maximizing environmental benefits and cost savings through use of full lifecycle cost methodologies; purchasing products that contain recycled content, are biobased, or are energy and water efficient, in accordance with relevant statutory requirements; and, to the maximum extent practicable, purchasing sustainable products and services identified or recommended by the EPA.

Implementing instructions were not issued in 2021. NETL will incorporate the requirements of the implementing instructions into its ES&H Management System, as appropriate.

2.12 COVID-19 IMPACTS

From the onset of the COVID-19 pandemic, NETL has been committed to protecting its workforce and preserving the Laboratory's ability to complete its mission while keeping its ES&H values at the forefront of the way day-to-day activities are approached.

Since March 2020 and throughout 2021, on average, approximately 77% of the NETL workforce has worked from home. Minimum personnel reported on site to handle non-portable work, including managing ES&H compliance, facilities, security, information technology, and research and construction activities that, if stopped or paused, would lead to an unacceptable loss of key research results or significant expense. In addition, the Laboratory instituted a myriad of health, safety, and workplace operations protocols following the latest guidance provided by Federal, state and local public health agencies; the Safer Federal Workforce Task Force established by Executive Order (EO) 13991 and the DOE. Protocols included accommodations for maximum telework; increased leave flexibilities; symptom monitoring; face masks; physical distancing; cleaning and disinfection; HVAC upgrades and personal hygiene. Actionable planning to transition the Laboratory from response to recovery and a return of personnel to the sites in more significant numbers began when the DOE issued its first COVID-19 Workplace Safety and Reentry Framework on December 3, 2021.

As noted above, while there were limited personnel reporting to the site throughout CY2021, NETL environmental activities and compliance continued as normal.

No environmental sampling, monitoring, or inspection compliance issues were identified as being impacted due to the COVID-19 pandemic in CY2021.

2.13 ORGANIZATIONAL RESILIENCE

NETL performed a Vulnerability Screening in FY2019. Results of the screening found that NETL did not require a full vulnerability assessment at that time. However, based on the requirement of the 2021 DOE Climate Adaptation and Resilience Plan (CARP), it was determined that NETL would complete a Vulnerability Assessment and Resilience Plan (VARP) in FY2022.

The NETL COOP Plan provides planning, program direction, and guidance for implementing NETL COOP plans and programs. The plan aims to ensure the lab can conduct its mission essential functions and essential supporting activities under all threats and conditions. The plan supports guidance and direction to NETL offices developing and maintaining internal procedures (e.g., orders, operating plans, procedures, etc.). Interdependencies include the private sector and municipal services vendors NETL relies on for its energy, water, and internet service capabilities. The lab maintains a GSA fleet vehicle program and shuttle services between the MGN and PGH sites. Additionally, the nearest airports are the Pittsburgh International Airport, Morgantown Municipal Airport, and Albany Municipal Airports. Stationary generators are located throughout the sites to provide back-up power to critical infrastructure and key resources if normal power from the electric utility providers is interrupted. The NETL All-Hazards Surveys for the MGN, PGH, and ALB sites provide a qualitative analysis of the hazards that apply to the operation of NETL and offer a planning basis for the emergency response and continuity programs.

In addition, the NETL Continuity of Operations Program (COOP) Business Impact Analysis (BIA) was developed following guidance issued for risk management by the DOE Office of Continuity Programs. The BIA provides a qualitative analysis of potential hazards and an analysis of the resulting risk to mission essential functions that NETL is associated with or acts as a partner organization. Similar to the All-Hazards Surveys, the BIA offers a planning basis for the NETL continuity program and will be updated following NETL's participation in DOE's enterprise-wide Business Process Analysis. Finally, NETL's Office of Information Technology (IT) is updating the NETL IT Disaster Recovery Plan (DRP). An IT DRP provides procedures for relocating information systems operations to an alternate location following major system disruptions with long-term effects.

NETL has a COOP plan and Pandemic Response Action Plan. The basis of planning assumes a significant number of personnel being unable to work due to illness (upwards of 50%), which was not the case during the coronavirus pandemic. DOE managed the event as an emergency response and preventive action safety event rather than reacting to a workforce illness. NETL did not categorize the pandemic as an "operational emergency" or an emergency event requiring Headquarters notification following DOE Order 151.1D, Comprehensive Emergency Management System. To match the circumstances, existing NETL plans were bridged with a Pandemic Response Action Plan to capture the preventive safety and health aspects of the response and continuing the entire NETL mission rather than mission essential functions.

As a research lab, NETL maintains plans for suspending lab operations as part of its continuity, emergency, and lapse of appropriations planning. The research and support organizations of NETL understood the issues and cooperated to quickly update plans to safely suspend lab, engineering, and support activities and identify appropriate telework efforts necessary to continue NETL mission accomplishment. The initial Pandemic Response Action Plan established a decision-making framework and documented the earliest actions NETL took to prevent the virus's spread. The contribution of that planning continued with the development of the NETL Return-to-Work (RTW) Plan. The RTW Plan is a living document with regular updates as the pandemic evolves and lessons are learned and shared across the DOE complex.

2.14 PFAS AND ADDITIONAL EMERGING CONTAMINANTS

Emerging contaminants refers to chemicals that can enter the water supply and have a detrimental affect on aquatic species and nonaquatic species (bioaccumulating up the food web). The U.S. EPA has identified a number of emerging contaminants that present unique issues and challenges to the environmental community, one of which is Per- and Polyfluoroalkyl Substances (PFAS),

These chemicals are of particular concern to the Department since they do not break down easily in the environment or the human body due to their strong carbon-fluorine bond. According to the Department's policy statement regarding PFAS on September 16, 2021, the use of PFAS-containing Aqueous Film Forming Foam (AFFF) should be discontinued, except in cases of actual fire emergencies. Fire protection personnel must use appropriate personal protective equipment to minimize exposure to PFAS and sites may continue to store quantities of PFAS-containing AFFF on site for emergencies, but disposal would be suspended, and considered on a case-by-case basis with approval by the head of the departmental element.

In 2021, NETL provided information to the Department with respect to its use of PFAS is summarized below:

- NETL does not have an active sampling, analysis, tracking, and monitoring program for PFAS-related compounds at any of its sites because it is not required under each site's industrial wastewater or stormwater NPDES permits. However, NETL maintains and tracks all chemicals on-site using a chemical inventory management system to ensure proper disposal at the end of chemical life (recycling or hazardous waste disposal).
- NETL does not have a firefighting facility, fire department, or fire training at any of its sites.
- NETL has two AFFF systems at the Pittsburgh site for fire suppression in chemical storage buildings. These systems would only be discharged in a fire emergency (per DOE's PFAS Policy Memorandum).
- Drinking water at each site is supplied by public drinking water systems; groundwater and surface water sources do not provide drinking water.

2.15 EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT REPORTING STATUS TABLE

The table below provides status of the Emergency Planning and Community Right-to-Know Act (EPCRA) Reporting at NETL for 2021.

EPCRA Section	Description of Reporting	Status*
EPCRA Sec. 302-303	Planning Notification	Not Required
EPCRA Sec. 304	EHS or HS Release Notification**	Not Required
EPCRA Sec. 311-312	(M)SDS/Hazardous Chemical Inventory***	Yes
EPCRA Sec. 313	TRI Reporting	Not Required

* An entry of "yes," "no," or "not required" is sufficient for "Status."

** Extremely Hazardous Substance or Hazardous Substance

*** (Material) Safety Data Sheet

3.0 COMPLIANCE BY SITE

NETL has three research sites and two program office sites. Each focus on different activities. Each of the sites are subject to varying state and local environmental regulations. This section includes detailed compliance status discussions for each of the research sites. Since the Albany, Morgantown, and Pittsburgh sites include laboratory facilities, they may present a broad array of environmental concerns and regulatory requirements. The Anchorage and Houston program offices perform only administrative functions, therefore, the environmental impacts and regulatory compliance issues for these locations are discussed in less detail.

3.1 ANCHORAGE, ALASKA

3.1.1 Site Description

NETL's Arctic Field Office promotes the research, development and deployment of energy production and conversion technology in Alaska. Activities in the Anchorage office include facilitating communication among Arctic energy stakeholders, as well as assessing Arctic energy R&D needs associated with unconventional oil and gas, remote electric power technology, and tundra access.

Since 2015, the Anchorage program office has been staffed by a site support contractor employee, who provides technical support to the NETL's Oil & Gas Program. The contractor is responsible for support and delivery of DOE technical assistance, capacity building, energy education, and outreach to all Alaskan tribal entities.

Anchorage is Alaska's primary governmental, transportation, industrial and population center. Anchorage (Photo 3.1.1) is in south-central Alaska on the northern end of the Cook Inlet and is situated between the Chugach Mountains and the tidal inlets known as Turnagain and Knick Arms. By air, Anchorage is 55 minutes from Fairbanks and 3.5 hours from Seattle. It is located 358 road miles (576 km) south of Fairbanks.

As of the most recent U.S. Census, there were 291,826 people and 105,517 households in the city of Anchorage. The population density was 171.2 per square mile, with 113,032 housing units at an average density of 66.3 per square mile. The racial makeup was 66.0% White, 8.1% Asian, 7.9% Native American, 7.6% Hispanic or Latino, 5.6% African American, 2.0% Pacific Islander, and 8.1% from two or more races.

The median household income in Anchorage was $76,495 and the per capita income was $36,145. About 7.7% of the population was below the poverty line. The major employers in Anchorage are the military, state government, federal government (civilian sector), the University of Alaska, the Anchorage School District, Ted Stevens International Airport, and Providence Health and Services.

Photo 3.1.1: City of Anchorage.

Building operations, maintenance and janitorial services are under the control of the landlord, therefore, minimal compliance assessments and ES&H inspections and investigations are required. The Anchorage office does not undertake in-house audits, external audits or subject matter reviews. However, in-house inspections and regulatory agency inspections (e.g., by the local fire marshal or municipal building inspectors) of the building and facilities may occur, with any subsequent findings assessed against the landlord. Although fire drills are not practiced, the building is equipped with a fire detection and suppression system that is tested by the landlord on an annual basis.

The NETL support contractor employee and DOE Office of Indian Energy employees moved to office space is located in the James M. Fitzgerald United States Courthouse and Federal Building in 2021. The new space is leased under an agreement with Office of Indian Energy.

3.1.2 Environmental Compliance

Due to the nature of the work (assessment of Arctic Energy R&D need areas and coordination with Arctic Energy stakeholders) the waste management services are minimal and are provided by the landlord under the terms of the rental agreement. The city of Anchorage does not impose recycling requirements that apply to leased office space. No formal recycling program is in place at the Anchorage office; however, designated containers exist for recycling paper and plastic.

The Anchorage office is not required to implement an environmental compliance program. It does not formally implement a pollution prevention program. Anchorage staff practice affirmative procurement whenever possible (i.e., the procurement of goods containing recycled content

or having less life-cycle impact on the environment). No actions have been taken that alter the facility or operations in a manner that could change the current impacts on the environment in or around the Anchorage office.

3.1.2.1 NEPA

NETL independently reviews any contract performed through or supported by the Arctic Energy Office for potential environmental impacts before the project is undertaken. The Anchorage Office does not conduct National Environmental Policy Act (NEPA) reviews for such proposed, off-site actions.

3.1.2.2 Radiation Protection

The only sources of potentially harmful radiation in the Anchorage office are Class 1 lasers, commonly found in printers and CD/DVD readers/recorders. Anchorage staff is ensured protection from these lasers through proper engineering design of the electronic devices.

3.1.2.3 Air Quality and Protection Activities

The air quality in the city of Anchorage follows all governing regulations. The Anchorage office landlord is responsible for maintaining sufficient air quality in the building and implements ventilation air filter changes on a quarterly basis. Any ozone-depleting refrigerants that may be used for air conditioning are under the control of the landlord.

Due to the nature of the work performed (assessment of Arctic Energy R&D need areas and coordination with Arctic Energy stakeholders), it is unnecessary to implement air quality monitoring, regulation or protection programs.

3.1.2.4 Water Quality and Protection Activities

The Anchorage office landlord is responsible for maintaining sewer and storm water and other related permits. The landlord tests the domestic water supply annually to ensure compliance with Safe Drinking Water Act standards.

3.1.2.5 Responsibilities for Addressing Executive Orders 13423, 13514, and 13693

See Section 4.0 ES&H Management System.

NETL-Anchorage engages in minimal ES&H activities. On-site ES&H primarily focuses on affirmative procurement of office supplies and miscellaneous items. The Anchorage office does not maintain an ES&H Management System and is not covered by NETL's ES&HMS system in effect at the Albany, Morgantown and Pittsburgh sites.

3.1.2.6 Other Major Environmental Issues and Actions

Anchorage staff is not aware of any ongoing or pending lawsuits, Notices of Violation, public accusations of regulatory violations or any environmental occurrences. No violations of compliance agreements or cleanup agreements or any unresolved compliance issues have occurred. No audits were conducted in 2020 under the sponsorship of DOE Headquarters, independent regulators or other independent third parties.

3.2 ALBANY, OREGON

3.2.1 Site Description

The Albany site focuses on technologies in scientific and engineering areas creating commercially viable solutions to national energy and environmental problems. These areas include materials performance, multi-environmental materials characterization, alloy development/manufacture, and geospatial data analysis. The work is accomplished through both in-house R&D and contracted research. There are 127 employees at the Albany site, including 46 federal employees and 81 contractor employees.

The Albany site is located in Linn County, Oregon, in the western part of the state (Photo 3.2.1). Albany, the county seat of Linn County, is located approximately 45 miles north of Eugene, 70 miles south of Portland and 25 miles south of Salem. The facility is located in the Willamette Valley, which is structural and erosional lowland between the uplifted marine rocks of the Coast Range and the volcanic rocks of the Cascade Range. The Albany site covers 42 acres with 248,000 square feet of building working area. The site is relatively flat and located on a higher section of town away from any flood plains. The Calapooia River is located west of the laboratory, flowing in a broad arcuate pattern from southeast of the laboratory west to north, emptying into the Willamette River. Land use immediately surrounding the Albany site is a combination of residential housing developments, small businesses and public-school properties.

Photo 3.2.1: Albany site.

The most current census data indicates the city contained 56,472 people and 20,278 households. The population density was 3,219.6 per square mile. There were 20,979 housing units at an average density of 1,198.8 per square mile. The racial makeup of the city was 86.3% White, 0.4% African American, 0.8% Native American, 1.9% Asian, 0.0% Pacific Islander, and 6.2% from two or more races. Hispanic or Latino of any race comprised 13.3% of the population.

The median income for a household in the city was $62,172. The per capita income for the city was $28,802. About 10.9% of the population was below the poverty line. The major employers in Albany are Samaritan Health Services, Linn Benton Community College, Greater Albany Public Schools ATI, Greater Target Distribution Center, and Linn County.

3.2.2 Major Site Activities

3.2.2.1 B-28 Electrical Vault Upgrades Design

Completed a design for upgrades to the electrical infrastructure of B-28 to more effectively support current and future research capabilities.

Photo 3.2.2.1: B-28 electrical vault upgrades design.

3.2.2.2 Site Asphalt & Sidewalk Replacement

Existing asphalt at the main site entrance and the sidewalk near the B-1 main entrance were replaced as a result of degraded conditions,

Photo 3.2.2.2: Site asphalt & sidewalk replacement.

3.2.2.3 B-17 Central High Bay Renovation Design

A design to renovate and repurpose the central high bay of Building 17 to provide code compliant office spaces was completed.

Photo 3.2.2.3: B-17 Central high bay renovation design.

3.2.2.4 Site EISA 432 Energy & Water Evaluations

An evaluation of the site energy and water usage and the identified areas addressing for increasing usage efficiency was completed.

3.2.3 Environmental Restoration and Waste Management

3.2.3.1 CERCLA

The Albany site had no off-site remediation activities during 2021. There were no National Priorities List (NPL) sites for which the Albany site had liability under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)/Superfund Amendments and Reauthorization Act (SARA).

3.2.3.2 RCRA

There were no RCRA compliance issues identified in 2021. There were no Notices of Violation, corrective actions, or best management practices identified associated with the inspection or operations of hazardous waste handling during 2021. There were no RCRA compliance inspections completed by the Oregon Department of Environmental Quality (DEQ) at the Albany site during 2021, nor were there any EPA Region 10 inspections conducted during 2021. A summary of Albany's Hazardous Waste types and their amounts can be found in Table 3.2.3.2.

Table 3.2.3.2: 2021 Hazardous Waste Generation-Albany

Waste Stream	Qty. Generated {lbs.)
Poison (Toxic Solids & Liquids)	3
Mercury/Mercury Compounds	9
Flammable Solids	75
Corrosive (Liquids & Solids)	2607
Waste Oxidizers	4
Waste Paint (Oil Based)	0
Flammable/Combustible Liquids	60
Activated Carbon	0
Other RCRA Hazardous Wastes	9
Fluorescent Light Tubes (Universal Waste)	17
Batteries (Universal Waste)	5812
TOTAL	**8596**

3.2.3.3 Federal Facilities Compliance Act (FFCA)

There were no issues identified during 2021 regarding the Federal Facilities Compliance Act at the Albany site.

3.2.3.4 NEPA

See section 2.1.5 National Environmental Policy Act (NEPA) for information regarding Albany NEPA requirements.

3.2.3.5 TSCA

NETL-Albany does not manufacture chemicals and is not subject to sections of the Toxic Substance Control Act (TSCA) related to manufacturing. No external spills or releases of substances regulated by TSCA – including pesticides, polychlorinated biphenyls (PCBs), formaldehyde, methylene chloride, asbestos, etc. – were reported in 2021 at the Albany site. TSCA waste generated during 2021 included asbestos, lead-based paint debris, and spent PCB waste. These wastes were properly disposed of in accordance with Federal, state, and local requirements.

An unplanned asbestos disturbance occurred in February 2021 as a result of a building structural fire in Building 28. During the response, an Albany Fire Department firefighter inadvertently damaged some asbestos-containing materials (ACM – concrete asbestos boards) while conducting firefighting activities. Appropriate notifications were completed at the time of the incident and the affected areas were abated in accordance with TSCA and Oregon Department of Environmental Quality (DEQ) requirements. All wastes were properly disposed of in accordance with Federal, state and local requirements.

No unplanned external releases of air pollutants covered by CERCLA or toxic release inventory (TRI) regulations occurred during 2021.

All asbestos-containing materials (ACM) encountered during facility renovations or work orders have either been abated or encapsulated. Any remaining non-friable asbestos present in facilities has been inventoried and maintained. No samples taken in 2021 indicated materials contained fiber concentrations in excess of U.S. EPA or the Oregon DEQ clearance levels (0.01 fibers/cubic centimeters) for clearance samples taken upon completion of abatement projects. Total asbestos abatement for 2021 was 31,694 square feet of ACM over nine abatement or encapsulation activities including three major asbestos abatements. All asbestos abatements and encapsulation activities were completed in accordance with U.S. EPA and Oregon DEQ requirements and wastes were properly disposed of at approved landfills.

3.2.3.6 FIFRA

No restricted-use pesticides, herbicides or defoliants were used at the Albany site during 2021. Only general-use herbicides were used for routine vegetation control along fence lines, guard rails, and flower beds. Rodent control was provided via traps with commercial-use baits. Pest and plant/weed control services were provided by contracted professional pest control and professional landscape management companies, respectively.

3.2.4 Radiation Protection Program

The Albany site has legacy radiological issues, which includes an inventory of ores that are considered naturally occurring radioactive materials (NORM), as well as areas that have not been completely released from radiological controls (due to configuration and inability to complete release surveys). Radiological waste generated at the Albany site is packaged for proper waste

disposal as low-level radioactive waste (LLRW) in accordance with applicable regulations at the licensed regional facility in the State of Washington (U.S. Ecology), as authorized via an active site-use permit with the State of Washington–Department of Health. No LLRW disposal activities were required during 2021.There are no sealed sources identified at the Albany site.

Radiation monitoring performed at Albany consisted of whole-body thermoluminescent dosimeters and finger rings for the employees in the mail facility (mail and packages are scanned via X-ray upon receipt), and as identified in appropriate R&D Safety Analysis and Review System (SARS) packages. All radiation-generating devices are surveyed for possible leakage on an semi-annual basis.

The cumulative annual dose for all personnel performing all operations at the Albany site during 2021 was less than 100 millirem (roentgen equivalent man, <1 millisievert), with an average annual dose of less than 10 millirem (<0.1 millisievert) per person in the radiation monitoring program. See Table 3.2.4 Albany 2021 Annual Exposure Rates.

Table 3.2.4 Albany 2021 Annual Exposure Rates

Exposure Range (mrem)	Count	TED
No measurable exposure	37	0
Measurable < 100	0	0
100 - 250	0	0
250 -500	0	0
500 - 750	0	0
750 - 1000	0	0
1000 - 2000	0	0
2000 - 3000	0	0
3000 - 4000	0	0
4000 - 5000	0	0
5000 - 6000	0	0
6000 - 7000	0	0
7000 - 8000	0	0
8000 - 9000	0	0
9000 - 10000	0	0
10000 - 11000	0	0
11000 - 12000	0	0
>= 12000	0	0
Number with Measurable TED:	0	N/A
Total Monitored:	37	N/A
Total Collective TED (mrem):	0	0
Total CED:	N/A	0
Total CEqD:	N/A	0
Num Individuals with Uptake:	0	N/A
Validation Status Errors:	0	N/A
Warnings:	0	N/A

This table is from the REMS data summary report that is provide by Oak Ridge Institute for Science and Education

CONTROLLED

3.2.4.1 DOE Order 458.1, Radiation Protection of the Public and Environment

Additional information related to DOE Order 458.1 may be found in Section 2.2, *DOE Internal Environmental and Radiation Protection Orders*, and Section 2.3, *Atomic Energy Act of 1954*. In accordance with "as low as is reasonably achievable" (ALARA) principles, NETL manages its radiation protection program for protection of the public and the environment from radiation hazards since radiation sources are low-level, sealed instrumentation sources, radiation generating devices (RGDs) or processes that include NORM or technologically enhanced-naturally occurring radioactive materials (NORM/TE-NORM) with minimal radiation levels.

3.2.4.2 DOE Order 435.1, Radioactive Waste Management

There are no source materials located at the Albany site, however, X-ray generating devices are used for various analytical applications at the Albany site, including scanning and transmission electron microscopes, X-ray diffraction and fluorescence instruments and a particle-size analyzer. Table 3.2.4.2 lists the X-ray radiation generating devices at the Albany site, These devices are examined semi-annually for leaks and to make sure safety interlocks/controls are working properly.

Minor amounts of legacy radioactive materials remain stored in the B-28 hot cell and other controlled locations awaiting disposal. The site maintains an active site-use permit with the State of Washington–Department of Health (DOH) that allows for the disposal of low-level radioactive wastes (LLRW) at the regional waste handling facility, US Ecology Washington, There were no LLRW disposal shipments in 2021.

Table 3.2.4.2: 2021 Albany X-Ray Radiation Generating Devices

Device	Quantity
X-Ray Florescence Instrument	1
X-Ray Diffraction Instrument	2
Handheld/Portable XRF	1
Scanning Electron Microscope/Microprobe	2
Transmission Electron Microscope	1
Mail X-Ray Instrument	1
Sedigraph/Particle Analyzer	1
Ion Polisher	2

3.2.5 Air Quality and Protection Activities

The Albany site experienced a significant wildfire season during 2021, with several wildfires coming within less than 30 miles of the site. While there was no direct wildfire damage, the ambient air quality at the site was degraded significantly over a period of two weeks, with the resulting ash impacting site HVAC systems and ambient air quality impacting ability to perform work. Air quality index levels exceeded unhealthy levels for several days and necessitated the site being closed for operations for several days.

3.2.5.1 Clean Air Act

Albany has no emissions that require monitoring, reporting, or permitting based on current operations. In 2021, there were no New Source (Pre-Construction) Reviews for any facilities or projects owned or managed by the Albany site. Operation of the Albany site does not contribute significantly to any emissions under the National Ambient Air Quality Standards (NAAQS).

3.2.5.2 National Emission Standards for Hazardous Air Pollutants

No Albany facilities or projects are regulated under the National Emission Standards for Hazardous Air Pollutants. No Albany facilities and/or projects have the potential to emit more than 10 tons per year of a single designated toxic air pollutant or more than 25 tons per year in aggregate of all toxic air pollutants, nor are any facilities or projects regulated for any of the 189 toxic air pollutants. Table 3.2.5.2 displays the estimated 2021 Air Emissions for both facility operations and R&D projects at the Albany site.

Ozone-depleting substances (ODSs) or refrigerants are used for air conditioning, refrigeration, chilling, or for protection of sensitive electrical systems. ODSs on site being is maintained. Units are being replaced with more environmentally friendly units on a continual basis, whenever practicable.

Table 3.2.5.2: 2021 Air Emissions Inventory – Albany

Pollutant	Calculated Emissions (lbs./yr.)
Volatile Organic Compounds	11.9
Nitrogen Oxide	764
Carbon Monoxide	326
Sulfur Dioxide	13.5
Total Suspended Particulates	169
Particulate Matter 10 (PM_{10})	45.5
Total Organic Carbon	15.4

3.2.5.3 Hydrofluorocarbon (HFC) Phasedown

The American Innovation and Manufacturing (AIM) Act of 2020 was enacted on December 27, 2020. The AIM Act provides new authority to address HFCs and directs EPA: (1) to phase down the production and consumption of listed HFCs through an allowance allocation and trading program, (2) to manage these HFCs and their substitutes to maximize reclamation and minimize releases to the atmosphere from equipment, and (3) to facilitate the transition to next-generation technologies through sector-based restrictions.

Table 3.2.5.3 shows current HFC uses, replacements, procurement, and repository development at the Albany site. Plans to address how deal with the phaseout are underway. There were no issues in 2021 regarding compliance Hydrofluorocarbons (HFC) Phasedown at Albany.

Table 3.2.5.3: 2021 ALB HFC Phaseout Inventory Summary Information														
(All Values in pounds)													Mass Balance	
Refrigerant	Amount in Equipment 2020		Amount in Equipment 2021		Amount in Storage 2020		Amount in Storage September 2021		Amount Purchased in 2021		Amount Removed from Equipment in 2021		Annual Net Gain or Loss of ODS (Difference in Equipment + Difference in Storage)	Leaks (Initial Storage - Final Storage + Purchases)
	ALB	Total	ALB	Total	ALB	Total	ALB	Total	ALB	Total	ALB	Total	ALB	ALB
R134A-HFC	25.22	25.2	25.22	25.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00

3.2.6 Water Quality and Protection Activities

NETL engages in water quality and protection activities: (1) to maintain full compliance with all applicable federal, state, and local requirements; (2) to prevent spills of potential pollutants into the environment; and (3) to ensure the safety and protection of our employees, the public, and the environment. These activities include management of surface water, industrial process water and groundwater/soil. There were no water quality issues at the Albany Site during 2021. More details are provided in the following subsections.

3.2.6.1 Clean Water Act

The EPA and the Oregon Department of Environmental Quality (DEQ) have implemented water pollution control programs, including setting wastewater standards for industry and setting water quality standards for all contaminants in surface waters. These requirements are managed via permits issued to the City of Albany, and subsequently, the permits act as the CWA permitting authority for NETL.

3.2.6.2 Industrial Wastewater Program

NETL-Albany holds an industrial wastewater discharge permit with the City of Albany. The permit was issued in December 2018 (on a five-year renewal cycle), with a modification of the applicable terms and conditions per City of Albany correspondence effective May 2019. Semi-annual monitoring is required in accordance with the permit. Table 3.2.6.2 provides the results of the 2021 monitoring, with all results within permit limits. Based on permit requirements, Albany is also required to submit a Slug Discharge Control Plan to the city, when the permit is renewed.

Elementary neutralization units have been installed at several laboratory buildings (see Photo 3.2.6.2) to prevent potential pH excursions from laboratories even though procedures prohibit disposition of chemicals via laboratory drains. NETL-Albany had one instance when it was necessary to request permission to discharge laboratory process water in June 2021. This notifications was completed in accordance with NETL's industrial wastewater permit and slug discharge permit. City of Albany personnel inspected the facility in December 2021, and no issues were documented.

Table 3.2.6.2: 2021 Industrial Wastewater Discharge Permit Monitoring Analysis — Albany			
Constituent	Permit Limits	Sample Date	
		02/05/2021	07/06/2021
Arsenic	1.0 mg/L	ND	ND
Cadmium	0.44 mg/L	ND	0.00071 mg/L
Chromium	2.8 mg/L	0.0021 mg/L	0.014 mg/L
Copper	3.4 mg/L	0.0069 mg/L	0.095 mg/L
Cyanide (Total)	1.2 mg/L	ND	ND
Lead	0.7 mg/L	ND	0.021 mg/L
Mercury	0.08 mg/L	ND	0.00077 mg/L
Molybdenum	0.84 mg/L	0.0020 mg/L	ND
Nickel	1.6 mg/L	ND	0.010 mg/L
Oil & Grease (Total)	300 mg/L	ND	20 mg/L
Selenium	0.72 mg/L	ND	ND
Silver	1.1 mg/L	ND	ND
Zinc	1.5 mg/L	0.023 mg/L	0.29 mg/L

Photo 3.2.6.2: Elementary neutralization system.

3.2.6.3 NPDES Permit

The Albany site does not hold a stormwater permit because stormwater regulation is augmented by the City of Albany through its stormwater program. The City of Albany continues to work with Oregon DEQ concerning its NPDES MS4 Phase II requirements, including a Stormwater Management Plan. NETL will be required to comply with the final NPDES permit when it is issued. Since NETL does not have a specific, combined outfall or discharge directly to a body of water, any NPDES permit requirements from the City of Albany would likely be limited to general protective measures.

3.2.6.4 Stormwater Management and Energy Independence and Security Act of 2007

There were no issues in 2021 regarding the Stormwater Management and Energy Independence and Security Act of 2007 at the Albany site.

3.2.6.5. Safe Drinking Water Act

There were no issues in 2021 regarding compliance with the Safe Drinking Water Act. Albany site potable water is supplied by the local public drinking water system, which publishes Safe Drinking Water Act compliance reports detailing water quality testing. Drinking water fixtures on site are filtered, with filters and plumbing maintenance performed during periodic scheduled preventative maintenance.

3.2.6.6. PFSA and Additional Emerging Contaminants

Based on historical information, the Albany site is not considered to be a user of significant quantities of Per- and Polyfluoroalkyl Substances (PFAS). The Albany site has a limited quantity of R&D chemicals considered to be PFAS; however, it does not have any aqueous film forming foam (AFFF) systems for fire suppression; and it does not maintain fire-fighting capabilities that would utilize PFAS. As a result, the Albany site has not historically conducted sampling, analysis, tracking, or monitoring for PFAS-related compounds. Additionally, as previously mentioned, drinking water at the Albany site is provided by the local public drinking water system.

3.2.7 Other Environmental Statutes

3.2.7.1 Endangered Species Act

There were no issues at the Albany site regarding the Endangered Species Act during 2021.

3.2.7.2 EO 13751 Safeguarding the Nation from the Impacts of Invasive Species

There were no issues at the Albany site regarding impacts of invasive species during 2021.

3.2.7.3 National Historic Preservation Act

As part of its renovation efforts, the Albany site is required to ensure that the requirements of the Oregon State Historic Preservation Office (SHPO) are identified and their concurrence is obtained for the aspects of the long-term Albany Site Plan, because renovations at the site may impact the Albany Site Historic District. NETL continues to pursue an update to its Programmatic Agreement with the Oregon State Historic Preservation Office (SHPO). This update was prepared via contract and reviewed by Laboratory Operations, General Counsel, and the Chief Operating Officer in late 2016, and was presented to the Oregon SHPO in December 2016. NETL continues to work with representatives from the Oregon SHPO in attempt to finalize this updated agreement. In the interim, NETL continues to work with the Oregon SHPO to provide for reviews and potential mitigations associated with all major projects accomplished at the Albany site.

3.2.7.4 Migratory Bird Treaty Act

There were no issues at the Albany site regarding the Migratory Bird Treaty Act during 2021.

3.2.8 DOE Order 436.1, Departmental Sustainability

See Section 2.2.1.

3.2.8.1 Responsibilities for Addressing Executive Orders 13423, 13514, and 13693

See Section 4.0 ES&H Management System.

3.2.8.2 E.O. 13693 GHG Reduction Targets and Sustainability Goals

See Section 4.0 ES&H Management System.

3.2.8.3 Progress on Meeting DOE Strategic Sustainability Performance Plan Goals (2016)

See Section 4.0 ES&H Management System.

3.2.8.4 EO 11988 Floodplain Management

There were no issues at the Albany site regarding floodplain management in 2021.

3.2.8.5 EO 11990 Protection of Wetlands

There were no issues at the Albany site regarding protection of wetlands in 2021.

3.2.9 Executive Orders and DOE Orders

The Albany site was in full compliance with all applicable environmental executive orders in 2021. Throughout the year, numerous inspections and audits were performed and documented to ensure there were no instances of noncompliance E.O. 13693, Planning for Federal Sustainability in the Next Decade was rescinded because of the new executive order, which is described in more detail in Section 4.0.

In addition, other executive orders that apply to NETL, but for which no specific actions were required in 2021, include E.O.11514, Protection and Enhancement of Environmental Quality; E.O.11738, Providing For Administration of the Clean Air Act and the Federal Water Pollution Control Act with Respect to Federal Contracts, Grants, or Loans; E.O.11987, Exotic Organisms; E.O.12088, Federal Compliance with Pollution Control Standards; E.O.11988, Floodplain Management; and E.O.11990, Protection of Wetlands; and E.O.12898, Environmental Justice for Low Income & Minority Populations.

3.2.9.1 Executive Order 11988, Floodplain Management

There were no issues with Floodplain management at the Albany site in 2021, as there are no designated floodplains on the Albany site.

3.2.9.2 Executive Order 11990, Protection of Wetlands

There were no issues with protection of wetlands at the Albany site in 2021, as there are no designated wetlands on the Albany site.

3.2.10 Other Major Environmental Issues and Accomplishments

The Department's Occurrence Reporting Program System (ORPS) provides timely notification to the DOE complex of events that could adversely affect: the public or DOE worker health and safety, the environment, national security, DOE's safeguards and security interests, functioning of DOE facilities, or the Department's reputation. The Albany Site filed three ORPS reports in 2021; a structure fire that damaged Building-28 on February 27, 2021; an unscheduled full-site long-duration power outage on May 29, 2021; and an unscheduled electrical outage effecting multiple buildings on October 22, 2021.There were no environmental releases associated with these incidents. The structure fire was corrected via a contract for immediate fire damage repair/cleanup and a longer-duration contract to repair and rebuild the facility. All wastes were handled in accordance with applicable federal, state and local laws and regulations.

3.2.10.1 Natural Resources Conservation Programs and Projects

Natural resources conservation programs and projects help reduce soil erosion, enhance water supplies, improve water quality, increase wildlife habitat, and reduce damages caused by floods and other natural disasters. In 2021, no issues in this area were uncovered at the Albany site.

3.2.10.2 Sustainable Resilient Remediation (SRR)

There were no hazardous waste sites suitable for Sustainable Resilient Remediation (SRR) at the Albany site in 2021.

3.2.10.3 Organizational Resilience

For information on NETL's activities related to Organizational Resilience, see section 2.13.

3.2.11 Continuous Release Reporting

There was no continuous release reporting required at the Albany site in 2021.

3.2.12 Unplanned Releases

There were no unplanned releases at the Albany site during 2021.

3.2.13 Summary of Environmental Permits

A summary of environmental permits for the Albany site is provided in Table 3.2.13, 2021 Summary of Permits.

Table 3.2.13: 2021 Summary of Permits – ALB

Permit No. and Name	Site	Issue Date - Exp. Date	Regulatory Agency	Description
8731-02 Industrial Wastewater Discharge Permit	Albany	12/15/2018 - 12/14/2023 (updated every 5 years)	City of Albany Public Works Department	Authorization to discharge industrial wastewater to the City of Albany wastewater treatment system.
G2140 Site Use Permit	Albany	03/01/2020 - 02/28/2021 (updated annually)	State of Washington-Department of Public Health	Site-use permit to allow for low-level radioactive waste disposal at the regional disposal facility.

3.2.14 Fire Protection Management and Planning

A wildfire is an uncontrolled fire in an area of combustible vegetation that occurs in the countryside or rural area. The Albany site comprises 42 acres, with 10 acres being vacant fields. The site has a perimeter fence with neighborhoods surrounding the property.

Oregon has a very high risk for wildfire vulnerability. Wildfires often cause the worst air pollution days of the year leading to health risks for the young and elderly as well as those with respiratory ailments. More than 1.2 million people living in Oregon, or 33% of the state's population, are living in areas at elevated risk of wildfire. In 2017, more than 2,000 wildfires were reported in Oregon, burning more than 700,000 acres. Another threat of a forest fire would be incidental fires from off site, or equipment use on the property. Illegal or uncontrolled burning (burning leaves, bon fires, etc.) where debris travels into the woods or fields can ignite a fire during drought conditions. Also, misuse of fireworks from the surrounding neighborhoods could lead to fires in dry/hot summer conditions.

Fire detection systems are installed in most, but not all, site buildings. Each building with a fire detection system is equipped with visual and audible alarms, which aid in alerting employees to a fire within the building. Likewise, most, but not all, site buildings are equipped with fire suppression systems to quickly extinguish any large fires within the buildings. Annual fire drills are conducted, which allow all employees to practice evacuation and accountability protocols.

3.2.15 Recreational Hunting and Fishing

The Albany Site does not offer the opportunity for public recreational hunting and fishing to control wildlife populations in a controlled setting.

