Illinois International Port District

IIPD Decarbonization and Climate Resiliency Plan

May 2026

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Foreword

The Illinois International Port District (IIPD) is a cornerstone of regional, national, and global freight movement, supporting economic activity throughout the Chicago metropolitan area, the Midwest, and broader supply chains worldwide. As one of North America's most significant multimodal facilities, the Port must continuously evolve to remain competitive, resilient, and responsive to changing environmental, regulatory, and market conditions.

In 2022, IIPD adopted its Master Plan, establishing a long-term vision for revitalizing and modernizing the Port while strengthening its integration with surrounding communities. That plan identified infrastructure investment, land use optimization, economic development, and environmental stewardship as interconnected priorities essential to IIPD's future success. The Decarbonization and Climate Resiliency Plan presented here builds directly on that foundation, advancing the Master Plan from strategic vision to implementation-focused action.

For the first time, this Plan provides, a comprehensive, Port-wide understanding of greenhouse gas (GHG) emissions and climate-related risks within the context of a landlord port. It establishes a baseline of emissions across Scopes 1 and 2, along with key Scope 3 activities, and evaluates the physical climate risks that may affect Port infrastructure, operations, tenants, and neighboring communities over time. Together, these analyses create a clear, informed basis for integrating climate considerations into ongoing planning, capital investment, and governance processes, supporting more effective and coordinated decision-making.

Addressing decarbonization and resilience in a complex, multi-tenant environment requires collaboration and shared responsibility. While not all emissions sources or climate risks fall under direct operational control, IIPD plays an important leadership role through its planning authority, capital programming, lease frameworks, and its ability to convene tenants, public agencies, utilities, and community partners. The strategies outlined in this Plan reflect that role, emphasizing practical, phased approaches aligned with existing planning processes and investment cycles, while enabling coordinated action across the broader Port ecosystem. The Plan is designed as a practical and adaptive framework, with recommendations intended to inform near-term actions while evolving over time. As Port-level data improves, capital planning and Master Plan implementation progress, regulatory requirements change, and climate risks become better understood, the Plan will be refined. Continued progress will rely on coordinated, transparent engagement among IIPD's tenants, partners, and stakeholders, with ongoing input and guidance from the IIPD Board and Steering Committee.

IIPD recognizes the contributions of its tenants, public agencies, community representatives, and technical advisors, whose input ensured the Plan reflects current conditions and aligns with ongoing capital and master planning efforts. The District also acknowledges its Board Members and Steering Committee for their oversight, and the Arcadis team for their leadership and technical expertise in developing the Decarbonization and Climate Resiliency Plan.

Completion of this Plan marks a key step in advancing the Master Plan and strengthening IIPD's commitment to responsible stewardship, operational resilience, and long-term economic vitality. It establishes a clear, practical foundation to guide future efforts as the Port continues to operate as a strategic, reliable, and competitive multimodal gateway for the region.

Erik A. Varela | *Executive Director*
ILLINOIS INTERNATIONAL PORT DISTRICT
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Appendix A. Greenhouse Gas Inventory Management Plan

Acronyms and Abbreviations

AFDC	Alternative Fuels Data Center
AR5	Fifth Assessment Report
Arcadis	Arcadis U.S., Inc.
CAPEX	capital expenditure
CBECS	Commercial Buildings Energy Consumption Survey
CHE	cargo handling equipment
CMAP	Chicago Metropolitan Agency for Planning
CMIP5	Coupled Model Intercomparison Project Phase 5
CH_4	methane
CO_2	carbon dioxide
DERA	Diesel Emissions Reduction Act
DOE	U.S. Department of Energy
eGRID	Emissions and Generation Resource Integrated Database
EIA	U.S. Energy Information Administration
EPA	U.S. Environmental Protection Agency
EPC	engineering procurement and construction
EV	electric vehicle
EVSE	electric vehicle supply equipment
°F	degrees Fahrenheit
FEMA	Federal Emergency Management Agency
FIRM	flood insurance rate map
FIS	Flood Insurance Study
FY	fiscal year
GHG	greenhouse gas
GIS	Geographic Information System
GREET®	Greenhouse gases, Regulated Emissions, and Energy use in Technologies
GWP	global warming potentials
HVAC	heating, ventilation, and air conditioning
HVO	hydrotreated vegetable oil
ICAT	Illinois International Port District Community Advisory Team

ICE	Internal combustion engine
IDOT	Illinois Department of Transportation
IIPD	Illinois International Port District
IMP	IIPD Greenhouse Gas Inventory Management Plan
IPCC	Intergovernmental Panel on Climate Change
IRS	Internal Revenue Service
LOCA	Localized Constructed Analogs
mph	mile per hour
MWRD	Metropolitan Water Reclamation District of Greater Chicago
N_2O	nitrous oxide
NOAA	National Oceanic and Atmospheric Administration
NOFO	Notice of Funding Opportunity
NREL	National Renewable Energy Laboratory
OPEX	Perational Expenditure
PIDP	Port Infrastructure Development Program
PIS	place in service
$PM_{2.5}$	particulate matter in air with a diameter of 2.5 micrometers or smaller
PV	solar photovoltaic
PWA	Prevailing Wage and Apprenticeship
QA	quality assurance
QC	quality control
RCP	Representative Concentration Pathway
REC	renewable energy certificate
RTU	rooftop unit
tCO_2e	tons of carbon dioxide equivalent
USACE	U.S. Army Corps of Engineers
ZE	zero-emission

Organizational Information

Company name: Illinois International Port District (IIPD)

Corporate Address: Illinois International Port District
3600 East 95th Street
Chicago, IL 60617

Executive Summary

This *Decarbonization and Climate Resiliency Plan* was prepared by Arcadis for the Illinois International Port District (IIPD) to identify and quantify controllable emissions, establish a foundation for setting and tracking emission reduction targets and actionable measures for decarbonization, identify climate vulnerabilities, and present a 10-year resilience action plan. These analyses are presented herein as a Greenhouse Gas (GHG) Emissions Inventory and Decarbonization Plan and a Climate Vulnerability Assessment and Action Plan.

GHG Emissions Inventory and Decarbonization Plan

Overview and Purpose

The Illinois International Port District (IIPD) is a major freight and industrial hub in Chicago, supporting over 16 million tons of annual cargo throughput and serving as a critical link in regional and national supply chains. With growing regulatory, market, and community expectations for climate action, IIPD undertook a comprehensive GHG inventory and decarbonization planning process. This effort has established a data-driven baseline, identified major emissions sources, and set a clear strategy for emissions reduction across Scopes 1, 2, and 3.

The GHG Inventory and Decarbonization Plan:

- Quantifies emissions from all major activities under IIPD’s control and influence (including tenants and value chain partners).
- Provides a foundation for setting and tracking emission reduction targets.
- Identifies actionable measures to decarbonize operations, facilities, and the broader port ecosystem.
- Aligns with the Greenhouse Gas Protocol, best practices for ports in the United States, and emerging state and federal funding requirements.

GHG Inventory: Baseline and Key Findings

Scope Categories and Sources:

- Scope 1 (Direct Emissions): Stationary combustion (natural gas for heating in IIPD-owned buildings), mobile combustion (diesel and gasoline use in on-road vehicles and off-road equipment).
- Scope 2 (Indirect Emissions): Purchased electricity for IIPD-operated facilities (lighting, building systems).
- Scope 3 (Value Chain Emissions): Category 13 – Downstream Leased Assets (fuel and electricity used by tenants in IIPD-leased facilities). *Other Scope 3 sources (vessels, trucks, rail) are identified for future inclusion.*

Emissions Profile

The GHG inventory establishes a baseline across all scopes, summarized as follows:

Table ES-1. GHG Emissions Inventory Summary

GHG Scope	Emissions (tCO_2e)	% of Total
Scope 1 (Direct)	107	1.3%
Scope 2 (Indirect – Electricity)	119	1.5%
Scope 1 + 2 Total (Operational)	226	2.8%
Scope 3, Category 13 (Downstream Leased Assets)	7,882	97.2%
Total (Scopes 1, 2, 3)	**8,108**	**100%**

Note: tCO_2e = tons of carbon dioxide equivalent

Key findings:

- Scope 3 emissions account for approximately 97% of IIPD's GHG footprint, reflecting the dominant role of tenant and value chain activities.
- Scope 1 and Scope 2 emissions are small by comparison (approximately 3%) but remain material for operational control and regulatory compliance.

Table ES-2. Breakdown of Scope 1 GHG Emissions

Emissions Category	Emissions Source	Emissions (tCO_2e)	% of Scope 1
Stationary Combustion	Furnace (heating)	23	21%
Mobile Combustion	On-Road Vehicles	49	46%
	Off-Road Equipment	35	33%
	Total	**107**	**100%**

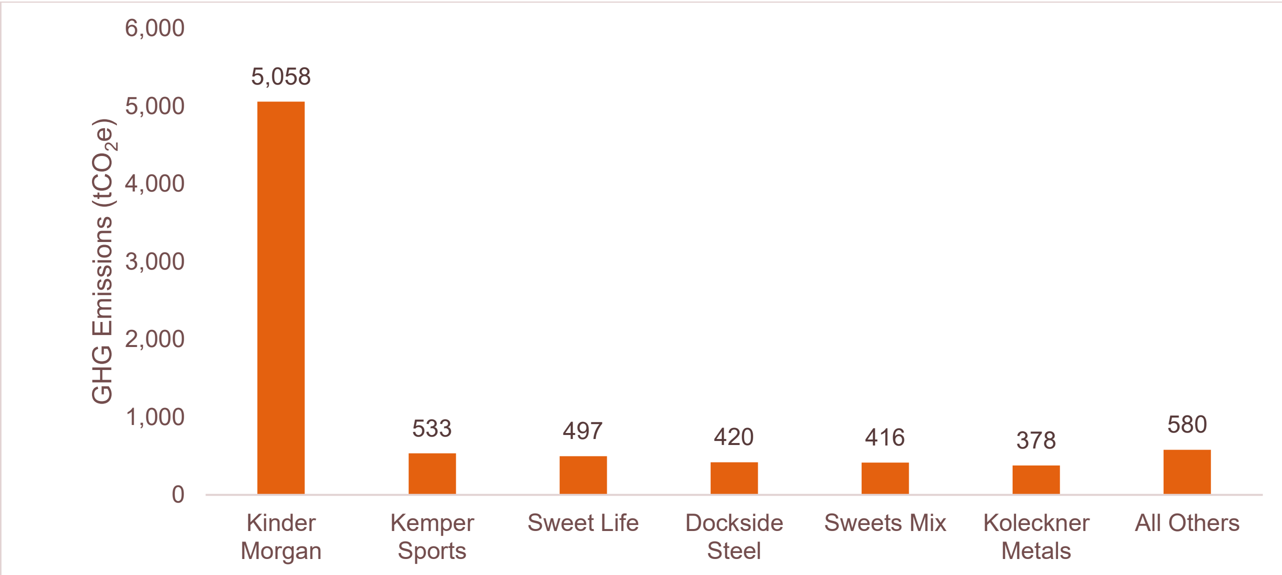
Scope 2 Details:

- All Scope 2 emissions are purchased from electricity, with 77% attributable to the CDL Building, Maintenance Building, and 95th Street Office.