3.3 PITTSBURGH, PENNSYLVANIA

3.3.1 Site Description

The Pittsburgh site (Photo 3.3.1) lies within Allegheny County, Pennsylvania, at the Bruceton Research Center. The Pittsburgh site comprises 63 acres 13 miles south of Pittsburgh in South Park Township (approximately 60 miles north of the Morgantown, West Virginia, site). NETL-Pittsburgh shares the Bruceton Research Center with CDC-NIOSH and U.S. Department of Labor, Mine Safety and Health Administration (which occupies part of the CDC-NIOSH portion of the site. The facility sits within the rolling hills and steeply incised stream valleys that are tributaries of the Monongahela River. It is a partially wooded tract with two subsites having both industrial and office buildings. The immediate vicinity was completely rural when the Bruceton Research Center was first established. However, the nearby population and housing densities have increased consistently in recent years.

Immediately west of the site is a low-ridge top with a road and houses. Another road with houses borders the north side of the site. The east side of the site is bordered by Lick Run, the Pleasant Hills Authority Sewage Treatment Plant, and Cochran Mill Road. Housing development is increasing around all boundaries of the site, especially to the southwest, where new homes overlook the site. Commercial zones are found more than three quarters of a mile away, although some small businesses are located nearby. About 40% of the immediately surrounding land is forested and about 25% is pasture or fallow field. The remainder is residential.

Photo 3.3.1: Pittsburgh site.

The Pittsburgh site focuses on technologies that create commercially viable solutions to national energy and environmental problems. Research areas include process systems engineering, decision science, functional materials, environmental sciences, and energy systems optimization. The work is accomplished through both in-house R&D and contracted research. As of December 31, 2021, there were 647 employees at the Pittsburgh site: 227 federal employees and 420 site-support contractor employees.

As of the 2020 U.S. Census, Pittsburgh's population consisted of 302,971 people and 140,496 households within the city limits. The population density was 5,440.8 per square mile. There were 140,496 housing units at an average density of 2,820.39 per square mile. The racial makeup of the city was 66.4% White, 23% African American, 5.8% Asian, 3.4% Hispanic or Latino of any race, 0.1% Native American and 3.6% from two or more races.

3.3.2 Major Site Activities

3.3.2.1 B-94 Functional Materials Research Center (FMRC) Project Second Floor Renovation

B-94 second floor laboratories were renovated to accommodate planned research operations. This project included renovations to the B-94 second floor laboratories, including new fume hoods, gas cabinets, lab benches and storage. The second floor of B-94 was only partially renovated and was unoccupied before the project. Further renovations were required to set up the second floor to accommodate a new Functional Materials Research Center.

CONTROLLED

Photo 3.3.2.1a: B-94 second floor – before renovation.

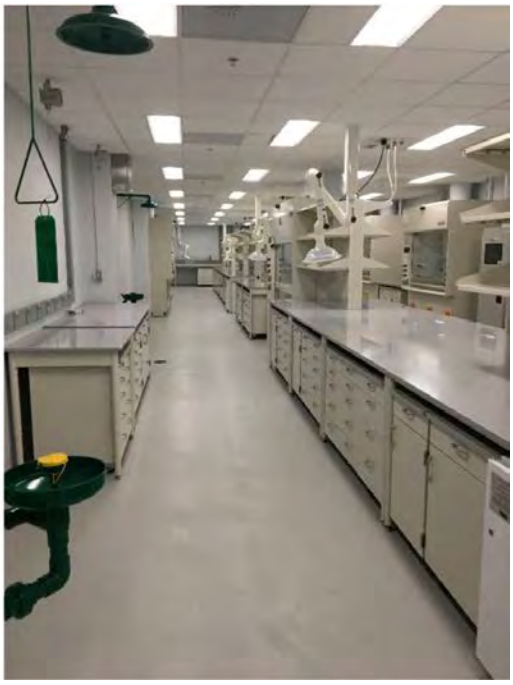

Photo 3.3.2.1b: B-94 second floor – after renovation.

Photo 3.3.2.1c: B-94 second floor – after renovation.

CONTROLLED

3.3.2.2 920 Plateau Potable and Fire Water Replacement Project

This project included the replacement of the potable and fire water piping on the 920 plateau.

Photo 3.3.2.2a: 920 plateau area – before/during construction.

Photo 3.3.2.2b: 920 plateau area – near end of construction.

3.3.2.3 B-922 Boiler Replacement Design and Award

This project included the removal and replacement of three boilers that serve B-922. This project also included electrical, plumbing, and exhaust work associated with these boilers. The design was completed and the project was awarded in 2019.

3.3.2.4 B-83 Machine Learning Data Center (CDAML) Design

This project designed the renovation of the north end of the first floor of B-83, as well as a new building addition that will ultimately house a new machine learning data center, visualization laboratory, and necessary office, mechanical, and electrical spaces.

Photo 3.3.2.4: B-83 CDAML – building addition.

3.3.2.5 Substation 6

This project replaced the existing aging switchgear that served the R&D plateau with new switchgear.

Photo 3.3.2.5: Substation 6 – new switchgear.

3.3.2.6 Summer Boiler

This project replaced the aging existing summer-use boiler for B-84 with a new boiler offering increased efficiency and control.

3.3.2.7 B-84 Roof Replacement

This project replaced the roof of B-84, including both the old roofing as well as the inadequate roofing from the previous project.

Photo 3.3.2.7: B-84 roof replacement – new roof in foreground, old roof in background.

CONTROLLED

3.3.2.8 Pittsburgh Miscellaneous Site Upgrades — R&D Plateau Asphalt Sealcoating, 920 Area Walkway Lighting, and 900/920 Area Perimeter Fencing Replacement

This project included seal coating and repainting the pavement markings on the R&D plateau parking lots and roadways, replacing the walkway lighting on the 920 plateau with energy efficient LED lighting, and replacing the perimeter fence in the 900/920 plateau roadway/ parking lot.

Photo 3.3.2.8a: 920 plateau energy efficient LED lighting.

Photo 3.3.2.8b: 900/920 plateau perimeter fence replacement.

3.3.2.9 B-83 Brick Repointing Project

This project repointed bricks and replaced sealants on the exteriors of building 83 (east, west, north, south). The project included removing and repointing mortar joints as necessary; cutting out and caulking masonry cracks with a high-strength, low-modulus epoxy; and patching existing holes in brick and terra-cota block.

Photo 3.3.2.9: B-83 brick repointing – B-83 South after brick repointing.

3.3.2.10 Sitewide Door Replacement

This project demolished existing hollow metal doors, door frames, and associated door hardware. New FRP doors were installed as well s FRP door frames and associated door hardware to match the existing configuration. Caulking was added around both sides of the new door frames with an approved exterior sealant.

Photo 3.3.2.10a: Door replacement – B-922-door 7S before replacement.

Photo 3.3.2.10b: Door replacement – B-922-door 7S after replacement.

3.3.2.11 B-920 First Floor Renovation Project

The project moved security operations from B923 to B920 and EOC operations from B167 to B920. This project included renovation of B920 offices to accommodate security and EOC operations and also included demolition of B923.

Photo 3.3.2.11a: B-920 renovation – additional parking and ADA ramp.

Photo 3.3.2.11b: B-920 renovation – first floor lobby.

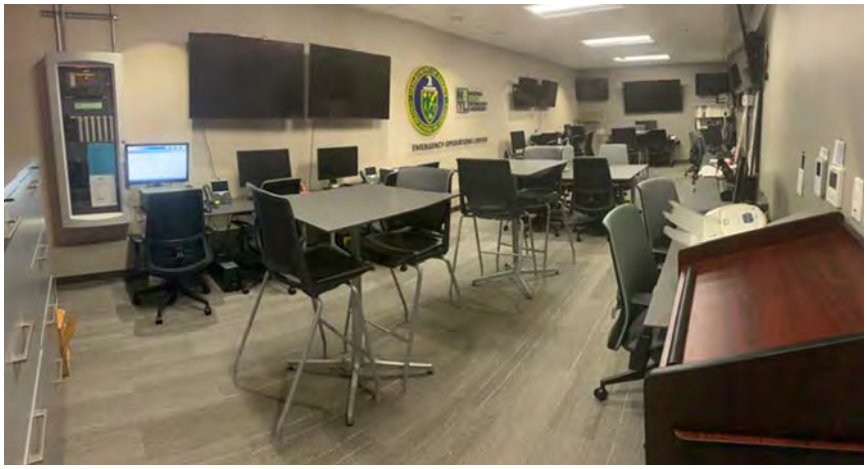

Photo 3.3.2.11c: B-920 renovation – new EOC room.

3.3.2.12 R&D Plateau Fire Water Line Replacement Project

This project replaced portions of underground fire water supply lines on the R&D plateau. Installation included replacement of building laterals, PIV and isolation valves, and interconnections to existing supply piping and services, landscaping and paving restoration. The project also included installation of underground concrete-encased electrical conduits.

Photo 3.3.2.12a: R&D plateau fire line replacement.

Photo 3.3.2.12b: R&D plateau electrical conduit installation.

3.3.3 Environmental Restoration and Waste Management

3.3.3.1 CERCLA

The EPA administers the CERCLA program in cooperation with the Commonwealth of Pennsylvania for the Pittsburgh site. Previously, the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database listed EPA's CERCLA Section 120 List in formation about the NETL-Pittsburgh site as "undetermined," based on soil and groundwater contamination prior to 1997. However, a remedial action plan regarding this issue was never received and historical information indicates remediation for the areas of concern was completed in 1997. Sampling and analysis results indicated that no further soil remediation was necessary. It was also determined that exposure to media at the facility was not expected to generate adverse health effects for on-site or current receptors. NETL-Pittsburgh has continued to monitor the site on a routine basis.

Additionally, the CERCLIS database has been retired and has been replaced with the Superfund Enterprise Management System (SEMS) database. NETL has verified that the Pittsburgh site is not listed as an NPL site for 2021, nor has it been listed as an NPL site at any other time in the recent past.

3.3.3.2 RCRA

Pennsylvania Department of Environmental Protection (PADEP) is authorized to enforce the federal and state hazardous waste management requirements at the Pittsburgh site. (Diagram 3.3.3.2 details the breakdown of hazardous waste generated at the Pittsburgh site in 2021 that was either recycled or landfilled.) Hazardous waste operations personnel review current waste industry newsletters and bulletins, receive information from the Alliance of Hazardous Materials Professionals, study NETL's regulatory compliance reviews, attend hazardous materials transportation training every three years, and attend annual hazardous waste operations training to maintain compliance with hazardous waste regulations. There were no RCRA non-compliances at the Pittsburgh site in 2021.

Diagram 3.3.3.2.: Pittsburgh 2021 RCRA hazardous waste disposition profile.

Due to the amount of waste generated each month, the Pittsburgh site is considered a large quantity hazardous waste generator (generating greater than 2,200 lbs [1,000 kg] of hazardous waste or greater than 2.2 lbs [1 kg] of acutely hazardous waste per calendar month) and has an EPA Large Quantity Generator Identification Number. While the Pittsburgh site typically generates lesser amounts of hazardous waste most months of the year, laboratory activities occasionally generate quantities, exceeding the threshold for a small-quantity generator. The generator status limits hazardous waste storage up to 90 days. Most of the waste is packaged and shipped in laboratory packs (lab packs) (Photo 3.3.3.2b) containing combinations of several compatible chemicals within a single container.

Hazardous waste support personnel at the Pittsburgh site are not authorized to transport hazardous waste. In 2021, the Pittsburgh site used Tradebe Environmental Services LLC (Tradebe) to transport five shipments of hazardous waste. Tradebe transported the waste to its storage and treatment facilities where small packages of similar wastes were combined and then repackaged for more cost-effective shipment to a final disposal facility. In some cases, due to the large operational size of Tradebe, more of Pittsburgh's final waste disposition is completed at Tradebe's own facilities. NETL monitors Tradebe facilities, along with other facilities that Tradebe might use for final treatment and disposal. The amount of hazardous materials and waste removed from the site in 2021 remained consistent with previous years. Pittsburgh generated 12,991 pounds of hazardous waste in 2021. (Pittsburgh also generated 3,676 pounds of universal waste.)

Photo 3.3.3.2a: PGH hazardous waste properly stored and labeled in a central accumulation area.

NETL-Pittsburgh continued to focus on reducing its chemical footprint, with the understanding that site research requires the purchase of new and sometimes uncommon chemicals. Any chemical items deemed unusable were disposed. (See Section 4.0, Environmental Objectives and Targets, for a detailed explanation of how this quantity was established.) For example, when unused and unopened chemicals are received for disposal, they are offered to other researchers for potential use. Less hazardous or nonhazardous chemicals are substituted for requested hazardous chemicals when possible. Batteries and fluorescent bulbs are sent to recyclers, and used computers and other electronics are recycled via NETL's (automatic data processing) ADP scrap contract.

Photo 3.3.3.2b: Lab packs.

The Chemical Handling Facility (B-92) is considered Pittsburgh's central accumulation area. Liquid wastes are managed in 55-gallon drums and lab packs (see Photo 3.3.3.2.b). The Pittsburgh site does not have a storage or treatment pond, nor does the Pittsburgh site have underground storage tanks to store petroleum or hazardous waste, or aboveground storage tanks to store hazardous waste. Liquid acids and bases are collected at satellite accumulation areas (SAAs) and are characterized and analyzed, as necessary. Waste management personnel ensure regulatory compliance by: (1) weekly walkthrough inspections of the Chemical Handling Facility; (2) monthly pickups at SAAs; (3) periodic battery pickups at various locations; (4) participation in the SARS process; (5) participation in Emergency Response Organization (ERO) exercises; (6) training on hazardous waste management; (7) regulatory reviews; and (8) attendance at conferences addressing hazardous waste requirements.

Hazardous waste generators have full responsibility for managing the waste they generate from the moment of generation until it is transferred to the Chemical Handling Facility. Waste generators ensure that all hazardous or potentially hazardous wastes are properly contained and identified at the point of generation. Generators are held accountable for wastes that are not properly contained or identified or are otherwise mismanaged.

Tradebe waste-handling personnel inspect the containers, the labels, and the internal documentation to ensure the wastes are properly packaged and labeled and that the required documentation is complete and accurate. Waste-handling personnel are not permitted to accept or move any hazardous waste without proper packaging, labeling, and identification. The responsibility for identifying the waste rests primarily with the hazardous waste generator, which in most cases, is the researcher generating laboratory waste.

NETL's hazardous waste manager ensures compliance with applicable regulations by overseeing the hazardous waste program. The hazardous waste manager reviews the program periodically and brings any deficiencies to the attention of the appropriate individuals or managers, and ensures the development, accuracy, and submission of the Biennial Hazardous Waste Report to the commonwealth of Pennsylvania and any other reporting required by DOE headquarters.

NETL's hazardous waste manager, or trained designee, signs the RCRA manifests and other relevant documentation (e.g., land disposal restriction forms, waste profiles, and bills of lading). The hazardous waste coordinator maintains the original copies of the RCRA manifests, biennial reports, and certificates of disposal/or destruction.

Table 3.3.3.2: 2021 Hazardous Waste Generation-Pittsburgh

Waste Stream	Qty. Generated {lbs.)
Poison (Toxic Solids & Liquids)	48
Mercury/Mercury Compounds	41
Flammable Solids	0
Corrosive (Liquids & Solids)	4611
Waste Oxidizers	185
Waste Paint (Oil Based)	0
Flammable/Combustible Liquids	2052
Activated Carbon	0
Other RCRA Hazardous Wastes	1366
Fluorescent Light Tubes (Universal Waste)	276
Batteries (Universal Waste)	783
TOTAL	**9362**

3.3.3.3 SARA Title III — Emergency Planning and Community Right-to-Know Act

NETL has established targets for reducing the accumulation of hazardous chemicals on site. The intent of these targets is to avoid the unnecessary accumulation of potentially hazardous chemicals in the laboratories, while maintaining sufficient chemical stores to complete mission-related research.

To meet these targets and regulatory requirements, NETL maintains an active inventory of all hazardous and extremely hazardous chemicals on-site, along with the Safety Data Sheets (SDS) for each substance within its chemical inventory software system, EMS (see Figure 3.3.3.3).

Figure 3.3.3.3: NETL EMS home page.

To meet SARA Title III Emergency Planning and Community Right-to-Know requirements, the Pittsburgh site submits a Tier II Emergency and Hazardous Chemical Inventory information by March 1. Specifically, Section 312 of SARA Title III requires NETL-Pittsburgh to provide copies of the information to the following stakeholders: Pennsylvania Department of Labor and Industry, Allegheny County Department of Emergency Services, South Park Local Emergency Planning Commission, South Park Township Police, Library Volunteer Fire Department, and Broughton Volunteer Fire Department.

NETL-Pittsburgh is not required to prepare a Toxic Release Inventory (TRI) Form R because the site does not use, produce, or process any of the listed toxic materials in quantities that exceed the threshold amounts (25,000 pounds of the chemicals manufactured or processed at the facility; 10,000 pounds of the chemical used at the facility). In 2021, no toxic releases occurred that would have triggered emergency notification as required by either the Emergency Planning and Community Right-to-Know Act (EPCRA) or CERCLA.

3.3.3.4 Federal Facilities Compliance Act

There were no issues related to the Federal Facilities Compliance Act for the Pittsburgh site in 2021.

3.3.3.5 NEPA

See section 2.1.5 National Environmental Policy Act (NEPA) for information on Pittsburgh-related NEPA requirements.

3.3.3.6 TSCA

NETL-Pittsburgh does not manufacture chemicals and is not subject to sections of the Toxic Substance Control Act (TSCA) related to manufacturing. No spills or releases of substances regulated by the TSCA of 1976 (with amendments, et. seq.) — including pesticides, polychlorinated biphenyls (PCBs), formaldehyde, methylene chloride, asbestos, etc. — were reported in 2021 at the Pittsburgh site. TSCA waste generated during 2021 included asbestos and lead-based paint, which was disposed of in accordance with federal, state and local requirements.

No unplanned releases of air pollutants covered by CERCLA or toxic release inventory (TRI) regulations occurred during 2021. In Pittsburgh, most asbestos-containing material (ACM) is floor tile and floor tile mastic installed in various laboratory buildings (e.g., B-94 and B-901). The remainder of ACM is contained in roofing materials, caulking, or laboratory furniture. Asbestos remaining inside buildings is typically well encapsulated by the matrix material (e.g., floor tiles and laboratory tabletops). In addition, asbestos can be found in some gaskets and inside some laboratory devices, such as muffle and tube furnaces. All known friable ACM has either been removed or encapsulated. Non-friable asbestos present at the NETL-Pittsburgh site is inventoried and maintained. No samples taken in 2021 indicated that the materials contained fiber concentrations in excess of U.S. EPA or the commonwealth of Pennsylvania clearance levels of (0.01 fibers/cc). Asbestos engineering drawings based on the Pittsburgh site inventory continue to be maintained and updated.

Evaluations, tests, and sample collection are conducted by an accredited Pennsylvania-licensed asbestos building inspector (ABI) who received certification for Class III Asbestos Activities per 40 CFR 763.92(a)(2) or by a certified industrial hygienist (CIH). Analysis of bulk ACM or presumed ACM is performed by persons or laboratories with proficiency demonstrated by current successful participation in a nationally recognized testing program such as the National Voluntary Laboratory Accreditation Program (NVLAP), the National Institute for Standards and Technology (NIST), the round robin for bulk samples administered by the American Industrial Hygiene Association (AIHA), or an equivalent nationally recognized round robin testing program per OSHA 29 CFR 1910.1001(j)(8)(ii)(B) and OSHA 29 CFR 1926.1101(k)5)(ii)(B).

When asbestos is removed as part of any remodeling or reworking in a room, building, or facility, it is handled by a licensed asbestos abatement/removal contractor (AA/RC), who adheres to OSHA 29 CFR 1910.1001 (Asbestos-General Industry), OSHA 29 CFR 1926.1101 (Asbestos-Construction), OSHA Instruction CPL 2-2.40, 40 CFR 61 (Subpart M, NESHAPs), and applicable state regulations (Allegheny County Health Department [ACHD] Article XXI, the Asbestos Occupational Accreditation and Certification Act of 1990 (P.L. 805, No. 194), the Worker and Community Right-to-Know Act of Pennsylvania (P.L. 734, No. 159, P.S. 7317), 25 PA Code § 124, 25 PA Code § 299.152, 25 PA Code § 299.232, and 25 PA Code § 299.302). Two construction projects required a 10-day asbestos notification permit identified in 2021. Both construction projects were handled by a licensed AA/RC. These included:

- B-920 First Floor Renovations — This project involved removal of 1,313 ft^2 of exterior soffit panels, cove base, floor tile and adhesive from a single room; removal of 840 ft^2 of carpet adhesive and cove base adhesive from multiple rooms. A total of 2,153 ft^2 of asbestos was removed and disposed.

- B-83 High Bay Electrical Gasket Rope — This project involved removal and disposal of 5 ft^2 of asbestos, which included 10 light fixtures with gaskets.

Eight additional asbestos sampling events were conducted in 2021 related to operation/ maintenance and construction projects. Samples were collected by an ABI (License #: 059101 & 059485). These samples included interior window frames, black felt material; caulking; floor tile and mastic grout, and insulation.

Additionally, NETL tests for lead paint before demolition, renovation, and maintenance projects or elimination of materials through excess property or recycling. Nineteen lead-based paint sampling events were conducted in 2021 related to operation/ maintenance and construction projects; 16 were related to preventive operation/maintenance, and three were related to construction projects. The paint renovation work for the positive samples was conducted in accordance with OSHA 29 CFR 1910.1025, Lead (General Industry), and OSHA 29 CFR 1926.62, Lead (Construction).

3.3.3.7 FIFRA

No restricted-use pesticides, herbicides, or defoliants, as regulated by FIFRA were kept on site. Only general-use pesticides were kept and used for routine insect control. A professional pest control company, Leaf Pest Control, is subcontracted to spray inside certain offices, as needed, cafeteria drains, certain lunch areas, certain basement areas, and the daycare facility. Herbicides are not used for controlling weeds, except in extremely limited cases. The only recurring use of an herbicide is for the fence lines, mulch beds and guard rails. No defoliants are used.

3.3.4 Radiation Protection Program

NETL maintains an inventory of on-site radiation sources and tracks each item, isotope(s), quantity, custodian, location, status and activity. Table 3.3.4a lists the 2021 source inventory at Pittsburgh. Table 3.3.4b contains the 2021 X-ray radiation generating devices.

Table 3.3.4a: 2021 Radioactive Source Materials Inventory—Pittsburgh

Isotope	Activity/Date Determined	Source
Depleted Uranium	1427 µR/Hr (11.1 µCi) (08/19/21)	Geiger Counter: Model: 6A Serial #, 75788 Victoreen Industries
Depleted Uranium	1537 µR/Hr (11.9 µCi) (08/19/21)	Geiger Counter: Model: 6A Serial #, 7311 Victoreen Industries
N/A	1558 µR/Hr (12.1 µCi) (08/19/21)	Geiger Counter: Model: 290 Serial # 681 Victoreen Industries
N/A	1349 µR/Hr (10.5 µCi) (08/19/21)	Geiger Counter: Model: 290 Serial # 2429 Victoreen Industries
Cs137*	1177 µR/Hr (9.1 µCi) (08/19/21)	Check Source: CS137 Description: PL Yellow Spectrum Techniques for Ludlum Measurements (ID-223)
Cs137*	1272 µR/Hr (9.9 µCi) (08/19/21)	Check Source: CS137 Description: PL Yellow Spectrum Techniques for Ludlum Measurements (ID-470)

* Exempt quantity per 10 CFR 835 Appendix E: No known radiation hazard.

Table 3.3.4b: 2021 Pittsburgh X-Ray Radiation Generating Devices	
Device	**Quantity**
Mail X-Ray Instrument	1
X-Ray Florescence Instrument	1
VersaProbe III XPS Microprobe	1
X-Ray Photoelectron Spectroscopy	3
FEI Quanta 600 ESEM	1
X-Ray Diffraction (Phillips X'PERT MPD)	1
Gatan PIPS Model 695 (TEM)	1
FEI Quanta 450 Scanning Electron Microscope	1
X-Ray Diffractometer (Rigaku D/maX Rapid II)	1

The Pittsburgh site did not release any radiation source materials into the environment, as all source materials are sealed. No low-level radioactive waste (LLRW) disposal shipments were required in 2021.

Radiation monitoring performed at Pittsburgh consisted of whole-body thermoluminescent dosimeters and finger rings for the employees in the mail facility (mail and packages are scanned via x-ray upon receipt) and as identified in appropriate R&D Safety Analysis and Review System (SARS) packages. In addition, specific radiological control areas have dosimeter badges continually displayed. All radiation-generating devices are surveyed for possible leakage on a semi-annual basis.

The cumulative annual dose for all personnel performing all operations at the Pittsburgh site during 2021 was less than 100 millirem (roentgen equivalent man, <1 millisievert), with an average annual dose of less than 10 millirem (<0.1 millisievert) per person working in the radiation monitoring program. See Table 3.3.4c.

Table 3.3.4c: PGH 2021 Annual Exposure Rate		
Exposure Range (mrem)	**Count**	**TED**
No measurable exposure	33	0
Measurable < 100	0	0
100 - 250	0	0
250 -500	0	0
500 - 750	0	0
750 - 1000	0	0
1000 - 2000	0	0
2000 - 3000	0	0
3000 - 4000	0	0
4000 - 5000	0	0
5000 - 6000	0	0
6000 - 7000	0	0
7000 - 8000	0	0
8000 - 9000	0	0
9000 - 10000	0	0
10000 - 11000	0	0
11000 - 12000	0	0
>= 12000	0	0
Number with Measurable TED:	0	N/A
Total Monitored:	33	N/A
Total Collective TED (mrem):	0	0
Total CED:	N/A	0
Total CEqD:	N/A	0
Num Individuals with Uptake:	0	N/A
Validation Status Errors:	0	N/A
Warnings:	0	N/A

This table is from the REMS data summary report that is provide by Oak Ridge Institute for Science and Education

3.3.4.1 DOE Order 458.1, Radiation Protection of the Public and Environment

Additional information may be found in Section 2.2, DOE Internal Environmental and Radiation Protection Orders and Section 2.3, Atomic Energy Act of 1954. In accordance with "as low as is reasonably achievable" (ALARA) principles, NETL manages an appropriate radiation protection program for protection of the public and the environment from radiation hazards since radiation sources are low-level, sealed instrumentation sources, radiation-generating devices (RGDs), or processes that include naturally occurring radioactive materials or technologically enhanced naturally occurring radioactive materials (NORM/TE-NORM) with minimal radiation levels.

3.3.5 Air Quality and Protection Activities

3.3.5.1 Clean Air Act

Pennsylvania's Department of Environmental Protection (PADEP) Bureau of Air Quality is responsible for implementing the requirements of the federal Clean Air Act, as well as Pennsylvania's Air Pollution Control Act. Additionally, the Allegheny County Health Department (ACHD), is authorized to administer Title V Operating Permits under the Clean Air Act Amendments.

To address necessary compliance requirements, NETL's Ambient Air Quality Management Program includes protection of outdoor air quality. Through this program, applications are submitted for air emission permits, which can include the existing sources (boilers, generators, fuel storage tanks), as well as sources related to on-site research activities. The air quality program manager prepares permit applications, obtains permit renewals (every five years), as needed, and oversees monitoring programs and reporting.

Based on Pittsburgh's existing Title V Operating Permit, NETL reports air emissions annually. The Title V permit (issued on July 7, 2021) designates NETL-Pittsburgh as a synthetic minor source (i.e., any source that has its emissions administratively limited below certain thresholds by means of a federally enforceable order, rule, or permit condition.) Additionally, no existing Pittsburgh facility or project had the potential to emit more than 100 tons per year of any designated air pollutant in 2021.

Current regulatory requirements include an annual emissions inventory, which is submitted to the ACHD by March 15 of each year, for the preceding calendar year. NETL utilizes an air emission inventory model (AES* Online) required by both the ACHD's Bureau of Environmental Quality and PADEP's Bureau of Air Quality to calculate the emissions. The model is based on fuel usage and provides a worst-case scenario for potential emissions, The model considers the type, quantity, and total burn time of each fuel to calculate the estimated emission levels. Results of the modeling are summarized in Table 3.3.5.1.

In addition to the annual emissions inventory, NETL-Pittsburgh also submits semi-annual reports to ACHD in accordance with the Title V Operating Permit, General Condition III.15.d. The semi-annual report includes data on comfort-heat boilers, space heaters, and emergency generators. The Pittsburgh site did not receive any notices of violation, nor were there any unplanned air emission occurrences in 2021.

NETL-Pittsburgh's permit is effective for five years, with an expiration date of July 6, 2026. Preparations for a new permit submission will be initiated in December 2025.

Table 3.3.5.1: 2021 Air Emissions Inventory — Pittsburgh	
Pollutant	**Calculated Emissions (lbs./yr.)**
Ammonia	118
Benzene	0.08
Butane	7.7
Carbon Dioxide	4,300,000
Carbon Monoxide	3,100
Hexane	0.70
Naphthalene	0.02
Formaldehyde	2.8
Nitrogen Oxide	81
Lead	0.02
Pentane	9.6
Ethane	12
Methane	85
Particulate Matter, $PM_{2.5}$	1,100
Particulate Matter, PM_{10}	1,400
Sulfur Dioxide	22
Toluene	0.13
Arsenic	0.0070
Barium	0.20
Cadmium	0.040
Chromium	0.050
Cooper	0.030
Manganese	0.010
Mercury	0.010
Molybdenum	0.040
Nickel	0.10
Vanadium	0.10
Zinc	1.1
VOC	200

3.3.5.2 National Emission Standards for Hazardous Air Pollutants

NETL actively participates in a program to reduce the use of Class I ozone depleting substances (ODS). The goal of this program is to recover and reclaim chlorofluorocarbon refrigerants from HVAC equipment for subsequent reuse and recycle. In recent years, the inventory of ODS-containing equipment has been steadily decreasing at the Pittsburgh site. Older ODS-containing equipment is being replaced and the use of Class I ODSs is being phased out from the HVAC equipment and replaced with environmentally friendly substitutes.

3.3.5.3 Hydrofluorocarbon Phasedown

Enacted Dec. 27, 2020, the American Innovation and Manufacturing (AIM) Act of 2020 provides new authority to address HFCs and directs EPA to: (1) phase down the production and consumption of listed hydrofluorocarbons (HFCs) through an allowance allocation and trading program, (2) manage these HFCs and their substitutes to maximize reclamation and minimize releases to the atmosphere from equipment, and (3) facilitate the transition to next-generation technologies through sector-based restrictions. Below is a table that shows a list of all HFCs on the phaseout list at the Pittsburgh site. Plans to address how deal with the phaseout are underway. There were no issues in 2021 regarding compliance with HFC phasedown at the Pittsburgh site.

Table 3.3.5.3: 2021 PGH HFC Phaseout Inventory Summary Information

(All Values in pounds)													Mass Balance		
Refrigerant	Amount in Equipment 2020		Amount in Equipment 2021		Amount in Storage 2020		Amount in Storage September 2021		Amount Purchased in 2021		Amount Removed from Equipment in 2021		Annual Net Gain or Loss of ODS (Difference in Equipment + Difference in Storage)	Leaks (Initial Storage - Final Storage + Purchases)	Zero-sum check for leaks (Storage Difference+ Purchases- Leaks)
	PGH	Total	PGH	Total	PGH	Total	PGH	Total	PGH	Total	PGH	Total	PGH	PGH	PGH
R134A-HFC	1737.41	1737.41	1906.85	1906.85	657.59	657.59	634.391	634.391	390.0	390.0	385.39	385.39	146.24	146.24	413.20

3.3.5.4 Meteorological Tower Data

NETL-Pittsburgh also tracks meteorological data in support of the ERO. The site maintains two 30-foot meteorological towers (west of B-74 and west of B-901) that monitor temperature, relative humidity, precipitation, wind speed, wind direction, barometric pressure, and solar radiation; they are not used for emissions monitoring. The meteorological towers were upgraded with new communications systems, software, and sensors in 2015. The meteorological towers were recalibrated in 2021.

The data collected from the meteorological towers provides critical meteorological information to the ERO during emergency situations, as back-up information to employee heat-stress data, and in the models used for the air emissions inventory. An example of one of the meteorological towers is shown in Photo 3.3.5.4.

Photo 3.3.5.4: Pittsburgh meteorological tower.

3.3.6 Water Quality and Protection Activities

The topography of the Pittsburgh site consists of rolling hills separated by the natural flow of water for the Bruceton Research Center site. As a result, surface water at the Pittsburgh site is divided into two distinct areas: the northern area and the southern area. The northern area is located north of Experimental Drive and houses the laboratory and process facilities for the DOE portion of the site. The southern area is south of Wallace Road and houses administrative, project management and contractor maintenance operations. The northern area is referred to as the "R&D plateau," and the southern area is referred to as the "main plateau."

NETL-Pittsburgh's water quality program ensures that activities do not result in contamination of industrial wastewater, sanitary wastewater, or storm water discharges. ES&H staff review all on-site research projects, support activities, and construction activities for potential impacts to air, surface water, groundwater, and soil as part of the Safety Analysis and Review System (SARS) processes. Applicable federal, state, and local regulations affecting these activities are reviewed to ensure compliance before approval is given to proceed.

3.3.6.1 Industrial Wastewater

Industrial wastewater from the R&D plateau (northern area) is routed to the wastewater treatment facility (WWTF) in Building 74. This wastewater, consisting of laboratory and process wastewater from the site's R&D operations, is regulated under the Pleasant Hills Industrial Sewer Use Permit Program. The current industrial sewer use permit was issued by Pleasant Hills Authority (PHA) Dec. 16, 2020. Permit conditions limit the quantity and quality of effluent constituents (total cyanide, mercury, cadmium, and pH level) discharged to the PHA treatment plant and the subinterceptor. As part of the permit, wastewater analysis data for effluent discharged through the WWTF and subinterceptor must be submitted on a semi-

annual basis to the PHA's consulting engineering firm, Gannett Fleming Inc. Table 3.3.6.1a: Industrial Sewer Use Permit Monitoring Analysis – Pittsburgh shows the results of the 2021 wastewater analysis data collected by NETL-Pittsburgh,

Although not required by the permit, NETL-Pittsburgh collects and analyzes monthly wastewater samples (see Table 3.3.6.1b: B-74 2021 Monthly Monitoring Results [mg/L]) as a best practice. An annual wastewater report of the site's industrial wastewater discharge is prepared, including the volume of wastewater discharged, the number of site employees, the type of waste discharged, and the type of pretreatment performed.

In addition to the sampling and analysis performed by NETL-Pittsburgh and Centers for Disease Control/National Institute of Occupational Safety and Health (CDC/NIOSH), the PHA also conducts independent sampling and analysis of wastewater effluent from these locations. PHA uses this information to determine whether any discharges of the treated effluent exceed local limits. No industrial wastewater permit limits were exceeded in 2021.

The Pittsburgh site main plateau (southern area) is not part of the industrial wastewater permit. The main plateau does not require an industrial wastewater treatment system, since this portion of the site does not house laboratory operations — only administrative, project management and contractor maintenance operations occur in that area.

Description of Pittsburgh Wastewater Treatment Facility

Treatment in the Wastewater Treatment Facility (WWTF) begins with flow equalization, followed by pH adjustment using either caustic soda or ferric chloride. Subsequently, metals and particulates are removed by agglomeration in the flocculation tank, followed by solids separation in the plate separator (Photo 3.3.6.1). Final removal of metals and particulates occurs in a filter press. Prior to discharge to the Pleasant Hills sanitary sewer, the treated water is sent through an activated clay/activated carbon filtration system for additional removal of organics and metals. Once through the filtration system, if the effluent does not meet the necessary pH (6 to 9), it is recirculated through the system. If the pH is outside the allowable range, a diverter valve in the effluent monitoring tank opens automatically, allowing the off-specification effluent to be recirculated within the system for additional treatment. Final effluent pH adjustment occurs in a chamber inside the effluent monitoring tank prior to discharge. Once the WWTF effluent meets specification, it is routed to the Pleasant Hills Authority Sewage Treatment Plant for final treatment.

Photo 3.3.6.1: Pittsburgh plate separator.

Table 3.3.6.1a: 2021 Industrial Sewer Use Permit Monitoring Analysis — Pittsburgh					
Constituent	**Total Cyanide**	**Copper**	**Mercury**	**Cadmium**	**pH**
Permit Limit	3.21 mg/L	N/A	0.0062 mg/L	0.061 mg/L	6.0–9.0 s.u.
April 13, 2021, Sampling Date					
Sub interceptor Location					
Composite	ND	0.023 mg/l	0.00019 mg/l	ND	N/A
Grab #1	N/A	N/A	N/A	N/A	7.55 s.u.
Grab #2	N/A	N/A	N/A	N/A	7.59 s.u.
Grab #3	N/A	N/A	N/A	N/A	7.58 s.u.
Grab #4	N/A	N/A	N/A	N/A	7.61 s.u.
B-74 Effluent					
Composite	ND	0.021 mg/l	ND	ND	N/A
Grab #1	N/A	N/A	N/A	N/A	7.02 s.u.
Grab #2	N/A	N/A	N/A	N/A	7.16 s.u.
Grab #3	N/A	N/A	N/A	N/A	7.39 s.u.
Grab #4	N/A	N/A	N/A	N/A	7.92 s.u.
Oct. 13, 2021, Sampling Date					
Sub interceptor Location					
Composite	ND	0.063 mg/l	ND	ND	N/A
Grab #1	N/A	N/A	N/A	N/A	7.59 s.u.
Grab #2	N/A	N/A	N/A	N/A	7.09 s.u.
Grab #3	N/A	N/A	N/A	N/A	7.35 s.u.
Grab #4	N/A	N/A	N/A	N/A	7.30 s.u.
B-74 Effluent					
Composite	ND	0.023 mg/l	ND	ND	N/A
Grab #1	N/A	N/A	N/A	N/A	7.24 s.u.
Grab #2	N/A	N/A	N/A	N/A	7.19 s.u.
Grab #3	N/A	N/A	N/A	N/A	7.25 s.u.
Grab #4	N/A	N/A	N/A	N/A	7.29 s.u.

ND = Not detected; s.u. = standard units; N/A = Not applicable

Table 3.3.6.1b: B-74 2021 Monthly Monitoring Results (mg/L) — Pittsburgh													
		Sampling Date											
Constituent	Permit Limit	1/13/21	2/10/21	3/10/21	4/13/21	5/12/21	6/16/21	7/07/21	8/11/21	9/15/21	10/13/21	11/10/21	12/15/21
Aluminum	None	0.200	0.240	ND	ND	ND	ND	ND	ND	ND	ND	0.170	ND
Cadmium	0.061	ND	0.002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	None	0.005	0.020	0.001	ND	0.001	0.001	ND	0.001	0.009	ND	0.004	ND
Copper	0.32	0.022	0.027	0.026	0.019	0.010	0.015	0.020	0.025	0.022	0.022	0.098	0.020
Cyanide Total	3.21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOX	None	0.078	0.120	0.045	0.070	0.049	0.032	0.047	0.028	0.029	0.064	0.071	0.043
Iron	None	1.700	1.800	1.400	0.580	0.750	0.920	0.470	1.600	0.450	0.410	1.600	0.910
Lead	None	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mercury	0.0062	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	None	0.004	0.008	0.006	0.006	0.003	0.004	0.004	0.003	0.003	ND	0.005	0.005
Oil and Grease	None	ND	ND	ND	ND	ND	1.3	5.6	ND	ND	ND	ND	ND
pH (s.u.)	6.0-9.0	7.20*	7.21*	7.23*	7.19*	7.86*	6.76*	7.21*	6.97*	7.23*	7.19*	7.63*	7.12*
Phenolics	None	0.009	ND	ND	0.280	0.011	ND	0.010	ND	ND	0.013	ND	ND
TSS	None	ND	1.70	ND	1.00	1.10	2.20	2.30	6.00	2.60	1.70	4.80	0.50
Tin	None	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloro-methane	None	0.0014	0.0018	0.0021	0.0022	0.0009	0.0008	ND	ND	ND	0.0013	0.0056	0.0015
Zinc	None	0.069	0.120	0.110	0.075	0.059	0.069	0.074	0.072	0.065	0.064	0.160	0.081

3.3.6.2 Sanitary Wastewater

Separate from the discharge of the treated laboratory/process wastewater, sanitary sewage from the R&D plateau (northern area) is combined with sanitary sewage from CDC/NIOSH, the other major federal agency on the site. The NETL/NIOSH sub-interceptor sanitary sewer line then discharges into the South Park (PA) main sanitary line at a point close to the PHA wastewater treatment facility. CDC/NIOSH also has another sanitary sewer line that discharges directly in the South Park main sanitary line.

The NETL-Pittsburgh sanitary sewage from the main plateau is routed to and treated at the Clairton Municipal Sewage Treatment Plant.

3.3.6.3 Stormwater

NETL-Pittsburgh discharges stormwater in conjunction with CDC/NIOSH, which holds the National Pollutant Discharge Elimination System (NPDES) stormwater permit for the Bruceton Research Center. The NPDES permit lists four outfalls associated with the NETL portion of the site: North Outfall (001), South Outfall (002), North Outfall Extension (101), and South Outfall Extension (102). The NPDES permit regulates contaminants to the stormwater effluent.

Potential stormwater discharges include: the salt-storage facility area, air-conditioning condensate (Photo 3.3.6.3), runoff from various impervious surfaces into the site storm sewers, and treated acid-mine drainage from a research coal mine operated by CDC/NIOSH. The permit requires CDC/NIOSH to monitor and report discharge results for North Outfall (001) and South Outfall (002) on a quarterly basis, however, the permit does not mandate any discharge limits.

Photo 3.3.6.3: Pittsburgh air conditioner condensate.

On the R&D plateau, stormwater (surface water) runoff from the 69-acre area exits the site through the northern storm drainage system, which drains directly into nearby Lick Run, a small natural stream that flows along the eastern boundary of the 238-acre Bruceton Research Center. The stormwater discharge occurs at the NPDES-permitted North Outfall (001). Likewise, the North Outfall Extension (101) also discharges directly into the North Outfall. CDC/NIOSH performs sampling for the outfalls and issues a monthly Discharge Monitoring Report, which measures pH, flow, total suspended solids, manganese, iron, and aluminum.

Stormwater collected from the NETL main plateau exits the site through a dedicated southern drainage system, which also enters Lick Run. This discharge occurs at NPDES-permitted South Outfall (002). Stormwater discharged from the site's southern (main plateau) side is also regulated through the NPDES permit. The South Outfall receives stormwater from both NETL-Pittsburgh and NIOSH.

No notices of violation were issued with respect to the Bruceton Research Center's NPDES permit in 2021.

3.3.6.4. Safe Drinking Water Act

There were no issues in 2021 regarding compliance with the Safe Drinking Water Act. Pittsburgh site potable water is supplied by the local water utility, which publishes Safe Drinking Water Act compliance reports detailing water quality testing. Drinking water fixtures on-site are filtered, with filters and plumbing maintenance performed during period scheduled preventative maintenance.

3.3.6.4.1 PFSA and Additional Emerging Contaminants

NETL-Pittsburgh has historically maintained only limited quantities of per- and polyfluoroalkyl substances (PFAS) for use in R&D operations. Additionally, the Pittsburgh site has two aqueous film forming foam (AFFF) systems for fire suppression in its chemical handling and storage areas. These systems are tested on an annual basis (by tripping the valve to ensure water flows as designed), but no foam is produced; however, the foam in the tanks

is sampled and disposed, per regulation, by the laboratory conducting the analysis. The Pittsburgh site does not maintain fire-fighting capabilities that would utilize PFAS,

Two documented historical discharges at the Pittsburgh site (1999-2000) were associated with facility equipment failure and maintenance. Appropriate notifications were made at the times of the discharges and no follow up sampling and analyses has been requested by state or local regulatory agencies. While there is an active groundwater monitoring program (See Section 5.1), PFAS-related substances are not a regular analyte and have never been part of any historical sampling, nor is it part of the site's industrial wastewater permit. Drinking water at the Pittsburgh site is provided by the local public drinking water system.

Given the Department's policy memorandum regarding PFAS, efforts were initiated in 2021 to evaluate the two existing AFFF systems to determine if the systems could be removed entirely or if the system contents could be replaced with a more environmentally benign chemical suppressants. An engineering evaluation of the fire protection systems is planned for the spring of 2022.

3.3.7 Other Environmental Statutes

3.3.7.1 Endangered Species Act

There were no issues at the Pittsburgh site regarding the Endangered Species Act in 2021.

3.3.7.2 EO 13751 Safeguarding the Nation from the Impacts of Invasive Species

There were no issues at the Pittsburgh site regarding impacts of invasive species during 2021.

3.3.7.3 National Historic Preservation Act

There were no issues at the Pittsburgh site regarding the National Historic Preservation Act in 2021.

3.3.7.4 Migratory Bird Treaty Act

There were no issues at the Pittsburgh site regarding the Migratory Bird Treaty Act in 2021.

3.3.8 DOE Order 436.1, Departmental Sustainability

See Section 2.2.1.

3.3.8.1 Responsibilities for addressing Executive Orders 13423, 13514, and 13693

See Section 4.0 ES&H Management System.

3.3.8.2 E.O. 13693 GHG Reduction targets and sustainability goals

See Section 4.0 ES&H Management System.

3.3.8.3 Progress on Meeting DOE Strategic Sustainability Performance Plan Goals (2017)

See Section 4.0 ES&H Management System.

3.3.9 Executive Orders

The Pittsburgh site was in full compliance with all applicable environmental executive orders in 2021. Throughout the year, numerous inspections and audits were performed and documented to ensure there were no instances of noncompliance. As noted above, E.O. 13990, Climate Crisis; Efforts to Protect Public Health and Environmental and Restore Science, was implemented as part of NETL's ES&H Management System. This rescinded E.O. 13834, Efficient Federal Operations. This executive order is described in more detail in Section 4.0.

Other executive orders that apply to NETL-Pittsburgh but that required no specific actions in 2021 include E.O. 11514, Protection and Enhancement of Environmental Quality; E.O. 11738, Providing For Administration of the Clean Air Act and the Federal Water Pollution Control Act with Respect to Federal Contracts, Grants, or Loans; E.O.13112, Invasive Species; E.O. 12088, Federal Compliance with Pollution Control Standards; E.O. 11988, Floodplain Management; and E.O. 11990, Protection of Wetlands; and E.O. 12898, Environmental Justice for Low Income & Minority Populations.

3.3.9.1 Executive Order 11988, Floodplain Management

There were no issues at the Pittsburgh site regarding floodplain management in 2021.

3.3.9.2 Executive Order 11990, Protection of Wetlands

There were no issues at the Pittsburgh site regarding protection of wetlands in 2021.

3.3.10 Other Major Environmental Issues and Accomplishments

The Department's Occurrence Reporting Program System (ORPS) provides timely notification to the DOE complex of events that could adversely affect: the public or DOE worker health and safety, the environment, national security, DOE's safeguards and security interests, functioning of DOE facilities or the Department's reputation.

The Pittsburgh site filed three ORPS reports in 2021, described below.

- On August 3, 2021, a site HVAC technician reported to the Occupational Health Unit (OHU) reporting right rib discomfort after pulling a roof hatch closed in building 922. Initially the injury was diagnosed as a muscle sprain/strain. Follow up indicated the employee had a rib fracture. Because the employee had stated he had not struck his ribs, there was a question regarding the age of the fracture. The OHU physician ordered a follow-up computed tomography scan of the fracture to confirm an acute rib fracture. Ultimately, on October 6, 2021, the OHU physician reported that based upon follow up with a radiologist and a lack of evidence for any other underlying medical causes, the fracture was determined to have been caused by pulling a roof hatch closed.
- On Sept. 1, 2021, at 0427 hours, the Pittsburgh site experienced a site-wide electrical outage. Upon investigation it was determined that the initial electrical outage was caused by a tree that had fallen on power lines on an off-site property controlled by NIOSH. The initial site-wide electrical outage caused the NETL site to operate under a 1000 hours delayed opening Sept. 1. Upon restoration of electrical service to NETL, the 920 plateau main underground electrical line failed due to the power company single phasing that occurred from the fallen tree. The main electrical line failure caused a subsequent prolonged electrical outage to buildings 920, 921, 922, 923, and 924. The referenced buildings then remained operationally closed through 1600 hours Sept. 3 until electrical system repairs could be completed.

- On Nov. 15, 2021, at 0943 hours the Pittsburgh site experienced an unscheduled electrical outage effecting the R&D plateau and 920 plateau. The 900 plateau and B-925 daycare facility were not impacted. The electrical fault from the power company resulted in a B-920 load interrupter switch blowing two fuses. In response to this issue a decision was made to close the buildings on the 920 plateau. Electrical service was restored to the R&D plateau at approximately 1005 hours. Electrical service was restored to the 920 plateau at approximately 1700 hours.

3.3.10.1 Natural Resources Conservation Programs and Projects

Natural resources conservation programs and projects help reduce soil erosion, enhance water supplies, improve water quality, increase wildlife habitat, and reduce damages caused by floods and other natural disasters. In 2021, no issues in this area were uncovered at the Pittsburgh site.

3.3.10.2 Sustainable Resilient Remediation

There are no hazardous waste sites suitable for Sustainable Resilient Remediation (SRR) at the Pittsburgh site in 2021.

3.3.10.3 Organizational Resilience

Organizational resilience is defined as the ability of an organization to anticipate, prepare for, respond, and adapt to incremental change and sudden disruptions in order to survive and prosper. NETL has identified climate-related risks as they relate to national disasters, fire, medical emergencies, hazardous materials, physical assets and real property, and energy/water supplies, and developed initial response procedures. In addition, NETL's ERO meets with local emergency planning committees on a quarterly basis to review hazards-based risks to the region including high-priority impacts from high-water levels and storm damage due to weather events of increasing intensity.

NETL management strongly supports utilization of the best available science related to organizational resiliency policies and programs and will continue to update all applicable NETL orders, policies and procedures, as necessary.

3.3.11 Continuous Release Reporting

No continuous release reporting was required at the Pittsburgh site in 2021.

3.3.12 Unplanned Releases

There were no unplanned environmental releases at the Pittsburgh site in 2021.

3.3.13 Summary of Environmental Permits

A summary of environmental related permits for the Pittsburgh site is provided in Table 3.3.13.

Table 3.3.13: 2021 Summary of Permits — PGH			
Permit No. and Title	**Issue Date/ Renewal**	**Regulatory Agency**	**Description**
0296-OP21 Minor Source Operating Permit	07/07/2021 01/06/2026	Allegheny County Health Department, Air Quality Program	Establishes NETL-PGH as a minor source for particulate matter (PM), particulate matter of 10 microns or less in diameter (PM10), sulfur dioxide (SO2), volatile organic compounds (VOCs), nitrogen oxides (NOX), carbon monoxide (CO) and Hazardous Air Pollutants (HAPs), as defined in section 2101.20 of Article XXI Air Pollution Control of the Allegheny County Health Department, Rules and Regulations.
GF 47497.009 Industrial Sewer Use Permit	12/16/2020, 12/16/2025	Pleasant Hills Authority (PHA)	Establishes permission for the discharge of certain industrial wastewaters for the purposes of treatment by PHA. Includes permit requirements, general provisions, fees, reporting and local limits for certain discharge parameters.
PA0025844 NPDES Storm Water Discharge Permit	Responsibility for the NPDES Permit was transferred to CDC/ NIOSH effective October 1, 2015	Pennsylvania Department of Environmental Protection (PADEP)	NPDES permit for the discharge of site stormwater into the public waterways of Pennsylvania (Lick Run). If NETL becomes aware of a stormwater discharge, it must be reported to CDC/NIOSH and PADEP.
ID: 02-81183 SEQ#: 008A Aboveground Storage Tank Registration Permit/ Certificate	1990s, 10/04/2021 Renewal 10/04/2022	PADEP Bureau of Environmental Cleanup and Brownfields	Permit for above ground storage tank containing ferric chloride at Pittsburgh's wastewater treatment facility (B-74).
ID: 02-81183 SEQ#: 009A Aboveground Storage Tank Registration Permit/ Certificate	1990s, 10/04/2021 Renewal 10/04/2022	PADEP Bureau of Environmental Cleanup and Brownfields	Permit for above ground storage tank containing caustic soda at Pittsburgh's wastewater treatment facility (B-74).
S-1018 Certificate of Fire and Explosion Safety	05/18/2004	Allegheny County Fire Marshal	Approval for the storage and handling of flammable and/or combustible liquids in aboveground storage tank; certificate covers ethanol tank and pump.
S-1102 Certificate of Fire and Explosion Safety	10/06/2006	Allegheny County Fire Marshal	Approval for the storage and handling of flammable and/or combustible liquids in aboveground storage tank; certificate covers one diesel tank and one gasoline tank.

3.3.14 Fire Protection Management and Planning

A wildfire is an uncontrolled fire in an area of combustible vegetation that occurs in the countryside or rural area. The Pittsburgh site comprises 57 acres (of the Bruceton Research Center) with 31 acres being forest/fields. The site has a perimeter fence separating it from residential neighborhoods to the north, south, and west. A railroad and stream lie on the east side of the property.

Pennsylvania's Department of Conservation and Natural Resources identifies danger ratings based on the National Fire Danger Rating System. Typically, Pennsylvania has a low risk for wildfire vulnerability. The main threat of a fire would be incidental fires from an off-site incident, or from equipment use on the property. In addition, illegal or uncontrolled burning (burning leaves, bonfires, etc.), where debris travels into the woods or fields can ignite fires during drought conditions, as well as misuse of fireworks from the surrounding neighborhoods under dry/hot summer conditions. NETL-Pittsburgh has wooded areas that are mowed and trimmed; there is a very low potential of fire from a lawn mowing equipment malfunction.

At the NETL-Pittsburgh site, fire alarm control panels (FACPs) are installed in the majority of the buildings on-site. These FACPs are equipped with digital alarm communication transmitters (DACTs) that enable the panels to send fire alarm and trouble signals to the Pittsburgh Security Command Center for monitoring and response. Each building with a FACP is equipped with alarm and notification devices to alert personnel of a fire. Fire suppression systems are installed in most of the buildings on-site to combat and/or extinguish a fire.

While NETL does not have a firefighting program, the site does have an ERO for on-site emergencies. The site maintains an emergency phone line reporting system (by dialing ext. 11), which connects the individual reporting a fire to the security office. NETL's response to any fire — facility, project area, vehicle, wildfire, or other, would be to call the local fire department. Voluntary fire extinguisher usage is allowed, but not required. Annual fire drills are conducted, to allow all employees to practice evacuation and accountability protocols. During any hot work or fire protection outages, a trained "fire watch" person(s) is designated to continuously monitor the area of concern and report any fires.

3.3.15 Recreational Hunting and Fishing

The Pittsburgh site does not offer the opportunity for recreational hunting and fishing to control wildlife populations in a controlled setting.

3.4 HOUSTON, TEXAS

3.4.1 Site Description

The Houston program office is located at 1011 Highway 6, South, Suite 309, Houston, Texas 77077 (Photo 3.4.1). The office has no laboratory facilities but focuses on extramural research related to oil and gas, Because building and facility operations and maintenance are under the control of the landlord, the Houston office itself must comply with few regulatory requirements, The Houston office does not undertake in-house audits, external audits, or subject matter reviews. Regulatory agencies do not conduct ES&H inspections or investigations of activities. However, regulatory agency inspections (e.g., by the local fire marshal or municipal building inspectors) of the building and facilities could occur, with any subsequent findings assessed against the landlord. Four personnel are employed at the Houston location; three are federal employees and one is a site support contractor.

Building occupants participate in fire drills, which are conducted according to local fire marshal requirements and in cooperation with the building management. Volunteer fire wardens conduct roll call during drills and facilitate orderly evacuations. Tornado drills are announced through a building-wide public address system and are conducted in accordance with OSHA emergency response requirements.

The city of Houston does not impose recycling requirements that would apply directly to office space leases. Nevertheless, building management has a recycling program throughout the office building complex. The landlord has a building-wide recycling plan and procedure for tenant participation.

As of the most recent U.S. Census estimates showed 2,320,268 people and 848,340 households in the city. The population density was 3,501.5 per square mile.

Photo 3.4.1: Houston office.

The median income for a household in the city was $51,140. The city's per capita income was $31,576, and about 20.6% of the population was below the poverty line. The major employers in Houston are Walmart, Memorial Hermann Health System, H-E-B, University of Texas MD Anderson Cancer Center, McDonald's Corp., Houston Methodist, Kroger, United Airlines, Schlumberger, and Shell Oil Co.

3.4.2 Major Site Activities

NETL leases the office space under its own leasing authority. In 2019, the Houston office undertook actions to add three offices, cubicle space and a reception area. No activities were conducted in 2021.

3.4.3 Environmental Restoration and Waste Management

The Houston office had no off-site remediation activities, no on-site Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)/Superfund Amendments and Reauthorization Act (SARA) cleanups, and no spills or leaks from facilities or operations that were ongoing in 2021. No National Priorities List sites for which NETL-Houston had liability under CERCLA/SARA exist. No cleanups or surveillance activities for leaks or spills or other activities that would lead to Resource Conservation and Recovery Act (RCRA) cleanups occurred in prior years.

3.4.3.1 NEPA

The Houston office does not conduct National Environmental Policy Act (NEPA) reviews for proposed off-site federal actions. These actions relate to contract awards or grants to other governmental organizations, educational institutions, and private industry,

3.4.3.2 Radiation Protection

This does not apply to the Houston office.

3.4.3.3 Ionizing Radiation Program

No ionizing radiation sources are at Houston.

3.4.3.4 Air Quality and Protection Activities

Because it is strictly a project management office implementing oil and gas programs, Houston has no air quality protection program and no emissions that require monitoring, reporting, or permits.

3.4.3.5 Water Quality and Protection Activities

The sewer use permits and storm water runoff control and permits are the responsibility of the building landlord. Houston office activities in 2021 resulted in no unplanned releases, leaks, or spills that would require reporting to governmental agencies.

Potable water supplies are managed by six community public water systems and are tested to verify compliance with Safe Drinking Water Act standards. All testing has been performed by the city of Houston (municipal water authority) in compliance with the Safe Drinking Water Act standards, and the report can be reviewed at the city of Houston's Water Quality Report 2021.

3.5 MORGANTOWN, WEST VIRGINIA

3.5.1 Site Description

The Morgantown site (Photos 3.5.1a and 3.5.1.2b) lies within Monongalia County, West Virginia, on the northern end of the city of Morgantown. The location is about 70 miles south of Pittsburgh, Pennsylvania, and about 200 miles west of Washington, D.C. Geographically, the Morgantown site sits within the rolling hills of the Appalachian Plateau, about 1,000 feet east of the Monongahela River and about 10 miles west of Chestnut Ridge, the westernmost ridge of the Allegheny Mountains. The site covers approximately 135 acres, 33 of which are developed as industrial use. All surface drainage goes into two small streams that border the site on the east and northeast sides. Land use immediately surrounding the Morgantown site is a combination of residential, commercial, deciduous forest, and pasture.

Photo 3.5.1a: Morgantown site.

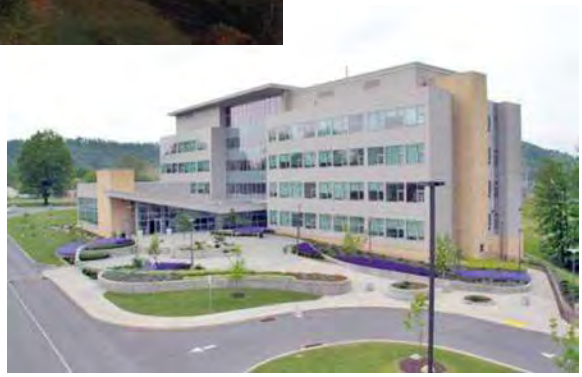

Photo 3.5.1b: B-39 in Morgantown.

The Morgantown site focuses on technologies in scientific and engineering areas creating commercially viable solutions to national energy and environmental problems. The areas include energy conversion devices, simulation-based engineering, in-situ materials characterization, supercomputer infrastructure, and diagnostics, sensors and controls. The work is accomplished through both in-house R&D and externally through funding awarded for specific research. As of Dec. 31, 2021, 561 personnel were employed at the Morgantown site; 213 federal employees and 348 site-support contractor employees.

Morgantown's population per the 2020 U.S. Census was 30,347 in 10,851 households within the city limits. (The above information was not provided by 2020 censes). The racial makeup of the city was 85.7 % White, 3.8 % African American, 3.9 % Asian, 3.8 % Hispanic or Latino of any race, 0.1% Native American, and 4.5 % from two or more races.

The median household income for the Morgantown, West Virginia, metro area was $42,474 in 2020. (The above information was not provided by 2020 censes). About 34.7% of the population was below the poverty line. Major employers within the Morgantown area according to the Morgantown Area Partnership were West Virginia University, WVU Medicine, Monongalia County Board of Education, Monongalia General Hospital, NETL, CDC, and TeleTech.

3.5.2 Major Site Activities — Morgantown

3.5.2.1 Tree Removal

NETL removed numerous trees around the Morgantown campus. Several trees, particularly ash trees were killed by the invasive emerald ash borer. Others were removed due to concerns of infringement on buildings or underground assets. NETL also addressed concerns from surrounding neighbors of trees that had grown very large and posed safety concerns associated with severe weather events. Additional trees had obscured security camera coverages.

Photo 3.5.2.1: Trees being removed.

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3.5.2.2 Physical Access Control System Update

NETL Morgantown is the master site for the enterprise-wide access control system. NETL uses the Siemens CCure 9000 platform for physical access control to the three sites. The federal government announced updates to the standardized HPSD-12 badge technology which in turn required a firmware and software upgrade to be compatible with the badging technology. The project required all card readers (over 300 units), field panels, servers, and workstations to be updated,

Photo 3.5.2.2a, Access control card reader.

Photo 3.5.2.2b: Access control workstation.

3.5.2.3 Security Facility

As part of the larger Computational Science and Engineering Project that NETL is currently executing, the primary security office was relocated to B-39 to allow the approximately 65-year-old B-7 to be demolished. The move to B-39 is only a temporary as NETL plans to build a new dedicated security building. The design was substantially completed during FY21 and the security program will benefit from having a purpose-built 2,400 square foot facility that will feature a hardened control room, training room, and emergency power to keep the security center operational in challenging conditions. Occupancy is expected in early FY23.

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Photo 3.5.2.3a: B-7, previous security building; demolition in process.

Photo 3.5.2.3b: Site of future Morgantown security building.

3.5.3 Environmental Restoration and Waste Management

3.5.3.1 CERCLA

Morgantown had no National Priorities List (NPL) sites in 2021 and has never been proposed as an NPL site. Furthermore, NETL has never been on the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) list or the West Virginia Hazardous Waste Site list (state equivalent of CERCLIS). There were no reportable releases in 2021.

3.5.3.2 SARA Title III/Emergency Planning and Community Right-to-Know Act

Superfund Amendments and Reauthorization Act (SARA) Title III requires the reporting of hazardous chemicals that were present at a facility and exceeded certain established quantities during the preceding year. This includes gaseous, liquid and solid chemicals designated as extremely hazardous substances in amounts greater than or equal to 500 pounds, liquids in amounts greater than or equal to 55 gallons or amounts greater than or equal to the Threshold Planning Quantity (TPQ). SARA Title III also requires reporting of all other hazardous chemicals present at the facility during the preceding calendar year in amounts equal to or greater than 10,000 pounds.

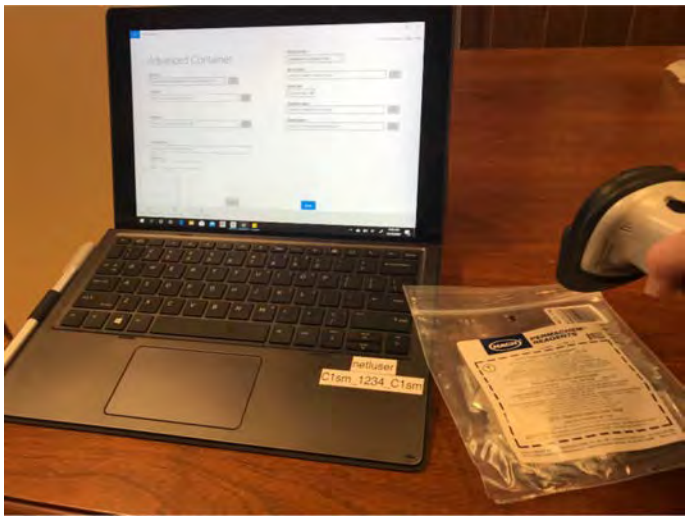

Photo 3.5.3.2a: Bar code scanning of chemicals.

NETL has established targets for reducing the accumulation of hazardous chemicals on site. The intent of these targets is to avoid the unnecessary accumulation of potentially hazardous chemicals in the laboratories, while maintaining sufficient chemical stores to complete mission-related research.

To meet these goals and regulatory requirements, NETL maintains an active inventory of all hazardous and extremely hazardous chemicals on-site, along with the Safety Data Sheets (SDS) for each substance using with its chemical inventory software, Environmental Management System (EMS) (see Figure 3.5.3.2b).

Figure 3.5.3.2b: NETL EMS home page.

The Morgantown site submits Tier II Emergency and Hazardous Chemical Inventory information by March 1 of each year. Section 312 of SARA Title III requires NETL-Morgantown to provide copies of the information to the following: West Virginia State Emergency Response Commission, the Monongalia Emergency Centralized Communications Agency (MECCA911) and the Morgantown Fire Department. MECCA911 receives the data in its role as the local emergency planning committee and for the Morgantown Fire Department.

NETL-Morgantown does not prepare a Toxic Release Inventory (TRI) Form R because the site does not use, produce or process any of the listed toxic materials in quantities that exceed the threshold amounts. In 2021, no releases occurred that would have triggered emergency notification as required by either the Emergency Planning and Community Right-to-Know Act (EPCRA) or CERCLA.

3.5.3.3 RCRA

NETL generates RCRA hazardous wastes from research activities, site operations, and construction projects, etc., and therefore must comply with Title 40 CFR parts 260 through 273. In addition, NETL accumulates hazardous waste on-site, and therefore, must comply with applicable requirements of 40 CFR 124, 264 through 267, and 270, as well as Section 3010 of RCRA. The Morgantown site is designated as a large quantity generator (EPA ID #: WV7890031886) under the jurisdiction of the West Virginia Department of Environmental Protection (WVDEP).

The site does not have an on-site program to treat hazardous waste or render it harmless; however, the site does recycle some universal wastes. In 2021, NETL recycled batteries, fluorescent light bulbs (Photo 3.5.3.3), and various items containing mercury.

Photo 3.5.3.3: Morgantown fluorescent light bulbs.

MGN had no RCRA non-compliances in 2021. (See Table 3.5.3.3: 2021 Hazardous Waste Generation – Morgantown for a summary of RCRA Hazardous Waste generated in 2021 in Morgantown.) Hazardous waste generated at the Morgantown site was managed by trained personnel from NETL's Hazardous Waste Program and was transported to the TSD facilities of Tradebe Inc. located in East Chicago, Indiana, for ultimate disposition in accordance with regulatory requirements.

Morgantown's management of SAAs complied with all requirements specified in 40 CFR 262.15. As a large quantity generator, Morgantown met the preparedness, prevention and emergency procedures in 40 CFR 262, Subpart M — Preparedness, Prevention, and Emergency Procedures for Large Quantity Generators. SAAs were identified, tracked/inventoried, and a servicing schedule (collection and transportation of wastes) for each SAA was established. The identified SAAs were labeled "Satellite Accumulation Area — Hazardous Waste." Generators of the waste were responsible for maintaining the SAAs and ensuring all generated hazardous waste was properly contained, stored, and identified. NETL's RPs of any project/ operation generating waste ensured compliance for all team members,

NETL's hazardous waste program manager was responsible for the appropriate management of all waste at the central accumulation facility prior to and during the time of pickup by the certified contracted transporter, Tradebe. This included ensuring all required documentation (i.e., profiles, testing documentation) was accurate, proper labeling appears on each container, and the handling and transport of all regulated waste was accomplished in compliance with applicable DOE/NETL policies and all other applicable regulations.

Morgantown accumulated its regulated waste in B-33, MGN's central accumulation area. Extra spill protection and containment in B-33 was provided by an epoxy coating on the concrete floor, which drains to fully contained sumps. The building was constructed with blast abatement and spill containment features to minimize the potential risks of spark-induced ignition and the spread of contaminants, in the event of an explosion or leak. Each waste class was stored in a separate room to minimize the chance that a leaked material could contact an incompatible substance and cause a reaction.

The Hazardous Waste Program Manager ensured weekly inspections were performed of the building and its operations and records were kept. All NETL employees take general computer-based awareness training; employees who generate hazardous waste take additional training for compliance with all applicable regulations and DOE/NETL policies. RCRA-required worker training was mandatory for all technicians who collect and handle hazardous waste.

The West Virginia Department of Environmental Protection (WVDEP) Office of Environmental Enforcement conducted an inspection at the Morgantown site in 2021 and discovered no deficiencies or findings.

Table 3.5.3.3: 2021 Hazardous Waste Generation — Morgantown

Waste Stream	Qty. Generated (lbs.)
Poison (Toxic Solids & Liquids)	27
Mercury/Mercury Compounds	2
Flammable Solids	4
Corrosive (Liquids & Solids)	234
Waste Oxidizers	18
Waste Paint (Oil Based)	144
Flammable/Combustible Liquids	343
Activated Carbon	6
Other RCRA Hazardous Wastes	181
Fluorescent Light Tubes (Universal Waste)	163
Batteries (Universal Waste)	857
TOTAL	**1,979**

3.5.3.4 Federal Facilities Compliance Act

There were no issues related to the Federal Facilities Compliance Act (FFCA) for the Morgantown site in 2021.

3.5.3.5 NEPA

See section 2.1.5 National Environmental Policy Act (NEPA) for information on any NEPA requirements related to the Morgantown site.

3.5.3.6 TSCA

NETL-Morgantown does not manufacture chemicals and is not subject to sections of the Toxic Substance Control Act (TSCA) related to manufacturing. No spills or releases of substances regulated by the TSCA of 1976 (with amendments, et. seq.) — including pesticides, polychlorinated biphenyls (PCBs), formaldehyde, methylene chloride, asbestos, etc. — were reported in 2021 at the Morgantown site. TSCA waste generated during 2021 included asbestos and lead-based paint, which was disposed of in accordance with federal, state and local requirements.

No unplanned releases of air pollutants covered by CERCLA or toxic release inventory (TRI) regulations occurred during 2021. Asbestiform fiber concentration air monitoring is conducted annually in buildings 1, 2, 3, 4 and 7 because asbestos-containing building materials were used in the construction of these facilities. All known friable asbestos-containing material (ACM) has either been removed or encapsulated. Non-friable asbestos present at the NETL-Morgantown site is inventoried and maintained. No samples taken in 2021 indicated that the materials contained fiber concentrations in excess of EPA or the state of West Virginia clearance levels (0.01 fibers/cc). Asbestos engineering drawings based on the Morgantown site inventory continue to be maintained and updated.

Evaluations, tests, and sample collection shall be conducted by an accredited West Virginia licensed asbestos building inspector (ABI) who received certification for Class III Asbestos Activities per 40 CFR 763.92(a)(2) or by a certified industrial hygienist (CIH). Analysis of bulk ACM or presumed ACM shall be performed by persons or laboratories with proficiency demonstrated by current successful participation in a nationally recognized testing program such as the National Voluntary Laboratory Accreditation Program (NVLAP), or the National Institute for Standards and Technology (NIST), or the round robin for bulk samples administered by the American Industrial Hygiene Association (AIHA) or an equivalent nationally recognized round robin testing program per OSHA 29 CFR 1910.1001(j)(8)(ii)(B) and OSHA 29 CFR 1926.1101(k)5)(ii)(B).

When asbestos is removed as part of any remodeling or reworking in a room, building or facility, it is handled by a licensed asbestos abatement/removal contractor (AA/RC) who adheres to OSHA 29 CFR 1910.1001 (Asbestos-General Industry), OSHA 29 CFR 1926.1101 (Asbestos-Construction), OSHA Instruction CPL 2-2.40, 40 CFR 61 (Subpart M, NESHAPs), and applicable state regulations (WV Code § 16-32, WV 33 CSR 1, WV 64 CSR 51, and WV CSR 63).

No projects required a 10-day asbestos notification permit in 2021.

Seven asbestos work activities were exempt from notification per WV Code § 16-32-11 Section (c) and 64 CSR 63 Section 10.3 and were handled by either a licensed AA/RC or by individuals who received certification for Class III Asbestos Activities per 40 CFR 763.92(a)(2):

Four were related to the B-2 construction project:

- Removal of 4 ft^2 Transite panels for door installation.
- Disturbance of 50-100 1/8 inch ceiling screw installation through overlaying foil and into cemestos decking (where square footage was ≤ 3ft^2 or 3 linear feet).
- Removal of 14 ft iron pipe with < 1 ft^2 of insulation from bell housing on a cast iron roof drain line.
- Disturbance of 30 1/8 inch screw installation for the HVAC system (where square footage was ≤ 3 ft^2 or 3 linear feet).

Three were related encapsulation efforts conducted by ABIs (License #: AI010082 & AI010672) (where the square footage was ≤ 3 ft^2 or 3 linear feet) as part of preventive maintenance in:

- B-3 room 151 (gas cylinder storage room wall penetration holes)
- B-3 room 162/163 (countertop damage)
- B-17 room 11 (hood transite panel cracks)

Seven asbestos sampling events were conducted in 2021 related to operation/maintenance and construction projects. Samples were collected by a licensed ABI (License #: AI010082 & AI010672). These included:

- Non-detect samples as part of the B-4 wall penetration (Drywall).
- Non-detect samples as part of the B-4 high roof leak repair project, black/grey tar with rolled roof, black/brown tar, roof core layers, black roof mastic with embedded screen, black coating on fan cowling. For the three pitch pockets, MGN09309 safety data sheet for the Black-Jack All-Weather Roof Cement is non-asbestos containing.
- Positive samples as a part of the B-7 demolition project, electrical room's black insulation mastic.
- Non-detect samples as part of the B-7 demolition project, exterior window brown caulking.
- Non-detect samples as part of the B-19 maintenance floor tile and mastic repair (vending machine hallway), white/blueish floor tile, black mastic, and cove molding/black mastic.
- Non-detect samples as part of the B-25 room 101 broken floor tile/mastic repairs, white/bluish floor tile and black mastic.
- Non-detect samples as part of the B-13 exterior refresh project (grey caulking).
- Non-detect samples as part of the B-3 room 162/163 floor tile/mastic penetrations, floor tile (tan/gray).
- Positive (TRACE < 1% Chrysotile asbestos) samples as part of the B-3 room 162/163 floor tile/mastic penetrations, black mastic.