Scope 3 Details:

- Category 13 emissions are highly concentrated: Kinder Morgan accounts for 64% of tenant-related emissions; the next five tenants account for 28%.
- *Future inclusion of vessel, truck, and rail emissions will be critical for a more complete scope 3 profile.*

Figure ES-1. Breakdown of Scope 3 GHG Emissions by Tenant



Methodology and Data Quality

The inventory was developed using direct activity data (utility bills, fuel records, operating hours) wherever available, and industry-standard estimation methods (e.g., U.S. Energy Information Administration [EIA] building energy intensities, Commercial Buildings Energy Consumption Survey [CBECS], and U.S. Environmental Protection Agency [EPA] factors) where data gaps existed.

- Emissions are calculated for carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) using the latest EPA and the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) factors.
- Where actual activity data were unavailable, estimates were based on asset size, usage, or standard conversion rates.
- A detailed GHG Inventory Management Plan (IMP) is included as an appendix and will be updated as data, emission factors, and methodologies evolve.

Table ES-3. Data Sources and Emission Factors

Data Type	Source
Utility Bills	IIPD, Tenants
Energy Intensities	EIA, CBECS, U.S. Department of Energy
Emission Factors	EPA, Emissions and Generation Resource Integrated Database (eGRID), IPCC AR5

Decarbonization Opportunities

Scope 1 and Scope 2 Decarbonization Plan

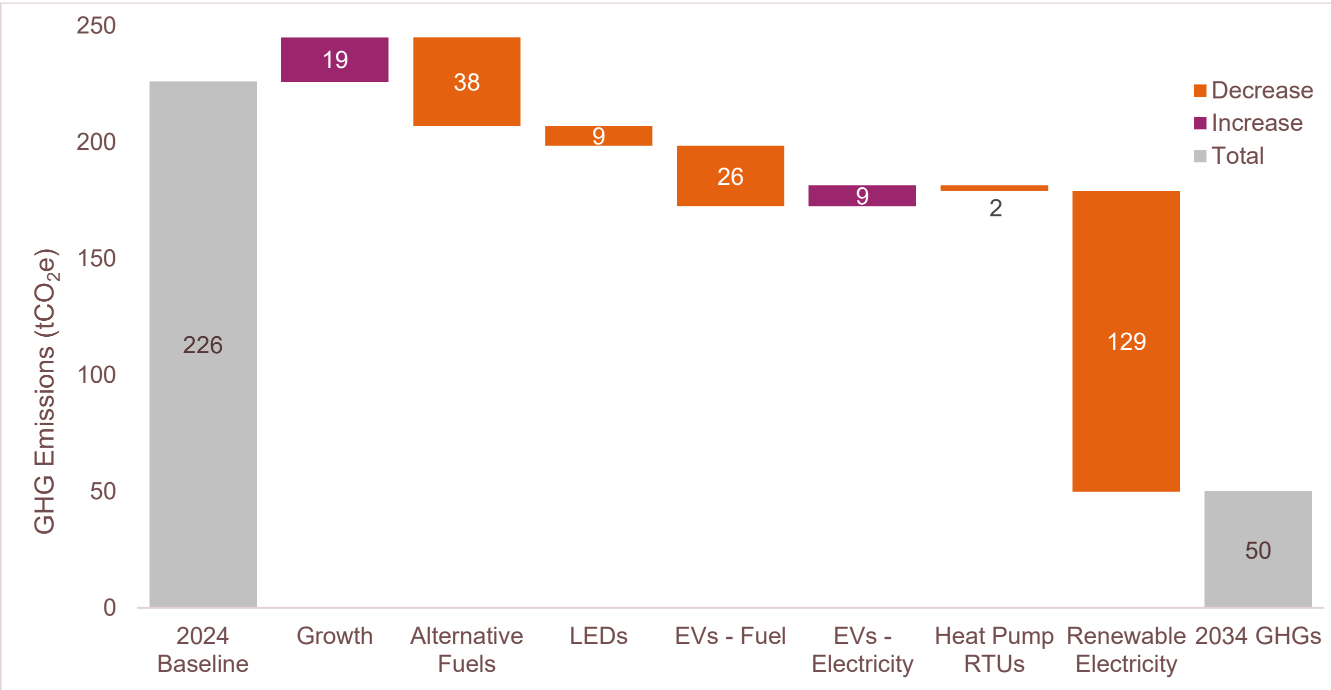
The decarbonization plan models six main decarbonization measures for IIPD-controlled assets, using a "use less/choose alternatives" hierarchy:

1. **LED Lighting Upgrades** – High-efficiency retrofits at CDL Building, guard shacks, and corporate facilities (9 tCO_2e reduction; $62,000 capital expenditure (CAPEX; 20-year payback).
2. **Alternative Fuels** – Transition to 80% hydrotreated vegetable oil (HVO; renewable diesel) for maintenance fleet (38 tCO_2e reduction; no CAPEX; net operational expenditure [OPEX] increase).
3. **Vehicle Electrification** – Fleet replacement with electric SUVs and pickups (26 tCO_2e reduction; $54,000 CAPEX; net OPEX increase).
4. **Heat Pump Rooftop Units (RTUs)** – Electrify heating at select facilities (2 tCO_2e reduction; $6,000 CAPEX; $400 OPEX savings).
5. **Off-site Renewables/Renewable Energy Certificates** – Purchase Green-e certified renewable power (129 tCO_2e reduction; $11,000 annual net OPEX increase; flexible timeline).
6. **On-site Solar Solar Photovoltaic (PV)** – Install solar at Shed 4 and Kloeckner Building ($7.8 million CAPEX; 1,818 tCO_2e reduction; $497,000 OPEX savings; funded in part by $60 million from EPA Clean Ports Grant).

Table ES-4. Scope 1 and Scope 2 Decarbonization Measures – Summary Results

Project	Scope	GHG Reduction (tCO_2e)	CAPEX	Net OPEX Savings	Payback (Years)	Implementation Year
LEDs	Scope 2	9	$62,000	$3,100	20	2026
Alternative Fuels	Scope 1	38	$0	$(2,700)	Annual Cost	2028
Vehicle Electrification	Scope 1	26	$54,000	$(4,000)	Annual Cost	2030
Heat Pump RTUs	Scope 1	2	$6,000	$400	15	2030
Off-site Renewables	Scope 2	129	$0	$(11,000)	Annual Cost	Variable
On-site Renewables	Scope 2/3	1,818	$7.8M	$497,000	15.7	2028+

Figure ES-2. Waterfall Chart: Cumulative Impact of Decarbonization Measures



- Implementation timeline: Measures are sequenced for realism: LEDs (2026), alternative fuels (2028), electrification (2030), with flexibility for renewables.
- Co-benefits: Include improved air quality, reduced maintenance, grid resilience, workforce upskilling, and local economic and health impacts.

Scope 3 Decarbonization Measures

Given the dominance of Scope 3 emissions in IIPD's profile, targeted measures include:

- **Aggregated Renewable Energy Sourcing**: Combine tenant and port electricity loads for joint procurement of green power (community solar, power purchase agreements, virtual power purchase agreements).
- **Green Leases**: Embed energy and emissions performance requirements, submetering, and electrification timelines into all new/renewed leases.
- **GHG Impact Reporting**: Standardized, digital tenant data submission; periodic quality assurance and quality control; annual public reporting.
- **Preferred Vendor/Engineering Procurement and Construction List**: Pre-qualified vendors for zero-emission (ZE) upgrades, with standardized specs and performance tracking.
- **Electrification Guidance**: Asset-specific ZE roadmaps, grid impact studies, and future-proofing for smart charging and microgrid integration.
- **Shared Infrastructure Investment**: Multi-tenant charging yards, microgrids, and data platforms to overcome site and capital constraints.

- **Recognition/Incentive Programs**: Tiered rewards for tenant ZE and GHG performance.
- **Scorecarding**: Public dashboard tracks tenant performance on energy, emissions, and community indicators.

Climate Vulnerability Assessment and Action Plan

Overview

The IIPD faces a growing array of climate-related risks that threaten port infrastructure, operations, and surrounding communities. The Climate Vulnerability Assessment and Action Plan provides a detailed assessment of IIPD's climate vulnerabilities and presents a 10-year resilience action plan. The assessment integrates the latest regional climate science, local data, peer-reviewed literature, and stakeholder input, and is designed to complement IIPD's decarbonization and GHG reduction strategy.

Climate Vulnerability Assessment: Methods and Key Findings

Background and Methodology

IIPD's climate risk assessment focuses on its two major facilities – Lake Calumet and Iroquois Landing – encompassing over 1,600 acres of land, multiple tenants, and diverse industrial and logistical activities. The analysis used a combination of geospatial modeling, stakeholder engagement, and downscaled climate projections (Coupled Model Intercomparison Project Phase 5 [CMIP5]/Localized Constructed Analogs [LOCA], IPCC RCP4.5, and RCP8.5) to evaluate exposure and impacts from a range of climate hazards.

Hazard categories analyzed include:

- Flooding: Rainfall-driven (stormwater), lake-driven (Lake Michigan water levels), and riverine flooding.
- Weather Extremes: Extreme heat, cold, high winds, and drought.
- Additional Hazards: Wildfire, invasive species, snow squalls, and fog.

Spatial data sources were drawn from the U.S. Climate Resilience Toolkit, the Federal Emergency Management Agency (FEMA), Michigan Tech, The Trust for Public Land, the U.S. Department of Agriculture, the National Oceanic and Atmospheric Administration (NOAA), and the U.S. Forest Service (see Table 15). A detailed inventory of IIPD structures and assets was developed to enable site-specific risk analysis.

Climate Hazards and Trends

Flooding:

- FEMA's National Risk Index rates Cook County at "very high" risk for flooding, heat waves, and other hazards.
- Both rainfall and lake flooding are recurring threats for IIPD, with stakeholder reports and site visits confirming frequent ponding and drainage issues.
- Projections indicate an increase of up to 2.65 inches in annual precipitation by late-century (RCP8.5), and a higher frequency of >3-inch rain events (Table 17; Figure 9).
- Bluespot analysis identified numerous site depressions at both facilities as high-priority flood risk areas.

Lake Level Rise:

- Models project that average Lake Michigan levels may rise by 1.44 feet by 2040–2049, with chronic inundation risk low but periodic high-water events expected to increase.
- Two structures at Lake Calumet are at long-term risk; no structures at Iroquois Landing are directly exposed under the most likely scenarios.

Extreme Heat and Urban Heat Island:

- Average daily maximum temperatures could rise by up to 9.5 degrees Fahrenheit (°F) by late-century (RCP8.5).
- Extreme heat days (>95°F) may increase eightfold or more, with significant increases in cooling degree days (Tables 20, and 21; Figures 14, 15, and 16).
- Urban heat island mapping shows several IIPD zones with elevated heat risk.

Extreme Cold:

- While the number of days below freezing will decrease, the risk of intense snowstorms and lake-effect events may rise due to increased atmospheric moisture.

Wind:

- The port is vulnerable to damaging wind events, including tornadoes, derechos, and remnants of tropical systems, as documented in recent and historical events (Table 24).
- High winds can cause major disruptions to power, logistics, and physical infrastructure.

Drought:

- Droughts are projected to become more frequent due to increased dry days and intensified summer heat, affecting water supply, dust suppression, and navigability.

Wildfire, Invasive Species, Snow Squalls, Fog:

- While direct wildfire risk is low, smoke from regional fires could increasingly affect air quality and operations.
- Invasive species and environmental stressors may degrade wetlands and habitat, impacting restoration and land use planning.
- Snow squalls and fog, though difficult to project, can disrupt operations and safety.