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Additionally, NETL tests for lead paint before demolition, renovation, and maintenance projects or through the elimination of materials by excess property or recycling. Five lead-based paint sampling events were conducted in 2021 related to operation/maintenance and/or construction projects. The paint renovation work for the positive samples was conducted in accordance with OSHA 29 CFR 1910.1025, Lead (General Industry) and OSHA 29 CFR 1926.62, Lead (Construction),

Preventive operation/maintenance projects included:

- Non-detect samples as part of the smoke shack heater and electrical components.
- Non-detect samples as part of the B-26/B-3 alleyway/utility tunnel hatch.
- Presumed lead-based paint as part of the B-33 service door #2 (two separate work order inquiries).
- Positive sample as part of the B-33 B33EXH03.
- Positive samples as part of the B-17 basement pipe deterioration.

In October/November 2021, there were two remediations of assumed microbial growth (AMG): (1) the B-26 cafeteria; and (2) the B-33 offices (conducted in-house by the SOS4 Industrial Hygiene Support Operations Services Task) and Rooms 27, 28, and 29 (conducted by Panhandle Cleaning & Restoration of Morgantown). The remediation scope was based upon industry protocols as detailed in the IICRC/ANSI S-520 (Professional Standards and Protocols for Mold Remediation) and S-500 (Professional Standards and Protocols for Water Damage Restoration).

The first remediation was for the B-26 cafeteria.

- The B-26 cafeteria had not been used since the COVID-19 pandemic, and upon discovery, approximately 6,000 ft^2 of AMG was identified.
- The remediated areas within B-26 cafeteria includes the cafeteria serving area, main kitchen, dry storage shelving area, walk-in freezers (includes detaching thresholds and thoroughly cleaning/disinfecting to remove long-term bio film and AMG), kitchen manager's office, janitor's closet, cart storage room, kitchen prep area, staff restroom, and hallways/offsets present in the common areas listed above.
- Removal of all non-salvageable contents and disposal in the waste containers present at the facility, establishment of negative pressure containment barriers, and detailed environmental cleaning and disinfection of all building materials, structural components and salvageable contents/appliances present within the affected areas. These services did not include cleaning inside of the HVAC system, though it did include cleaning diffusers, registers, or radiant heating units which were accessible via traditional cleaning means.
- Post-remediation rinsing was performed on any food service equipment, storage, or prep areas.
- It was recommended that the in-house cafeteria staff clean small items and utensils, such as serving trays in the same manner they normally would prior to opening for normal services.

The second remediation was for B-33 offices and Rooms 27, 28, and 29.

- The remediated small surface areas within B-33 offices included the upper walls, the diffuser, and one fax machine. These surfaces were cleaned and disinfected utilizing Benefect Botanical Decon 30 Disinfectant (SDS ID: MGN08895).
- The remediated areas included Rooms 27, 28 and 29.
- Removal of all non-salvageable contents and disposal in the waste containers present at the facility, establishment of negative pressure containment barriers, and detailed environmental cleaning and disinfection of all building materials, structural components and salvageable contents/appliances present within the affected areas. These services did not include cleaning inside of the HVAC system, though it did include cleaning diffusers, registers, or radiant heating units which were accessible via traditional cleaning means. Encapsulation of areas with visible AMG was utilized as part of this project. It was white in color and can be painted overtop using a normal interior coat following remediation.
- It was recommended to have an HVAC technician/specialist determine the source of condensation that appeared to be spreading via the supply runs, as evident by the AMG present throughout nearly all visible supply diffuser vents at the time of the initial inspection Nov. 3, 2021. A work order (#R0314825) was approved to investigate the presence of potential microbial growth for the interior duct servicing the offices, bathroom, hallway, and rooms 27, 28 and 29 in addition to evaluating the HVAC system for the source of condensation concerns and identifying methods to prevent efflorescence within the building.

3.5.3.7 FIFRA

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) is a United States federal law that set up the basic U.S. system of pesticide regulation to protect applicators, consumers, and the environment. No restricted-use pesticides, herbicides or defoliants, as regulated by FIFRA, were kept on-site. Only general-use pesticides were kept and used for routine insect control. Professional pest control companies are subcontracted under the site support contract to spray around the base of office trailers and outside of certain buildings (for example, B-1). Herbicides are not used for weed control, except for extremely limited cases. No defoliants are used.

3.5.4 Radiation Protection Program

NETL's Radiation Safety Officer maintains an inventory of on-site radiation sources, tracking each item, isotope(s), quantity, custodian, location, status and activity. Table 3.5.4a lists the 2021 source inventory at Morgantown. Table 3.5.4b contains the 2021 X-ray radiation generating devices.

Table 3.5.4a: 2021 Radioactive Source Materials Inventory — Morgantown

Isotope	Activity/Date Determined	Source
Cs-137	10 mCi (3/10)	Registration #0190/10, Geotek, Ltd
Cs-137*	1 µCi (1/14)	Serial #206, Spectrum Techniques

* Exempt quantity per 10 CFR 835 Appendix E: No known radiation hazard

Table 3.5.4b: 2021 Morgantown X-Ray Radiation Generating Devices	
Device	**Quantity**
X-ray photoelectron spectroscopy (Monochromator/Dual Anode X-ray Source) - Unit #1	1
X-ray photoelectron spectroscopy (Dual Anode X-ray Source) - Unit #2	1
X-Ray Diffractometer - PANalytical (X'Pert Pro)	2
Astrophysics (Mailroom X-Ray Instrument)	1
Toshiba Aquillion - CT Scanner, Model TSX-101A. SN: 1AA1312101, (Medical CT Scanner)	1
Micro CT Scanner, DynaTOM. Tescan.	1
Industrial CT Scanner (Comet X-Ray Tube) M5000 Industrial. North Star Imaging.	1
400 xCT Micro CT Scanner, Xradia	1
Olympus Innov-X-Delta XRF (Radioactive cesium source 137Cs, approximately 10 milli-Curies.)	1
Vanta XRF M Series Model VMR-CCC-G3U	1
PANalytical XRF. Axios.	1
Yxlon International MGC 441	1
Apreo 2 C LoVac Electron Microscope, Thermo-Fisher.	1

The Morgantown site did not release any of the radiation source materials into the environment, because all source materials are sealed from release or discharge. No radiation source materials were sent from the Morgantown site to off-site storage or disposal facilities. No low-level radioactive waste (LLRW) disposal activities were required during 2021.

Radiation monitoring performed at Morgantown consisted of whole-body thermoluminescent dosimeters and finger rings for the employees in the mail facility (mail and packages are scanned via X-ray upon receipt), and as identified in appropriate R&D Safety Analysis and Review System (SARS) packages. In addition, specific radiological control areas have dosimeter badges continually displayed. All radiation-generating devices are surveyed for possible leakage on an annual basis.

The cumulative annual dose for all personnel performing all operations at the Morgantown site during 2021 was less than 100 millirem (roentgen equivalent man, <1 millisievert), with an average annual dose of less than 10 millirem (<0.1 millisievert) per person working in the radiation monitoring program are referenced in Table 3.5.4c, MGN 2021 Annual Exposure Rate.

Table 3.5.4c: MGN 2021 Annual Exposure Rate		
Exposure Range (mrem)	**Count**	**TED**
No measurable exposure	22	0
Measurable < 100	0	0
100 - 250	0	0
250 -500	0	0
500 - 750	0	0
750 - 1000	0	0
1000 - 2000	0	0
2000 - 3000	0	0
3000 - 4000	0	0
4000 - 5000	0	0
5000 - 6000	0	0
6000 - 7000	0	0
7000 - 8000	0	0
8000 - 9000	0	0
9000 - 10000	0	0
10000 - 11000	0	0
11000 - 12000	0	0
>= 12000	0	0
Number with Measurable TED:	0	N/A
Total Monitored:	22	N/A
Total Collective TED (mrem):	0	0
Total CED:	N/A	0
Total CEqD:	N/A	0
Num Individuals with Uptake:	0	N/A
Validation Status Errors:	0	N/A
Warnings:	0	N/A

This table is from the REMS data summary report that is provide by Oak Ridge Institute for Science and Education

3.5.4.1 DOE Order 458.1, Radiation Protection of the Public and Environment

Additional information may be found in Section 2.2, DOE Internal Environmental and Radiation Protection Orders and Section 2.3, Atomic Energy Act of 1954. In accordance with “as low as is reasonably achievable” (ALARA) principles, NETL manages an appropriate program to protect the public and the environment from radiation hazards since radiation sources are low-level, sealed instrumentation sources, radiation generating devices (RGDs), or processes that include naturally occurring radioactive materials (NORM) or technologically enhanced naturally occurring radioactive materials (TE-NORM) with minimal radiation levels.

3.5.4.2 DOE Order 435.1, Radioactive Waste Management

Use of radioactive materials at NETL Morgantown is limited to research instrumentation and geologic samples that have been identified as NORM/TE-NORM via surveys. The 2021 source inventory is displayed in Table 3.5.4a. NETL Morgantown does not generate or treat any radioactive material, nor does it have any temporary or permanent facility for radioactive waste disposal on-site. An inventory of radiation sources is maintained and monitored by the Radiation Safety Oficer. Information is retained about the item, isotope, quantity, custodian, location, status and sealed-source activity. All radioactive sources are sealed and are used in instrumentation/equipment or as check sources.

X-ray generating devices are used for analytical applications at the Morgantown site, such as scanning and transmission electron microscopes, X-ray diffraction and fluorescence instruments, and particle-size analyzers. These devices are examined semi- annually for leaks and safety interlocks/controls to ensure employee safety.

No radiation leakage, release, or abnormal exposure events occurred in 2021.

3.5.5 Air Quality and Protection Activities

3.5.5.1 Clean Air Act

The Ambient Air Quality Program is one of NETL's environmental protection programs. Significant requirements and responsibilities of this program are listed in Procedure 436.1-03.01, NETL Ambient Air Quality Management.

Under this program, NETL's Federal Air Quality Manager (FAQM) ensures compliance with all federal (The Clean Air Act, including the National Emission Standards for Hazardous Air Pollutants (NESHAP), state, and local regulations, as well as all DOE/ NETL policies. The FAQM also oversees monitoring programs, permitting, and reporting. Air emissions data for the site is calculated and maintained to ensure compliance with regulatory requirements.

To maintain quality control, NETL subcontracts analytical work only to certified laboratories. These laboratories must submit their Quality Assurance/Quality Control (QA/QC) manuals to NETL for review. NETL submits quality control samples (duplicates, blanks, and spikes) to the laboratories to verify the quality of the analyses.

The West Virginia Division of Air Quality's (WVDAQ) Permitting Section implements West Virginia's permit program established under the State's Air Pollution Control Act. West Virginia's permit program includes review of applications, determination of permit applicability and issuance of permits for both minor and major sources. Per the WVDAQ definitions, a *source or stationary source* is defined as any governmental, institutional, commercial or industrial structure, installation, plant, building or facility that emits or has the potential to emit any regulated air pollutant under the Clean Air Act. Per WVDAQ, NETL-MGN's operations (laboratory facilities associated with R&D activities) fall under 45CSR13. Specifically, 45CSR13B, The Permitting of Laboratories Under 45CSR13, provides guidance and clarification regarding any necessary permitting for construction and operation of stationary sources of air pollutants from laboratory facilities. The Morgantown site had no new source reviews in 2021, nor does the site meet the criteria for a stationary source; no permit or regulatory reporting is required.

WVDAQ generally evaluates air quality on a county-by-county basis, although the regional data may be aggregated into Air Quality Control Region #6, for north central West Virginia. Monongalia County performs monitoring daily at several sites, and the data is made available from the WVDEP website's air-quality index and from the EPA AirNOW webpage. Although, the Morgantown site is not a significant contributor to ambient air quality issues, air emissions are estimated in quarterly and annual air emission inventories to analyze the cumulative effect of all the projects and facilities. This analysis showed that no regulatory or other environmental impact occurred during 2021. Table 3.5.5.1 displays the estimated 2021 Air Emissions.

Table 3.5.5.1: 2021 Air Emissions Inventory — Morgantown

Pollutant	Estimated Emissions (lbs. /yr.)
Aldehydes	0.12
Carbon Dioxide	76,000
Carbon Monoxide	1,400
Formaldehyde	2.6
Nitrogen Oxide	174
Particulate Matter (PM), Condensable	4.3
Particulate Matter, Filterable	3.5
Particulate Matter, Total	8.1
Particulate Matter, PM_{10}, Filterable	0.09
Particulate $Matter_{10}$, Total	0.56
Sulfur Dioxide	1.1
Sulfur Oxides	23.4
Toluene	0.03
TOC	14.0
VOC	49.7
Xylene, Mixed Isomers	0.01

3.5.5.2 National Emission Standards for Hazardous Air Pollutants

The National Emission Standards for Hazardous Air Pollutants (NESHAP) are air pollution standards issued by the United States Environmental Protection Agency (EPA). The standards, authorized by the Clean Air Act, are for pollutants not covered by the National Ambient Air Quality Standards (NAAQS) that may cause an increase in fatalities or in serious, irreversible, or incapacitating illness. There were no issues in 2021 regarding compliance with the National Emission Standards for Hazardous Air Pollutants (NESHAP) at Morgantown.

NETL actively participates in a program to reduce the use of Class I ozone depleting substances (ODSs). This goal of the program is to recover and reclaim chlorofluorocarbon refrigerants from HVAC equipment for subsequent reuse and recycle. In recent years, the inventory of ODS-containing equipment has been steadily decreasing at the Morgantown site. Older ODS-containing equipment is being replaced and the use of Class I ODSs is being phased out from the HVAC equipment and replaced with environmentally friendly substitutes.

3.5.5.3 Hydrofluorocarbon (HFC) Phasedown

The American Innovation and Manufacturing (AIM) Act of 2020 was enacted on December 27, 2020. The AIM Act provides new authority to address HFCs and directs EPA to: (1) phase down the production and consumption of listed HFCs through an allowance allocation and trading program, (2) manage these HFCs and their substitutes to maximize reclamation and minimize releases to the atmosphere from equipment, and (3) facilitate the transition to next-generation technologies through sector-based restrictions. Below is a table that shows a list of all HFCs on the phaseout list at the Morgantown site. Plans to address how deal with the phaseout are underway. There were no issues in 2021 regarding compliance Hydrofluorocarbons (HFC) Phasedown at Morgantown,

Table 3.5.5.3: 2021 MGN HFC Phaseout Inventory Summary Information

(All Values in pounds)													Mass Balance	
Refrigerant	Amount in Equipment 2020		Amount in Equipment 2021		Amount in Storage 2020		Amount in Storage September 2021		Amount Purchased in 2021		Amount Removed from Equipment in 2021		Annual Net Gain or Loss of ODS (Difference in Equipment + Difference in Storage)	Leaks (Initial Storage - Final Storage + Purchases)
	MGN	Total	MGN	Total	MGN	Total	MGN	Total	MGN	Total	MGN	Total	MGN	MGN
R134A-HFC	981.66	981.66	980.329	980.329	91.40	91.40	181.4	181.4	390.0	390.0	0.96	0.96	88.669	30.00
R23	2	2	2	2	0	0	0	0	0	0	0	0	0	0
R125-HFC	39.44	39.44	39.44	39.44	0	0	0	0	0	0	0	0	0	0

3.5.5.4 Meteorological Tower Data

The Morgantown site maintains two small meteorological towers, one is located on the roof of Building 39 (Photo 3.5.5.4a) and the other is on the roof of Building 19 (Photo 3.5.5.4b). The Building 39 station monitors wind speed, direction, and air temperature. The data collected at the Building 19 location includes air temperature, wind speed and direction, relative humidity, and total rainfall. The data is collected every second, averaged over 15 minutes, and over 24 hours to provide critical meteorological information to the Emergency Response Organization (ERO) during emergency situations, to assist in employee heat stress data, and to provide meteorological information used in the models for the Air Emissions Program. The data collected at the Building 19 location includes air temperature, wind speed and direction, relative humidity, and total rainfall.

Photo 3.5.5.4a: B-39 meteorological tower.

Photo 3.5.5.4b: B-19 rain gauge.

3.5.6 Water Quality and Protection Activities

NETL engages in water quality and protection activities: (1) to maintain full compliance with all applicable federal, state, and local requirements; (2) to prevent spills of potential pollutants into the environment; and (3) to ensure the safety and protection of our employees, the public, and the environment. These activities include management of surface water, industrial process water and groundwater/soil. There were no water quality issues at the Morgantown Site during 2021. More details are provided in the following subsections.

3.5.6.1 Clean Water Act

National Pollutant Discharge Elimination System (NPDES) Permit

Morgantown's Surface Water Quality Program is managed per NETL Manual 436.1-03.03, *Surface Water Quality Management*. The manual covers permitting and monitoring for storm water sewers and for construction-related disturbances that have the potential of increasing sediment loads in streams. It also includes spill prevention, hazardous waste control and emergency actions, which are addressed specifically in other procedures.

The Clean Water Act, and corresponding state water quality regulations, require facilities generating point-source discharges, or facilities or areas discharging storm water associated with industrial activities, to obtain a National Pollutant Discharge Elimination System (NPDES) permit. The WVDEP has primacy over its NPDES permitting program. NETL Morgantown (Registration No. WVG610042) is authorized to operate under WV/NPDES General Water Pollution Control Permit No. WV0111457 and subject to the provisions of Section W-1 of the General Permit.

Under the existing permit, the site is required to test their effluent quarterly to verify permit compliance; the test results are submitted to the WVDEP per the Site's NPDES Permit. The Permit also requires that Storm Water Pollution Prevention Plan (SWPPP) be developed and maintained to prevent or minimize potential storm water contamination.

Morgantown has four major outfall locations (Outfalls 002, 003, 005, and 010). Three of the outfalls are required to be monitored under the current permit (002, 005, and 010). Outfall 003 is not,

- Outfall 002 drains stormwater from a 616,000 square foot area that contains most of the site's office buildings, research facilities, and storage areas.
- Outfall 003 receives drainage from a 42,000 square foot area that is approximately 65% impervious with the remainder consisting of the vegetated hillside next to B-17.
- Outfall 005 drains a 229,000 square foot area that includes B-19 (warehouse and machine shop), the parking lot behind B-33, and various research facilities.
- Outfall 010 drains a 3.8 million square foot area that includes four facilities, B-39 (offices), B-40 (childcare facility) and B-43 (guard shack and roof at main entrance) parking areas, offices, and a large section of undeveloped land.

The effluents from these outfalls are monitored according to the WV/NPDES Permit #WV0111457 and the site's SWPPP. Per the permit, designated storm water outfalls are sampled quarterly and tested for basic pollutants that can indicate contamination from site applications of fertilizer or

leaking sewer lines (see Table 3.5.6.1a). This table displays information that is contained in the Discharge Monitoring Report (DMR) reporting form. The monitoring results are presented in Table 3.5.6.1b. If a spill were to occur, emergency response procedures would be activated immediately, and the appropriate outfalls would be monitored, as necessary, for the contaminants of concern. The permit does not have reporting limits, it utilizes benchmark monitoring concentrations, and only requires NETL to report the monitoring results. If the benchmark concentrations are exceeded additional monitoring will be required along with the review and update of the Stormwater Pollution Prevention Plan (SWPPP). No permit issues were identified in 2021. (Note: WVDEP issued the latest Multi-Sector Stormwater General Permit (MSGP) for the Morgantown Site on February 25, 2021, expiring on September 12, 2024.)

Table 3.5.6.1a: 2021 NPDES Permit Storm Water Monitoring Requirements — Morgantown

Outfall	Pollutants of Concern	DMR Limits	Frequency
	Fecal Coliform	Report Only	6 Months
	BOD	Report Only	6 Months
	COD	Report Only	6 Months
	TSS	Report Only	6 Months
	pH	Report Only	6 Months
	Total Nitrite plus Nitrate	Report Only	6 Months
	Total Ammonia Nitrogen	Report Only	6 Months
	Oil and Grease	Report Only	6 Months
005	Fecal Coliform	Report Only	6 Months
	BOD	Report Only	6 Months
	COD	Report Only	6 Months
	TSS	Report Only	6 Months
	pH	Report Only	6 Months
	Total Nitrite plus Nitrate	Report Only	6 Months
	Total Ammonia Nitrogen	Report Only	6 Months
	Oil and Grease	Report Only	6 Months
010	Fecal Coliform	Report Only	6 Months
	BOD	Report Only	6 Months
	COD	Report Only	6 Months
	TSS	Report Only	6 Months
	pH	Report Only	6 Months
	Total Nitrite plus Nitrate	Report Only	6 Months
	Total Ammonia Nitrogen	Report Only	6 Months
	Oil and Grease	Report Only	6 Months

BOD = Biological Oxygen Demand; COD = Chemical Oxygen Demand; TSS = total suspended solids

Table 3.5.6.1b: 2021 NPDES Storm Water Analysis Results — Morgantown

Constituents	Outfall 002				Outfall 005				Outfall 010			
	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Total Nitrite plus Nitrate (Grab)	.52 mg/L	1.27 mg/L	.63 mg/L	< 0.66 mg/L	.54 mg/L	.70 mg/L	1.07 mg/L	< 0.41 mg/L	0.75 mg/L	0.67 mg/L	0.53 mg/L	< 0.62 mg/L
Total Ammonia Nitrogen (Grab)	< 0.6 mg/L	< 0.6 mg/L	< 0.6 mg/L	< 0.6 mg/L	< 0.6 mg/L	< 0.6 mg/L	< 0.6 mg/L	< 0.6 mg/L	< 0.6 mg/L	< 0.6 mg/L	< 0.6 mg/L	< 0.6 mg/L
Fecal Coliform (Grab)	53.8 Cfu/ 100ml	770.1 Cfu/ 100ml	>2419.6 Cfu/ 100ml	980 Cfu/ 100ml	< 1.0 Cfu/100ml	16.0 Cfu/ 100ml	1299.7 Cfu/ 100ml	9.6 Cfu/ 100ml	98.7 Cfu/ 100ml	2419.6 Cfu/ 100ml	>2419.6 Cfu/ 100ml	4.1 Cfu/ 100ml
TSS (Grab)	38 mg/L	7 mg/L	19 mg/L	11 mg/L	10 mg/L	5 mg/L	23 mg/L	18 mg/L	10 mg/L	< 4.0 mg/L	328 mg/L	11 mg/L
BOD	< 2.0mg/L	3.8 mg/L	4.0 mg/L	< 2.0mg/L	< 2.0mg/L	4.8 mg/L	3.3 mg/L	< 2.0mg/L	< 2.0mg/L	< 2.0mg/L	4.3 mg/L	< 2.0mg/L
pH	8.4	7.41	7.80	7.71	7.7	7.78	7.77	7.93	8.2	7.74	7.72	7.73
COD	75.6 mg/L	23.1 mg/L	< 10.0 mg/L	20.9 mg/L	27 mg/L	< 10.0 mg/L	< 10.0 mg/L	< 10.0 mg/L	< 10.0 mg/L	< 10.0 mg/L	27.4 mg/L	< 10.0 mg/L
Oil and Grease	< 3.0 mg/L	< 3.0 mg/L	< 3.0 mg/L	< 3.0 mg/L	< 3.0 mg/L	< 3.0 mg/L	< 3.0 mg/L	< 3.0 mg/L	< 3.0 mg/L	< 3.0 mg/L	< 3.0 mg/L	< 3.0 mg/L

ND = not detected; NS = not sampled; NR = not reported; TSS = total suspended solids

Photo 3.5.6.1: Storm water sampling at Out 002.

Table 3.5.6.1c: 2021 Wastewater Effluent Analysis (lbs./d); Pretreatment Permit, Outlet No. 01, One Sample/Qtr. — Morgantown					
Parameter	**Limit**	**1st Qtr.**	**2nd Qtr.**	**3rd Qtr.**	**4th Qtr.**
Flow (MGD) Monthly Avg. Daily Max.	 0.09 0.15	 0.006 0.02	 0.004 0.025	 0.01 0.036	 0.005 0.015
BOD5 Monthly Avg. Daily Max.	 Monitor Monitor	 ND ND	 ND ND	 ND ND	 ND ND
TSS Monthly Avg. Daily Max.	 Monitor Monitor	 0.15 0.5	 0.1 0.65	 0.48 1.74	 0.13 0.39
Arsenic Monthly Avg. Daily Max.	 0.005 0.008	 < 0.00005 < 0.0002	 < 0.00003 < 0.0002	 < 0.00008 < 0.0003	 < 0.00004 < 0.0001
Cadmium Monthly Avg. Daily Max.	 Monitor Monitor	 ND ND	 ND ND	 ND ND	 ND ND
Chromium Monthly Avg. Daily Max.	 0.007 0.011	 ND ND	 ND ND	 ND ND	 ND ND
Copper Monthly Avg. Daily Max.	 0.04 0.06	 0.0007 0.002	 0.0004 0.002	 0.00008 0.003	 0.0006 0.002
Cyanide Monthly Avg. Daily Max.	 0.02 0.03	 ND ND	 ND ND	 ND ND	 ND ND
Lead Monthly Avg. Daily Max.	 0.025 0.038	 < 0.00001 < 0.0002	 < 0.00001 < 0.0002	 ND ND	 < 0.00001 < 0.0001
Mercury Monthly Avg. Daily Max.	 0.0006 0.0009	 ND ND	 < 0.00001 < 0.00004	 ND ND	 ND ND
Nickel Monthly Avg. Daily Max.	 Monitor Monitor	 0.00006 0.0002	 0.00005 0.0003	 < 0.00010 < 0.0004	 < 0.00005 < 0.0002
Silver Monthly Avg. Daily Max.	 0.011 0.017	 ND ND	 ND ND	 ND ND	 ND ND
Zinc Monthly Avg. Daily Max.	 0.1 0.15	 0.0008 0.003	 0.0002 0.00015	 0.0008 0.003	 0.0004 0.001
Iron Monthly Avg. Daily Max.	 Monitor Monitor	 0.014 0.05	 0.007 0.04	 0.011 0.04	 0.01 0.03
Manganese Monthly Avg. Daily Max.	 Monitor Monitor	 0.007 0.02	 0.005 0.03	 0.01 0.04	 0.004 0.01

Table 3.5.6.1c: 2021 Wastewater Effluent Analysis (lbs./d); Pretreatment Permit, Outlet No. 01, One Sample/Qtr. — Morgantown					
Parameter	**Limit**	**1st Qtr.**	**2nd Qtr.**	**3rd Qtr.**	**4th Qtr.**
Phenolics Monthly Avg. Daily Max.	 Monitor Monitor	 ND ND	 < 0.0005 < 0.003	 0.0009 0.003	 ND ND
TOX Monthly Avg. Daily Max.	 Monitor Monitor	 0.003 0.01	 0.002 0.01	 0.007 0.02	 0.004 0.01
Organics Alachlor- 1254 All others	 Report Report	 0 0	 0 0	 0 0	 0 0
pH (s.u.) Minimum Maximum	 6 9	 6.77 8.05	 6.43 7.94	 6.51 8.08	 6.85 8.01
TDS Monthly Avg. Daily Max.	 Monitor Monitor	 80.1 267	 22 137.7	 33.4 120.2	 15.9 47.6

MGD = millions of gallons per day; NS = not sampled; ND = not detected; TSS = total suspended solids; BOD5 = biological oxygen demand for 5-day period; s.u. = standard units; TDS = total dissolved solids

Potential sources of spills of petroleum products and oils are aboveground storage tanks, oil-filled transformers and switches and 55-gallon drums stored at several locations (B-5, B-19 and B-36). Five aboveground storage tanks contain petroleum products (diesel fuel and gasoline), and one contains ethanol. All storage tanks are compliance with West Virginia's Aboveground Storage Tank regulations, and all have appropriate spill control. Two of the aboveground storage tanks are located inside the area drained by Outfall 002. One storage tank is in the drainage area of Outfall 005, and the remaining two are in the drainage area of Outfall 010. The site also has 28 oil-filled transformers, all of which have been tested for polychlorinated biphenyls (PCBs). No buried, or partially buried, storage tanks exist at the Morgantown site.

An oil-water separator, Photo 3.5.6.1a, is installed inside the runoff collection system of the parking garage, but no other treatment systems are installed for storm water at the Morgantown site. Based on previous test results, the primary concern with surface water has been sediment loading. Sediment loading of surface water runoff affects Burroughs Run along the southeastern margin of the site, West Run along the northeastern margin of the Site, and a small stream that traverses the northern portion of the site and empties into West Run. West Run is highly acidic from mine drainage located on the upper reaches of the drainage basin, and suburban development is increasing within the basin. Burroughs Run drains an area of significant urban and suburban development, which contributes typical urban/suburban pollution (e.g., oil, salt, pesticides, and herbicides).

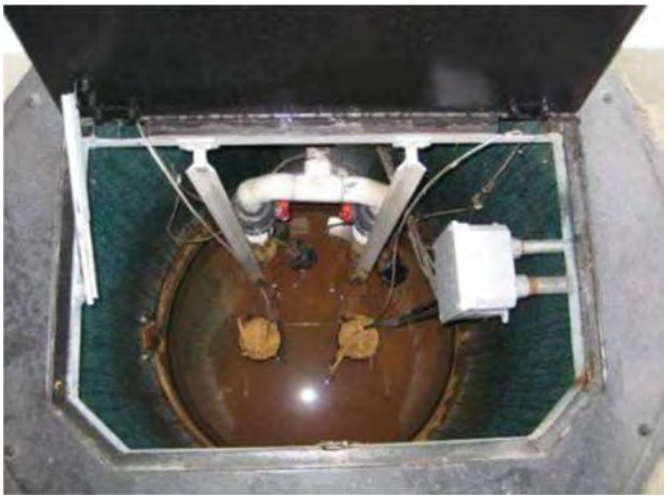

Photo 3.5.6.1a: Morgantown parking lot oil-water separator.

Protection of surface water and groundwater requires the prevention of leaks from storage tanks. Accordingly, NETL is compliant with the WVDEP's Above Ground Storage Tank Regulations. In addition, per NETL Manual 436.1-03.03, Surface Water Quality Management, and as required by the NPDES storm water permit, this program maintains written Spill Prevention, Control, and Countermeasures Plan (SPCC) for each site and a written operation and maintenance plan for each individual storage tank system. Each system capable of contributing to fires, explosions, emissions, or spills of hazardous materials must have a written operating plan addressing emergency prevention and actions to be taken should an emergency occur.

Aboveground storage tanks are visually inspected on a weekly basis and have their interstitial cavity checked each quarter. Visible leaks are corrected immediately. Oil-filled transformers are visually inspected daily. If leaked materials are observed, it is collected or absorbed with spill kits and disposed of per applicable regulations, No issues with surface water quality were identified in 2021.

Industrial Wastewater Program

Industrial wastewater quality is managed per NETL Manual 436.1-02.04, Industrial Wastewater System Management Program. Industrial wastewater is conveyed from Morgantown's facility floor drains, equipment condensate lines, and laboratory sinks to the Clarifier (Photo 3.5.6.1b) and associated processes/equipment for sediment removal and pH adjustment. The site's Industrial Waste Discharge Permit (MUB 012), issued by the local utility, Morgantown Utility Board (MUB), allows for the operation and maintenance of a 16-foot diameter Lakeside Equipment Company Spirotlo Clarifier, a batch pH treatment system with a 2,632-gallon equalization lank and two 2,500-gallon neutralization tanks, a 12 x 16-foot sludge drying bed, and one 12-inch tap to the Morgantown Utility Board Sanitary Sewer Collection System. The wastewater discharge rate limit is 90,000 gallons per day. Per the 2021 permit requirements, monthly sampling is performed at a laboratory chosen from a list certified by the EPA, and Discharge Monitoring Reports (DMRs) detailing this sampling and analysis are provided to the MUB. Results of the DMRs for 2021 are provided in Table 3.5.6.2.3: 2021 Wastewater Effluent Analysis (lbs./d); Pretreatment Permit, Outlet No. 01, One Sample/Month – Morgantown. The sampling point is displayed in Photo 3.5.6.1c, There were no issues with the industrial wastewater discharges in 2021.

Photo 3.5.6.1b: Morgantown clarifier.

Photo 3.5.6.1c: Morgantown wastewater permit sampling point.

Photo 3.5.6.1d: Weekly pH monitoring at the Morgantown pH control facility (water leaving the clarifier).

3.5.6.2 Safe Drinking Water Act

There were no issues in 2021 regarding compliance with the Safe Drinking Water Act. Morgantown site potable water is supplied by the local water utility, which publishes Safe Drinking Water Act compliance reports detailing water quality testing. Drinking water fixtures on site are filtered, with filters and plumbing maintenance performed during period scheduled preventative maintenance.

3.5.6.3 PFAS and Additional Emerging Contaminants

Historically, the Morgantown site has not been a major user of Per- and Polyfluoroalkyl Substances (PFAS). Only limited quantities of R&D chemicals considered PFAS are used on site and there had been only one portable aqueous film forming foam (AFFF) system on site. However, the contents of the portable system have since been removed from the site and appropriately disposed, Similar to the other sites, the Morgantown site does not maintain fire-fighting capabilities that would utilize PFAS. Accordingly, the Morgantown site has not historically conducted sampling, analysis, tracking, and monitoring program for PFAS-related

compounds. Drinking water at the Morgantown site is provided by the local public drinking water system,

3.5.7 Other Environmental Statutes

3.5.7.1 Endangered Species Act

There were no issues at the Morgantown site with regard to the Endangered Species Act in 2021.

3.5.7.2 EO 13751 Safeguarding the Nation from the Impacts of Invasive Species

There were no issues at the Morgantown site regarding impacts of invasive species during 2021.

3.5.7.3 National Historic Preservation Act

There were no issues at the Morgantown site with regard to the National Historic Preservation Act in 2021.

3,5.7.4 Migratory Bird Treaty Act

There were no issues at the Morgantown site regarding the Migratory Bird Treaty Act in 2021.

3.5.8 DOE Order 436.1, Departmental Sustainability

See Section 2.2.1.

3.5.8.1 Responsibilities for Addressing Executive Orders 13423, 13514, and 13693

See Section 4.0 ES&H Management System.

3.5.8.2 E.O. 13693 GHG Reduction Targets and Sustainability Goals

See Section 4.0 ES&H Management System.

3.5.8.3 Progress on Meeting DOE Strategic Sustainability Performance Plan Goals (2017)

See Section 4.0 ES&H Management System.

3.5.9 Executive Orders

The Morgantown site was in full compliance with all applicable environmental Executive Orders in 2021. Throughout the year, numerous inspections and audits were performed and documented to ensure there were no instances of noncompliance. As noted above, E.O.13834, Efficient Federal Operations, was implemented as part of NETL's ES&H management system. E.O. 13693, Planning for Federal Sustainability in the Next Decade was revoked because of the new executive order, which is described in more detail in Section 4.0.

In addition, other executive orders that apply to NETL, but for which no specific actions were required in 2021, include E.O. 11514, Protection and Enhancement of Environmental Quality; E.O. 11738, Providing For Administration of the Clean Air Act and the Federal Water Pollution Control Act with Respect to Federal Contracts, Grants, or Loans; E.O. 11987, Exotic Organisms; E.O. 12088, Federal Compliance with Pollution Control Standards; E.O. 11988, Floodplain Management; and E.O. 11990, Protection of Wetlands; and E.O. 12898, Environmental Justice for Low Income & Minority Populations.

3.5.9.1 Executive Order 11988, Floodplain Management

There were no issues with floodplain management at the Morgantown site.

3.5.9.2 Executive Order 11990, Protection of Wetlands

There were no issues with protection of wetlands at the Morgantown site.

3.5.10 Other Major Environmental Issues and Accomplishments

The Department's Occurrence Reporting Program System (ORPS) provides timely notification to the DOE complex of events that could adversely affect the public or DOE worker health and safety, the environment, national security, DOE's safeguards and security interests, functioning of DOE facilities or the Department's reputation. The Morgantown site did not file any reports with the Department's ORPS in 2021.

3.5.10.1 Sustainable Resilient Remediation (SRR)

There are no hazardous waste sites suitable for Sustainable Resilient Remediation (SRR) at the Morgantown site in 2021.

3.5.10.2 Organizational Resilience

Organizational Resilience is defined as the ability of an organization to anticipate, prepare for, respond and adapt to incremental change and sudden disruptions in order to survive and prosper. NETL has identified climate-related risks as they relate to national disasters, fire, medical emergencies, hazardous materials, physical assets and real property, and energy/water supplies, and developed initial response procedures. In addition, NETL's Emergency Response Organization (ERO) Program Manager represents NETL on local emergency planning committees and is available to review hazard-based risks to a particular region, for example, high-priority impacts from high-water levels and storm damage due to weather events of increasing intensity.

NETL management strongly supports utilization of the best available science related to organizational resiliency policies and programs and will continue to update all applicable NETL orders, policies and procedures, as necessary.

3.5.10.3 Natural Resources Conservation Programs and Projects

Natural resources conservation programs and projects help reduce soil erosion, enhance water supplies, improve water quality, increase wildlife habitat, and reduce damages caused by floods and other natural disasters. In 2021 no issues in this area were uncovered at the Morgantown site.

3.5.11 Continuous Release Reporting

There was no continuous release reporting required for the Morgantown site.

3.5.12 Unplanned Releases

There were no unplanned releases at the Morgantown site.

3.5.13 Summary of Environmental Permits

A summary of environmental permits for the Morgantown site is provided in Table 3.5.13, 2021 Summary of Permits.