Key Asset Impacts

- Over 230 structures at Lake Calumet and six at Iroquois Landing were analyzed.
- Flooding and heat are the most widespread threats, impacting dozens of structures, particularly in the East, Finger, and West Districts.
- High winds and occasional snow/ice events pose significant risks to critical infrastructure, power supply, and logistics.

Previous and Ongoing Efforts

IIPD has proactively engaged in federal and state-funded resilience initiatives, including:

- EPA Clean Ports Program (ZE equipment, chargers, solar, battery storage);
- Climate Pollution Reduction Grant implementation;
- Green infrastructure projects with the Delta Institute;
- Green Marine environmental certification; and
- Ongoing collaboration with the Chicago Metropolitan Agency for Planning (CMAP), the Illinois Department of Transportation (IDOT), the Metropolitan Water Reclamation District of Greater Chicago (MWRD), Cook County, the U.S. Army Corps of Engineers (USACE), and others.

These efforts align IIPD with best practice regional and national climate adaptation strategies.

Resilience Action Plan: Strategies and Priority Actions

The resilience action plan provides a 10-year roadmap of 15 priority actions, grouped into:

- **Physical and Nature-Based Infrastructure**: Stormwater management, coastal resilience, flood protection, cooling, resilient buildings, power redundancy, and climate-adaptive rail;
- **Programs and Policies**: Risk assessments, design guidelines, emergency operations, sensors, integration with master planning and decarbonization, regional coordination; and
- **Outreach and Capacity Building**: Tenant and community engagement, education, and a tenant coordinating committee on resilience.

Each action includes:

- Lead entities (IIPD, tenants, agencies);
- Hazards addressed;
- Co-benefits (e.g., water quality, community health, operational efficiency);
- Estimated cost (dollar per dollar); and
- Near-term steps and 10-year implementation timeline.

Table ES-5. IIPD Resilience Action Plan – 15 Priority Actions

No.	Action	Type	Lead Entity(ies)	Hazards Addressed	Co-Benefits	Cost
1	Assess and improve capacity of drainage infrastructure.	Physical/Nature-Based	IIPD, IDOT, City of Chicago Department of Transportation, MWRD	Flooding	Water quality, aesthetics, reduced neighborhood flooding	$$
2	Collaborate to improve physical resiliency of tenant facilities.	Outreach/Capacity Building	IIPD, Tenants	All	Improved tenant communication, best practices	$
3	Assess and improve emergency operations for natural hazards.	Programs/Policies	IIPD, Police, Fire, OEMC	All	Business continuity, staff safety	$
4	Mitigate urban heat island “hotspots”.	Physical/Nature-Based	IIPD, Tenants	Extreme Heat	Lower energy use, aesthetics, worker safety	$$
5	Mitigate climate impacts to rail infrastructure.	Physical/Nature-Based	IIPD, Railroads, Tenants	Flooding, Extreme Heat	Supply chain resilience, reliability	$$
6	Prepare for power outages.	Programs/Policies and Physical/ Nature-Based	IIPD, ComEd, Tenants	All	Energy efficiency, operational continuity	$$
7	Develop resilient design guidelines for facilities.	Programs/Policies	IIPD, Tenants	All	Reduced energy use, resilient infrastructure	$
8	Collaborate with surrounding communities on education.	Outreach/Capacity Building	IIPD, Tenants, Local Schools, Community Orgs, Local Gov	All	Community preparedness, equity, relationships	$

No.	Action	Type	Lead Entity(ies)	Hazards Addressed	Co-Benefits	Cost
9	Integrate climate resilience into master plan and asset management.	Programs/Policies	IIPD, CMAP, Master Plan Steering Committee	All	Lower lifecycle costs, resilient assets	$
10	Integrate climate resilience into decarbonization measures.	Programs/Policies	IIPD, Tenants	All	Reduced emissions, future-proofing	$$
11	Integrate climate resilience into marsh restoration.	Physical/Nature-Based	IIPD	Flooding, Air Quality, Extreme Weather	Habitat, water quality, ecological resilience	$$
12	Monitor lake level rise and develop adaptation plans.	Programs/Policies	IIPD	Flooding	Risk forecasting, operational planning	$
13	Monitor and participate in local/regional planning efforts.	Programs/Policies	IIPD, CMAP, USACE	All	Funding access, technical support, coordination	$
14	Strategically install smart sensors for flooding, temperature, air quality.	Programs/Policies	IIPD, Tenants	All	Data-driven decision making, health/safety	$$
15	Convene a tenant coordinating committee on resilience.	Outreach/Capacity Building	IIPD, Tenants	All	Enhanced tenant engagement, joint action	$

Highlights of Key Actions

- **Drainage and Stormwater Upgrades**: Comprehensive assessment, green infrastructure, and targeted upgrades to address flooding risk and improve water quality.
- **Tenant Engagement**: Outreach, technical guidance, and collaboration to assess and improve facility-level adaptation.

- **Emergency Preparedness**: Updated protocols, first responder engagement, and power outage planning to ensure business continuity.
- **Heat Mitigation**: Targeted urban heat island interventions, including shade, reflective materials, and landscaping.
- **Climate-Resilient Rail**: Design and material upgrades, drainage improvements, and coordinated maintenance for critical rail assets.
- **Power Resilience**: Backup systems, microgrids, and energy-efficient solutions for operational continuity.
- **Resilient Design Guidelines**: Standards for all new construction and renovations, integrating flood, heat, and wind adaptation.

Integration with Decarbonization and Master Planning

The action plan ensures that all decarbonization projects (e.g., electrification, renewables) are designed with resilience in mind—assessing climate risks to new technologies, incorporating adaptation measures (e.g., flood-resistant solar arrays), and embedding resilience into capital planning and master plan updates.

Implementation and Monitoring

- A structured implementation timeline outlines near- and long-term actions, with lead responsibilities, cost estimates, and integration with ongoing capital projects.
- Progress will be evaluated via annual reviews, performance indicators, and updates to the master plan and GHG inventory.
- Ongoing coordination with regional agencies, tenants, and community partners is critical for success.

Conclusion and Next Steps

IIPD's Climate Vulnerability Assessment and Resilience Action Plan provides a comprehensive foundation for proactive, data-driven adaptation to climate risks. By combining physical infrastructure upgrades, policy improvements, and stakeholder engagement, IIPD will strengthen its capacity to safeguard critical assets, protect operations, and support the health and well-being of port-adjacent communities.

Implementation of these actions will require ongoing investment, coordination, and monitoring as part of IIPD's commitment to building a sustainable, resilient, and future-ready port district.

1 Introduction

Arcadis U.S., Inc. (Arcadis) prepared this *Decarbonization and Climate Resiliency Plan* for the Illinois International Port District (IIPD; also known as the Port of Chicago) to present the IIPD Greenhouse Gas (GHG) Emissions Inventory and Decarbonization Plan and Climate Vulnerability Assessment and Action Plan. The GHG Inventory and Decarbonization Plan quantifies IIPD's controllable emissions and establishes a foundation for setting and tracking emission reduction targets as well as actionable measures for decarbonization. The Climate Vulnerability Assessment and Action Plan identifies IIPD's climate vulnerabilities and presents a 10-year resilience action plan.

1.1 Purpose and Context

The IIPD is a major municipal port authority driving economic activity, freight movement, and community connectivity across the Chicago region. IIPD operates two primary terminal areas—Lake Calumet Terminal and Iroquois Landing Terminal—which serve as critical nodes for shipping, barge, rail, and trucking activity, and accommodate over 16 million tons of cargo annually. IIPD facilities are integral to regional supply chains, provide recreational amenities, and support workforce and community development in Chicago's South Side.

Recognizing the urgent challenges posed by climate change, as well as evolving business needs, the IIPD has embarked on a strategic planning process to ensure the long-term sustainability, resilience, and competitiveness of its operations and neighboring communities. This Decarbonization and Climate Resiliency Plan is designed to identify innovative, actionable strategies that can help the IIPD mitigate climate impacts while also supporting the Illinois economy and improving quality of life for residents in the area; the plan is funded in part by the Illinois Department of Transportation's (IDOT) Statewide Planning and Research Program and was developed in compliance with all relevant State of Illinois and IDOT procurement and grant requirements.

Background and Motivation

IIPD's statutory mission, established under the Illinois International Port District Act, is to study and implement harbor plans that meet changing commercial and community needs. In 2019, the IIPD, in partnership with the Chicago Metropolitan Agency for Planning (CMAP), launched a multi-phase master planning process, culminating in the 2022 IIPD Master Plan. The 2022 IIPD Master Plan[1] was developed with input from multiple advisory teams and technical experts and identified the need for comprehensive sustainability and resilience strategies as central to the port's future.

This Decarbonization and Climate Resiliency Plan builds directly on the recommendations included in the 2022 IIPD Master Plan, focusing on:

- Developing a robust GHG emissions inventory (Scopes 1, 2, and 3);
- Setting emission reduction goals and identifying decarbonization pathways;
- Assessing renewable energy and electrification opportunities;
- Recommending land use strategies for improved resilience, stormwater management, and community benefit; and

[1] CMAP. 2022. Illinois International Port District Master Plan. September. https://cmap.illinois.gov/wp-content/uploads/IIPD-Master-Plan_2022_09_09_final_lowres.pdf

- Outlining a funding and implementation strategy for critical actions.

This Decarbonization and Climate Resiliency Plan addresses both Iroquois Landing and Lake Calumet Terminal, with analysis supported by peer-reviewed literature, best practices from other ports, and data collected in collaboration with tenants and public partners.

1.2 Stakeholder Engagement

Approach and Framework

Stakeholder engagement was integral to developing the IIPD Decarbonization and Climate Resilience Plan. As a landlord port with a diverse range of tenants, public agencies, industry partners, and community stakeholders, IIPD implemented a structured engagement process to ensure the plan reflected both operational realities and community priorities.

The engagement process supported three primary objectives:

1. **Communicate analyses**: Ensure that GHG inventory findings, resilience considerations, and planning assumptions aligned with the practical functioning of the port and surrounding communities.
2. **Validate strategic direction**: Leverage the Steering Committee and IIPD Community Advisory Team (ICAT) guidance to confirm that proposed actions are feasible, appropriately sequenced, and aligned with regional and state initiatives.
3. **Build shared ownership**: Ensure that key partners remain informed throughout the process and have meaningful opportunities to shape the evolving plan.

Engagement followed a structured framework for a coordinated approach to project delivery and occurred at key milestones, including inventory confirmation, strategy development, and review of draft findings. In addition to formal Steering Committee, ICAT, and Board touchpoints, the project team held regular client check-ins to maintain momentum, align expectations, and ensure transparent progress throughout the project cycle. Objectives for each stakeholder group are as follows:

- **Steering Committee**: An executive forum to validate analyses, approve key decisions (metrics, targets, measures), and guide investment priorities across decarbonization and resilience efforts. Governance roles and landlord–tenant levers (master planning, lease provisions, shared infrastructure, incentives) were reviewed with the Steering Committee to ensure practical, durable implementation.
- **ICAT**: An environmental justice forum comprising working groups and neighborhood representatives that provided input on engagement cadence, community public health indicators, and climate vulnerability considerations.
- **Board Engagement**: Strategic oversight to confirm alignment with IIPD priorities, the 2022 IIPD Master Plan, and the integrated decarbonization–resilience scope of work.
- **Tenant Outreach (Scope 3, Category 13)**: Direct outreach and data requests to tenants for leased-asset energy use, followed by data clarification as needed.
- **Routine Client Check-ins**: Regular coordination calls to discuss project progress, align on next steps, and resolve data or assumption questions in real time.

Engagement Activities and Impact

Engagement occurred at critical milestones with the following objectives:

- Steering Committee (three meetings): Confirmed Scope 1 and Scope 2 framework and focus on Scope 3 Category 13; reviewed measure sequencing, resilience considerations, and governance elements such as green lease provisions.
- ICAT (three sessions): Provided community and agency input on interconnection timing, environmental justice priorities (anti-idling, truck routing, localized exposure), public-facing metrics, and equity considerations.
- Board Briefing: Presented integrated findings across the GHG inventory, decarbonization strategy, and climate-resilience assessment, along with recommendations and roadmaps.
- Tenant Outreach: Gathered leased-asset energy data, validated data assumptions, and identified operational constraints and readiness for shared programs (e.g., renewables, electrification).
- Site Visits and Desktop Reviews: Verified on-site conditions and supported interpretation of stakeholder input.
- Client Check-ins: Maintained project progress and resolved data and assumption questions in real time.

The input received from the wide range of stakeholders informed every stage of the report through multiple rounds of feedback:

- **Methodology and Data System**: Inputs from the Steering Committee, ICAT, tenants, and IIPD shaped standardized tenant templates, improved data quality control and accuracy, and informed the final report's inputs.
- **Governance and Delivery**: Engagement confirmed the use of proposed measures from each workstream; clarified roles for IIPD, tenants, the utility, the City of Chicago, and environmental justice partners, translating landlord influence into measurable outcomes.
- **Measure Prioritization**: Sequencing of early recommendations reflects feasibility feedback and grid/interconnection timing.
- **Resilience Integration**: Hazard and critical asset considerations from the Steering Committee and ICAT informed the siting and phasing of shared infrastructure, as well as the development of near-term resilience actions in tandem with decarbonization investments.
- **Environmental Justice Alignment and Transparency**: Engagement prioritized near-term diesel reductions, anti-idling enforcement, truck-routing buffers, and public-health indicators for the scorecard and public briefings.

Together, these insights helped ensure the Decarbonization and Climate Resiliency Plan is designed to be responsive to real community needs and supportive of IIPD and tenant operations, with achievable implementation pathways.

Stakeholder Roster (Steering Committee Agencies/Stakeholder Groups)

The Steering Committee engagement included representation from the following agencies, organizations, and stakeholder groups:

Steering Committee	
Illinois International Port District	Chicago Department of Planning and Development
Delta Institute	Chicago Metropolitan Agency for Planning
City of Chicago Ward 10	The Nature Conservancy
IIPD Community Advisory Team	Illinois Department of Natural Resources
Midwest Salt	Illinois Department of Transportation
NASCO/QSL America	Illinois Environmental Protection Agency
Chicago South Shore and South Bend Railroad	Openlands
Calumet Area Industrial Commission	

ICAT representation included the following community and environmental justice partners:

- Neighborhood-based community organizations;
- Community environmental justice advocates and coalitions;
- Local neighborhood volunteer and faith-based groups;
- Education and cultural institutions;
- Residents of neighborhoods adjacent to port operations; and
- IIPD staff liaisons supporting community engagement.

Forward Engagement Cadence

To support future planning and implementation, IIPD will maintain a structured engagement schedule to support implementation and ongoing monitoring, including:

- **Quarterly Steering Committee meetings** to review progress, evaluate milestones, and assess investment decisions.
- **Semi-annual ICAT sessions** to support coordination across environmental justice partners, utilities, and agency stakeholders.
- **Annual public briefings** aligned with the release of the Emissions Inventory and the IIPD performance scorecard.

1.3 Structure of this Report

This remainder of this report is organized into two main sections:

- Section 2, GHG Emissions Inventory and Decarbonization Plan, presents baseline GHG estimation, emissions reduction targets, and actionable decarbonization strategies for IIPD's operations and value chain.

- Section 3, Climate Vulnerability Assessment and Action Plan, presents an assessment of physical climate vulnerabilities, scenario analysis, and a prioritized resilience action plan, all grounded in best practices and stakeholder input.

Additionally, the IIPD GHG Inventory Management Plan (IMP) is included as Appendix A. The IMP provides detailed context on the methodologies, data sources, and assumptions used in compiling IIPD's GHG inventory. It is important to note that the IMP should be treated as a living document that will require regular review and updates as data collection processes, emission factors, operational boundaries, and reporting standards evolve. IIPD should plan to revisit and improve the IMP on an annual basis to ensure continued accuracy, transparency, and alignment with best practices.

2 Greenhouse Gas Emissions Inventory and Decarbonization Plan

2.1 Greenhouse Gas Inventory

2.1.1 Greenhouse Gas Emissions Analysis

This section provides a baseline GHG emissions inventory for IIPD, covering Scope 1, Scope 2, and Scope 3 Category 13: Downstream Leased Assets in alignment with the Greenhouse Gas Protocol.[2] The narrative describes the main sources and relevant port activities, presents a summary of total emissions followed by scope-specific results, outlines the methodology used (including activity data estimation), and offers recommended future improvement opportunities. This inventory establishes a foundation for tracking progress and informing decarbonization strategies over time.

Main Sources of Emissions and Port Activities

GHG emissions associated with IIPD, included in this inventory are categorized as follows:

- **Scope 1 (Direct Emissions)**:
  - Stationary combustion: Primarily natural gas for space heating in IIPD-operated buildings (e.g., Maintenance Building, IIPD 95th Street Office).
  - Mobile combustion: Diesel and gasoline use in on-road vehicles and off-road equipment.
- **Scope 2 (Indirect Emissions from Purchased Energy)**:
- Sources: Purchased electricity consumed in IIPD-operated buildings for lighting and building systems.
- **Scope 3 (Other Indirect Value Chain Emissions)**:
- For this inventory, limited to Category 13: Downstream Leased Assets – fuel and electricity consumption by tenants operating within IIPD-leased facilities.
- Sources: Purchased electricity consumed in IIPD-operated buildings for lighting and building systems.

Note: Scope 3 emissions represent indirect emissions that occur throughout IIPD's value chain and are not directly owned or controlled by IIPD. It is recommended that other relevant Scope 3 categories be calculated in the future, as noted in Section 2.1.2, Recommended Future Improvements. Examples of future Scope 3 sources may include ocean-going vessels, trucks, and rail.

Greenhouse Gas Emissions Summary

This section summarizes IIPD's GHG emissions inventory, which establishes a baseline emissions profile across Scope 1, Scope 2, and Scope 3 Category 13: Downstream Leased Assets. The results provide an overview of total emissions and illustrate the relative contribution of each emissions scope and source.

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[2] Greenhouse Gas Protocol. GHG Protocol standards and guidance. World Resources Institute & World Business Council for Sustainable Development. https://ghgprotocol.org/

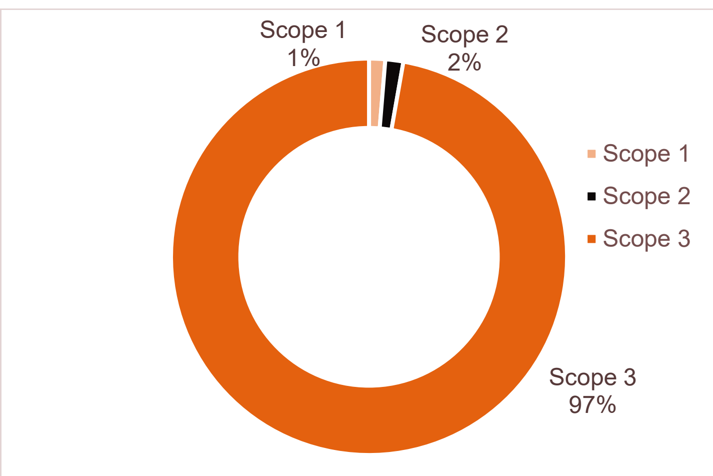
As shown in Table 1 IIPD's combined Scope 1, Scope 2, and Scope 3 emissions total 8,108 metric tons of carbon dioxide equivalents (tCO_2e). In total, 226 tCO_2e are associated with Scope 1 and Scope 2, with the remaining 7,882 tCO_2e attributable to Scope 3. The large disparities in emissions between the three scopes highlights that the majority of IIPD's GHG footprint occurs within its value chain, rather than from operations, which is typical of organizations in this sector.

Table 1. GHG Emissions Inventory Summary

GHG Scope	Emissions (tCO_2e)
Scope 1	107
Scope 2	119
Operational Emissions Total (Scope 1 + Scope 2)	226
Scope 3, Category 13 (Downstream Leased Assets)	7,882
Total (Scope 1 + Scope 2 + Scope 3)	**8,108**

As shown in Figure 1, Scope 3 emissions account for approximately 97% of total reported emissions, while Scope 1 and Scope 2 emissions together represent approximately 3% of the overall estimated emissions profile. This indicates that value chain management and tenant engagement will be extremely impactful strategies for IIPD's decarbonization efforts.

Figure 1. Breakdown of Scope 1, 2, and 3 GHG Emissions



Scope 1 Emissions Analysis

The following analysis focuses on Scope 1 emissions, which are generated from direct fuel combustion sources under IIPD's operational control.

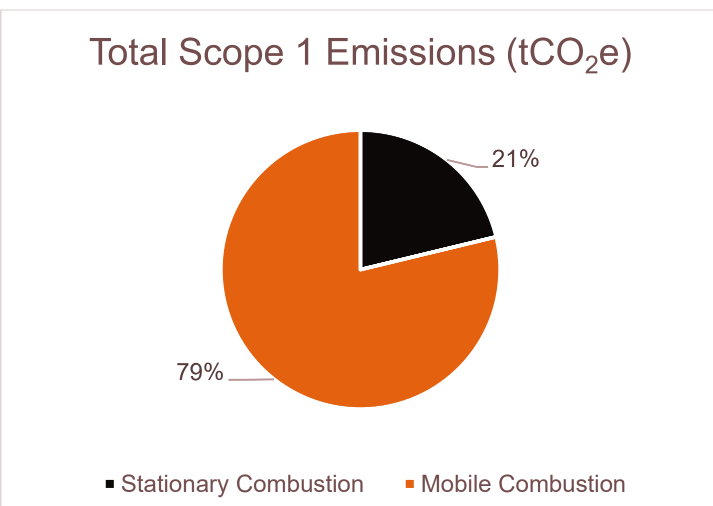
As shown in Table 2, Scope 1 stationary emissions are limited to space heating, which accounts for 21% of total Scope 1 emissions and is highly concentrated. Specifically, 89% of space heating emissions originate from two locations: Maintenance Building and IIPD 95th Street Office.

However, mobile combustion is the dominant source of Scope 1 emissions, representing 79% of the total, as shown in Figure 2. Within mobile combustion, 46% of emissions are attributed to IIPD-operated fleet vehicles, with diesel fuel use accounting for approximately 50% of total mobile combustion emissions. For future inventories, collecting detailed fuel type and equipment usage data will improve the specificity of Scope 1 estimates.