Table 3.5.13: 2021 Summary of Permits — MGN

Permit No. and Name	Site	Issue Date, Exp. Date	Regulatory Agency	Description
MUB 012 Industrial Waste Discharge Permit	Morgantown	09/12/2019, Modified 02/25/2021 09/12/2024	Morgantown Utility Board (MUB)	Permit allows for the operation of wastewater pretreatment facilities and discharge into MUB's sanitary sewer system. It establishes discharge limits and monitoring requirements, compliance with the Morgantown Industrial Waste Ordinance, reporting requirements, including accidental discharge reporting and testing procedures.
WV0111457 WV/NPDES General Water Pollution Control Permit	Morgantown	Old Permit: Issued 03/03/2014, Expired 03/30/2020. Permit Extended through 08/2020: Pending new permit at the state level. New Permit: Issued 09/12/2019, Expires 09/12/2024. New permit Modified 02/25/2021 Expires 09/12/2024	WV Department of Environmental Protection (WVDEP), Division of Water and Waste Management	MGN Site (NPDES Stormwater Permit Registration Number: WVG610042) is authorized to operate under WV/NPDES General Water Pollution Control Permit No. WV0111457 and subject to the provisions of Section W-1 of the General Permit. Semi-annual stormwater samples are collected and submitted as per Water Pollution Prevention Plan and Groundwater Protection Management Plan required by the permit.

3.5.14 Fire Protection Management and Planning

A wildfire is an uncontrolled fire in an area of combustible vegetation that occurs in the countryside or rural area. The Morgantown site comprises 132 acres, with 86 acres being considered forest and/or field. The site has a perimeter fence separating it from other industrial sites to the west and north); there is also a railroad to the north, and neighborhoods to the east and south of the site.

West Virginia Division of Forestry links to the Wildfire Assessment System (www.wfas.net) to assess the risk of wildfires based on Fire Danger maps; these typically indicate low to moderate risk for West Virginia. The main threat of a fire would be incidental fires from an off-site incident, or from equipment use on the property. In addition, illegal or uncontrolled burning (burning leaves, bonfires, etc.), where debris travels into the woods or fields can ignite fires during drought conditions, as well as misuse of fireworks from the surrounding neighborhoods under dry/hot summer conditions. NETL-Morgantown has wooded areas that are mowed and trimmed; there is a very low potential of fire from a lawn mowing equipment malfunction.

Fire Alarm Control Panels (FACPs) are installed in most of the buildings on site. These FACPs are equipped with Digital Alarm Communication Transmitters (DACTs) that enable the panels to send fire alarm and trouble signals to the B-7 Security Office for monitoring and response. Each building with a FACP is equipped with alarm and notification devices to alert personnel of a fire. Fire suppression systems are installed in most of the buildings on site to combat and/or extinguish a fire.

While NETL does not have a firefighting program, the site does have an Emergency Response Organization for on-site emergencies. The site maintains an emergency phone line reporting system (by dialing ext. 11), which connects the individual reporting a fire to the security office. NETL's response to any fire - facility, project area, vehicle, wildfire, or other, would be to call the local fire department. Voluntary fire extinguisher usage is allowed, but not required. Annual fire drills are conducted, to allow all employees to practice evacuation and accountability protocols. During any hot work or fire protection outages, a trained 'fire watch' person(s) is designated to continuously monitor the area of concern and report any fires.

3.5.15 Recreational Hunting and Fishing

The Morgantown site does not offer the opportunity for the public to entertain recreational hunting and fishing to control wildlife populations in a controlled setting.

4.0 ENVIRONMENTAL, SAFETY, AND HEALTH MANAGEMENT SYSTEM

The scope of ES&H Management System covers on-site operations involving employees at the Albany, Morgantown, and Pittsburgh sites, including on-site research and development activities, site maintenance and operations, construction management and verification activities, and the supporting administrative functions related to these activities and operations. Operations not owned or controlled by NETL are excluded from the ES&H Management System, such as the credit unions, childcare facilities and other tenant facilities/operations.

The underlying framework of the ES&H Management System is DOE's Integrated Safety Management (ISM) system, whereby ES&H accountability is integrated into individual decisions and corporate planning processes. The Department's ISM Program, ISO 14001 (Environmental), and ISO 45001 (Occupational Health and Safety) all require NETL to implement a plan-do-check-act approach to maximize the protection of the public, employees, the environment, and property. The ES&H Management System uses the same philosophy to protect the environment, both on site and off site, during the conduct of operations under NETL's control.

The Morgantown and Pittsburgh sites received initial certification to the ISO 14001:1996 standard August 31, 2003. The Morgantown and Pittsburgh sites were recertified as a single entity in 2007 by Orion Registrar, Inc. to the upgraded ISO 14001:2004 standard, The Albany site received initial ISO 14001:2004 certification in April 2005, as well as achieving certification to ISO 9001 (Quality) in November 2008, Subsequently, all three sites were recertified to a combined scope by Orion Registrar, Inc., in 2010, It should be noted that NETL's facilities/offices in Houston, TX,

and Anchorage, AK ,are not required to have an ES&HMS because these operations are not considered facilities, as defined by E.O. 13148, *Greening the Government through Leadership in Environmental Management*.

Surveillance audits continued based on prescribed audit schedules to maintain certifications, with external audits generally occurring as combined Morgantown/Pittsburgh audits and Albany audits occurring separately. A listing of historical major audits is provided below.

Table 4.0 Historical Major Audits

Date	Site(s)	Standard	Type	Auditor
2007	MGN / PGH	ISO 14001:2004	Recertification	Orion Registrar
Nov 2009	ALB	ISO 14001:2004	Recertification	Orion Registrar
2010	ALB / MGN / PGH	ISO 14001:2004	Recertification	Orion Registrar
Jun 2010	MGN / PGH	OHSAS 18001:2007	Certification	Orion Registrar
Aug 2010	ALB	OHSAS 18001:2007	Certification	Orion Registrar
Sep 2013	ALB / MGN / PGH	ISO 14001:2004	Recertification	Orion Registrar
Sep 2013	ALB / MGN / PGH	OHSAS 18001:2007	Recertification	Orion Registrar
Aug 2016	MGN / PGH	ISO 14001:2004	Recertification	Orion Registrar
Aug 2016	MGN / PGH	OHSAS 18001:2007	Recertification	Orion Registrar
Sep 2016	ALB	ISO 14001:2004	Recertification	Orion Registrar
Sep 2016	ALB	OHSAS 18001:2007	Recertification	Orion Registrar
Apr 2018	MGN / PGH	ISO 14001:2015	Upgrade	Orion Registrar
Jul 2018	ALB	ISO 14001:2015	Upgrade	Orion Registrar
Aug 2019	ALB / MGN / PGH	ISO 14001:2015	Recertification	Orion Registrar
Aug 2019	ALB / MGN / PGH	ISO 45001:2018	Certification	Orion Registrar

NETL recompeted its ISO 14001/ISO 45001 external auditor contract in 2020, with the new contract being awarded to Government & Military Certification Systems, Inc. of Washington, DC (G&MCS). A surveillance audit was completed in October 2020 and was completed virtually due to travel restrictions associated with the COVID-19 pandemic. This audit resulted in two minor nonconformances, including: (1) NETL did not ensure that all required inputs into management review have been covered and that top management is a part of the review, and (2) NETL did not ensure that all of the requirements in the ISO 14001 and ISO 45001 standards were assessed. NETL provided corrective actions to its external auditor for the nonconformities and completed those corrective actions during 2021. Twenty Observations/Opportunities for Improvement (OFIs) were also noted during the audit.

External audits in 2021 returned to regular frequency using G&MCS and included three surveillance audits: a virtual audit in April 2021 at all three sites, an on-site audit in October 2021 at the Morgantown and Pittsburgh sites, and a special virtual audit concerning corrective actions at all three sites in December 2021. Results of the audits were as follows:

- The April 2021 surveillance audit identified four minor nonconformities and three observations, with the nonconformities including: the NETL Scope and Targets and Objectives are not controlled as documents; NETL has not conducted internal audits evidencing that the planned requirements were assessed; NETL has failed to ensure that one corrective action was recorded along with the root cause and corrective action plan; and NETL has failed to ensure that all required inputs in ISO 14001 and ISO 45001 were covered as part of NETL's Management Review process.
- The October 2021 surveillance audit identified two minor nonconformities and four observations, with the nonconformities including: the use of uncontrolled documents and inadequate construction contractor training.
- An observation during the October 2021 audit noting that corrective actions associated with prior NETL audits were not being completed, necessitating a special audit in December 2021 to review to closure of the audit findings from October 2020 and April 2021. This special surveillance audit was completed virtually and resulted in the closing of the first six external audit findings with no further actions.

The ES&H Management System continues to ensure consideration of the environmental, safety and health impacts of day-to-day activities and minimizes these impacts, as much as possible, consistent with the mission of fossil energy R&D. The ES&H Management System, as described in NETL's directives and manuals, includes a policy statement, top-down responsibility, personal accountability for work being performed, regulatory awareness, document control, goals, self- assessments, and continual improvement activities. By maintaining its ISO 14001:2015/ ISO 45001:2018 certifications, NETL demonstrates to its workforce, the surrounding community, DOE, and other stakeholders that it is committed to responsible environmental, safety, and health stewardship.

4.1 ENVIRONMENTAL, SAFETY, AND HEALTH POLICY

NETL strives to minimize hazards to the public and the environment and reduce injuries to the workforce. NETL requires consideration of potential environmental, safety and health impacts when planning and executing work at all levels. NETL's ES&H policy was updated and approved by senior management in 2005 to align with the ISO 14001:2004 version of the standard. It was updated again August 9, 2006, to incorporate safety and health considerations; the Albany site was also added to the scope of the management system.

NETL's ES&H Policy is found in NETL Order NETL-O-440.1B, *Environment, Safety, and Health Management System* and is provided below:

1.) NETL will achieve ES&H quality by proactively, systematically, and fully integrating ES&H considerations into the planning and execution of all work so that the mission is successfully accomplished for the safety and health of the public without detriment to NETL or the environment.

2.) NETL is committed to reducing environmental, safety, and health impacts by:

- Complying with all applicable ES&H laws, regulations, and standards through rigorous regulatory compliance programs.
- Implementing pollution prevention programs to eliminate or reduce waste and implementing emissions and accident/incident reduction programs to eliminate or reduce accidents and incidents.
- Conserving energy and materials through resource management and recycling/ reuse.
- Using safety analysis and review systems to identify, control, and reduce safety and health risks and environmental impacts through engineering and administrative controls.

3.) NETL will work continually to improve environmental, safety, and health systems with the goal of improved ES&H performance. Performance will be measured against stated objectives and targets to demonstrate continuous improvement of ES&H systems and outcomes.

4.) NETL will communicate information to employees and seek their involvement in reducing environmental, safety, and health impacts and will communicate its policies to stakeholders and the public.

Management commitment and employee involvement are necessary to maximize oversight and improve communications. However, responsibility for effective environmental, safety and health performance rests with line management. Line management must involve workers in the planning and execution of environmental, safety, and health programs and must fully communicate information to site personnel.

NETL uses the acronym "PRISM" to illustrate its policy (see Diagram 4.1). PRISM describes the incorporation of Integrated Safety Management (ISM) into the Environmental Management System (ES&HMS). The PRISM graphic is used as part of NETL's ES&H management system training, as a reminder of the policy. The PRISM logo was updated in 2006 to include safety and health; this helps to support the NETL's ISO 45001:2018 certification.

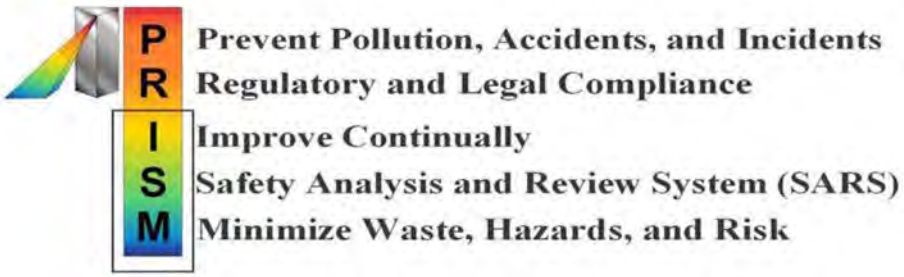

Diagram 4.1: Illustration of NETL's environmental policy.

4.2 IDENTIFICATION OF ES&H SIGNIFICANT ASPECTS, OBJECTIVES, AND TARGETS

Significant aspects are elements of an organization's activities that can interact with the environment and are under NETL's control or influence. All research projects, operations, and facilities have been inventoried and scored based on their potential to impact the environment and natural resources, as well as whether they require compliance with specific environmental laws and regulations. The ES&H Management System Crosscutting Team - a group composed

of the ES&H Management System Representative and supervisors/leads for the Environmental, Safety, and Health Team and the Engineering and Facilities Team, and the ES&H management system coordinator - reviews the highest impact scores and develops the list of significant aspects. The ES&H Management System Representative then approves NETL's significant aspects.

Table 4.1: Environmental, Safety, and Health Significant Aspects for FY2021 and Table 4.2: Environmental, Safety, and Health Significant Aspects for FY2022 provides a listing of the ES&H significant aspects. The ES&HMS crosscutting team determined the following regarding the ES&H significant aspects:

The ES&H crosscutting team considered, in more detail, the following significant aspects for FY2022:

- Under Waste Minimization, Pollution Prevention, and Recycling, it was determined that the recycling EMP will be tracked only for the tons of nonhazardous solid waste generated and percentage recycled. DOE is no longer setting a target, although NETL will continue to consider net-zero waste as a strategy for waste reduction going to be harder to find projects/opportunities for net-zero or additional diversion; will suggest to the EMP owner the idea of using hand dryers at each site. Recycling construction waste will have no target and only be tracked and reported for the Site Sustainability Plan (similar to 2021) and the new Sustainability Executive Order will likely drive this EMP.
- It was determined that the aspect for High-Performance Sustainable Building Implementation should remain because this aspect is based on DOE's 2019 Sustainability Report and Implementation Plan's (SRIP) target of 15% of GSF of buildings over 10,000 GSF meeting the HPSB GPs in FY2021. NETL is already meeting these Guiding Principles, which were updated in FY2020. NETL continues to annually assess and report on building conformance to sustainability metrics. The new Sustainability Executive Order may also drive this EMP.
- For the Hazardous Materials Procurement, Consumption, and Storage aspect, it was determined that the Chemical Inventory baseline for the number of containers and pounds will be updated to the FY2021 numbers. The objective and target will remain as is.
- EMPs associated with Electronic Stewardship will remain the same, with at least reporting data pending changes based on the new Sustainability Executive Order.
- With respect to the Greenhouse Gas Air Emissions aspect, while there are currently no metrics in the guidance for the new Sustainability Executive Order, the order does mention tracking and reporting of these emissions; NETL can continue to track and report these.
- For the Green Purchasing aspect, the Environmentally Preferred Products EMP will need more information and specifications developed based on DOE's SRIP and E.O. 13834. Targets need to be developed and reviewed for evaluation and implementation of the EMP. A new objective and target are proposed to track the number of contracts with a sustainable action clause or clauses and the related funding to the clauses.
- The Energy and Fuel Management aspect includes Energy Use, Management of Servers and Data Centers, Renewable Energy, and Fleet Management and will remain the same for FY2022. For the Energy Use EMP, the baseline needs to be evaluated due to the fact this is now tracked on a year-to-year basis per DOE's SRIP target of 0.5% reduction in FY2021 based on FY2020 baseline. For the Management of Servers and Data Centers

EMP, the objectives and targets will need to be re-written based upon changes through the Chief Information Officer guidance (Federal Cloud Computing Strategy and Data Center Optimization Initiative Memorandum). The guidance is likely to be along the lines of building the standard PUE for data centers into new designs and construction. For the Renewable Energy EMP, NETL is still required to comply with EPAct 2005, which requires a reduction of 7.5% of total electrical energy use. NETL plans to purchase renewable energy credits (RECs) to meet this goal. For the Fleet Management EMP, the petroleum consumption target will need to be updated per DOE's SRIP target of 2% reduction in FY2021 based on FY2020 baseline.

- The Water Usage aspect's Potable Water Consumption EMP, the target will need to be modified with the FY2020 result being the baseline for FY2021 as this is tracked on a year-to-year basis per DOE's SRIP.
- For the Workplace Health and Safety aspect, the EMPs will remain the same. The NORM ES&H Management Plan includes revising procedures/manuals and the other targets will be updated as needed for FY2022. It is expected that the SARS packages with NORM will be identified and updated as needed during the year. The EMP for R&D Project-Specific Training Completion Rate Improvements should continue in FY2022.
- Organization Resilience – Climate Change Adaptation will remain on hold pending the President's Council of Environmental Quality (CEQ) or DOE updated guidance.
- A new Significant ES&H Aspect was identified for Refrigerant Management, with its own EMP, as refrigerant management needs to be better accounted and managed to maintain regulatory compliance with ozone-depleting substance (ODS) reduction goals implemented by the U.S EPA.
- A new Significant ES&H Aspect was identified for Safety Culture and includes two new EMPs: development and implementation of Leading Indicators for measuring safety performance and update of e-SARS which houses all of the R&D project information.

Following the annual update and ranking of significant aspects, NETL's ES&H objectives and targets were revised and presented to the Management Review Board (MRB) for approval. The MRB is a group of senior managers (Chief Operating Officer; Associate Director for Facility Operations; and the Albany, Morgantown and Pittsburgh Site Managers) that reviews and approves ES&H objectives and targets, reviews ES&H performance, and takes appropriate action when needed to ensure ES&H programs continue to meet ES&H policy. At the MRB meeting held January 29, 2021, the MRB approved the list of significant aspects (see Table 4.1: Environmental, Safety, and Health Significant Aspects for FY2021), the objectives, and the targets for FY2021. At the MRB meeting on February 24, 2022, the MRB approved the list of significant aspects (see Table 4.2: Environmental, Safety, and Health Significant Aspects for FY2022), the objectives, and the targets for FY2022.

Objectives are overarching for the organization, while targets are specific measurable or quantifiable criteria supporting those objectives. Performance measures are compared to targets to determine the degree of success in reaching associated objectives. Before establishing and reviewing its objectives, NETL considers regulatory and DOE requirements; technological options; financial, operational, and business requirements; and the views of interested parties. Line managers within the organization assign responsibility for objectives and targets to individuals

with expertise in the respective subject areas. These individuals, known as responsible persons, develop ES&H management plans (EMPs) specifying how NETL will meet its objectives and targets.

The approved objectives and targets, as well as the actual performance data for the FY2021, are presented in Table 4.3: FY2021 Environmental Management Plan Metrics for Albany, Morgantown, and Pittsburgh, and the performance data for the first quarter of FY2022 are presented in Table 4.4. The following discussion presents the significant "environmental" aspects and their respective EMP results for Fiscal Year 2021.

4.2.1 Waste Minimization, Pollution Prevention, and Recycling

For FY2021, EMPs addressing nonhazardous waste recycling, and construction waste recycling included objectives and targets that address the requirements of E.O. 13834. As an example, the objective of the FY2021 *EMP for Nonhazardous Waste Recycling* was to increase diversion of nonhazardous solid waste from disposal by 50%. By the end of FY2021, NETL had recycled 70% of the nonhazardous waste stream (922,350 lbs. out of 1,311,741 lbs.). In addition, the objective for *EMP for Recycling Construction Waste* is to recycle the maximum extent feasible of construction/demolition waste and divert it from landfill disposal by the end of FY2021 NETL diverted 1,830,900 lbs. of its construction/demolition waste.

4.2.2 Hazardous Materials Procurement, Consumption, and Storage

For FY2021, the significant aspect for addressing hazardous materials procurement, consumption, and storage focused on NETL's chemical inventory. The primary objective of the *EMP for Chemical Inventory* was to reduce and minimize the quantity of toxic and hazardous chemicals and materials acquired, used, and disposed based on E.O. 13693. NETL had a 4.2% increase in the number of containers (550 containers) compared to the baseline that was adjusted in FY2019. The number of containers are within the no net gain of (+/- 10%) target for FY2021. As of the 4th quarter of 2021, the chemical inventory contained 13,064 containers, weighing 21,139 pounds. The chemical inventory verifications were completed as planned as part of this EMP.

4.2.3 Green Purchasing

The FY2021 EMP for Environmentally Preferred Products focused on various aspects of E.O. 13834, including maximizing site use of environmentally preferred products (EPPs) in operation and maintenance, janitorial, and general office activities; purchasing products that are recycled, bio-preferred, Energy Star, Federal Emergency Management Program (FEMP)-designated, EPEAT- registered, WaterSense or otherwise water efficient; acquiring uncoated printing and writing paper containing at least 30% post-consumer fiber; reducing printing paper use; ensuring that 95% of new contract actions for products and services are energy and water efficient; have bio-based and environmentally preferable, non-ozone depleting, recycled content; and are non-toxic or less toxic than alternatives. The FY2021 targets were to achieve the following: 95% of new contract actions for products and services are: energy efficient, water efficient, bio based-content, environmentally preferable, non-ozone depleting, recycled content, and non-toxic, or less toxic than alternatives; 80% of all products that can be purchased "green" under the site support and construction contracts are of environmentally preferred products; and 98% of copier and printer paper shall contain a minimum of 30% recycled post-consumer fiber. In FY2021, NETL achieved the following: 97.5% of contract actions will be energy efficient, water

efficient, bio-based content, environmentally preferable, non-ozone depleting, recycled content, and non-toxic, or less toxic than alternatives; 93.6% of janitorial and operation and maintenance products are environmentally preferred products through its storeroom purchases; and 99.7% of copier and printer paper contains a minimum 30% recycled post-consumer fiber through storeroom purchases.

4.2.4 Electronic Stewardship

In FY2021 the objective for the EMP for Operation and Maintenance of Electronic Products continued to be to enable power management, duplex printing and other energy-efficient or environmentally preferable features on all eligible DOE electronic products. In FY2022, when exempt monitors and computers are accounted for, 100% of printers and 98.47% (1,546/1,570) of workstations have power management settings in place.

4.2.5 Water Use

To address the goals of E.O. 13834 NETL's objective was to reduce water consumption intensity, relative to the baseline of 27.3 million gallons (which equates to 23.3 gallons/gross square foot [gal/gsf]) through life-cycle cost-effective measures, by 2% annually through FY2021, or 36% by the end of FY2025 using a baseline of FY2007. NETL's FY2021 potable water intensity was 8.7 gal/gsf. This equates to a 11.2% decrease in potable water intensity from FY2020.

4.2.6 Energy and Fuel Use

DOE 2020 SRIP Facility Energy Efficiency goal is a 1 percent reduction in FY 2021 from FY 2020, NETL's FY 2021 energy intensity was 143,457 BTU/GSF, a 1.7 percent increase from FY 2020 which does not meet the 2020 SRIP goal.

Analysis of FY 2021 electricity and natural gas usage found several contributing factors accounting for the increased energy intensity over FY2020, even though NETL has been on maximum telework status for all of FY 2021 due to the coronavirus pandemic:

- Based on CDC/ASHRAE recommendations, Guidance for Building Operations During the Covid-19 Pandemic, HVAC systems in NETL buildings were adjusted to improve ventilation by opening outdoor air dampers beyond minimum settings to reduce or eliminate HVAC recirculation, demand-controlled ventilation controls were turned off, filter efficiencies were increased as much as possible in each HVAC system, and HVAC systems ran longer hours (2 hours before and after the building is occupied).
- NETL demolished two office trailers (MGN T-43 and T-45) in late FY2020, reducing NETL's energy consuming square footage by 0.7 percent. Removing low energy intensity square footage such as these office trailers increased NETL's overall energy intensity.

DOE's 2020 SRIP Renewable Energy goal is 7.5% of total electricity in FY2021. To meet the DOE 2020 SRIP Renewable Energy Goal of 7.5 percent, and to meet the EPACT 2005 requirement that renewable electric account for 7.5% of total electric consumption, NETL purchased 3,000 MWh of RECs. NETL's annual on-site renewable electrical energy generation equates to 0.5% of its total electric energy usage based on the EPACT 2005 double bonus for onsite renewable energy. With these RECs, NETL's renewable electric energy totaled 9.5 percent of NETL's FY 2021 total electric consumption of 32,684 MWh.

NETL has a data center business case with FITARA approval that outlines NETL's full data center strategy. A summary of this strategy is below.

- The Albany data center is relocating to the first floor of B-1 with design plans having been accepted by NETL. The new datacenter will be fully metered and have an estimated power usage effectiveness (PUE) of 1.3. Data center will be monitored natively over the network, enabling NETL to calculate power consumption and PUE.
- The Morgantown data center will undergo a remodel and consolidate racks into a smaller, contained space. This will significantly save on power and cooling costs. It will be will be monitored natively over the network, enabling NETL to calculate power consumption and PUE; in this case it had an estimated PUE of 1.14.
- Pittsburgh began the construction phase of a new data center in B-83 in FY 2021 that will combine high performance computing, research IT equipment, and commodity enterprise IT equipment. This consolidation will eliminate the need for multiple data centers on site. It will also be will be monitored natively over the network, enabling NETL to calculate power consumption and PUE.
- All three sites are currently going through a physical to virtual migration of our applications and services. Physical servers will be virtualized and placed on shared hardware to save on power and cooling, thus reducing PUE.

The 2020 DOE SRIP Fleet Goal was to reduce petroleum usage in FY 2021 by 2.0% as compared to FY2020. NETL's consumption of petroleum fuel increased in FY2021 by 21.3% from FY2020 petroleum consumption.

NETL's FY 2021 fuel consumption and year-over-year metrics were greatly impacted by travel restrictions due to the coronavirus pandemic. These travel restrictions were in place for half of FY 2020 and all of FY 2021 fiscal year. NETL's GSA-lease Fleet travelled 118,000 miles less in FY 2021 than in FY 2020, a 57 percent reduction in miles travelled. Note that last year NETL's GSA-leased Fleet travelled 290,000 miles less in FY 2020 than in FY 2019. Almost all GSA-lease Fleet miles in FY 2021 were onsite Security and Maintenance vehicles which are primarily gasoline vehicles. The motor pool vehicles used for offsite travel were rarely offsite.

The Morgantown and Pittsburgh sites operate and maintain E85 refueling infrastructure to support the alternate fuel vehicles (AFVs) in the NETL Fleet,

Although not applicable in FY 2021 due to coronavirus pandemic travel restrictions, the information below is included as a record of NETL's fleet sustainability strategies.

- NETL measures to reduce vehicle miles and petroleum consumption include daily intra-site shuttle service between the Morgantown and Pittsburgh sites. This service has reduced the fleet usage miles by an average of 81,000 miles annually and resulted in the elimination of 4 vehicles in the NETL Fleet.
- NETL management, in another measure to reduce vehicle miles and petroleum consumption, strongly encourages the usage of videoconferencing and teleconferencing centers as an alternative to utilizing a vehicle to attend meetings, hearings, and Training. NETL installed electric vehicle charging stations in Pittsburgh and Morgantown in FY 2018

and currently has 4 electric vehicles (Chevrolet Bolts). The electric vehicles are used for inter-site travel between the Pittsburgh and Morgantown sites (130 miles round trip). Using the all-electric Chevy Bolts between Sites can save NETL between $12 to $20 per round trip. Each round trip also saves 4 to 6 gallons of gas, reducing NETL's greenhouse gas emissions and helping to reduce the petroleum usage increase from the 5 gasoline-only Hyundai's mentioned above.

4.2.7 Air Emissions/Greenhouse Gas Emissions

DOE FY 2021 Site Sustainability Plan Guidance states that DOE will continue to track and reduce GHG emissions in FY 2021, *DOE FY 2020 Sustainability Report and Implementation Plan* required tracking of FY2021 Scope 1 and 2 GHG emissions. Neither set target reductions for FY 2021 Scope 1 and 2, or Scope 3 GHG emissions.

NETL's FY2021 Scope 1 and 2 GHG emissions were 16,652 MtCO2e. NETL's FY 2021 Scope 3 GHG emissions were 1,594 MtCO2e, NETL will continue efforts to reduce energy intensity by implementing energy conservation projects.

4.2.8 High-Performance Sustainable Building (HPSB) Implementation

DOE's 2020 SRIP High Performance Sustainable Building goal for FY 2021 is 15% of buildings > 10,000 GSF. In FY2021, NETL met the DOE 2020 SRIP goal of having at least 15% of existing buildings, larger than 10,000 GSF meet the HPSB Guiding Principles (GPs). In FY2021, 18.5 percent (5 of 27) of NETL's applicable buildings over 10,000 GSF met the HPSB GPs, Including the bonus credit for 2 buildings below 10,000 GSF, 24.1 percent (7 of 29) of NETL's applicable building GSF met the meeting the HPSB GPs.

NETL had been using the Portfolio Manager HPSB Checklist to track compliance with the 2008 HPSB GPs for each building in the NETL HPSB Plan, but as of December 2020, the Portfolio Manager HPSB Checklist can no longer be used, To maintain HPSB compliance, in FY2021 NETL began to reassess buildings to the December 2020 Guiding Principles for Sustainable Federal Buildings and Associated Instructions.

NETL plans to ensure the seven current HPSB compliant NETL buildings meet ongoing EISA requirements and will add the sixth guiding principle, "Assess and Consider Climate Change Risks,", for these buildings as part of the Vulnerability Assessment and Resilience Plan to be performed in FY2022.

NETL will incorporate planned building modifications into the Annual Lab Plan and 5-Year GPP Plan. NETL will continue to incorporate the planning and funding required for the buildings in the NETL HPSB Plan to meet HPSB compliance by FY2025 into the NETL ES&H Management System, Annual Lab Plan and GPP planning. Requirements to meet the CEQ's Guiding Principles for Sustainable Federal Buildings and Associated Instructions, latest version, will be written into all NETL renovation/construction specifications.

Table 4.2.8: NETL FY 2021 HPSB PLAN							
Building	FY Compliance	Compliance	Current Status	GSF Total = 1,143,803	Cumulative % GSF	Cumulative % BLDGS >10,000 GSF (Total = 271) Add 2 for B-40 + B-900 29	Action
MGN B-39	2009	LEED Gold	Met HPSB Criteria Grandfathered	106,522	9.3%	3.4%	Complete
PGH B-58	2015	HPSB	Met HPSB Criteria Grandfathered	32,240	12.1%	6.9%	Complete
MGN B-1	2016	HPSB	Met HPSB 2008 GP Criteria Per CEQ Instructions	51,598	16.6%	10.3%	Complete
PGH B-921	2016	HPSB	Met HPSB 2008 GP Criteria Per CEQ Instructions	25,033	18.8%	13.8%	Complete
PGH B-920	2017	HPSB	Met HPSB 2008 GP Criteria Per CEQ Instructions	11,681	19.9%	17.2%	Complete
MGN B-40	2013	LEED Gold	Met HPSB Criteria Grandfathered	9,411	20.7%	20.7%	Complete - Bonus Credit < 10,000
PGH B-900	2017	HPSB	Met HPSB 2008 GP Criteria Per CEQ Instructions	6,065	21.2%	24.1%	Complete - Bonus Credit < 10,000
MGN B-26	2021	HPSB	Meets 92% of HPSB 2008 GPs. Energy Efficiency/IAQ	63,616	26.8%	27.6%	2016 GPs Apply
PGH B-925	2021	HPSB	Meets 88% of HPSB 2008 GPs. Energy Efficiency/IAQ	9,326	27.6%	–	2016 GPs Apply (Bonus Credit)
ALB B-1	2022	HPSB	Meets 62% of HPSB 2008 GPs. Energy Efficiency/IAQ	23,348	29.6%	31.0%	2016 GPs Apply

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4.3 IMPLEMENTATION AND OPERATIONAL CONTROLS

The ES&H Management System is implemented through an organizational structure shown in Diagram 4.3. Senior-level positions include the NETL Director, who serves as the ultimate authority for the ES&H Management System; Chief Operating Officer, Laboratory Operations Center, the lead member on the MRB; the Associate Director for Facility Operations, who is the environmental, safety, and health steward and champion; the Site Manager for Albany; the Site Manager for Morgantown; and the Site Manager for Pittsburgh, who also acts as the ES&H Management System Representative. (Site-specific ES&H leads are consulted by the MRB, as necessary.) Mid-level titles and responsibilities are defined in several NETL directives that specify key components of the ES&H Management. The Site Managers assign employees to the functional titles and responsibilities.

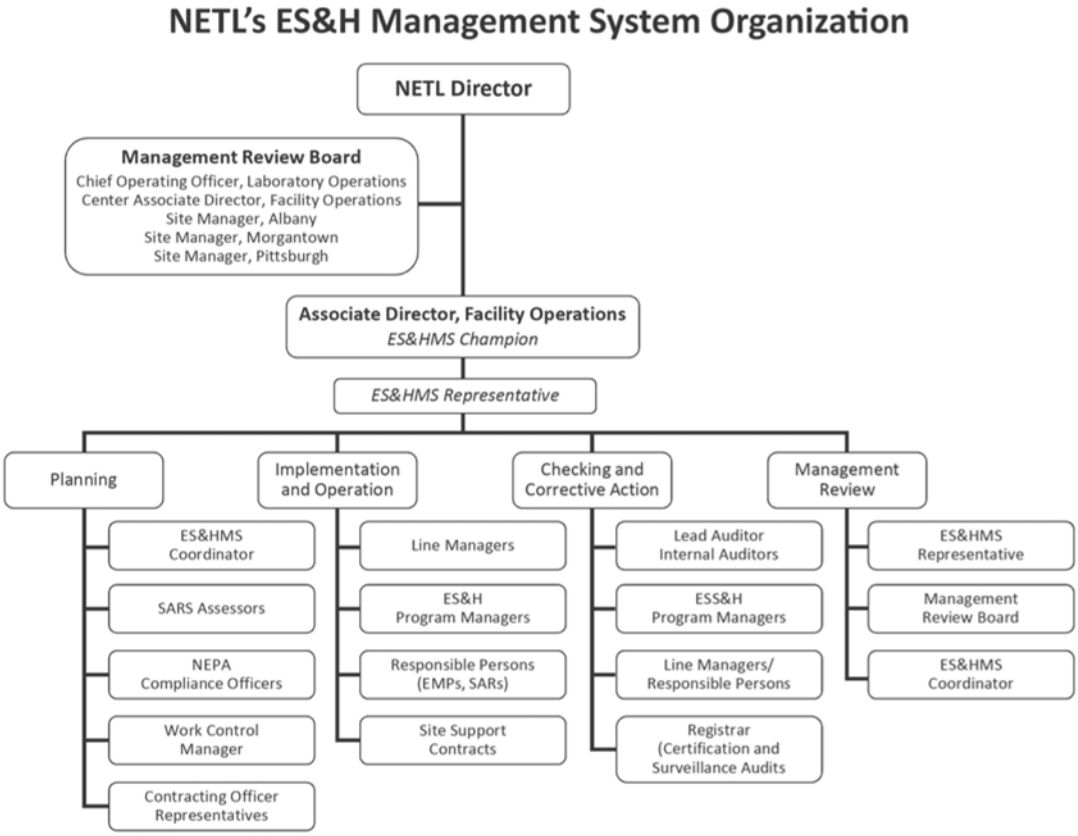

Diagram 4.3: NETL's ES&H management system organization.

Line managers are the primary means for NETL to achieve operational control within the ES&H Management System. Communication also occurs through the NETL intranet, which provides a secure internal website containing current versions of all NETL directives, as well as general reference information, forms, and programmatic information. The ES&H Team webpage contains a "ISO 14001:2015/ISO 45001:2018 Roadmap" that provides an overview of available information about the NETL ES&H Management System.

Another example of internal communication at NETL is the biweekly regulatory review, which promotes awareness of regulatory changes and new programs. Every two weeks, federal and state agency websites are reviewed to identify changes in environmental laws, regulations, guidance documents, compliance information and regulatory agency programs. DOE Headquarters'

website is also reviewed to check for new DOE requirements and guidance. These reviews are circulated to the ES&H staff and posted on the NETL intranet homepage.

NETL also communicates information about the ES&H Management System to its employees through the NETL intranet, training, staff meetings, e-mail and posters. The training program includes general ES&H Management System training designed to make employees aware of the ES&H Management System by providing them with information about significant environmental, safety, and health aspects and the potential impacts on their work, employee roles and responsibilities and the potential consequences of not following operating procedures. In addition to the general training, program- and job-specific training is required based on an employee's job duties. The computer- based training system uses a job hazard survey to determine which training modules are necessary. Job-specific training for an employee can also be requested directly by the employee or by his/her supervisor. Each employee and his/her supervisor are responsible for ensuring that all required training is complete before beginning an assignment.

For purposes of communication with external parties, NETL maintains an external webpage (www.netl.doe.gov). The webpage includes a section on Site Environmental Quality that provides the ES&H policy and significant ES&H aspects.

NETL conducts public participation activities under the requirements of the National Environmental Policy Act (NEPA). For projects receiving federal funding, NETL is required by law to use the NEPA process to identify potential environmental impacts, consider alternatives, invite public comment or participation, plan the project with due regard for the environment, impose mitigation requirements, and make informed decisions about whether to proceed with the proposed project. The NEPA process provides a system for reviewing actions prior to a major expenditure of funds to ensure the environmental and social impacts have been identified and analyzed and will be mitigated to the extent practicable prior to committing to the project.

To implement the ES&H Management System effectively and efficiently, NETL must maintain operational control of its on-site R&D projects, facilities, operations and construction activities. This is accomplished through the Safety Analysis and Review System (SARS) process. This process requires proposed projects to be described in writing and subjected to ES&H and quality reviews by subject matter experts and technical committees. Approval must be granted before a project, operation, construction can proceed beyond the planning stage, or before a facility can operate. Included within this process is a review of the potential environmental impacts, regulatory requirements, safety and health hazards, and monitoring plans. After a project begins, annual reviews are required to ensure the project continues to follow environmental, safety, and health requirements. If the project requires changes, the SARS package must be modified, and the SARS process repeated. Other processes for operational control include:

- Environmental Programs that have been established for both defined media (air, surface water, and groundwater), and likely pollution routes (spills, hazardous waste, and nonhazardous waste). Each program is described in directive and is managed by a corresponding ES&H program manager.
- Work performed by contractors that is controlled at the NETL sites through contractual provisions and directives that define the ES&H requirements for work on NETL property, as well as for NETL-funded work at off-site locations.