Table 2. Breakdown of Scope 1 GHG Emissions by Source

Scope	Emissions Category	Emissions Source	Total Emissions (tCO_2e)	% of TOTAL Scope 1
Scope 1	Stationary Combustion	Furnace (heating)	23	21%
	Mobile Combustion	On-Road Vehicles	49	46%
		Off-Road Equipment	35	33%
		Total	**107**	**100%**

Figure 2. Breakdown of Scope 1 GHG Emissions by Source



Scope 2 Emissions Analysis

The following analysis focuses on Scope 2 emissions, which are generated from purchased electricity used in IIPD-operated facilities.

As shown in Table 3, purchased electricity is the sole contributor to Scope 2 emissions. Electricity-related emissions are concentrated across a small number of facilities, with 77% of total electricity emissions attributable to three buildings: the CDL Building, the Maintenance Building, and the IIPD 95th Street Office.

Table 3. Breakdown of Scope 2 GHG Emissions by Source

Scope	Emissions Category	Emissions Source	Total Emissions (tCO_2e)	% of TOTAL Scope 2
Scope 2	Electricity (location-based)	Electricity	119	100%
		Total	**119**	**100%**

Scope 3 Emissions Analysis

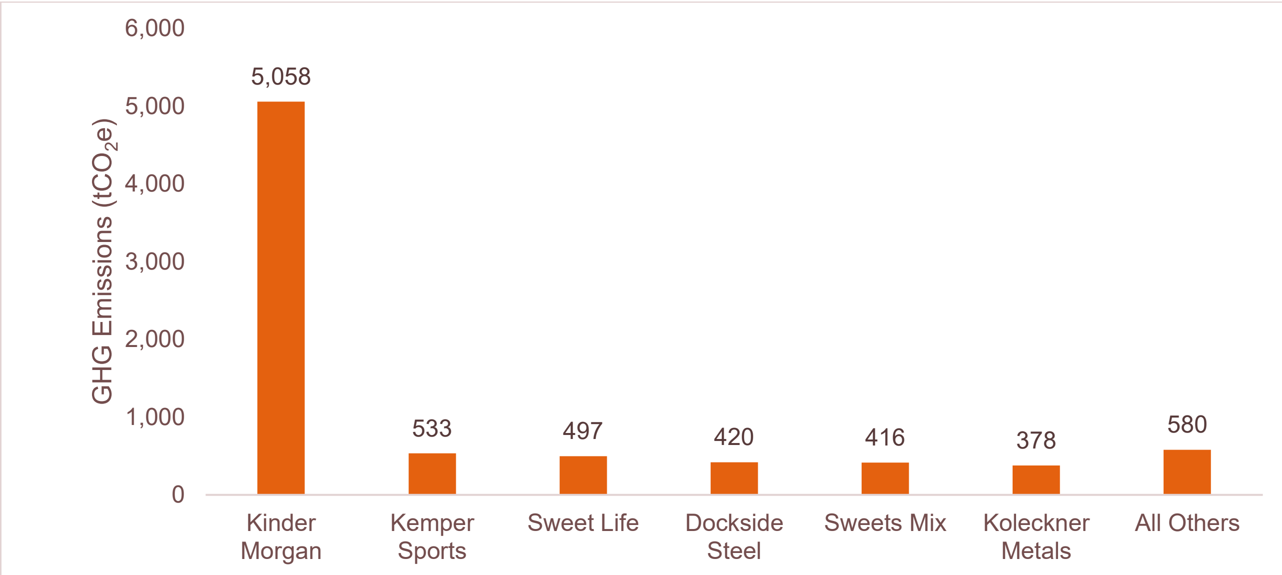
The following analysis is focused on Scope 3 Category 13: Downstream Leased Assets emissions, representing indirect emissions that occur outside of IIPD direct operational control.

As shown in Table 4, Scope 3 emissions from Category 13: Downstream Leased Assets, which represent the natural gas and electricity use of IIPD tenants, were calculated for 15 tenants and are highly concentrated among a small number of entities. Kinder Morgan accounts for approximately 64% of total emissions within this category, while the next highest-emitting tenant represents only 7% of emissions. Additionally, the next largest five tenants collectively account for approximately 28% of Category 13 emissions. As shown in Figure 3, Kinder Morgan dominates the emissions profile for Category 13, representing a potential priority area for future engagement and emissions reduction efforts. In future cycles, IIPD should work toward collecting direct energy use data from all tenants, rather than relying solely on square footage-based estimates, for improved accuracy.

Table 4. Breakdown of Estimated Scope 3 GHG Emissions by Tenant

Scope	Emissions Category	Tenant	Total Emissions (tCO2e)	% of TOTAL Scope 3
Scope 3	Category 13: Downstream Leased Assets	Kinder Morgan	5,058	64%
		Kemper Sports Harborside	533	7%
		Sweet Life Services	497	6%
		Dockside Steel	420	5%
		The Sweets Mix Company	416	5%
		Koleckner Metals	378	5%
		All others	580	7%
		Total	**7,882**	**100%**

Figure 3. Breakdown of Scope 3 GHG Emissions by Tenant



Inventory Methodology

This section describes the methodologies, data sources, and activity data estimation methods used to estimate GHG emissions for the IIPD inventory. The inventory was developed using activity data and standard emission factors, aligned with established practices to support transparency and comparability.

Activity data was collected from IIPD utility bills for Scope 1 and Scope 2, and tenant leases for Scope 3 Category 13. Data provided for Scopes 1 and 2 included therms of natural gas, gallons of fuel (diesel and motor gasoline) consumed by fleet vehicles, equipment usage hours, and kilowatt-hours of electricity, while Scope 3 Category 13 data consisted of square footage information. Please refer to the section "Activity Data Estimation" for further information on estimation methodologies in the event actual data was not available.

Activity data was then multiplied by emission factors to estimate emissions of each individual GHG, carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Emissions of CO_2, CH_4 and N_2O were then multiplied by their respective global warming potentials (GWPs) and added together to obtain CO_2e.

Emission factors used for IIPD's inventory include the U.S. Environmental Protection Agency (EPA) Emission Factors Hub[3] and the EPA Emissions and Generation Resource Integrated Database (eGRID) database[4]. GWPs used for the inventory are from the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5)[5], consistent with common reporting practices. Refer to the IMP (Appendix A) for more detailed information on specific emissions factors used for each source. Where possible, future reports should cite the most recent eGRID/GWPs and indicate any changes from prior years.

[3] U.S. Environmental Protection Agency. (2025). Emission factors for greenhouse gas inventories (Table 1: Stationary combustion, Tables 2 and 4, Mobile combustion). https://www.epa.gov/system/files/documents/2025-01/ghg-emission-factors-hub-2025.pdf
[4] U.S. Environmental Protection Agency. (2025). Emissions & Generation Resource Integrated Database(eGRID) 2023 summary data. https://www.epa.gov/egrid/summary-data
[5] Intergovernmental Panel on Climate Change. (2013). Climate change 2014:Synthesis report (AR5). https://www.ipcc.ch/report/ar5/syr/

Activity Data Estimation

In cases where complete or direct activity data were not available, Arcadis used the estimation methods listed below to ensure full coverage of the reporting period and align with industry best practices and to maintain consistency with Greenhouse Gas Protocol principles of transparency and completeness.

Scope 1

- Stationary Combustion – Natural Gas Usage:
  - For locations with incomplete utility billing records, Arcadis used average monthly natural gas usage based on available data and applied to the months for which utility bills were missing.
  - When natural gas utility bills were not available, Arcadis estimated natural gas consumption using building square footage and average United States natural gas energy intensities for the applicable building type from the U.S. Energy Information Administration (EIA) Commercial Buildings Energy Consumption Survey (CBECS).[6] IIPD should work towards full utility data coverage.
- Mobile Combustion – On-Road Vehicles Motor Gasoline and Diesel Fuel Usage:
  - For months with missing fuel invoices, Arcadis estimated fuel usage using average monthly consumption based on available data. For invoices reporting costs only, Arcadis estimated fuel usage by applying an average cost per gallon derived from available invoice records.
  - To convert fuel consumption into miles travelled, Arcadis used standard mile per gallon factors from the U.S. Department of Transportation, Federal Highway Administration Highway Statistics.[7]
- Mobile Combustion – Off-Road Equipment Motor Gasoline and Diesel Fuel Usage:
  - IIPD estimated annual operating hours for each individual equipment.
  - Arcadis verified equipment horsepower using manufacturer specifications and converted annual operating hours to gallons consumed using EPA AP-42 conversion factors and standard fuel burn rates for gasoline and diesel engines.[8] Where possible, collecting actual fuel usage rather than relying on operating hour estimates will improve accuracy.

Scope 2

- Purchased Electricity:
  - For locations with incomplete utility billing records, Arcadis used average monthly electricity usage based on available data and applied to the months for which utility bills were missing.
  - When electricity utility bills were not available, Arcadis estimated electricity consumption using building square footage and average United States electricity energy intensities for the applicable building type from the EIA CBECS.[9] IIPD may consider requesting supplier-specific emissions factors from utilities for greater accuracy.

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[6] U.S EIA Commercial Buildings Energy Consumption Survey Final Results. (2018) (Table C32: Natural gas intensities). https://www.eia.gov/consumption/commercial/data/2018/

[7] U.S. Department of Transportation, Federal Highway Administration. (2023). *Highway statistics 2023: Table VM-1—Annual vehicle-miles of travel, fuel consumption, and fuel efficiency*. https://www.fhwa.dot.gov/policyinformation/statistics/2023/pdf/vm1.pdf

[8] U.S. Environmental Protection Agency. (2006). *Compilation of air pollutant emission factors* (AP-42, Fifth ed.). Office of Air Quality Planning and Standards. https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors

[9] U.S EIA Commercial Buildings Energy Consumption Survey Final Results. (2018) (Table C22: Electricity Intensities). https://www.eia.gov/consumption/commercial/data/2018/

Scope 3

- Category 13: Downstream Leased Assets Natural Gas and Electricity Usage:
  - Arcadis estimated tenant natural gas and electricity consumption using building square footage and average United States natural gas and electricity energy intensities for the applicable building type from the EIA CBECS.[10] Expanding direct data collection from tenants should be a priority for ongoing improvement.

2.1.2 Recommended Future Improvements

GHG emissions quantification is an iterative process that is expected to evolve over time as data availability, methodologies, and organizational capabilities advance. The assessment described herein provides both overall recommendations to strengthen IIPD's GHG inventory and specific recommendations to each scope and source. These recommendations are intended for implementation over time, aligned with IIPD's resources and data availability.

IIPD can enhance the accuracy of its emissions inventory by implementing standardized activity data collection practices. This approach minimizes errors, improves data reliability, and reduces reliance on estimations. Currently, data collection depends on tracking monthly invoices. By adopting a system that consistently collects, aggregates, and manages data across the entire reporting period, IIPD can significantly strengthen the completeness of its activity data, and potentially avoid estimation.

To further strengthen the inventory and support long-term decarbonization planning, IIPD should consider the following technical improvements:

Recommendations for Strategic Data Management and Quality Assurance

- Transition the GHG inventory to more digitally-enabled data management platforms or environmental data systems, enabling automated data collection, real-time tracking, and more robust quality assurance and quality control (QA/QC) processes.
- Adopt a formal GHG IMP with clearly defined annual review cycles and version control to ensure year-on-year methodological consistency.
- Establish a centralized documentation repository for all data sources, assumptions, emission factors, and estimation methods to facilitate third-party review and future updates.
- Consider periodic third-party verification (e.g., every three years) for increased transparency and credibility.
- Benchmark IIPD's GHG inventory and decarbonization progress annually against peer ports and publish results transparently.