- Procedure 243.1-01, Records Management, that details operational control through documentation. Critical documents are controlled per a defined process to ensure they can be located. They are also periodically reviewed and revised. This ensures that the current versions are readily available and obsolete documents are promptly disposed.

- Core ES&HMS documentation that is embodied primarily within NETL ES&H directives. The most recent and official hard-copy versions of NETL directives reside with the NETL directives coordinator. Electronic versions of these controlled directives are placed on the intranet for employee use and are considered official versions. Official copies of ancillary tables, lists and forms are also maintained on the intranet and are reviewed and updated as required.

4.4 SELF-ASSESSMENT PROCEDURES

NETL uses a variety of self-assessment procedures to improve its ES&H performance. This includes internal and external audits, project reviews, and inspections; independent assessments; and reporting through NETL's corrective action tracking system, the Assessment Input Information System (AIIS). Self-assessment enables NETL to make observations and to identify strengths, opportunities for improvement, and nonconformities. In some cases, findings can be corrected on the spot, however, if opportunities for improvement and nonconformities require additional communication, resources and time, they are tracked as preventive and corrective actions.

As noted above, NETL is subject to both internal and external audits of its Environment, Safety, and Health (ES&H) Management System as required by the ISO 14001:2015 and ISO 45001:2018 standards. The auditing process is defined in NETL Manual 450.4-01.02, ES&H Assessments Process. An annual planning schedule is used to ensure that all sections of the ISO 14001:2015 and ISO 45001:2018 standards are audited against. A total of five ES&HMS audits were performed in 2021, including two internal audits and three external surveillance audit which encompassed activities at the Morgantown, Pittsburgh, and Albany sites. The internal audit performed in February-March 2021 resulted in six nonconformities and ten opportunities for improvement (OFIs), and the internal audit performed in November-December 2021 resulted in six nonconformities and one OFI. The external surveillance audits to the ISO 14001:2015 and ISO 45001:2018 standards were conducted by an independent contracted auditor, Government and Military Certification Systems, Inc. of Washington, DC (G&MCS), who became NETL's external auditor in 2020. The external audit performed in April 2021 identified four minor nonconformities and three observations/OFIs, the external audit performed in October 2021 identified two minor nonconformities and four observations/OFIs, and the external audit performed in December 2021 was focused on closing existing corrective actions (resulting in no further actions).

Top management's commitment to the ES&H Management System is evidenced by participation in the Management Review Board, as well as review of a variety of ES&H assessments. Both DOE and contractor ES&H specialists participate in regular site audits, as well as facility inspections. These audits and facility inspections focus on observable conditions [e.g., compliance with Occupational Safety and Health Administration (OSHA) regulations, National Fire Protection Association (NFPA) codes, National Electric Code (NEC), and other environmental, safety, and health requirements]. Findings from the audits and inspections are entered into the corrective action tracking system, AIIS, and the status of the corrective actions is provided to the office directors each month, as well as to the Management Review Board on a semi-annual basis.

In addition, Safety Analysis and Review System (SARS) assessments are performed on new and modified R&D projects, construction activities, facilities, and support operations. Similarly, annual SARS assessments are performed to ensure continued ES&H compliance for these R&D projects, facilities, and support operations. A comprehensive discussion of the SARS process can be found in Section 6.0, Quality Assurance.

In order to better manage ES&H programs (e.g., Water Quality Program, Air Quality Program, Electrical Safety Program, Confined Space Program, etc.), responsible program managers review their areas on a continual basis at varying frequencies to ensure compliance with both external regulatory and NETL requirements. These reviews are both formal and informal and may vary in scope and detail allowing managers to verify NETL directives are relevant and are being met. Some programmatic reviews occur more frequently or focus on monitoring results. The reviews look for trends to identify correctable problems and to address promptly.

In addition, site-support contractor employees periodically inspect higher risk items, documenting findings and providing the results to program managers. This information provides program managers with opportunities to assess the effectiveness of their programs.

Examples include:

- Daily inspections – selected potential spill sources and storm water outfalls.
- Weekly inspections – hazardous waste central accumulation areas, industrial wastewater discharge points.
- Quarterly inspections – discharge monitoring reports are compiled and reviewed to determine if permit limits have been exceeded.
- Semi-annual inspections – Surface water monitoring reports are compiled and reviewed.

Meaningful reviews for compliance can occur only if the program managers are aware of changing Federal and State laws and regulations and DOE administrative requirements. Subject matter experts, primarily ES&H staff, are responsible for keeping NETL informed of changing laws and regulations. Part of the program manager's general job responsibilities is to stay abreast of regulatory issues that may affect the NETL ES&H Management System and to take appropriate actions to implement these requirements. NETL has several means of maintaining awareness:

- A biweekly regulatory review covers significant changes in Federal and State laws and regulations. Information is gathered from selected Federal, State and other government websites and DOE's Office of Health, Safety, and Security (AU-1).
- Private sector publications, including "Environmental Compliance in West Virginia," a quarterly regulatory update bulletin published by Business and Legal Reports, Inc.; environmental compliance updates published by the Bureau of National Affairs; and various trade journals.
- Pennsylvania Bulletin and the Pennsylvania Code, (produced by the Commonwealth of Pennsylvania) and the Code of Federal Regulations (published by the National Archives).
- Review of appropriate Oregon state regulatory websites managed by the State of Oregon Department of Consumer and Business Services (DCBS).

- NETL's library subscriptions that are relevant to regulatory documents are available electronically on the NETL intranet or in the library.
- Updated lists of hazardous or regulated chemicals, as needed.
- Current information from regulatory agencies, such as the West Virginia Department of Environmental Protection (WVDEP), the Pennsylvania Department of Environmental Protection (PADEP), and the Oregon Department of Environmental Quality (ORDEQ).
- Training classes on relevant statutes and regulations.

4.5 CORRECTIVE AND PREVENTIVE ACTION PROGRAM:

- Nonconformance with any of the appropriate regulations or standards identified during any of the self-assessment audits (or external assessments/audits) mentioned above would be documented using NETL's current Corrective and preventive Action Tracking System, the Assessment Input Information System (AIIS).
- NETL Manual 450.4-01.04, *Corrective and Preventive Action Process*, outlines how corrective and preventive action items identified in the various assessments are captured, prioritized, assigned, analyzed for their root cause, tracked, closed, and incorporated, as appropriate, into the lessons learned and training systems. This process holds responsible persons and line management accountable for timely closure of corrective actions within their programs, organizations, or facilities, and disseminates lessons learned across appropriate organizational elements.
- After completion of an assessment, the lead assessor uses the AIIS to generate an assessment record. When a finding is entered into the system, a unique identifying number is assigned and cataloged in the database with the associated assessment record. A notification of the finding is sent electronically to the responsible person and their line manager. All corrective actions taken regarding the finding are then documented in AIIS. To ensure findings have been fully addressed, a follow up is done through the internal auditing process. Each month, several closed findings undergo verification audits to determine if the corrective actions taken address the closed findings appropriately. Open findings are generated into a monthly report and sent out to appropriate line management to further address and complete accordingly.
- Other processes used for reporting corrective actions include: Manual 151.1-01.02, *Emergency Categorizations, Classifications, and Notifications*, a procedure used to catalog and investigate major nonconformities related to emergencies, as required by DOE; and Manual 231.1-00.02, *Injury/Illness Reporting*, which sets forth the minimum reporting requirements for injury or illness classification investigation for NETL.

4.6 MANAGEMENT REVIEW PROCESS

Management review of the ES&H Management System ensures the ES&H policy and management system remain appropriate and effective. The ES&H Management System Representative conducts review meetings regularly during the year with the Management Review Board – MRB (see Diagram 4.3: NETL ES&H Management System Organization), to allow the MRB to review current environmental, safety and health policy; objectives and targets; internal and external audits;

and related issues. Changes are documented and implemented. Management involvement in the ES&HMS ensures that projects are funded with the appropriate priority. Notes from the MRB meetings are posted to the intranet.

The MRB met on January 29, 2021, and October 7, 2021. Scope of the management review process (per ISO 14001/45001, Section 9.3) includes:

- Status of actions from previous management reviews;
- Changes in external and internal issues relevant to the ES&H management system;
- The extent to which ES&H management policies and ES&H objectives have been met;
- Information on ES&H performance;
- Adequacy of resources for maintaining an effective ES&H management system;
- Relevant communication(s) with interested parties; and
- Opportunities for continual improvement.

Outputs of the management review process (per ISO 14001/45001, Section 9.3) include:

- Conclusions on the continuing suitability, adequacy and effectiveness of the ES&H management system in achieving its intended outcomes;
- Decisions related to continual improvement opportunities;
- Any need for changes to the ES&H management system, including resources;
- Actions, if needed (including if objectives have not been achieved);
- Opportunities to improve integration of the ES&H management system with other business processes, if needed; and
- Any implications for the strategic direction of the organization.

Since objectives and targets are tracked on a fiscal year basis, the first MRB meeting of the calendar year also focuses on progress towards NETL's current fiscal year objectives and targets, while the second meeting of the calendar year also focuses on ensuring that the aspects, objectives, and targets were approved for the next fiscal year.

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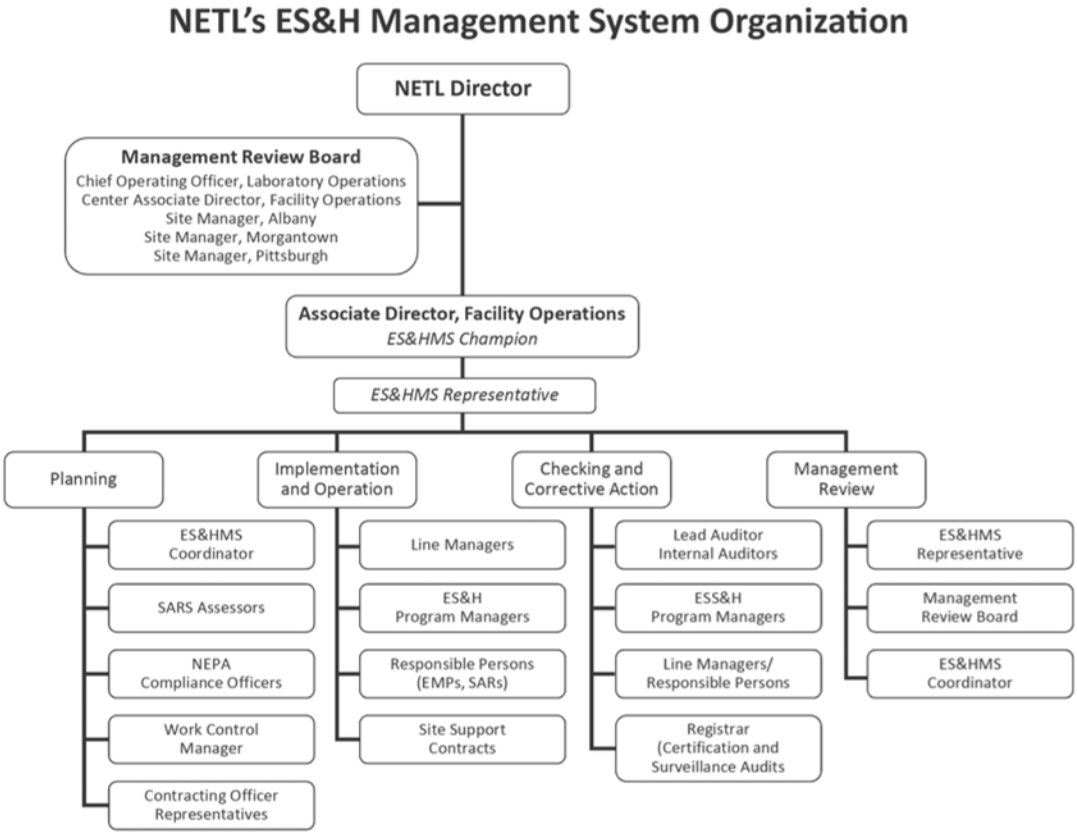

Diagram 4.3: NETL's ES&H management system organization.

4.7 ENVIRONMENTAL OPERATING EXPERIENCE AND PERFORMANCE MANAGEMENT

NETL sets performance goals as part of the Enterprise Performance Assessment System (EPAS). These metrics are reviewed quarterly by NETL senior management. The specific performance measures that are tracked and their performance for FY2021 are contained in Table 4.7a. The upper targets and lower targets are shown for each performance metric. If the upper target is met, then the metric is considered "Met." If the metric falls between the upper and lower targets, it is treated as "Caution," which means that the performance needs to be investigated to ensure that the metric does not fall below the lower target. A metric that falls below the lower target is considered "Not Met," and is investigated to determine why the metric was not met. FY2021 performance was obtained by taking the average of the four quarters of the performance measures for the fiscal year.

Table 4.7a: Performance Management Metrics				
Metric	**Objective**	**Target**	**FY 2021 Performance**	**Strategic Objective**
Ensure Worker Safety	Minimal cases of work-related injuries to federal and contractor personnel (assessed quarterly).	Total Recordable Case Rate (TRC) <=1.0 Days Away/ Restricted (DART) Case Rate <= 0.4	TRC = 0.53 DART = 0.23	Infrastructure Support
Energy and Sustainability	Demonstrated progress in meeting significant aspects of energy efficiency (assessed quarterly).	Achieve at least 85% energy efficiency score based on compliance with EO 13834 significant aspects.	Energy Efficiency Score = 89.5%	Infrastructure Support
Minimize Environmental Impacts	Environmental protection programs that minimize adverse impacts on the environment (assessed quarterly).	<2 Group 5 Environmental Occurrence Reports (ORPS) annually. At least 85% ES&H objectives met.	ORPS = 0 ES&H Obj. = 84.25%	Infrastructure Support

Goal setting is used at NETL to motivate and monitor performance. NETL's environmental performance and progress toward goals is tracked and reported to satisfy both internal and external requirements.

Throughout the year, trained ES&H professionals performed cross-cutting audits and inspections of the NETL ES&H programs to ensure adequate performance. The performance measures used to monitor progress include EMP objectives and targets (see Section 4.2) and institutional environmental performance measures. This includes NETL's performance measures established under the Government Performance and Results Act of 1993. These measures are tracked on a fiscal year basis and cover performance goals and accomplishments.

In addition to these measures, surveillance monitoring is conducted through routine reviews and inspections. Examples of the types of performance monitoring conducted through this program are presented in Table 4.7b: 2021 Surveillance Monitoring.

Table 4.7b: 2021 Surveillance Monitoring
Type of Surveillance
SARS Assessments
Transformer Inspections
Storage Tank Inspections
Interstitial Storage Tank Monitoring (MGN)
Back-up Generator Inspections
Hazardous Waste Central Accumulation Areas Inspections

5.0 ENVIRONMENTAL NON-RADIOLOGICAL PROGRAM INFORMATION

There are two programs in place at NETL that monitor non-radiological effluents. These include: the Industrial Wastewater Management Program and Ambient Air Quality Management.

5.1 INDUSTRIAL WASTEWATER MANAGEMENT PROGRAM

NETL's industrial wastewater quality is managed per NETL Manual 436.1-02.04, Industrial Wastewater System Management Program, and is administered by the Industrial Wastewater Quality Program Manager. Each site (Albany, Pittsburgh and Morgantown) has its own industrial wastewater permit that specifies the criteria for discharges to meet the permit requirements, For specific information about the industrial wastewater program at each, see the following sections 3.2.6 (Albany), 3.3.5 (Pittsburgh) and 3.5.6 (Morgantown).

5.2 AMBIENT AIR QUALITY MANAGEMENT

The requirements of the Ambient Air Quality program are discussed in Procedure 436.1- 03.01, *NETL Ambient Air Quality Management*. Under this Program, the Air Quality Manager (AQM) ensures compliance with all Federal, state and local regulations, as well as DOE Directives. The AQM also oversees monitoring programs, permitting and reporting. Additionally, historical ES&H management plans (EMPs) have been used to track various emission categories or sources where NETL can make the most improvement.

In order to maintain quality control, NETL subcontracts analytical work only to certified laboratories. These laboratories submit their Quality Assurance/Quality Control (QA/QC) manuals to NETL for inspection, and NETL submits quality control samples (duplicates, blanks and spikes) to the laboratories to verify the quality of the analyses. Air emissions data for the sites are calculated and maintained to ensure compliance with regulatory requirements.

6.0 GROUNDWATER PROTECTION PROGRAM

Groundwater protection at NETL is administered through Procedure 436.1-03.02, *Groundwater Quality Management*. The program covers regulatory requirements and best management practices to prevent leaks and spills, to monitor groundwater and soil, to remove contaminated soil and to address closeout actions. More detailed information is provided in NETL's Groundwater Protection Plan for each site, which documents site hydrogeology, potential pollution sources, potential contaminants to be monitored, well installation and sampling methods, a monitoring strategy and QA/QC processes. Maps of the site aquifers and wells are also included in the plan.

Photo 6.0: Morgantown monitoring wells.

Each site has specific reasons for monitoring its groundwater. The groundwater protection and monitoring program in Albany (initiated in 2001) is aligned with the Oregon Department of Environmental Quality (ODEQ) Voluntary Cleanup Program. Albany groundwater monitoring includes 33 wells and two piezometers. The wells were originally sampled for a broad range of contaminants, including volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, nitrates, and PCBs. Current plans include the continued development of a conceptual site model (CSM) to document groundwater and contaminant trends. The CSM is a living document and is updated periodically. NETL continues to assess the results of periodic monitoring, update the CSM, and plan for future remediation activities (subject to available funding). NETL provides the monitoring to ODEQ.

The Pittsburgh site has 23 monitoring wells. Nineteen (19) wells are screened in shallow weathered bedrock; seven are screened at the R&D plateau area, and 12 are screened at the valley fill area (administrative and maintenance areas). The primary objective of the Groundwater Monitoring Program (GMP) at the Pittsburgh site is to monitor the shallow, weathered bedrock zone as the first significant aquifer or water-bearing unit beneath the Pittsburgh facilities of NETL. Contamination entering the ground from soil surface sources would be expected to impact this zone first, and as a result, most wells are placed in this zone. The GMP also monitors the wells screened in the deeper

water-bearing zone to provide data on water quality and contaminant migration. Another goal of the Pittsburgh GMP also identifies and characterize groundwater flow and relate it to surface water flow conditions to better evaluate potential environmental effects of any groundwater contamination.

Also, there are 20 active monitoring wells exist at the Morgantown site. These wells monitor two shallow aquifers within the unconsolidated Lake Monongahela sediments and one bedrock aquifer, the Morgantown Sandstone. None of the Morgantown site aquifers are used as a source of water in the immediate area, but selected monitoring wells are sampled and tested for general water-quality parameters. Should a spill occur, containment and cleanup would commence, and the affected soil would be monitored, as necessary, for the contaminants of concern.

6.1 GROUNDWATER AND SOIL QUALITY PROTECTION ACTIVITIES - ALBANY

In 2001, Albany initiated a groundwater protection and monitoring program in accordance with DOE requirements. The program follows the requirements of the Oregon Department of Environmental Quality (DEQ) Voluntary Cleanup Program, with regulatory input from Oregon DEQ. There is no formal agreement between NETL and Oregon DEQ. Albany installed 14 monitoring wells on site in July 2002 and sampled the wells for a broad range of contaminants, including volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, nitrates, and PCBs. A selected subset of the wells was also screened for pesticides, herbicides, dioxins, and radiological constituents.

Initial periodic sampling showed potential concern over elevated levels of VOCs, metals, and radiological constituents. This necessitated continued periodic monitoring. Subsequent periodic monitoring events have shown excessive turbidity of samples, which directly influenced the metals and radiological results. A review of sampling protocols was undertaken and a requirement established for future collection of groundwater samples to be performed using U.S. EPA low-stress protocols. Upon implementing the enhanced sampling protocols in 2003, metal and radiological contaminant levels in groundwater were found to be at or near background levels for the Willamette Valley in Oregon.

Photo 6.1: Albany groundwater sampling.

VOC detections during periodic monitoring prompted Albany to further investigate areas of suspected contamination, with planning efforts starting in September 2004 and on-site work initiated in January 2005. Results from samples taken in February 2005 showed contaminants of potential concern (COPCs) were likely crossing the eastern boundary of the site and migrating toward Liberty Elementary School. After meeting with Oregon DEQ and the Greater Albany Public School (GAPS) District personnel, investigations were made on site and off-site during March-December 2005. Results of the site investigation showed no concern over surface soils, subsurface soils, soil gas, or ambient air at off-site properties. The only issue identified was with elevated levels of COPCs in groundwater at depth, including trichloroethene (TCE), carbon tetrachloride, and chloroform.

Oregon DEQ sampled residential wells within an approximate two-block radius of the site due to resident concerns voiced at Town Hall meetings and further reviews of the sampling results during 2006. A total of 31 residential wells were sampled, with some residential wells (including some used as drinking water) showing elevated levels of COPCs. NETL connected all owners of impacted wells that were used for drinking water (10) to City of Albany potable water supplies by December 2006. One additional owner contacted NETL concerning connection to the City of Albany potable water supplies in 2018, and this action was completed in 2019. NETL has also properly closed any wells that residents requested to be abandoned per Oregon DEQ requirements between 2007-2009.

An independent health consultation was requested by Oregon DEQ in 2006 with the Agency for Toxic Substances and Disease Registry (ATSDR) under U.S Department of Health and Human Services, Public Health Services. This consultation focused on the above-noted groundwater investigation concerns, as well as radioactive waste disposal and beryllium dust concerns, and was completed on October 25, 2006. Results concluded that current and future exposures to VOCs via contaminated groundwater are “no apparent public health hazard,” past exposures at most residences with contaminated wells are “no apparent public health hazard”, and past exposure at one residence is a public health hazard due to exposures to carbon tetrachloride and TCE. The entire health consultation can be found at: https://www.atsdr.cdc.gov/hac/pha/albanyresearchcenter/albanyresearchcenterhc10.25.06.pdf.

Additional monitoring wells have been installed over the years to enhance the groundwater investigation both on site and off site at Liberty Elementary School property, adjacent to the site (see Figure 6.1 for well locations). Regular periodic monitoring is performed twice per year; once during the wet season (March-April) and once during the dry season (August-September), with sampling performed in accordance with the Albany Groundwater Monitoring Plan. Sampling is currently limited to volatile organic compounds (VOCs) and metals. The results of the 2021 monitoring program are presented in Tables 5.1.1-5.1.5.

NETL continues its site investigation activities, periodic monitoring, and remedial actions at the Albany site in accordance with Oregon DEQ requirements and will evaluate and pursue actions to protect human health and the environment by eliminating risk and minimizing potential exposures. Copies of all periodic monitoring reports are provided by NETL to Oregon DEQ. A groundwater conceptual site model continues to be periodically updated for the Albany site.

Based on review of available current and historical information, Albany is not considered to be a major source of Per- and Polyfluoroalkyl Substances (PFAS) since the site: (1) has historically only used very limited quantities of R&D chemicals considered as PFAS; (2) has no fixed aqueous film forming foam (AFFF) systems; and (3) does not operate its own fire department or maintain fire-fighting training facilities.

There were no historical discharges at the site. However, NETL maintains and tracks all chemicals on-site using a chemical inventory management system that ensures proper disposal at the end of chemical life, either via recycling or hazardous waste disposal. Accordingly, Albany does not have an active sampling, analysis, tracking, and monitoring program for PFAS-related compounds, since it is not required per the site's industrial wastewater permit or the Albany Groundwater Monitoring Plan. Drinking water is provided by the local public drinking water system and site groundwater or surface water is not used as a drinking water source.

6.2 GROUNDWATER AND SOIL QUALITY PROTECTION ACTIVITIES — PITTSBURGH

The primary objective of Pittsburgh Groundwater Monitoring Program (GMP) is to monitor the shallow, weathered bedrock zone as the first significant aquifer or water-bearing unit beneath the Pittsburgh facilities. Contamination entering the ground from soil surface sources would be expected to impact this zone first, hence, most the monitoring wells are placed in this zone. The GMP also monitors the wells screened in the deeper water-bearing zone to provide data on water quality and contaminant migration. Another objective of the monitoring program is to identify and characterize groundwater flow and relate the groundwater flow to surface-water flow conditions to better evaluate potential environmental effects of any groundwater contamination.

By properly characterizing local groundwater conditions, it is possible to ensure that potential contamination and potential contaminant migration routes have been suitably identified and investigated. This enables NETL to be cognizant of potential continuing contamination and to remediate these contamination sources, if warranted.

The Pittsburgh site (see Figure 6.2a: Topographic Site Map – Pittsburgh) is located within the Appalachian Plateau physiographic province. The topography, consisting of rolling hills and ridges, reflects the dendritic drainage erosion of the uplifted Allegheny Peneplain.

All rocks in the area are of sedimentary origin. They are almost exclusively of Pennsylvanian or Permian Age, except for alluvium in the stream and river valleys, which is of Quaternary Age. At the Bruceton Research Center location, bedrock is of Pennsylvanian Age and belongs to the Monongahela and Conemaugh Groups. The contact is identified by the Pittsburgh Coal, which is the basal member of the Monongahela Group (see Figure 6.2b: General Geologic Column – Pittsburgh).

The shallowest aquifer on NETL property is found in the weathered bedrock just below the rock/soil contact and occurs over most of the site, except where it is undermined. Recharge of this unit occurs where rainfall percolates downward into the weathered strata until a continuous horizon of low vertical permeability (unweathered bedrock) is encountered. A total of 19 groundwater monitoring wells are screened in shallow weathered bedrock; seven (7) groundwater monitoring wells are in the R&D plateau area, and 12 groundwater monitoring wells are in the valley fill area Figure 6.2c: Groundwater Management Program R&D plateau Well Locations – Pittsburgh and Figure 6.2d: Groundwater Management Program Valley Fill Well Locations – Pittsburgh show the locations of the monitoring wells.

A deeper, water-bearing zone has been noted at the contact between the Connellsville Sandstone and the Clarksburg Clay and Limestone. A total of four (4) wells are screened in this deeper zone (located in the R&D plateau area). This deeper aquifer had extremely low yield in the valley fill area.

Four wells (two in the R&D plateau and two in the valley fill area) were originally screened in the depth interval between the two aquifers, within fractured strata. These wells had extremely low yields and were subsequently abandoned. The minimal amount of groundwater occurring in this intermediate zone may be the result of leakage from the overlying shallow, weathered bedrock zone.

The Lick Run Valley, which borders the eastern edge of the Pittsburgh site, is made up of silt and sand alluvial deposits. The alluvial deposits comprise a water-bearing unit, which discharges to form the stream-base flow within Lick Run. Although shallow piezometers have been established in these deposits, the thickness of this water-bearing unit is unknown.

Most domestic water supplies for the area surrounding the Pittsburgh site are provided by the Pennsylvania American Water Company, which processes water from the Monongahela River. There is one groundwater well listed for domestic usage within a one-mile radius of the site. This groundwater well, situated near central Bruceton, is 140 feet deep and was completed in the Monongahela Group, per the computerized PADEP Water Well Inventory. However, topographic review of the well location, based on reported longitude and latitude and the reported well depth, indicates that this well was possibly completed in the Conemaugh Group. The well is located to the north of the Pittsburgh site and, as a result, it should not be affected by potential NETL groundwater impacts because groundwater is assumed to flow in a southerly direction beneath the Lick Run Valley.

A second groundwater well is located on Piney Fork Road, approximately 1½ miles south of NETL-Pittsburgh. This well was recently included in the PADEP Water Well Inventory and is associated with a landfill. The PADEP Water Well Inventory reported no other domestic groundwater wells in Jefferson Borough or South Park Township; however, the inventory does not list wells drilled prior to 1966.

The Pittsburgh site has two groundwater flow patterns. First, groundwater flowing in the shallow, weathered bedrock aquifer may percolate along the soil/bedrock interface and/or along near vertical stress relief fractures and follow the general site topography, flowing from the tops of hills on the site and generally perpendicular to ground-surface elevation contours. This flow is directed by the intervening valleys toward the Lick Run Valley, where it joins the water-bearing unit located in the valley and adds to the base flow of Lick Run itself, Photo 6.2a. Some of this flow also discharges as springs on the hillsides or in the valleys.

Photo 6.2a: Lick Run.

The second flow pattern is associated with the deeper aquifer. Groundwater in this zone generally flows east toward the Lick Run Valley, where it comingles with water of the shallow zone as it flows off the hillsides.

Groundwater monitoring (Photo 6.2b) in 2021 was performed per the NETL-Pittsburgh 2021 Groundwater Detection Monitoring Plan. The results of the NETL-Pittsburgh Groundwater Detection Monitoring Program are presented in Tables 5.2.1-5.2.4, and the results were compared against federal and state standards for groundwater. The following is a summary of the results:

- Well MPW-8 exceeded the EPA Region III risk-based tables for 1, 1-dichloroethane. This well is near a previously removed underground gasoline storage tank.
- Aluminum exceeded Pennsylvania (PA) Secondary Drinking Water MCL for one well.
- Chloride exceeded PA Secondary Drinking Water MCL and Act 2 Secondary MCL standards for all nine wells. These exceedances have been attributed to road salt used at the site.
- Iron exceeded PA Secondary Drinking Water MCL and Act 2 Secondary MCL standards for two wells and EPA Region III Risk Based Table, PA Secondary Drinking Water MCL, and Act 2 Secondary MCL for one well.
- Manganese exceeded PA Secondary Drinking Water MCL, EPA Region III risk-based tables, and Act 2 Secondary MCL standards for three wells.
- Nickel exceeded the EPA Region III Risk Based Table for three wells. This level has been attributed to the interaction of the sodium and chloride with the stainless-steel well casings.
- Strontium exceeded the EPA Region III Risk Based Table for three wells.
- Sulfate exceeded PA Secondary Drinking Water MCL and Act 2 Secondary MCL standards for one well. This exceedance has been attributed to past mining activities in the area.
- Total Dissolved Solids exceeded PA Secondary Drinking Water MCL for all nine wells.
- Wells MPW-2 and MPW-10 exceeded PA drinking water secondary MCL standards for pH.

Photo 6.2b: Pittsburgh groundwater monitoring.

Statistical analysis was conducted on the indicators of groundwater contamination [pH and specific conductance for eighteen NETL-PGH Groundwater Monitoring Wells and total organic carbon (TOC) and total organic halogens (TOX) for nine Monitoring Wells] on the 2021 monitoring data using the tolerance interval-two tailed method. The analysis compared the upgradient wells to the downgradient wells. The upgradient well is MPW-1 for the Main Plateau Wells and the upgradient wells are VFW-2 and VFW-10 for the Valley Filled Wells. The following are the results of the statistical analysis:

- pH - The replicate average value was outside the background tolerance intervals for Wells MPW-10 and VFW-12.
- Specific Conductance - The replicate average value was outside the upper tolerance limit for Wells MPW-2, MPW-8, and VFW-7.
- TOC - MPW-4D had TOC value outside the upper tolerance limit.
- TOX - No wells had TOX values outside the upper tolerance limit.

NETL will perform additional statistical analysis of historical and current data to ascertain if exceedances of risk-based limits can be attributed to activities at NETL, and will communicate with EPA Region III if this is indicated."

Monthly groundwater elevation measurements to determine contaminant transport were completed in accordance with the Groundwater Protection Management Program. The elevation measurements are consistent with the general groundwater flow patterns described previously.

With respect to Per- and Polyfluoroalkyl Substances (PFAS), NETL-Pittsburgh is not considered a major user. At present, the Pittsburgh site only maintains limited quantities of R&D chemicals considered as PFAS. The Pittsburgh site does have two fixed aqueous film forming foam (AFFF) systemslocated in its chemical storage building for fire suppression. However, Pittsburgh does not operate its own fire department or fire-fighting training facilities.

There were two documented historical discharges at the site (1999-2000) associated with facility equipment failure and maintenance (no history of discharges associated with facility fires), Appropriate notifications were made at the times of the noted discharges. NETL maintains and tracks all chemicals on-site using a chemical inventory management system that ensures proper disposal at the end of chemical life, either via recycling or hazardous waste disposal. Accordingly, Pittsburgh does not have an active sampling, analysis, tracking, and monitoring program for PFAS-related compounds, as it is not required per the site's industrial wastewater or stormwater NPDES permits. PFAS-related substances are not a regular analyte and have never been part of any historical sampling. Drinking water is provided by the local public drinking water system; site groundwater or surface water is not used as a drinking water source.

6.3 GROUNDWATER AND SOIL QUALITY PROTECTION ACTIVITIES - MORGANTOWN

Morgantown's Groundwater Protection Program is controlled via NETL Procedure 436.1-03.02, Groundwater Quality Management, which is administered by the Federal Groundwater Quality Manager (FGQM). This procedure covers regulatory requirements for permitting, monitoring, compliance, and reporting, as well as best management practices for preventing leaks and spills, monitoring groundwater and soil quality, emergency releases, and quality control.

The procedure also ensures that the Groundwater Protection Plan (GWPP) is developed and implemented to obtain data for the purpose of determining baseline conditions of groundwater quality and quantity; demonstrating compliance with and implementation of all applicable permits, regulations and DOE orders; providing data to allow the early detection of groundwater pollution or contamination; providing a reporting mechanism for detected groundwater pollution or contamination; identifying existing and potential groundwater contamination sources and maintain surveillance of these sources; and providing data upon which decisions can be made concerning land disposal practices and the management and protection of groundwater resources. The GWPP documents the Site's hydrogeology, potential sources of pollution and the associated contaminants that should be monitored, methods of well installation and sampling, a monitoring strategy and QA/QC processes related to water/soil sample analysis.

Spills and accidental discharge cleanup procedures are also addressed in the GWPP. Should a spill occur, containment and cleanup would commence, and the affected soil would be monitored or removed, as necessary.

The primary strategy for groundwater protection is spill and leak prevention. Together, the NETL Spill Prevention, Control, and Countermeasures (SPCC) Plan and the Storm Water Pollution Prevention Plan lay out the strategy for minimizing the risk of unintentional releases and quickly responding to an unintentional release to minimize environmental contamination. In addition, R&D Projects are only initiated or modified after a rigorous ES&H review is conducted in accordance with the SARS directives. According to these directives, the responsible person for each project must prepare a set of written procedures documenting how the project is to be operated, how waste and feedstocks are to be safeguarded and how to contain and control unintended releases. When a leak or spill does occur, and the environment is threatened, the on-site emergency response team is activated, and the facility makes the appropriate internal and regulatory-driven notifications.

Twenty (20) active monitoring wells exist at the Morgantown site. The locations of the wells are displayed in Figure 6.3a: Active Monitoring Wells at the Morgantown site. These wells monitor two shallow aquifers within the unconsolidated Lake Monongahela sediments and one bedrock aquifer, the Morgantown Sandstone. None of these aquifers are used as a source of water in the immediate area. Figure 6.3b: Generalized Cross-Section of Aquifer Units at the Morgantown site shows a generalized cross-section through the site and the relationship between the aquifers.

No groundwater contaminants have been consistently detected above regulatory levels at the Site. Groundwater monitoring at the Morgantown site has been focused primarily on past spills and leaks and the effectiveness of the cleanup actions undertaken. The section on CERCLA Section 3.1.3.1 lists the past events and the status of the spill sites.

The only contaminants consistently found in significant amounts in the groundwater at the Morgantown site are related to the application of salts for de-icing. Sodium chloride is applied to the parking lots and roads, and calcium chloride is applied to the sidewalks and outdoor steps. Wells located near these features and near the runoff routes from these features show significantly elevated levels of chloride compared to background levels. This impact on groundwater is a problem shared with many businesses and road maintenance activities in this region, but it is considered a necessary safety practice to prevent injuries to site personnel and visitors.

The overall groundwater monitoring strategy has been to monitor any flow coming onto the site through each aquifer and to monitor the flow after it passes beneath the facilities and moves toward the springs and seeps. Groundwater monitoring at the Morgantown site from

1993 to 2002 was driven by two motivating factors. The first was the mandate of the WVDEP regarding the closure of Pond 005. The second was the mandate of DOE Order 5400.1, General Environmental Protection Program. Although DOE Order 5400.1 no longer exists, samples from many wells were analyzed between 1993 and 2002 for a lengthy list of analytes. This list of analytes included all organic compounds known to have been detected in analyses of the coal tar waste from the gasifier, the Pond 005 bottom sludge, and the sampled soils beneath Pond 005. It also included metals alleged to have been present in the Stretford solution used to remove sulfur oxides in the off-gas from the gasifier. No organic compounds were consistently detected during 10 years of sampling, and no consistent indications of contaminant concentrations above the state limits have been found. Only one analyte (cadmium), traceable to the operation of the closed pond, has been detected, but not above West Virginia groundwater regulatory limits.

After more than 15 years of monitoring, groundwater conditions are well understood. Spills and leaks in the past have not significantly degraded the groundwater on site. The facilities and most of the underlying contaminated soils associated with spills and leaks in the past have been removed. In recent years, operations have changed greatly, and there are few large projects on site that could result in significant groundwater contamination. Most of the research is bench-scale and uses small quantities of chemicals and solvents. Accordingly, the groundwater analyses have been significantly curtailed. Under the new scheme, wells will be sampled each spring and fall. Wells located around the perimeter of the developed portion of the site in the two shallow aquifers will be tested to check water quality as it enters and leaves the developed area. For the deep aquifer (Morgantown Sandstone), sampling will continue for one up-gradient well and three down-gradient wells. The original list of measurements and analyzed compounds, which was presented in the annual site environmental reports of previous years, has been reduced to the list presented in this year's report. The results of the ground water monitoring conducted during 2021 are presented in the Appendix as Table 5.3.1 through Table 5.3.6.

Morgantown is not major user of Per- and Polyfluoroalkyl Substances (PFAS) since: (1) only maintains limited quantities of R&D chemicals considered as PFAS; (2) the one portable fixed aqueous film forming foam (AFFF) system that was present in the past and contents have been removed from the site; and (3) does not operate its own fire department or fire-fighting training facilities.

There is no history of any AFFF discharges at the site. NETL maintains and tracks all chemicals on-site using a chemical inventory management system that ensures proper disposal at the end of chemical life, either via recycling or hazardous waste disposal. Accordingly, Morgantown does not have an active sampling, analysis, tracking, and monitoring program for PFAS-related compounds at any of its sites, as it is not required per the site's industrial wastewater permit or stormwater NPDES permits. While there is an active groundwater monitoring program, PFAS-related substances are not a regular analyte and have never been part of any historical sampling. Drinking water is provided by the local public drinking water system and site groundwater or surface water is not used as a drinking water source.

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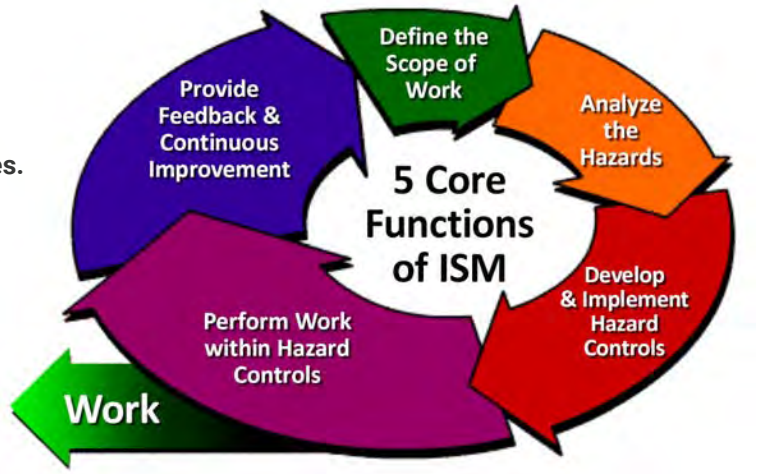
7.0 QUALITY ASSURANCE

NETL manages a wide range of work activities, including basic and applied on-site research; contract administration for off-site research, development, and demonstration projects; design, construction, operation, modification, decommissioning, and environmental remediation of NETL facilities; and oversight functions related to these activities.

NETL's Quality Assurance (QA) Program provides the tools to ensure this work is accomplished safely while minimizing potential hazards to the public, site workers, the environment, and facilities and operations, through directives (orders and procedures), manuals, handbooks, and forms. DOE Order 414.1, Quality Assurance and DOE's Integrated Safety Management (ISM) principles (see Diagram 7.0, ISM core functions) govern NETL's QA Program.

NETL fully integrates its ISM and QA programs, ensuring line management accountability for ES&H issues. NETL implements this through work performance goals assigned to all line managers. Internal assessments and audits also ensure that line managers meet for their ES&H responsibilities.

Diagram 7.0: DOE's ISM principles.



The SARS process serves as the backbone of NETL's QA Program for ES&H. The SARS process identifies and mitigates hazards and environmental impacts highlighting the importance of its effective performance. NETL has four distinct SARS processes: R&D projects, facility construction, facility use, and support operations.

The R&D SARS procedure, NETL Procedure 421.1-01, describes the process for a safety analysis and review of on-site R&D projects. The process identifies, analyzes, and provides the elimination, mitigation, or control of risks associated with on-site R&D projects to a degree acceptable by line management. Following the SARS review, R&D projects receive a SARS operating permit. A team comprising the project's responsible person, an ES&H representative, a project QA engineer, and the site's environmental manager conduct an annual review on all SARS-permitted R&D project. The assessment includes (1) checking for significant modifications made to the project without authorization and SARS review; (2) ES&H Team inspection of the project area covering chemical hygiene, OSHA requirements and environmental compliance; (3) review of the SARS files and the project area for engineering design and QA/quality control concerns; and (4) review of any issues

found in the project area or in the SARS file. Records from each annual assessment become part of the project's SARS file. The team sends the findings from the annual assessment to the responsible person for correction and tracked in the corrective action tracking system.

The Construction Permit SARS manual, NETL Manual 421.1-00.04, ensures that NETL conducts construction activities in a safe and environmentally compliant manner. The review results in an approved construction permit issued before construction activities. Initially, the selected contractor develops and documents an ES&H plan. Construction activities not explicitly covered in contractor ES&H plans will receive an Activity hazard analysis (AHA). Similarly, an AHA will ensure development, consideration, and mitigation of all potential environmental impacts due to construction according to codes and standards.

The Facility SARS manual, NETL Manual 421.1-00.03, addresses on-site facilities including buildings, trailers, utilities, services, structures, roads, and walkways. It ensures the operation, maintenance, and modification of facilities comply with codes, regulations, and standards. The facility SARS focuses on identifying life safety, fire safety, and electrical safety classifications; assessing the compliance of the facility with codes and standards; documenting any deviations of the facility from codes and standards; and developing mitigations to address code deviations and to establish acceptable risk levels for facility utilization when code compliance cannot be achieved without a General Plant Project.

The Support Operations SARS procedure, NETL Procedure 421.1-00.02, addresses on-site support operations conducted by site-support contractors. It includes construction, operations, maintenance, and renovation activities conducted by site support contractors and ensures the analysis of associated risks and their elimination, mitigation, or control to a degree acceptable by responsible line management before initiation of the project or operation. An annual assessment is conducted by ES&H on all SARS-permitted support operations. The annual assessment determines the continued validity of the SARS package and addresses changes in operations. Typical items reevaluated include changes in site conditions, worker training, operating procedures, and the effectiveness of controls. Findings from the annual assessment are sent by the ES&H gatekeeper to the responsible person for correction and tracked in the corrective action tracking system.

Other mechanisms for ensuring the quality of the ES&H programs include internal auditing required by ISO 14001/ISO 45001 certifications, external surveillance and certification audits related to the ISO 14001/ISO 45001 certifications, monthly focused inspections, facility inspections, internal reviews, and annual emergency response drills and exercises.

Many directives, manuals, and handbooks governing ES&H programs also contain monitoring requirements ensuring ES&H programs comply with directives and legal requirements. For example, the Fire Protection Program requires the conduct of fire protection appraisals every three years to ensure the evaluation and reduction to acceptable level of hazards to life and property from fires, explosions, or related risks; evaluation of the adequacy of the local fire protection and prevention programs to minimize injury and protect DOE property; and written reports to responsible management, which include recommendations for action, have been provided.

These activities result in findings tracked to a final resolution in the corrective action tracking system resulting in continual improvement of the ES&H programs.

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APPENDIX

ACRONYM LIST

AAD	Acquisition and Assistance Division
ACHD	Allegheny County Health Department
AEA	Atomic Energy Act of 1954
AEP	American Electric Power Service Corporation
AES	American Environmental Services, Inc.
AHA	Activity Hazard Analysis
AIIS	Assessment Information Input System
ALARA	As Low as Reasonably Achievable
ALB	Albany, Oregon
ANWR	Alaska National Wildlife Refuge
AQCR	Air Quality Control Region
ARRA	American Recovery and Reinvestment Act
B-	Building
BAMF	Biomass Alternative Methane Fuel
BOD	Biochemical Oxygen Demand
CO2e	Carbon Dioxide equivalent
CAA	Clean Air Act
CBOD5	Carbonaceous Biochemical Oxygen Demand 5-day Test
CBT	Computer-Based Training
CCPI	Clean Coal Power Initiative
CCUS	Carbon Capture, Utilization, and Storage
CED	Committed Equivalent Dose
CEqD	Committed Equivalent Dose
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFC	Chlorofluorocarbon

CFO	Chief Financial Officer
CFR	U.S. Code of Federal Regulations
COD	Chemical Oxygen Demand
COPC	Contaminants of Potential Concern
CRADA	Cooperative Research and Development Agreement
CWA	Clean Water Act
CX	Categorical Exclusion
CY	Calendar Year
DMR	Discharge Monitoring Report
DOE	U.S. Department of Energy
DOEGRIT	DOE Green IT
DOT	Department of Transportation
EA	Environmental Assessment
ECM	Energy conservation measure
EISA	Energy Independence and Security Act
EIS	Environmental Impact Statement
EMP	ES&H Management Plan
EMS	Environmental Management System
E.O.	Executive Order
EOR	Enhanced Oil Recovery
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
EPEAT	Electronic Product Environmental Assessment Tool
EPP	Environmentally Preferred Product
ERO	Emergency Response Organization
ES&H	Environmental, Safety, and Health
ES&HMS	Environmental, Safety, and Health Management System
ESPC	Energy Savings Performance Contract
ES&H	Environmental, Safety, Security, and Health
FCOG	Facility Contractors Group

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FECM	Office of Fossil Energy and Carbon Management
FEMP	Federal Emergency Management Program
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FLC	Federal Laboratory Consortium
FONSI	Finding of No Significant Impact
FY	Fiscal Year
GCFCI	Ground-Fault Circuit Interrupter
GHG	Greenhouse Gas
GIS	Geographic Information System
GMP	Groundwater Management Program
GPP	General Plant Project
GSA	U.S. General Services Administration
HAZWOPER	Hazardous Waste 0perations & Emergency Response
HPSB	High Performance and Sustainable Buildings
HVAC	Heating, Ventilation, and Air Conditioning
HQ	Headquarters
IAQ	Indoor Air Quality
ICCS	Industrial Carbon Capture and Sequestration
IGCC	Integrated Gasification Combined Cycle
ISM	Integrated Safety Management
ISO	International Organization for Standardization
LDR	Land Disposal Restriction
LED	Light-Emitting Diode
LEED	Leadership in Energy and Environmental Design
LLRW	Low-Level Radioactive Waste
MAA	Mutual Aid Agreement
MGN	Morgantown, West Virginia
MRB	Management Review Board
MSHA	Mine Safety and Health Administration
MUB	Morgantown Utility Board

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NAAQS	National Ambient Air Quality Standards
NEC	National Electric Code
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NETL	National Energy Technology Laboratory
NFPA	National Fire Protection Association
NIMS	National Incident Command System
NIOSH	National Institute of Occupational Safety and Health
NNSA	National Nuclear Security Administration
NORM	Naturally Occurring Radioactive Material
NOV	Notice of Violation
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPRA	National Petroleum Reserve
NRC	Nuclear Regulatory Commission
ODEQ	Oregon Department of Environmental Quality
ODS	Ozone-Depleting Substance
ORPS	Occurrence Reporting and Processing System
OSHA	Occupational Safety and Health Administration
PADEP	Pennsylvania Department of Environmental Protection
PCB	Polychlorinated Biphenyl
PGH	Pittsburgh, Pennsylvania
PHA	Pleasant Hills Authority
QA	Quality Assurance
QC	Quality Control
R&D	Research and Development
RCRA	Resource Conservation and Recovery Act
REC	Renewable Energy Credit
SARA	Superfund Amendments and Reauthorization Act
SARS	Safety Analysis and Review System

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SCC	Strategic Center for Coal
SCNGO	Strategic Center for Natural Gas and Oil
SHPO	State Historic Preservation Officer
SMS	Safety Management System
SOFC	Solid Oxide Fuel Cell
SPCC	Spill Prevention, Control, and Countermeasures Plan
SSP	Site Sustainability Plan
SVOC	Semi-Volatile Organic Compound
SWQM	Surface Water Quality Manager
TCE	Trichloroethylene
TED	Total Effective Dose
TLD	Thermo-Luminescent Dosimeter
TMDL	Total Maximum Daily Loading
TOX	Total Organic Halogens
TPH	Total Petroleum Hydrocarbons
TPQ	Threshold Planning Quantity
TRI	Toxic Release Inventory
TSCA	Toxic Substances Control Act
TSD	Treatment, Storage, and Disposal
TSS	Total Suspended Solids
USDA	U.S. Department of Agriculture
USGBC	U.S. Green Building Council
VOC	Volatile Organic Compound
WDEQ	Wyoming Department of Environmental Quality
WVDEP	West Virginia Department of Environmental Protection
WVU	West Virginia University
WWTF	Wastewater Treatment Facility

TABLES AND FIGURES

Table: ES&H Programs	
Affirmative Procurement Advocate/Greening Acquisition Program	Hazardous Waste Program
Air Quality Program	Hearing Conservation Program
Alarms Oversight Program	Illumination Quality Program
Asbestos and Lead Abatement Program	Inactive Waste Sites/Off-Site Remediation Program
Authority Having Jurisdiction (AHJ)/Exemptions Program	Indoor Air Quality and Ventilation Program
Assessment Information Input System (AIIS) Program	Industrial Hygiene Program
Computerized Accident/Incident Report System (CAIRS) Program (Injury/Illness Reporting)	Industrial Wastewater Quality Program
Chemical Handling Facility	Laser Safety Program
Chemical Hygiene Program	Lessons Learned Program
Chemical Inventory and Safety Data Sheet (SDS) Program	Life Safety Program
Confined Space Program	Medical Monitoring Program
Construction and Maintenance Safety Program	National Environmental Policy Act (NEPA) Compliance Program
Cryogenic Safety Program	Resource Conservation and Recovery Act (RCRA) Nonhazardous Waste Program
Directives Program	Occupational Medicine Program
Electrical Safety Program	Occurrence Reporting and Processing System (ORPS) Program
Emergency Preparedness Program/Emergency Response Program	Organization Incident Reporting Program
Environment, Safety, and Health Management System (ESHMS)— Management Review Program	OSHA Safety Program
Environmental Program	R&D Projects Program
Ergonomics Program	Radiation Safety Program
ES&H Communications Program	Records Program
ES&H Training Program	Respiratory Protection Program
Facility and Area Custodian Program	Safety & Health Program
Facility Work Authorization Program (Site Operations Division)	Superfund Amendments and Reauthorization Act (SARA) Title III Program
Facility Safety Committee Program	Safety Analysis and Review System (SARS) Program
Fire Protection Program	Soil Quality Program
Fire Warden Program	Storage Tank Program
Ground Water Quality Program	Surface Water Quality Program
Hazard Communication Program	Waste Management Oversight Program
	Waste Minimization and Pollution Prevention Program
	Water Quality Program

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Table 4.1: Environmental, Safety, and Health Significant Aspects for FY2021
Waste Minimization, Pollution Prevention, and Recycling
High Performance Sustainable Building Implementation
Hazardous Materials Procurement, Consumption, and Storage
Electronic Stewardship
Greenhouse Gas Air Emissions
Green Purchasing
Energy and Fuel Management
Water Usage
Workplace Health and Safety Issues
Organizational Resilience – Climate Change Adaptation (ON HOLD)

Table 4.2: Environmental, Safety, and Health Significant Aspects for FY2022
Waste Minimization, Pollution Prevention, and Recycling
High Performance Sustainable Building Implementation
Hazardous Materials Procurement, Consumption, and Storage
Electronic Stewardship
Greenhouse Gas Air Emissions
Green Purchasing
Energy and Fuel Management
Water Usage
Workplace Health and Safety Issues
Organizational Resilience – Climate Change Adaptation
Refrigerant Management
Safety Culture

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Table 4.3: FY2021 Environmental Management Plan Metrics				
Environmental Management Plan	Objective/ Target	Baseline	Target	Actual
Waste Minimization, Pollution Prevention, and Recycling				
Recycling	Divert nonhazardous solid waste from disposal annually. Pursue opportunities for net-zero waste or additional diversion opportunities. (E.O. 13834)		Divert/recycle non-hazardous waste produced.	922,350 lbs. out of 1,311,741 lbs. recycled in FY2021 = 70%.
			Identify opportunities to reduce nonhazardous waste in FY2021.	An opportunity was identified concerning touchless paper towel units for the restrooms. It has not been completed yet.
Recycling Construction Waste	Divert/recycle any construction/demolition waste from landfill disposal to the maximum extent feasible. (E.O. 13834)		Divert/recycle construction/demolition waste.	1,830,900 lbs. diverted/recycled during the fiscal year.
High-Performance Sustainable Building Implementation				
High Performance Sustainable Buildings	Ensure all new construction and major renovations comply with the 2016 Guiding Principles. Make annual progress towards 100% conformance with the Guiding Principles. (E.O. 13834) Ensure at least 15% of existing facilities above 10,000 gross square feet meet the Guiding Principles by FY2021. (E.O. 13834)		Track the design packages to ensure they contain High Performance Sustainable Building (HPSB) requirements.	As of the end of the fiscal year, 7 out of 46 applicable buildings (15.2%) were certified to the Guiding Principles.
			Develop a High-Performance Sustainable Building Plan as part of the Site Sustainability Plan.	The Site Sustainability Plan contains the High-Performance Sustainable Building Plan.
			Submit Site Sustainability Plan (SSP) to DOE-HQ.	Site Sustainability Plan was submitted to DOE-HQ on 12/5/20.
Hazardous Materials Procurement, Consumption, and Storage				
Chemical Inventory	Reduce the quantity of toxic and hazardous chemicals and materials acquired, used, and disposed during FY2021 using FY2020 as a baseline. (E.O. 13834)	12,514 containers	No net gain (plus or minus 10% of baseline) of chemicals (by number of containers and/or weight in pounds).	13,064 containers 21,139 pounds (4.4% increase)

Table 4.3: FY2021 Environmental Management Plan Metrics				
Environmental Management Plan	Objective/ Target	Baseline	Target	Actual
Electronic Stewardship				
Purchase of Electronic Products	To revisit and ensure that processes are in place to evaluate requisitions that have been identified for EPEAT-certified electronic equipment based on the requirements of the aspect. (E.O. 13834) Inspect procurement reference for EPEAT-registered electronic products and the procurement of Energy Star- and FEMP-designated electronic equipment. (E.O. 13834)		95% of all products purchased that have EPEAT standards are EPEAT registered.	100% of products are EPEAT-registered.
			95% of specific electronic products are Energy Star- and FEMP-designated.	100% of electronic products are Energy Star and FEMP-designated.
Operation and Maintenance of Electronic Products	Enable power management, duplex printing, and other energy-efficient or environmentally preferable features on all eligible DOE electronic products. (E.O. 13834)		Ensure that 90% of managed workstations and printers have power management settings in place.	100% or printers and 98.16% of workstations have power management settings in place.
End of Life Management of Electronic Products	Verify end-of-life management of excess/surplus electronics follow Bulletin FMR B-34 and the hierarchy established: 1. Reuse within an agency 2. Reuse through transfers, donations, and sales; 3. Recycling through certified recyclers and manufacturer take-back programs using certified recyclers. (E.O. 13834)		Verify that disposition contracts are in place and being used at the PGH, MGN, and ALB sites. Provide contract no. or agreement and implementing person by the end of first quarter FY2020.	Contract between GSA and third-party recycler, Powerhouse Recycling, continues for both PGH and MGN. ALB has a separate contract which is followed and utilizes both UNICOR and the USPS to disposition ADP scrap.
			Report ultimate disposition weights on a quarterly basis.	Year-end total = 22,615 lbs.
			Verify a process is in place to determine the appropriate hierarchy for all excess/surplus electronic products.	ADP scrap is recycled in alignment with the GSA contract which is renewed annually. In addition, excess items are allocated thru GSA or OPMO-approved donations.

Table 4.3: FY2021 Environmental Management Plan Metrics				
Environmental Management Plan	Objective/ Target	Baseline	Target	Actual
Greenhouse Gas Air Emissions				
GHG Emission Reporting	Track and report comprehensive GHG emission inventory for FY2021 via the DOE Sustainability Dashboard. (E.O. 13834)		Track and report GHG emission inventory via the DOE Sustainability Dashboard.	Total emissions = 36,710,999.2 lbs. CO_2e (16,652 metric tons)

Table 4.3: FY2021 Environmental Management Plan Metrics				
Environmental Management Plan	Objective/ Target	Baseline	Target	Actual
Green Purchasing				
Environmentally Preferred Products	Purchase products that are: recycled, Bio Preferred, Energy Star, FEMP-designated, EPEAT, Water Sense - or otherwise water efficient. (E.O. 13834)		Ensure that 95% of new contract actions for products and services are: energy efficient, water efficient, bio-based content, environmentally preferable, non-ozone depleting, recycled content, and non-toxic, or less toxic than alternatives.	97.5% of contract actions were energy efficient, water efficient, bio-based content, environmentally preferable, non-ozone depleting, recycled content, and non-toxic, or less toxic than alternatives.
	Acquire uncoated printing and writing paper containing at least 30% post-consumer fiber. Reduce printing paper use. (E.O. 13834)		Ensure 98% of copier and printer paper shall contain a minimum of 30% recycled post-consumer fiber.	99.7% of copier and printer paper contained 30% recycled post-consumer fiber.
	Maximize site use of environmentally preferred products (EPPs), including those that have recycled content, are Bio Preferred, or have the Energy Star, FEMP, or EPEAT designation in operation and maintenance, janitorial, and general office activities. Also maximize the use of sustainable products. (E.O. 13834)		Ensure that 80% of all products that can be purchased "green" under the site support and construction contracts are of environmentally preferred products (EPPs).	93.6% of products purchased are "green" purchases.

Table 4.3: FY2021 Environmental Management Plan Metrics

Environmental Management Plan	Objective/ Target	Baseline	Target	Actual
Energy and Fuel Management				
Energy Use	Reduce energy usage/square foot by 1.0% in FY2021 from FY2020. (E.O. 13834)	141,060 BTU/ft^2	139,650 BTU/ft^2 (1.0%)	143,457 BTU/ft^2 1.7% increase
Management of Servers and Data Centers	Maximize efficiency of data centers through virtualization and consolidation. (E.O. 13834) Establish a power usage effectiveness (PUE) of 1.2 to 1.4 for new data centers and less than 1.5 for existing data centers. (E.O. 13834)		Have dedicated smart meters installed in MGN, PGH, and ALB data centers in order to measure a monthly PUE.	Smart meters are a part of the design package for all three data centers. The MGN data center is complete. Awaiting construction for the ALB and PGH data centers.
			Identify remaining physical servers and establish a plan to virtualize into the NETL datacenter or a cloud instance.	NETL has identified remaining physical servers and has virtualized 95% of the data centers according to the plan.
			Identify a plan (consolidation, hot/cold row, reduced footprint) to optimize the PUE for the data centers.	Plans have been identified: - ALB: hot/cold aisle containment - construction phase started - MGN: contained cooling space as well as hot/cold aisles - construction phase complete - PGH: hot/cold aisle containment Also, NETL is developing a strategy for moving services to a cloud provider.
Renewable Energy	Ensure that NETL meets renewable energy on-site usage goals as defined in EPACT 2005, E.O. 13834, DOE Order 436.1, EISA 2007, and DOE SRIP. Ensure that NETL's total electrical energy consumption includes 7.5% renewable energy in FY 2021. (2,500 MWh)	7.5% of renewable energy consumption	Ensure that NETL's total electrical energy consumption includes the DOE SRIP target of 7.5% renewable energy in FY 2021 (2,500 MWh).	0.14% onsite plus RECs to meet 7.5%.
	Procure Renewable Energy Credits to meet the 7.5% renewable electric energy and clean energy goals. (E.O. 13834)		Procure RECs to meet the renewable electric energy and clean energy goals.	NETL purchased Renewable Energy Certificates (RECs) to meet this goal.

Table 4.3: FY2021 Environmental Management Plan Metrics				
Environmental Management Plan	Objective/ Target	Baseline	Target	Actual
Energy and Fuel Management (cont.)				
Fleet Management	Reduce FY2021 petroleum consumption 2% from FY2020 level. (E.O. 13834)	2,356 GGE	Reduce FY 2021 fleet petroleum consumption by 2% from FY 2020 levels by increasing use of all-electric zero-emissions vehicles or plug-in hybrid vehicles in fleet and continue use of alternative fuel in fleet AFVs. Number is 2,309 GGE.	5,000 GGE 112% increase

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Table 4.3: FY2021 Environmental Management Plan Metrics				
Environmental Management Plan	Objective/ Target	Baseline	Target	Actual
Water Usage				
Potable Water Consumption	Reduce potable water consumption by 0.5% from the final number for FY2020. (E.O. 13834)	9.788 gal/gsf	9.739 gal/gsf (0.5% reduction)	8.7 gal/gsf (11.2% reduction)

Table 4.3: FY2021 Environmental Management Plan Metrics				
Environmental Management Plan	Objective/ Target	Baseline	Target	Actual
Workplace Health and Safety Issues				
Naturally Occurring Radioactive Materials (NORM)	To survey, manage, and control NORM/TE-NORM that is in use or part of R&D operations to ensure the safety of individuals performing the research, control the areas/methods of use, and allow for proper disposal of wastes associated with the use of NORM or TE-NORM. Incorporate proper controls, precautions, and warnings into procedures and R&D SARS packages to ensure appropriate controls are maintained to prevent possible exposure.		Continue to track the number of surveys and items that were surveyed each quarter.	66 items were surveyed during a total of 9 surveys.
			Combine the two different radiation protection procedures into one; incorporate NORM/TE-NORM updates.	The two old procedures have been combined and updated and are awaiting approval.
			Ensure tracking of NORM/TE-NORM inventory via tracking system.	The database has been finalized to track the radioactive and NORM materials.

Table 4.3: FY2021 Environmental Management Plan Metrics				
Environmental Management Plan	Objective/ Target	Baseline	Target	Actual
Workplace Health and Safety Issues (cont.)				
Research Project-Specific Training Completion Rate Improvements	Get NETL lab personnel training deficiencies down to more acceptable levels. Currently running between 250 and 300 since October 1st (203 = avg over the past 12 months).		No more than 100 instances of deficient project-specific training at the end of any week over the next calendar year.	240 instances on average at the end of the fiscal year.

Objective/target not met in FY2021

Objective/target partially met in FY2021

Objective/target met in FY2021

Table 4.4: FY2022 Environmental Management Plan Metrics—First Quarter				
Environmental Management Plan	Objective/Target		Target	Actual
Waste Minimization, Pollution Prevention, and Recycling				
Recycling	Divert non-hazardous solid waste from disposal annually. (E.O. 14057)		Divert/recycle non-hazardous waste produced.	22,413 lbs. recycled out of 93,023 lbs. = 24% recycled.
	Pursue opportunities for net-zero waste or additional diversion opportunities. (E.O. 14057)		Identify opportunities to reduce non-hazardous waste in FY2022.	A quote for the touchless paper towel units has been received. The quote is being forwarded for approval.
Recycling Construction Waste	Sites are expected to continue to reduce waste sent to landfill through elimination, source reduction, and recycling, as well as maintain or increase their waste diversion rate. (2020 DOE Sustainability Report and Implementation Plan)		Divert/recycle construction/demolition waste cost effectively in FY 2022.	80,000 lbs. have been diverted/recycled.
High-Performance Sustainable Building Implementation				
High-Performance Sustainable Buildings	Ensure all new construction and major renovations comply with the 2020 Guiding Principles for Sustainable Federal Buildings. (EISA 2007 "Energy Independence and Security Act 2007")		Track the design packages to ensure they contain High Performance Sustainable Building (HPSB) requirements.	All FY2020/2021/2022 construction/renovation projects have included HPSB Guiding Principles conformance.
	Ensure at least 15% of existing facilities above 10,000 gross square feet meet the Guiding Principles by FY 2022. (EISA 2007 "Energy Independence and Security Act 2007")		Develop a High-Performance Sustainable Building Plan as part of the Site Sustainability Plan.	The Site Sustainability Plan was submitted to DOE-HQ on December 3, 2021. It contains the HPSB Plan.
			Submit Site Sustainability Plan (SSP) to DOE-HQ.	The Site Sustainability Plan was submitted to DOE-HQ on December 3, 2021.

Table 4.4: FY2022 Environmental Management Plan Metrics—First Quarter				
Environmental Management Plan	Objective/Target		Target	Actual
Hazardous Materials Procurement, Consumption, and Storage				
Chemical Inventory	Reduce the quantity of toxic and hazardous chemicals and materials acquired, used, and disposed during FY 2022 using FY 2021 as a baseline. (E.O. 14057)	13,064 containers	No net gain (+/- 10% of baseline) of chemicals (by number of containers and/or weight in pounds).	12,813 containers 14,452 pounds
Electronic Stewardship				
Purchase of Electronic Products	To revisit and ensure that processes are in place to evaluate requisitions that have been identified for EPEAT-certified electronic equipment based on the requirements of the aspect. Inspect procurement reference for EPEAT-registered electronic products and the procurement of Energy Star designated electronic equipment.		95% of all products purchased that have EPEAT standards are EPEAT registered.	Purchases of electronics products for FY2022 YTD are at 99.14% purchased per EPEAT standards.
Operation and Maintenance of Electronic Products	Enable power management, duplex printing, and other energy-efficient or environmentally preferable features on all eligible DOE electronic products. (E.O. 14057)		Ensure that 90% of managed workstations and printers have power management settings in place.	100% of printers and 99.1% (1,517/1,530) of workstations have power management settings in place.

Table.4.4: FY2022 Environmental Management Plan Metrics—First Quarter				
Environmental Management Plan	Objective/Target	Baseline	Target	Actual
Electronic Stewardship (cont.)				
End-of-Life Management of Electronic Products	Verify end-of-life management of excess/surplus electronics follow Bulletin FMR B-34 and the hierarchy established: 1. Reuse within an agency 2. Reuse through transfers, donations, and sales; 3. Recycling through certified recyclers and manufacturer take-back programs using certified recyclers. (E.O. 14057)		Verify that disposition contracts are in place and being used at the PGH, MGN, and ALB sites. Provide contract no. or agreement and implementing person by the end of first quarter FY2022.	The contract between GSA and the third-party recycler, Powerhouse Recycling, continues for both PGH and MGN. ALB has a separate contract which is followed and utilizes both UNICOR and the USPS to disposition ADP scrap.
			Report ultimate disposition weights on a quarterly basis.	No scrap was received or dispositioned due to the lack of employees onsite.
			Verify a process is in place to determine the appropriate hierarchy for all excess/surplus electronic products.	ADP scrap is recycled in alignment with the GSA contract which is renewed annually. In addition, excess items are allocated thru GSA or OPMO-approved donations.

Table 4.4: FY2022 Environmental Management Plan Metrics—First Quarter				
Environmental Management Plan	Objective/Target	Baseline	Target	Actual
Greenhouse Gas Air Emissions				
GHG Emission Reporting	Report comprehensive GHG emission inventory for FY2022 by the end of January 2023. (DOE 2020 DOE Sustainability Report and Implementation Plan)		Report emission inventories on an annual basis for year-end (FY) wrap-up by January 31, 2023.	The data will be submitted at the end of FY2022.

Table 4.4: FY2022 Environmental Management Plan Metrics—First Quarter				
Environmental Management Plan	Objective/Target	Baseline	Target	Actual
Green Purchasing				
Environmentally Preferred Products	Purchase products that are: recycled, Bio Preferred, Energy Star, FEMP-designated, EPEAT, Water Sense - or otherwise water efficient. (E.O. 14057)		Report the number of applicable contract actions with sustainable clauses.	23 contract actions with sustainable clauses.
			Report the value of applicable contract actions with sustainable clauses.	Value of contraction actions with sustainable clauses = $15,543,100.03-

Table 4.4: FY2022 Environmental Management Plan Metrics—First Quarter				
Environmental Management Plan	Objective/Target	Baseline	Target	Actual
Energy and Fuel Management				
Energy Use	Reduce energy usage/square foot by 1.0% in FY2022 from FY2021.	143,457 BTU/ft^2	142,017 BTU/ft^2 1.0% reduction	39,172 BTU/ft^2 3.5% reduction
Management of Servers and Data Centers	Maximize efficiency of data centers through virtualization and consolidation. (E.O. 14057) Establish a power usage effectiveness (PUE) of 1.2 to 1.4 for new data centers and less than 1.5 for existing data centers. (E.O. 14057)		Have dedicated smart meters installed in MGN, PGH, and ALB data centers in order to measure a monthly PUE.	Smart meters are a part of the design package for all three data centers. The MGN data center is complete. Awaiting construction for ALB and PGH data centers.
			Identify remaining physical servers and complete a plan to virtualize into the NETL datacenter or a cloud instance.	NETL is 95% virtualized.
			Identify a plan (consolidation, hot/cold row, reduced footprint) to optimize the PUE for the data centers.	Change to: Plans have been identified: - ALB: hot/cold aisle containment - construction phase started - MGN: contained cooling space as well as hot/cold aisles - construction phase complete - PGH: hot/cold aisle containment Also, NETL is developing a strategy for moving services to a cloud provider.

Table 4.4: FY2022 Environmental Management Plan Metrics—First Quarter				
Environmental Management Plan	Objective/Target	Baseline	Target	Actual
Energy and Fuel Management (cont.)				
Renewable Energy	Ensure that NETL meets renewable energy on site usage goals as defined in EPAct 2005 and 2020 DOE SRIP. (EPACT 2005, 2020 DOE Sustainability Report and Implementation Plan (SRIP)). .	7.5% of renewable energy consumption	Ensure that NETL's total electrical energy consumption includes the 2020 DOE SRIP target of 7.5% renewable energy in FY2022 (3,500 MWh).	0.14% onsite plus RECs to meet 7.5%.
			Procure Renewable Energy Credits to meet the 7.5% renewable electric energy and clean energy goals.	NETL will purchase Renewable Energy Certificates (RECs) to meet this goal.
Fleet Management	Reduce FY 2022 petroleum consumption 2% from FY 2021 level. (DOE 2020 DOE Sustainability Report and Implementation Plan)	5,000 GGE	Reduce FY2022 fleet petroleum consumption by 2% from FY2021 levels by increasing use of all-electric zero-emissions vehicles or plug-in hybrid vehicles in fleet and continue use of alternative fuel in fleet AFVs. Number is 4,900 GGE.	884 GGE
	Increase FY 2022 alternate fuel usage by 10% from FY 2021 level. (DOE 2020 DOE Sustainability Report and Implementation Plan)	5,587 gallons	Increase FY 2022 alternate fuel usage by 10% from FY 2021 levels by increasing use of all-electric ZEVs or plug-in hybrid vehicles in fleet. FY 2022 Target = 5,028 gallons	1,616 gallons

Table 4.4: FY2022 Environmental Management Plan Metrics—First Quarter				
Environmental Management Plan	Objective/Target	Baseline	Target	Actual
Water Usage				
Potable Water Consumption	Reduce potable water consumption by 0.5% from the final number for FY2021.	8.7 gal/gsf	8.66 gal/gsf 0.5% decrease	2.862 gal/gsf 31.6% increase

Table 4.4: FY2022 Environmental Management Plan Metrics—First Quarter				
Environmental Management Plan	Objective/Target	Baseline	Target	Actual
Workplace Health and Safety Issues				
Radiation Protection Program	To survey, manage, and control radiation that is in use or part of R&D operations to ensure the safety of individuals performing the research, control the areas/methods of use, and allow for proper disposal of wastes associated with the use of NORM or TE-NORM. Also to incorporate proper controls, precautions, and warnings into procedures and R&D SARS packages to ensure appropriate controls are maintained to prevent possible exposure.		Continue to track the number of surveys and items that were surveyed each quarter. Continue to populate the radiation database with the all the radiation materials, sealed sources, and RGD.	1 survey was completed, which looked at 2 items. The access database has been completed and the SSC IH group is in the process of populating the data into the database.
			Combine the two different radiation protection procedures into one; incorporate NORM/TE-NORM, radiation generating devices, and non-ionizing radiation flow chart for when dosimetry is required.	Draft procedure that combined the two different radiation procedures into one is in final draft. Final draft has been approved by the Site Manager. Final draft is waiting for approval from the Associate Director.
			Ensure that that all personnel are properly trained.	All personnel have been trained.
			Ensure that dosimetry is worn when operating RGD.	Dosimetry has been worn in all cases when operating RGD.
			Ensure that all SARS protects that utilize RGD have the hazard properly documented in the SARS package.	RGD has been accounted for in all SARS packages reviewed this quarter.

Table 4.4: FY2022 Environmental Management Plan Metrics—First Quarter				
Environmental Management Plan	Objective/Target	Baseline	Target	Actual
Workplace Health and Safety Issues (cont.)				
Research Project-Specific Training Completion Rate Improvements	Get NETL lab personnel training deficiencies down to more acceptable levels.		No more than 100 instances of deficient project-specific training at the end of any week over the next calendar year.	Only data report analyzed (the training deficiencies from 12-30-21) gave an adjusted value of 41 deficiencies.

Table 4.4: FY2022 Environmental Management Plan Metrics—First Quarter				
Environmental Management Plan	Objective/Target	Baseline	Target	Actual
Refrigerant Measurement				
Refrigerant Management	Establish an inventory of refrigerants at NETL and set up a tracking system for purchases, losses, recovery, recycling, and disposal.		Identify all refrigerants currently used/stored refrigerants at each site in an inventory.	Identification of all refrigerants will be completed as part of 3rd quarter inventory report.
			Develop an equipment inventory for each site/include the refrigerant amount in each piece of equipment.	Identification of all equipment containing refrigerants will be completed as part of the 3rd quarter inventory report.
			Revise the Tracking Form to ensure all necessary inputs and losses (removals and leaks) are included.	Tracking form has been revised - NETL Form 434.1-4, Refrigerant Management Recordkeeping Logbook.
			Develop an Equipment/Refrigerant Purchase Form for new (incoming)refrigerants.	Developed NETL Form 434.1-4/1, Refrigerant & Equipment Purchase.
			Generate a refrigerant inventory on a quarterly basis to ensure the inventory tracks with the needs of the Site Sustainability Plan.	Report not generated this quarter and will be submitted shortly after the 2nd quarter for the first two quarters.