Recommendations on Scope 1

- Stationary Combustion – Natural Gas Usage:
- Given that activity data was estimated for one location for a single month and for two locations based on square footage, and that IIPD operates in a cold climate, seasonal variability may reduce the accuracy of

[10] U.S EIA Commercial Buildings Energy Consumption Survey Final Results. (2018) (Table C22: Electricity Intensities, Table C32: Natural gas intensities). https://www.eia.gov/consumption/commercial/data/2018/

estimated natural gas usage. Obtaining utility bills that cover the full reporting period and all IIPD locations would improve the accuracy and reliability of emissions calculations.

- Implement sub-metering for major natural gas appliances and use degree days or similar methods for weather normalization to refine heating estimates.

- Mobile Combustion – On-Road Vehicles Diesel Fuel and Motor Gasoline Usage:
- Given that BP fuel invoices were estimated for six months, and Exxon invoices were estimated for five months, and that fuel prices vary over time, emissions estimates based on average costs are less precise. Obtaining fuel usage that cover the entire reporting period would improve the accuracy of on-road vehicle emissions.
- Explore piloting telematics or Global Positioning System-based tracking to monitor vehicle use and idling, and support future fleet electrification analysis.
- Mobile Combustion – Off-Road Equipment Diesel Fuel and Motor Gasoline Usage:
- Given that off-road equipment operating hours were estimated and converted to fuel consumption using EPA fuel burn rates, the resulting usage estimates are less precise than utilizing actual fuel usage data. Obtaining fuel consumption data in gallons would improve the accuracy and reliability of off-road equipment emissions calculations.
- Conduct periodic equipment audits to verify fuel burn rates and identify opportunities for efficiency retrofits or replacement.

Recommendations on Scope 2 – Purchased Electricity

- Given that activity data was estimated for one location for a single month and for two locations based on square footage, and that emissions calculations currently rely on generic, regional emissions factors, emissions estimates may be less precise. Working with electrical utilities to obtain supplier-specific emissions factors and obtaining utility bills that cover the full reporting period for all IIPD locations would improve the accuracy and reliability of purchased electricity emissions calculations. Using utility-specific factors will further refine Scope 2 estimates.
- Where feasible, request Green-e certified renewable energy or renewable energy certificates (RECs) from utility providers and account for these in market-based Scope 2 reporting, alongside location-based reporting.
- Include both location-based and market-based emissions calculations per GHG Protocol guidance to provide a fuller picture of IIPD's electricity-related footprint.

Recommendations on Scope 3

- IIPD should focus on estimating emissions from other Scope 3 sources. Likely Scope 3 sources not owned or operated by IIPD include ocean-going vessels (at berth and in-transit), trucks, rail, cargo-handling equipment, harbor vessels, recreational vehicles, and fleet vehicles.
- IIPD can estimate these emissions based on industry averages to support the identification of emissions hot spots. Once hot spots are identified, IIPD should focus on developing data improvement plans to increase the use of actual data over time for the largest sources of emissions, instead of estimates. This approach allows IIPD to monitor hot spot performance, more accurately quantify emissions, and refine decarbonization plans. Engagement with tenants and logistics partners will be crucial to expanding Scope 3 data coverage.

- Assess the feasibility of incorporating Scope 3 categories beyond Category 13 (e.g., upstream supply chain, waste generated in operations, or business travel) to align with best practices among ports in the United States.
- Periodically benchmark against peer ports' Scope 3 boundary and coverage.
- It is recommended that IIPD regularly review Scope 3 emissions boundaries and update its inventory methodology to account for changes in tenant operations, new regulatory requirements, and best available emissions factors.

2.2 Decarbonization for IIPD

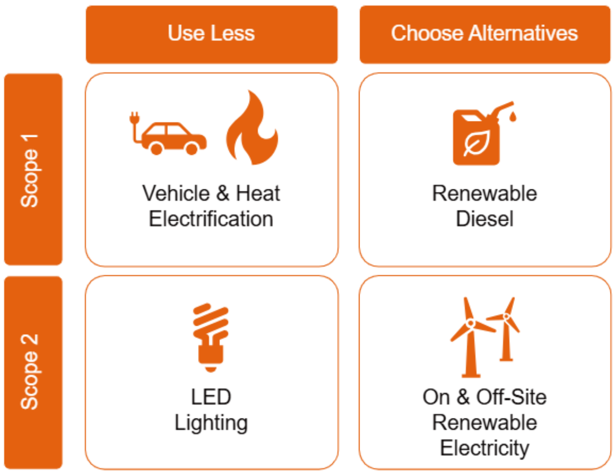
2.2.1 Decarbonization Opportunities

Scope 1 and Scope 2 Decarbonization Plan

The Scope 1 and Scope 2 decarbonization plan outlines a set of emissions-reduction measures tailored to IIPD's operational profile, with a focus on emissions sources directly within IIPD's control. The plan translates GHG inventory findings into practical actions across port facilities and operations, emphasizing measures that can be implemented within the constraints of existing infrastructure and capital planning cycles. Consistent with the "use less / choose alternatives" framework illustrated in Figure 4, six decarbonization measures were modeled across Scope 1 and Scope 2 emissions sources. These measures span both demand-reduction strategies, (electrification and lighting efficiency improvements), and lower-carbon energy supply options, reflecting a balanced approach that prioritizes reducing energy use before fuel switching or renewables.

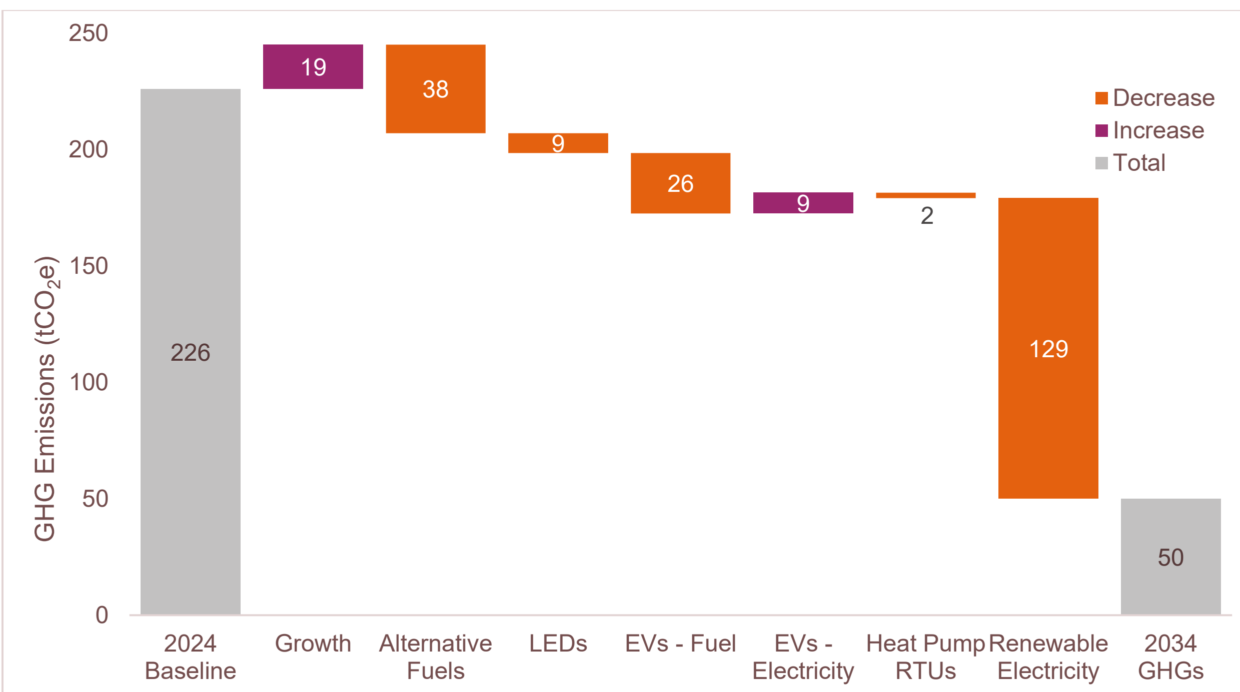
To ensure the plan remains robust and relevant, IIPD should conduct periodic scenario analysis to test the effectiveness of the decarbonization pathway under different assumptions (e.g., fuel price volatility, changes in grid emissions factors, or regulatory developments such as carbon pricing or new incentives). Integrating climate resilience considerations into project selection will help prioritize measures that both reduce emissions and enhance operational continuity in the face of extreme weather or other climate risks. It is recommended for IIPD to develop a process to align capital planning for decarbonization with scheduled asset replacements and facility upgrades, minimizing risk of stranded assets and unnecessary early retirements. Establishing clear key performance indicators, such as emissions intensity per ton or per tons of equivalent units of transport and percent renewable energy use, documenting progress, and communicating annually to stakeholders, will support accountability and transparency.

Figure 4. Measures Chosen for IIPD Decarbonization Plan



Together, the six measures represent a portfolio of actions applicable to IIPD-controlled assets. The combined impact of the evaluated measures is illustrated using the waterfall chart shown in Figure 5, which shows the relative contribution of each measure to overall Scope 1 and Scope 2 emissions reductions.

Figure 5. IIPD Waterfall Chart



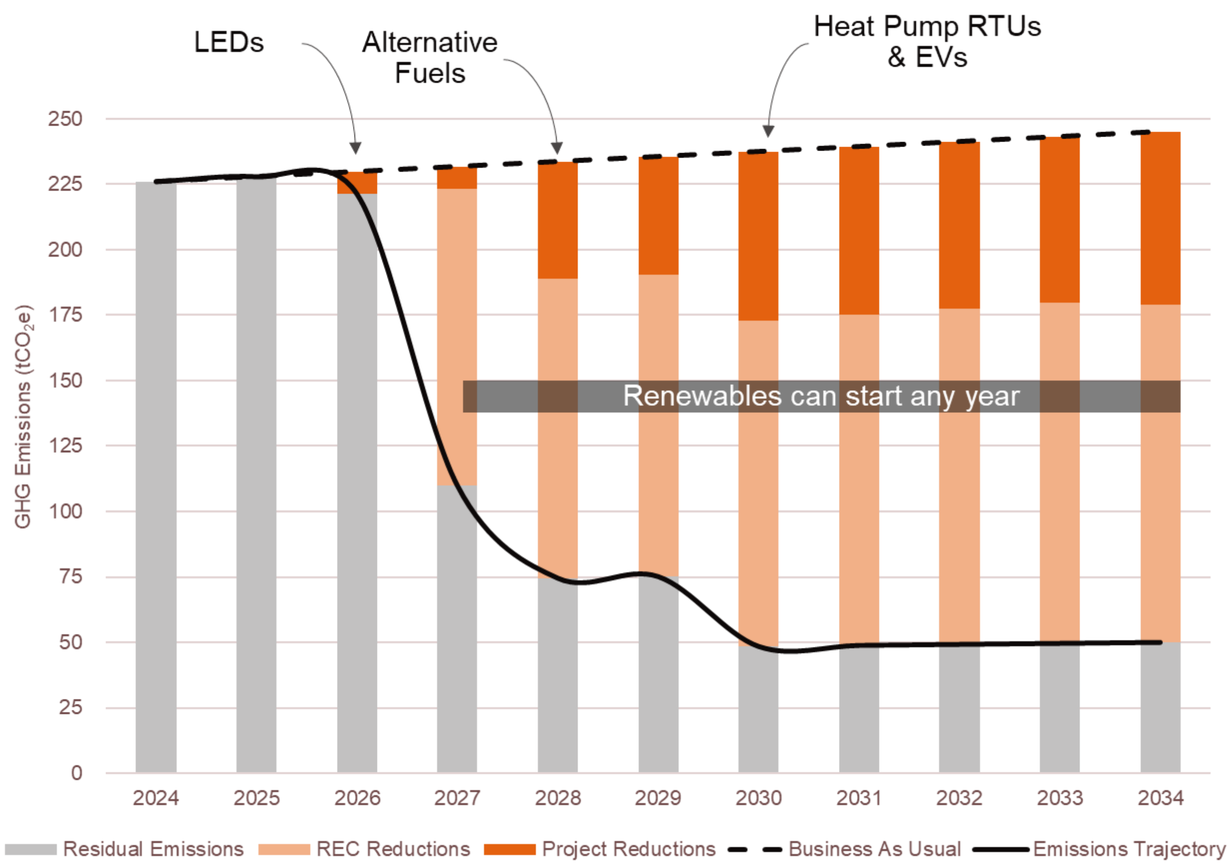
The glidepath bar chart in Figure 6 illustrates how implementation of these measures could reduce IIPD's Scope 1 and Scope 2 emissions over time compared to a baseline trajectory, providing a forward-looking view of potential progress.