Table 4.4: FY2022 Environmental Management Plan Metrics—First Quarter				
Environmental Management Plan	Objective/Target	Baseline	Target	Actual
Safety Culture				
Access and Clarity of R&D Project Safety Documentation	Improve consistency and accessibility of R&D SARS files.		Ensure eSARS documents are filed in a consistent manner.	No data available. The EMP will not start until the second quarter.
			Develop the Business System Upgrade Plan based on funding available.	No data available. The EMP will not start until the second quarter.
Leading Indicators	Improve the Safety Culture at NETL by establishing leading indicators for safety and health metrics.		Identify, develop, and implement leading indicators. Will monitor the DOE Safety Culture Improvement Panel (SCIP) and Measuring and Monitoring Workgroup for eventual alignment. Step 1: Identify possible leading indicators for management approval. Step 2: Information will begin to be gathered to establish a long term data-gathering process and establish a baseline for each approved metric. Step 3: Leading indicators will be implemented and data posted to the intranet.	The leading indicators are being developed for management approval.
Organizational Resilience				
Organizational Resilience Planning	Update policies to ensure planning for and addressing the impacts of climate change.		Complete the DOE-mandated Vulnerability Assessment and Resilience Plan (VARP) during FY 2022.	No data for the quarter. EMP will not be implemented until second quarter.

Objective/target not likely to be met in FY2022

Objective/target only partially met thus far in FY2022

Objective/target likely to be met in FY2022

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Table 5.3.1: NETL-Albany 2021 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples–VOC Constituents (µg/L)

Constituent	Well Number, Sample Date															
	MW-1		MW-2		MW-3		MW-4		MW-5		MW-6		MW-7		MW-8	
	N/A	N/A	N/A	N/A	03/02	08/23	03/03	08/23	03/04	08/25	03/04	08/25	03/04	08/26	03/03	08/24
1,1,1,2-Tetrachloroethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloropropene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichloropropane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,2-Dichloropropane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorotoluene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorotoluene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromobenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	NS	NS	NS	NS	ND	0.30	ND	ND	0.79	1.8	ND	ND	ND	ND	ND	ND

CONTROLLED

Table 5.3.1: NETL-Albany 2021 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples–VOC Constituents (µg/L)

Constituent	Well Number, Sample Date															
	MW-1		MW-2		MW-3		MW-4		MW-5		MW-6		MW-7		MW-8	
	N/A	N/A	N/A	N/A	03/02	08/23	03/03	08/23	03/04	08/25	03/04	08/25	03/04	08/26	03/03	08/24
Chloromethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	0.69	ND	ND	ND	ND
cis-1,3-Dichloropropene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromomethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorobromomethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl tert butyl ether	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Propylbenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Isopropyl toluene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene (TCE)	NS	NS	NS	NS	ND	0.60	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylene, Total	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND – Not detected NS – Not sampled

Exceeds Groundwater Quality Standards

Table 5.3.2: NETL-Albany 2021 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples–VOC Constituents (µg/L)

Constituent	Well Number, Sample Date															
	MW-9		MW-10		MW-11		MW-12		MW-13		MW-14		MW-15		MW-16	
	03/04	08/24	03/05	08/24	03/05	08/25	N/A	N/A	03/03	08/23	03/04	08/23	03/02	08/26	03/04	08/26
1,1,1,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloropropene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichloropropane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
2,2-Dichloropropane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorotoluene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorotoluene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Bromobenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	14	9.9	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	1.5	11	2.2	0.99	ND	ND

CONTROLLED

Table 5.3.2: NETL-Albany 2021 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples–VOC Constituents (µg/L)

Constituent	Well Number, Sample Date															
	MW-9		MW-10		MW-11		MW-12		MW-13		MW-14		MW-15		MW-16	
	03/04	08/24	03/05	08/24	03/05	08/25	N/A	N/A	03/03	08/23	03/04	08/23	03/02	08/26	03/04	08/26
Chloromethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	1.3	ND	ND
cis-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Dibromomethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorobromomethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	0.47	ND	ND	ND	ND
Dichlorodifluoromethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Methyl tert butyl ether	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
n-Propylbenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
p-Isopropyl toluene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene (TCE)	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	70	130	ND	ND
Trichlorofluoromethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Xylene, Total	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND

ND – Not detected NS – Not sampled

Exceeds Groundwater Quality Standards

CONTROLLED

Table 5.3.3: NETL-Albany 2021 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples–VOC Constituents (µg/L)

Constituent	Well Number, Sample Date															
	MW-17		MW-18		MW-19		MW-20		MW-21		MW-22		MW-23		MW-24	
	03/03	08/23	03/02	08/26	03/04	08/24	03/05	08/24	N/A	N/A	03/03	08/24	03/05	08/23	03/05	08/25
1,1,1,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,1-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,3-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
2,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
2-Butanone	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
2-Chlorotoluene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
2-Hexanone	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
4-Chlorotoluene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Bromobenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Bromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Bromomethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	0.62	170	140	ND	ND	2,200	1,700	NS	NS	17	14	1.4	0.42	180	250
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Chloroform	0.28	0.46	24	18	ND	ND	190	160	NS	NS	3.2	2.5	4.3	1.7	23	23

CONTROLLED

Table 5.3.3: NETL-Albany 2021 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples–VOC Constituents (µg/L)

Constituent	Well Number, Sample Date															
	MW-17		MW-18		MW-19		MW-20		MW-21		MW-22		MW-23		MW-24	
	03/03	08/23	03/02	08/26	03/04	08/24	03/05	08/24	N/A	N/A	03/03	08/24	03/05	08/23	03/05	08/25
Chloromethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	0.36	ND
cis-1,2-Dichloroethene	ND	1.5	ND	ND	ND	ND	0.71	0.57	NS	NS	1.9	2.2	ND	ND	ND	ND
cis-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Dibromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Dibromomethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Dichlorobromomethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Isopropylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Methyl tert butyl ether	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Naphthalene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
n-Butylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
n-Propylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
p-Isopropyl toluene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Styrene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	ND	ND	16	9.3	ND	ND	14	8.1	NS	NS	0.93	1.1	ND	ND	0.61	0.78
Toluene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	0.46	ND	ND	ND	ND
trans-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Trichloroethene (TCE)	1.5	44	44	94	ND	ND	240	190	NS	NS	6.5	7.8	0.87	0.31	82	88
Trichlorofluoromethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Vinyl chloride	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Xylene, Total	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND

ND – Not detected NS – Not sampled

Exceeds Groundwater Quality Standards

CONTROLLED

Table 5.3.4: NETL-Albany 2021 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples–VOC Constituents (µg/L)

Constituent	Well Number, Sample Date													
	MW-25		MW-26		MW-27		MW-28		MW-29		MW-30		MW-31	
	03/04	08/24	03/04	08/23	03/02	08/26	03/02	08/26	03/03	08/23	03/04	08/25	03/04	08/25
1,1,1,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorotoluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorotoluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND	73	32	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	17	2.4	ND	ND	ND	ND	ND	ND	0.47	ND

CONTROLLED

CONTROLLED

Table 5.3.4: NETL-Albany 2021 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples–VOC Constituents (µg/L)

Constituent	Well Number, Sample Date													
	MW-25		MW-26		MW-27		MW-28		MW-29		MW-30		MW-31	
	03/04	08/24	03/04	08/23	03/02	08/26	03/03	08/26	03/03	08/23	03/04	08/25	03/04	08/25
Chloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.4	5.8	ND	ND
cis-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromomethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorobromomethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl tert butyl ether	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Propylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Isopropyl toluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.53	ND	ND
trans-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene (TCE)	ND	ND	ND	ND	ND	0.59	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylene, Total	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND – Not detected NS – Not sampled

Exceeds Groundwater Quality Standards

CONTROLLED

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Table 5.3.5: NETL-Albany 2021 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples–VOC Constituents (µg/L)

Constituent	Well Number, Sample Date							
	MW-100		MW-101		MW-102		MW-103	
	03/03	08/25	03/03	08/25	03/03	08/25	03/03	08/25
1,1,1,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND
2,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorotoluene	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorotoluene	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	ND	ND	ND	ND	ND	ND	ND	ND
Bromobenzene	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	1.0	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	0.40	ND	ND	ND	ND	ND	ND

CONTROLLED

Table 5.3.5: NETL-Albany 2021 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples–VOC Constituents (µg/L)

Constituent	Well Number, Sample Date							
	MW-100		MW-101		MW-102		MW-103	
	03/03	08/25	03/03	08/25	03/03	08/25	03/03	08/25
Chloromethane	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	ND	0.54	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND
Dibromomethane	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorobromomethane	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	ND	ND	ND	ND	ND	ND	ND	ND
Methyl tert butyl ether	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	ND	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	ND	ND	ND	ND	ND	ND	ND	ND
n-Propylbenzene	ND	ND	ND	ND	ND	ND	ND	ND
p-Isopropyl toluene	ND	ND	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene (TCE)	2.9	80	0.94	1.8	10	6.5	ND	0.57
Trichlorofluoromethane	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	ND	ND	ND	ND	ND	ND	ND	ND
Xylene, Total	ND	ND	ND	ND	ND	ND	ND	ND

ND – Not detected

Exceeds Groundwater Quality Standards

CONTROLLED

Table 5.3.6: NETL-Albany 2021 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples–Metals (mg/L)

Constituent	Well Number, Sample Date							
	MW-3		MW-4		MW-6		MW-13	
	03/02	08/23	03/03	08/23	03/04	08/25	03/03	083/23
Aluminum	0.53	0.41	ND	ND	0.89	0.16	0.16	0.062
Antimony	ND	ND	ND	ND	ND	ND	0.00017	0.00018
Arsenic	0.00057	0.00063	0.00082	0.0025	0.0021	0.0017	0.0013	0.0038
Barium	0.015	0.0090	0.038	0.057	0.033	0.015	0.023	0.013
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	ND	ND	ND	ND	0.000080	0.000070
Calcium	24	27	37	36	9.1	14	17	17
Chromium	0.0012	0.0017	0.00078	0.00065	0.0041	0.00097	0.0018	0.0015
Cobalt	0.0014	0.00056	0.000081	0.00036	0.00087	0.00013	0.00013	0.000069
Copper	0.0037	0.0014	0.00070	0.00087	0.0023	0.00065	0.0014	0.0010
Iron	0.85	0.77	ND	0.60	4.0	0.30	0.068	0.067
Lead	0.00063	0.00017	0.000068	0.000049	0.00038	ND	0.00017	0.00016
Magnesium	11	15	19	19	4.7	7.8	9.0	9.4
Manganese	0.044	0.018	0.040	0.66	0.13	0.021	0.19	0.35
Mercury	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	0.0018	0.0010	0.00069	0.0034	0.0024	0.00061	0.012	0.0064
Potassium	1.6	0.83	1.2	1.4	0.36	0.46	1.0	1.1
Selenium	ND	ND	ND	ND	ND	ND	ND	ND
Silver	ND	ND	ND	0.00034	ND	ND	ND	ND
Sodium	9.9	11	19	19	6.7	9.3	7.5	8.2
Thallium	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	0.0083	0.0099	0.0046	0.0059	0.014	0.0055	0.0080	0.0043
Zinc	0.0074	0.0059	0.0026	0.0023	0.0029	0.0023	0.0028	0.0088

ND – Not detected

Exceeds Groundwater Quality Standards

CONTROLLED

Table 5.3.6: NETL-Albany 2021 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples–Metals (mg/L)

Constituent	Well Number, Sample Date							
	MW-14		MW-15		MW-16		MW-17	
	03/04	08/23	03/02	08/26	03/04	08/26	03/03	08/23
Aluminum	4.0	0.39	0.35	0.32	ND	0.17	0.093	0.049
Antimony	0.00019	0.00022	0.00025	ND	0.00016	0.00013	ND	ND
Arsenic	0.00083	0.0012	0.00089	0.00079	0.024	0.18	0.0011	0.0021
Barium	0.040	0.0044	0.0089	0.0075	0.037	0.19	0.0067	0.0055
Beryllium	0.00028	ND	ND	ND	ND	0.00019	ND	ND
Cadmium	0.000042	ND	ND	ND	ND	ND	0.000040	ND
Calcium	16	13	19	22	31	42	26	32
Chromium	0.0047	0.0017	0.0020	0.0027	0.0022	0.00051	0.00080	0.00085
Cobalt	0.0066	0.00047	0.0014	0.00046	0.00026	0.00061	0.00012	0.00012
Copper	0.0072	0.0015	0.0018	ND	ND	0.00097	0.0040	0.0013
Iron	6.2	0.59	0.50	0.55	16	120	0.15	ND
Lead	0.0012	0.00014	0.00032	ND	0.000076	0.000041	ND	ND
Magnesium	6.6	5.8	8.8	11	14	17	13	17
Manganese	0.20	0.023	0.13	0.043	0.46	1.1	0.086	0.21
Mercury	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	0.0078	0.00095	0.0025	0.00087	0.00089	0.0018	0.0018	0.00066
Potassium	0.67	0.65	0.67	0.63	1.1	1.4	1.1	1.0
Selenium	ND	ND	ND	ND	ND	ND	ND	ND
Silver	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	15	9.6	18	17	13	15	13	14
Thallium	ND	0.000029	ND	ND	ND	ND	ND	ND
Vanadium	0.019	0.0089	0.0074	0.0094	0.0022	0.0024	0.0059	0.0084
Zinc	0.012	0.0049	0.0040	0.0032	0.0014	0.0040	0.0064	0.0044

ND − Not detected

ND = Not detected

Exceeds Groundwater Quality Standards

Exceeds Groundwater Quality Standards

CONTROLLED

Table 5.3.7: NETL-Albany 2021 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples–Metals (mg/L)

Constituent	Well Number, Sample Date					
	MW-18		MW-19		MW-20	
	03/02	08/26	03/04	08/24	03/05	08/24
Aluminum	0.097	0.20	ND	ND	0.87	0.13
Antimony	0.00013	ND	0.00015	ND	0.00017	0.00015
Arsenic	0.00087	0.00053	0.0010	0.00060	0.0013	0.0027
Barium	0.0071	0.0075	0.012	0.0086	0.11	0.021
Beryllium	ND	ND	ND	ND	0.00011	ND
Cadmium	ND	ND	ND	ND	0.00010	ND
Calcium	34	39	15	13	37	32
Chromium	0.0019	0.00092	0.00051	0.00018	0.0049	0.00079
Cobalt	0.00025	0.00023	0.00066	0.00055	0.0011	0.00083
Copper	0.00071	ND	ND	0.00072	0.0029	0.00078
Iron	0.16	0.34	0.00015	0.19	0.31	0.19
Lead	0.00039	0.000086	0.00015	0.000066	0.000043	0.000079
Magnesium	17	19	7.8	6.4	17	15
Manganese	0.021	0.013	0.62	0.41	0.70	1.2
Mercury	ND	ND	ND	ND	ND	ND
Nickel	0.0010	0.00066	0.00064	0.0011	0.056	0.0031
Potassium	0.73	0.84	0.58	0.49	1.2	0.87
Selenium	ND	ND	ND	ND	ND	ND
Silver	0.000057	ND	ND	ND	0.000030	ND
Sodium	17	18	8.9	8.0	26	21
Thallium	ND	ND	ND	ND	ND	ND
Vanadium	0.011	0.0092	0.0028	0.0023	0.016	0.012
Zinc	0.0021	0.0044	0.0017	0.0035	0.011	0.0051

ND – Not detected

Exceeds Groundwater Quality Standards

CONTROLLED

Table 5.3.7: NETL-Albany 2021 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples–Metals (mg/L)

Constituent	Well Number, Sample Date					
	MW-22		MW-23		MW-24	
	03/03	08/24	03/05	08/23	03/05	08/25
Aluminum	ND	0.062	0.053	ND	5.7	0.76
Antimony	0.00015	ND	0.00013	ND	0.00034	ND
Arsenic	0.0018	0.0018	0.0013	0.0011	0.0033	0.0022
Barium	0.0087	0.0092	0.0046	0.0061	0.037	0.035
Beryllium	ND	ND	ND	ND	0.00035	ND
Cadmium	ND	ND	ND	ND	ND	ND
Calcium	25	25	25	32	26	24
Chromium	0.00040	0.00021	0.0015	0.00088	0.0074	0.0028
Cobalt	0.00082	0.00081	0.00039	0.00018	0.010	0.0020
Copper	ND	ND	ND	0.0022	0.011	0.0013
Iron	0.070	0.17	0.15	0.12	15	5.3
Lead	ND	ND	0.00012	0.00016	0.0028	0.00037
Magnesium	12	12	14	18	16	12
Manganese	0.058	0.066	0.0066	0.0044	0.21	0.24
Mercury	ND	ND	ND	ND	ND	ND
Nickel	0.00070	0.00073	0.00038	0.00029	0.0093	0.0019
Potassium	1.1	1.1	1.1	1.0	1.3	1.1
Selenium	ND	ND	ND	ND	ND	ND
Silver	ND	ND	ND	ND	ND	ND
Sodium	23	23	15	15	20	19
Thallium	ND	ND	ND	ND	ND	ND
Vanadium	0.0058	0.0043	0.011	0.0098	0.053	0.010
Zinc	0.0034	0.0034	0.0018	0.0068	0.018	0.0091

ND – Not detected

Exceeds Groundwater Quality Standards

Table 5.2.1 2021 Groundwater Detection Monitoring Program Results of Analysis – Groundwater Samples Valley Fill – TPH and Contamination Indicators Constituents - Pittsburgh

Constituent	Well Number, Sample Date							
	VFW-2		VFW-4		VFW-7		VFW-9	
	05/26/21	10/26-27/21	05/26/21	10/26-27/21	05/26/21	10/26-27/21	05/26/21	10/26-27/21
TPH-DRO (mg/L)	0.230	NS	ND	NS	ND	NS	ND	NS
pH (standard units)	6.72	NS	6.89	NS	7.67	NS	7.72	NS
Specific Conductance (uS/cm)	6,759	NS	3,302	NS	5,559	NS	1,994	NS
Temperature (^{0}C)	15.9	NS	15.0	NS	16.1	NS	15.3	NS
Constituent	Well Number, Sample Date							
	VFW-10		VFW-11		VFW-12		VFW-14	
	05/26/21	10/26-27/21	05/26/21	10/26-27/21	05/26/21	10/26-27/21	05/26/21	10/26-27/21
TPH-DRO	ND	NS	ND	NS	0.280	NS	ND	NS
pH (standard units)	8.03	NS	6.96	NS	7.79	NS	6.80	NS
Specific Conductance (uS/cm)	3,842	NS	4,041	NS	2,388	NS	3,482	NS
Temperature (^{0}C)	14.0	NS	13.1	NS	19.4	NS	12.6	NS

NS – Not sampled

CONTROLLED

CONTROLLED

Table 5.2:2 2021 Groundwater Detection Monitoring Program Results of Analysis - Groundwater Samples, Main Plateau - VOC Constituents (ug/L) - Pittsburgh					
Constituent	Well Number, Sample Date				
	MPW-8	MPW-9	MPW-10	MPW-11	MPW-12
	10/27/21	10/26/21	10/26/21	10/26/21	10/26/21
Acetone	10	ND	ND	ND	NS
Benzene	ND	ND	ND	ND	NS
Bromodichloromethane	ND	ND	ND	ND	NS
Bromoform	ND	ND	ND	ND	NS
Bromomethane	ND	ND	ND	ND	NS
2-Butanone (MEK)	ND	ND	ND	ND	NS
Carbon Disulfide	ND	ND	ND	ND	NS
Carbon Tetrachloride	ND	ND	ND	ND	NS
Chlorobenzene	ND	ND	ND	ND	NS
Chloroethane	ND	ND	ND	ND	NS
Chloroform	ND	ND	ND	ND	NS
Chloromethane	ND	ND	ND	ND	NS
Cyclohexane	ND	ND	ND	ND	NS
Dibromochloromethane	ND	ND	ND	ND	NS
1,2-Dibromo-3-chloropropane	ND	ND	ND	ND	NS
1,2-Dibromoethane (EDB)	ND	ND	ND	ND	NS
1,3-Dichlorobenzene	ND	ND	ND	ND	NS
1,4-Dichlorobenzene	ND	ND	ND	ND	NS
1,2-Dichlorobenzene	ND	0.67	ND	ND	NS
Dichlorodifluoromethane	ND	ND	ND	ND	NS
1,1-Dichloroethane	7.3	ND	ND	ND	NS
1,2-Dichloroethane	ND	ND	ND	ND	NS
1,1-Dichloroethene	ND	ND	ND	ND	NS
Cis-1,2-Dichloroethene	ND	ND	ND	ND	NS
Trans-1,2-Dichloroethene	ND	ND	ND	ND	NS
1,2-Dichloropropane	ND	ND	ND	ND	NS
Cis-1,3-Dichloropropene	ND	ND	ND	ND	NS
Trans-1,3-Dichloropropene	ND	ND	ND	ND	NS
Ethylbenzene	ND	ND	ND	ND	NS
2-Hexanone	ND	ND	ND	ND	NS
Isopropylbenzene	ND	ND	ND	ND	NS
Methyl acetate	ND	ND	ND	ND	NS
Methylene chloride	ND	ND	ND	ND	NS
Methylcyclohexane	ND	ND	ND	ND	NS
4-Methyl-2-pentanone (MIBK)	ND	ND	ND	ND	NS
Methyl tert-butyl ether	ND	ND	ND	ND	NS
Styrene	ND	ND	ND	ND	NS
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	NS
1,2,4-Trichlorobenzene	ND	ND	ND	ND	NS
Tetrachloroethene (PCE)	ND	ND	ND	ND	NS
1,1,1-Trichloroethane	ND	ND	ND	ND	NS
1,1,2-Trichloroethane	ND	ND	ND	ND	NS

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Table 5.2:2 2021 Groundwater Detection Monitoring Program Results of Analysis - Groundwater Samples, Main Plateau - VOC Constituents (ug/L) - Pittsburgh					
Constituent	Well Number, Sample Date				
	MPW-8	MPW-9	MPW-10	MPW-11	MPW-12
	10/27/21	10/26/21	10/26/21	10/26/21	10/26/21
Trichloroethene (TCE)	ND	ND	ND	ND	NS
Trichlorofluromethane	ND	ND	ND	ND	NS
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	ND	ND	ND	NS
Toluene	0.56	ND	ND	ND	NS
Vinyl chloride	ND	ND	ND	ND	NS
Xylenes (total)	ND	ND	ND	ND	NS

ND – Not detected
NS – Not sampled

	Exceeded EPA Region III Risk Based Table

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Table 5.2:3 2021 Groundwater Detection Monitoring Program
Results of Analysis – Groundwater Samples, Main Plateau
Groundwater Characteristics Constituents - Pittsburgh

Constituent	Well Number, Sample Date								
	MPW-2	MPW-4	MPW-4D	MPW-7	MPW-7D	MPW-8	MPW-9	MPW-10	MPW-11
	10/26/21	10/27/21	10/27/21	10/26/21	10/26/21	10/27/21	10/26/21	10/26/21	10/26/21
Inorganics: Dissolved Metals (ug/l)									
Aluminum	430	68	ND	ND	53	70	ND	ND	ND
Boron	39	87	180	100	77	40	120	150	130
Calcium	760,000	270,000	9,500	61,000	240,000	480,000	50,000	3,200	160,000
Iron	110,000	310	ND	ND	ND	580	ND	ND	ND
Magnesium	100,000	110,000	1,700	7,200	46,000	84,000	14,000	570	34,000
Manganese	8,700	380	36	ND	8.6	50	2.8	5.5	67
Nickel	20,000	370	49	8.7	23	310	33	ND	25
Potassium	6,000	4,500	1,300	3,200	3,600	7,700	1,800	860	5,600
Silica	11,000	9,000	8,500	7,200	8,500	8,000	8,200	8,500	5,700
Sodium	790,000	260,000	290,000	190,000	340,000	880,000	240,000	260,000	630,000
Strontium	2,900	1,100	300	190	1,400	1,000	2,600	160	450
Quality Parameters (mg/L)									
Chloride	2,950	1,110	302	287	1,060	2,590	323	246	1,290
Fluoride	ND	0.0872	0.984	0.354	ND	ND	0.0944	0.367	0.186
Nitrate	0.185	0.510	0.120	1.73	0.596	ND	0.401	ND	2.33
Sulfate	118	137	11.8	67.7	106	261	8.29	4.37	187
Total Dissolved Solids	4,900	2,100	810	740	2,000	4,900	800	700	2,400
Total Alkalinity	7.3	280	280	180	220	190	240	290	150

ND – Not detected
NS – Not sampled

	Exceeded Pennsylvania Secondary Drinking Water Maximum Contaminant Level and Act 2 Secondary Maximum Contaminant Level
	Exceeded EPA Region III Risk Based Table, Pennsylvania Secondary Drinking Water MCL and Act 2 Secondary Maximum Contaminant Level
	Exceeded EPA Region III Risk Based Table
	Exceeded Pennsylvania Secondary Drinking Water Maximum Contaminant Level

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Table 5.2:4 2021 Groundwater Detection Monitoring Program Results of Analysis – Groundwater Samples, Main Plateau Groundwater Contamination Indicators Constituents - Pittsburgh										
Constituent	**MPW-1**	**MPW-2**	**MPW-4**	**MPW-4D**	**MPW-7**	**MPW-7D**	**MPW-8**	**MPW-9**	**MPW-10**	**MPW-11**
	10/27/21	**10/26/21**	**10/27/21**	**10/27/21**	**10/26/21**	**10/26/21**	**10/27/21**	**10/26/21**	**10/26/21**	**10/26/21**
pH (standard units)	7.39	6.20	6.97	7.91	7.03	6.88	6.83	7.81	8.86	7.40
Specific Conductance (ms/cm)	4.997	8.915	3.489	1.343	1.225	3.448	7.797	1.382	1.204	4.039
Temperature (^{0}C)	13.9	12.0	14.3	13.0	16.0	14.0	17.9	11.6	11.9	15.0
TOX (mg/L)	NS	0.059	0.039	0.025	0.056	0.054	0.043	0.031	ND	0.034
TOC (mg/L)	NS	2.1	2.1	18	1.8	1.1	1.6	0.65	0.64	1.2

TOX = total organic halogens; TOC = total organic carbon; specific conductance unit = ms/cm @ 25 □C; NS= not sampled

	Exceeded Pennsylvania Secondary Drinking Water MCL

Table 5.3.1: May 2021 Data for "A" Aquifer—Morgantown										
Parameter	UNITS	Sample Location								
		A	B	GAS-4	I	J	L	M	N	SP1-A	SP4-A
pH (field)	S.U.	6.23	6.28	5.82	6.50	5.14	5.29	3.55	4.09	5.95	6.09
Specific Conductance (field)	µmhos	272	267	395	301	1355	1626	1904	1579	462	391
Temperature (field)	deg. C	15.79	15.41	17.30	16.60	14.90	14.30	13.00	15.00	15.97	16.80
Cadmium	ug/L	NT	NT	NT	< 0.21	2.1	3.2	1.40	2.9	NT	NT

Table 5.3.2: May 2021 Data for "B-C" Aquifer—Morgantown						
Parameter	UNITS	Sample Location				
		11	31	32-A	GAS-5	SP2-BC
pH (field)	S.U.	6.18	5.55	5.12	6.11	6.36
Specific Conductance (field)	µmhos	168	1222	3166	2299	406
Temperature (field)	deg. C	15.00	17.30	15.01	15.14	15.10

Table 5.3.3: May 2021 Data for Morgantown Aquifer				
Parameter	UNITS	Sample Location		
		D1-M	D2-M	D4-M
pH (field)	S.U.	6.50	9.30	6.20
Specific Conductance (field)	µmhos	467	534	613
Temperature (field)	deg. C	16.50	16.70	14.30

Table 5.3.4: Oct. 2021 Data for "A" Aquifer—Morgantown											
Parameter	UNITS	Sample Location									
		A	B	GAS-4	I	J	L	M	N	SP1-A	SP4-A
pH (field)	S.U.	6.53	6.03	5.32	6.31	4.96	5.78	3.80	4.06	5.92	6.26
Specific Conductance (field)	µmhos	308	258	427	276	1287	1806	1614	1504	510	382
Temperature (field)	deg. C	17.21	15.90	17.20	15.80	15.68	17.00	18.00	14.31	15.10	18.58
Cadmium	ug/L	NT	NT	NT	< 0.21	2.0	0.89 J	1.30	2.1	NT	NT

Table 5.3.5: Oct. 2021 Data for "B-C" Aquifer—Morgantown						
Parameter	UNITS	Sample Location				
		11	31	32-A	GAS-5	SP2-BC
pH (field)	S.U.	6.27	5.46	5.09	6.23	6.33
Specific Conductance (field)	µmhos	160	1280	2832	2093	422
Temperature (field)	deg. C	15.20	18.54	19.20	19.20	15.80

Table 5.3.6: Oct. 2021 Data for Morgantown Aquifer				
Parameter	UNITS	Sample Location		
		D1-M	D2-M	D4-M
pH (field)	S.U.	6.43	9.18	7.31
Specific Conductance (field)	µmhos	474	512	588
Temperature (field)	deg. C	16.10	16.40	14.26

ND – Not detected NS – Not tested

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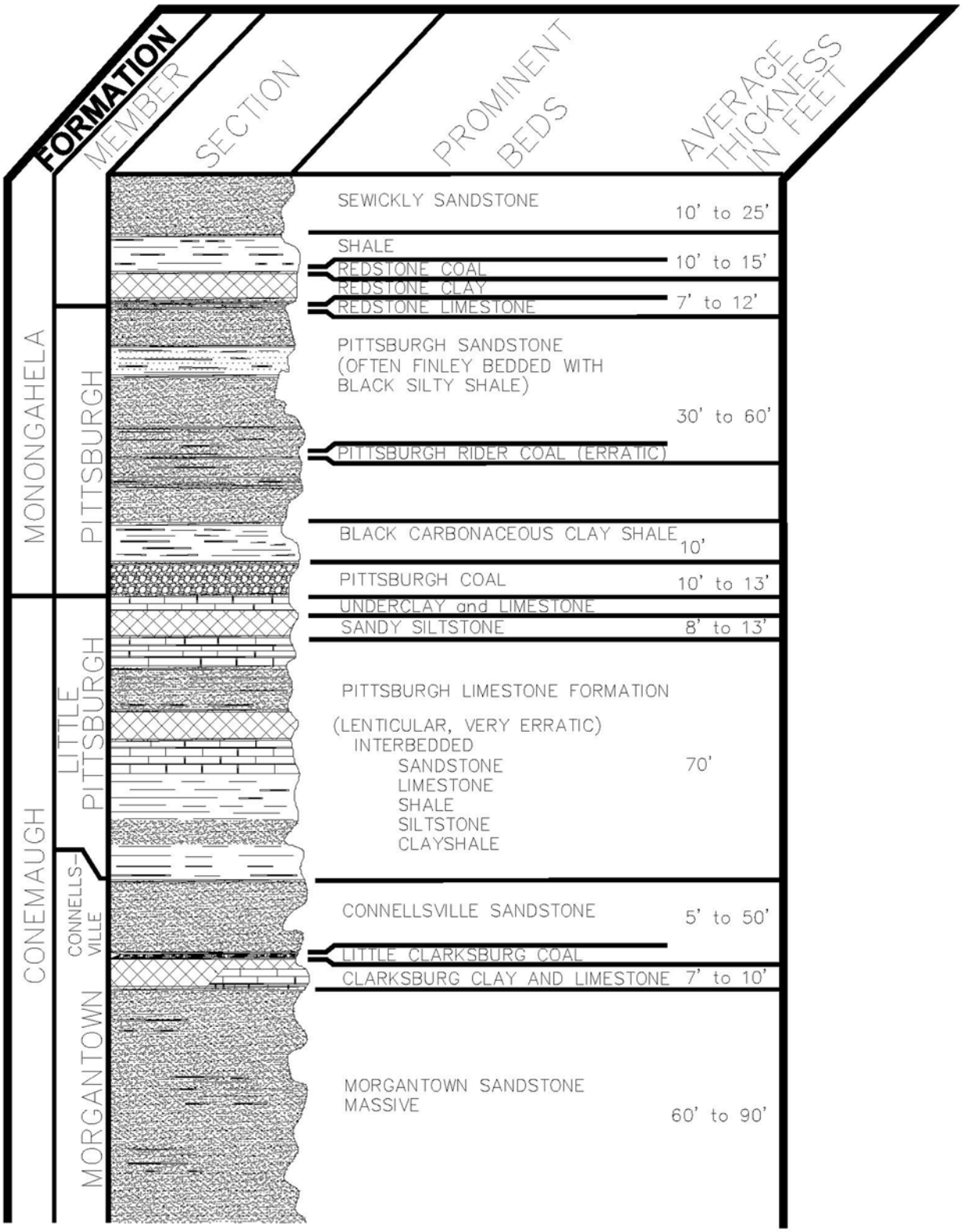

Figure 6.2b: General geologic column – Pittsburgh.

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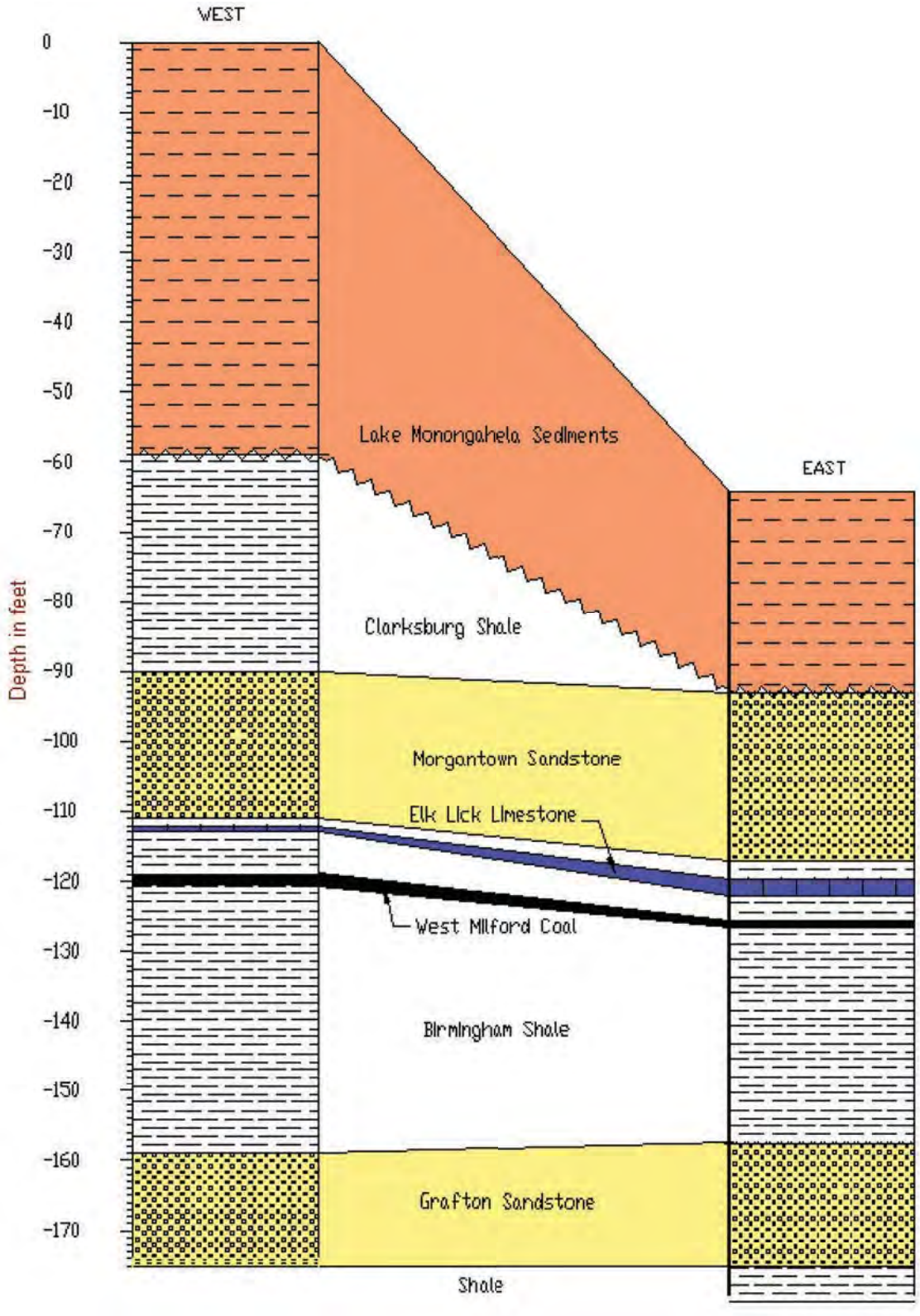

Figure 6.3b: Generalized cross-section of aquifer units at the Morgantown site.

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NATIONAL ENERGY TECHNOLOGY LABORATORY

1450 Queen Avenue SW
Albany, OR 97321-2198
541-967-5892

420 L Street, Suite 305
Anchorage, AK 99501-5901
907-271-3618

1011 Highway 6, South, Suite 309,
Houston, TX 77077
281-504-1000

3610 Collins Ferry Road
P.O. Box 880
Morgantown, WV 26507-0880
304-285-4764

626 Cochrans Mill Road
P.O. Box 10940
Pittsburgh, PA 15236-0940
412-386-4687

VISIT US AT: **www.NETL.DOE.gov**

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1-800-553-7681

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