The emissions reduction trajectory assumes a phased implementation of the evaluated measures over time to reflect practical deployment and to avoid front-loading multiple initiatives in a single year. **LED lighting upgrades** are recommended to continue in 2026, given that similar retrofits have already been completed in other spaces. The **adoption of alternative fuels** is assumed to begin in 2028; however, between now and then, IIPD should begin identifying potential suppliers of renewable diesel (also known as hydrotreated vegetable oil, HVO) and consider a small pilot to inform a broader roll out in 2028. **Electrification measures**, including heat pump rooftop units (RTUs) and vehicle electrification, are assumed to be implemented in 2030, reflecting longer planning and capital replacement cycles. These electrifications timelines should be revisited and updated to align capital planning with decarbonization goals, particularly as vehicle and equipment end-of-life dates become clearer. **Offsite renewable electricity procurement** is assumed to be flexible and may begin in any year. This sequencing is used solely to construct a realistic glidepath; in practice, measures can and should be implemented based on IIPD's operational constraints, asset lifecycles, and strategic priorities rather than a fixed timeline. Actual implementation should also consider external factors such as grant availability, evolving utility incentives, and regulatory changes.

IIPD is encouraged to integrate lessons learned from each implementation cycle into future planning, adapting approaches based on observed project performance and the evolving regulatory or market context.

The sixth decarbonization measure, **on-site solar**, has been excluded from the charts given it overlaps with off-site renewables (avoids double-counting). The details of this project are presented below in Scope 1 and Scope 2 Measure Descriptions.

Figure 6. IIPD Glidepath Bar Chart



The six decarbonization measures are summarized side-by-side in Table 5 to provide visibility into the emissions sources addressed, estimated reductions, and high-level cost considerations for each option. Where relevant, co-benefits such as air quality improvement, maintenance cost reduction, or workforce training should also be considered in evaluating these measures.

The EV costs in Table 5 are presented on a total cost of ownership basis, with annual costs driven by depreciation, insurance, registration, taxes, and related factors. All cost estimates are indicative and subject to an estimated uncertainty range of +50% / −30%. Negative values for annual net operating cost savings indicate an increase in operating expenses.

It is recommended to periodically review project assumptions (e.g., technology costs, fuel prices, grid emission factors) to keep the decarbonization plan current and responsive to market or policy changes.

Table 5. Scope 1 and Scope 2 Decarbonization Measures – Summary Results

Project	Emissions Scope	Emissions Source	Details	GHG Reduction (tCO_2e)	Incremental CAPEX (USD)	Annual Net OPEX Savings (USD)	Simple Payback (Years)	Implementation Year
LEDs	Scope 2	Electricity	CDL Building, guard shacks, corporate	9	$62,000	$3,100	20	2026
Alternative Fuels	Scope 1	Mobile Combustion	80% HVO in maintenance fuel tank	38	$0	$(2,700)	Annual Cost	2028
Vehicle Electrification	Scope 1	Mobile Combustion	Two SUVs, two pickup trucks	26	$54,000	$(4,000)*	Annual Cost	2030
Heat Pump RTUs	Scope 1	Stationary Combustion	Maintenance building, corporate	2	$6,000	$400	15	2030
Off-Site Renewables	Scope 2	Electricity	ComEd green power product	129	$0.00	$(11,000)	Annual Cost	Variable (Can start any year)
On-Site Renewables	Scope 2, Scope 3	Electricity, Tenant Electricity, Shore Power	Install solar PV systems at Shed 4 and Kloeckner Building	1,818	$7.8M	$497,000	15.7	2028+

Notes:
*Electric vehicles (EVs) represent total cost of ownership; annual cost is driven by factors such as depreciation, insurance, registration, taxes.
CAPEX = capital expenditure
OPEX = operational expenditure
PV = solar photovoltaic

EV costs in Table 5 above are presented on a total cost of ownership basis, with annual costs driven by depreciation, insurance, registration, taxes, and related factors. All cost estimates are indicative and subject to an estimated uncertainty range of +50% / −30%. Negative values for annual net operating cost savings indicate an increase in operating expenses.

Scope 1 and Scope 2 Measure Descriptions

LED Lighting Upgrades – IIPD-Owned Facilities

This measure considers upgrading existing lighting systems at IIPD-owned facilities to high-efficiency LED fixtures. LED lighting reduces electricity demand and internal heat generation, supporting facility performance during extreme heat or grid-constrained conditions. Lower cooling loads help maintain safe working environments while reducing energy use and emissions. LEDs also require less frequent maintenance, improving reliability and reducing operational disruptions during emergency or resource-limited situations. Additionally, LEDs enhance industrial visibility for improve safety, such as preventing trips and falls and reducing eye strain. Some facilities already have LED lighting, so this measure reflects upgrades at facilities that do not yet have them. Additional co-benefits include improved safety and visibility for staff and visitors, and fewer lighting outages due to longer lifespan of LED fixtures.

Table 6. LED Lighting Upgrades Decarbonization Summary

Scope	Source	GHG Reduction (tCO_2e)	Incremental CAPEX (USD)	Annual Net OPEX Savings (USD)	Simple Payback (Years)	Implementation Year
Scope 2	Electricity	9	$62,000	$3,100	20	2026

As shown in Table 6, LED lighting upgrades at IIPD-owned facilities reduce Scope 2 emissions by approximately 9 tCO_2e, requiring upfront capital investment and generating modest annual operating cost savings. LED upgrades reduce electricity demand and peak load, enable integration with advanced lighting controls, and lower internal heat gains that can reduce cooling energy use, if applicable. The analysis for LED upgrades assumes standard LED performance, estimated building square footage for IIPD locations, and current electricity emission factors and rates. IIPD should consider pursuing utility rebate programs or state/federal incentives to reduce upfront costs and improve payback for LED projects. Where feasible, pilot advanced controls such as occupancy sensors or daylight harvesting to maximize energy savings. Maintenance teams should implement a pre- and post-retrofit tracking system to validate reductions in labor and material costs.

Alternative Fuels – Renewable Diesel for IIPD Vehicles and Equipment

This measure evaluates the use of renewable and lower-emission fuels for IIPD-owned mobile and stationary equipment that currently relies on conventional fossil fuels. The approach focuses on assets expected to remain in service in the near-to-medium term, providing a practical pathway to reduce Scope 1 emissions without requiring immediate equipment replacement or major operational changes. Additional co-benefits include improved local air quality, and potential reductions in engine wear that may lower maintenance needs over time.

Table 7. Alternative Fuels Decarbonization Summary

Scope	Source	GHG Reduction (tCO2e)	Incremental CAPEX (USD)	Annual Net OPEX Savings (USD)	Simple Payback (Years)	Implementation Year
Scope 1	Mobile Combustion	38	$0	$(2,700)	Annual Cost	2028

As shown in Table 7, transitioning IIPD mobile equipment to renewable and lower-emission diesel fuels can achieve near-term Scope 1 emissions reductions (approximately 38 tCO_2e) with no incremental capital investment and modest net annual operating cost. Because biodiesel blends and renewable diesel are treated as drop-in fuels compatible with existing engines and fueling infrastructure, this measure is considered highly feasible and can be implemented without changes to fleet assets or supporting infrastructure. As a result, alternative fuels provide an immediately actionable pathway to reduce emissions from equipment that is expected to remain in service and are not yet suitable for electrification. Alternative fuels improve air quality, which can mitigate the effects of increasing temperatures, which will worsen air quality. Maintaining multiple fuel sourcing pathways increases operational flexibility and reduces the risk of supply interruptions during extreme weather or infrastructure disruptions. Tracking fuel supply chain certifications and verifying actual GHG reduction factors for procured fuels is recommended to ensure emissions reductions are accurately credited and reported.

In addition, IIPD should require suppliers to provide documentation of the lifecycle carbon intensity of fuels (e.g., via the U.S. Department of Energy [DOE] Greenhouse gases, Regulated Emissions, and Energy use in Technologies (GREET®) model or similar certification) and periodically review supplier compliance with low-carbon standards.

<u>Vehicle Electrification – End-of-Life Replacement Pathway</u>

This measure evaluates electrifying IIPD-owned vehicles through a phased replacement strategy aligned with normal end-of-life cycles. By integrating electrification into planned fleet turnover, IIPD can reduce Scope 1 emissions over time while managing capital costs and minimizing operational disruption. Additional co-benefits include improved local air quality and reduced noise at port facilities, and opportunities to upskill maintenance staff in emerging EV and charging technologies, supporting workforce development and long-term fleet resilience.

Table 8. Vehicle Electrification Decarbonization Summary

Scope	Source	GHG Reduction (tCO_2e)	Incremental CAPEX (USD)	Annual Net OPEX Savings (USD)	Simple Payback (Years)	Implementation Year
Scope 1	Mobile Combustion	26	$54,000	$(4,000*)	Annual Cost	2030

Note: *EVs represent total cost of ownership; annual cost is driven by factors such as depreciation, insurance, registration, taxes.

As shown in Table 8, vehicle electrification amounts to a reduction of 28 tCO_2e, with an upfront investment of approximately $54,000. Operating costs are estimated annually at $4,000, as well. The annual costs represent total cost of ownership, driven by factors such as depreciation, insurance, registration, and taxes. The analysis assumes total fuel consumption and associated emissions grow at an annual average historical rate of 0.84%, with EPA emission factors held constant over the analysis period. Average EV charging installation costs are based on values from multiple sources, and annual operating costs for internal combustion engine (ICE) road vehicles are assumed at $0.06 per mile. Installation cost estimates exclude broader infrastructure upgrades, such as electric service improvements.

Exploring integration of vehicle telematics and ongoing monitoring of charging and electricity grid carbon intensity are recommended to ensure real-world emissions reductions and cost performance. IIPD should actively pursue available grant funding (e.g., federal/state clean transportation funds) to reduce the capital burden of EV and charging infrastructure deployment. Develop a fleet transition plan that includes operator training on EV use and charging, evaluates grid impacts and utility rate optimization, and considers piloting vehicle-to-grid (V2G) capabilities as technology and utility programs evolve.

<u>Heat Pump RTUs – Building Heating Electrification</u>

This measure assesses replacing fossil fuel-fired RTUs with electric heat pump systems at buildings with the highest stationary combustion emissions. Electrifying space heating shifts energy use from direct fuel combustion to electricity, reducing Scope 1 emissions and supporting a targeted approach to building decarbonization. Their ability to operate efficiently across varying temperatures helps maintain safe and stable indoor conditions during extreme heat. When paired with resilient or renewable electricity sources, heat pumps improve building functionality during supply disruptions and support continuous operations. Additional co-benefits include improved indoor air quality, enhanced occupant comfort through more consistent temperature and humidity control, and potential reductions in long-term maintenance and fuel cost volatility compared to combustion-based systems.

Table 9. Heat Pump RTUs Decarbonization Summary

Scope	Source	GHG Reduction (tCO_2e)	Incremental CAPEX (USD)	Annual Net OPEX Savings (USD)	Simple Payback (Years)	Implementation Year
Scope 2	Electricity	2	$6,000	$400	15	2030

As shown in Table 9, Heat pump RTUs are modeled as a targeted replacement at the CDL and Corporate Office buildings, resulting in an estimated 2 tCO_2e reduction with incremental capital costs and modest annual operating cost savings. Maintenance requirements are assumed to be comparable to existing RTUs, resulting in no change in operating expenditures. Cost estimates exclude federal, state, or utility incentives and do not include potential upgrades to electrical service, panels, wiring, demand charges, or structural requirements. It is recommended to periodically review incentive programs and update cost/benefit analyses. Where possible, coordinate heat pump upgrades with building envelope improvements (e.g., insulation and glazing) to maximize emissions reduction and operational savings. Annual tracking of system performance (including coefficient of performance, runtime, and maintenance needs) is recommended to inform future electrification strategies.

Renewable Energy Certificates – Off-site Renewable Electricity Sourcing

This measure assesses the use of third-party RECs to reduce the emissions intensity of purchased electricity at IIPD-controlled assets, also called offset renewable electricity in this report. RECs provide a near-term and flexible option to support renewable electricity generation where direct procurement or on-site generation may be limited. Off-site renewable procurement lowers emissions while diversifying energy supply through long-term contracts that can improve cost and supply stability during grid stress events. Geographic diversity of renewable sources reduces vulnerability to localized climate hazards. Additional co-benefits include the ability to advance emissions reductions without construction or disruption at active port facilities, and support employee morale and engagement by delivering near-term sustainability outcomes while longer-term projects are developed.

Table 10. RECs Decarbonization Summary

Scope	Source	GHG Reduction (tCO_2e)	Incremental CAPEX (USD)	Annual Net OPEX Savings (USD)	Simple Payback (Years)	Implementation Year
Scope 2	Electricity	129	$0	$(11,000)	Annual Cost	Variable (Can start any year)

As shown in Table 10, RECs reduce Scope 2 emissions by 129 tCO_2e, requiring no upfront investment and a stated annual operating cost of $11,000. The analysis assumes that electricity prices for both conventional and renewable electricity remain constant over the analysis period. Total electricity consumption and associated emissions are projected using an annual average historical growth rate of 0.84%. The regional eGRID emissions factor is assumed to remain unchanged over time. Renewable electricity pricing is based on a per-kilowatt-hour rate derived from Clean Choice residential pricing program offered by ComEd, used as a proxy for third-party renewable electricity sourcing. It is important to ensure RECs are Green-e certified or meet credible standards, and to report Scope 2 emissions using both location- and market-based methods per GHG Protocol.

IIPD should periodically review the REC market and renewable electricity sourcing options to ensure they provide additionality, avoid double counting, and remain cost effective. Evaluating the potential to enter into long-term power purchase agreements for local or regional renewable projects is also encouraged, as this could potentially provide both price certainty and stronger sustainability claims.

On-Site Solar Installation

Note: IIPD has received a $60M Clean Ports Grant from the EPA for on-site solar evaluation and installation. That program will build on these recommendations and include detailed site-level feasibility studies and precise investment cost modeling.

This measure evaluates the installation of on-site PV systems at suitable IIPD-owned facilities to offset purchased electricity. On-site solar represents a longer-term opportunity to reduce Scope 2 emissions while enhancing energy resilience, particularly where roof or site conditions are favorable. To this effect, rooftop or canopy solar can also reduce surface heat absorption, helping mitigate localized urban heat impacts and lowering cooling demand. Additional co-benefits include increased energy cost predictability by reducing exposure to utility rate volatility, and improved operational resilience during grid disruptions.

Table 11. On-Site Solar Installation Decarbonization Summary

IIPD Facility	Scope	Source	GHG Reduction (tCO_2e)	Incremental CAPEX (USD)	Annual Net OPEX Savings (USD)	Simple Payback (Years)	Implementation Year
Shed 4	Scope 2	Electricity	845	$3.6M	$231,000	15.6	2028+
Kloeckner Building	Scope 2	Electricity	973	$4.2M	$266,000	15.8	2028+
		Total	**1,818**	**$7.8M**	**$497,000**	**15.7**	

As shown in Table 11, on-site solar installation at Shed 4 reduces emissions by 845 tCO_2e, with an upfront investment of $3.6 million and an estimated annual savings of $231,000. At the Kloeckner Building, on-site solar installation reduces emissions by 973 tCO_2e, with an upfront investment of $4.2 million and an estimated annual savings of $266,000. On-site solar can reduce reliance on grid electricity and exposure to utility rate volatility while supporting IIPD's sustainability commitments, with federal and state incentives helping to offset upfront costs and the potential to improve resilience when paired with storage. Performance is limited by seasonal variability; snow cover, intermittency, and potential exposure to physical damage in a port environment, and grid interconnection or storage requirements are not included in this analysis. Cost and performance estimates are based on average installation costs from multiple sources, system sizing and generation modeled using the National Renewable Energy Laboratory (NREL) PVWatts calculator, and site selection based on roof condition at the Kloeckner Building and Shed 4.

Prior to implementation, a detailed engineering and interconnection study should be performed to evaluate structural, electrical, and grid integration requirements as well as the feasibility of battery storage or microgrid integration for resilience. Annual monitoring of real-world solar system performance should be used to refine future OPEX and emissions savings estimates.

Decarbonization and Emissions Reduction Methodology

The decarbonization results and emissions reduction glidepath presented above were developed by applying a consistent modeling approach across the evaluated Scope 1 and Scope 2 measures.

To develop the business-as-usual emissions trajectory shown in the glidepath, activity growth was estimated using historical trends in port throughput across a peer set of ports in the United States. Monthly tons of equivalent units of transport data from 2019 to 2025 were analyzed and ports were grouped by size to differentiate growth dynamics between large and small ports. While large ports exhibited higher average growth over the period, small ports showed a lower and more variable growth profile, with an average annual growth rate of approximately 0.8%. Given IIPD's scale and operational characteristics, this small-port growth rate was applied as a proxy to estimate IIPD's baseline growth in activity, energy use, and associated emissions.

Measures were modeled based on IIPD's identified emissions hotspots, with a focus on assets and activities directly under IIPD's operational control. Measure selection and applicability were informed by input from IIPD stakeholders and observations from site visits, which helped refine assumptions related to building characteristics, equipment condition, fleet composition, and implementation feasibility across port facilities.

Performance and cost assumptions used to estimate emissions reductions, capital requirements, and operating impacts were supported through desktop research, including publicly available emissions factors, utility data, technology benchmarks, and cost references relevant to port and industrial facility contexts. Where site-specific data were unavailable, reasonable proxy assumptions were applied and documented.

A consolidated list of assumptions and sources used to generate the measure-level results and glidepath is provided in Table 12 to support transparency and interpretation. It is recommended that IIPD annually review and update all input assumptions and emission factors to reflect new regulatory requirements, market changes, and technology improvements. Where possible, third-party review or limited assurance of decarbonization modeling and reporting should be sought to enhance transparency and stakeholder confidence. A formal process for integrating lessons learned from project implementation into future planning cycles should also be established.

Table 12. Data Sources and References by Decarbonization Measure

Measure	Source / Reference	Section / Detail Used	Purpose in Analysis	Organization	Source Link
Alternative Fuels	Field Evaluation of Biodiesel (B20) Use by Transit Buses	Abstract, Paragraph 2	Basis for $0 incremental maintenance costs	NREL	https://docs.nrel.gov/docs/fy13osti/45872.pdf
	Illinois Transportation Data for Alternative Fuels and Vehicles	Regional Fuel Prices	Biodiesel (B20) pricing for Illinois	Alternative Fuels Data Center (AFDC) / DOE	https://afdc.energy.gov/states/IL
	Fuel Prices	Average Renewable Diesel and Diesel	Renewable diesel and diesel fuel pricing	AFDC / DOE	https://afdc.energy.gov/data/10969
LED Lighting	CBECS	Lighting Energy Use Share	Baseline lighting energy assumptions	EIA	https://www.eia.gov/consumption/commercial
	Renewables and Electricity	LEDs Section	Assumed % reduction in electricity from LEDs	DOE	https://www.energy.gov
	Commercial Lighting Cost	Average Cost per Square Foot	LED retrofit cost assumptions	FES Lighting / 4Front Energy	https://blog.feslighting.com/commercial-lighting-cost-per-square-foot ; https://4frontenergy.com/blog/commercial-lighting-cost-per-square-foot
	IIPD Electricity Usage	Electricity Usage – 2024	Electricity unit cost	Arcadis	{Arcadis Processed} 2024 IIPD Usage_Scope 1 &2.xlsx
Renewable Electricity (i.e., RECs)	Renewable Energy for ComEd Customers	Program Overview	REC sourcing option context	CleanChoice Energy	https://www.cleanchoiceenergy.com
	CleanChoice Energy Pricing	Plan Pricing	Renewable electricity price proxy	CleanChoice Energy	https://www.cleanchoiceenergy.com
	Price to Compare – ComEd	Retail Electricity Price	Baseline electricity price	Plug In Illinois	https://plugin.illinois.gov
Vehicle Electrification	2025 Equinox EV	Vehicle Specs and Pricing	EV cost assumptions	Chevrolet	https://www.chevrolet.com
	2025 F-150 Lightning	Vehicle Specs and Pricing	EV cost assumptions	Ford	https://www.ford.com

Measure	Source / Reference	Section / Detail Used	Purpose in Analysis	Organization	Source Link
	True Cost of EVs	Maintenance / Repair Costs	EV annual operation and maintenance assumptions	AAA	https://exchange.aaa.com
	Fuel Economy Data	kilowatt-hour/mi	EV energy consumption	DOE	https://www.fueleconomy.gov
	ICE Vehicle Pricing	Vehicle Overview	ICE vehicle cost baseline	Chevrolet / Ford	https://www.chevrolet.com ; https://www.ford.com
	EV Charger Costs	Installation Cost	Charger installation cost assumptions	Ford / Chevrolet / Car Charger Specialists	https://www.ford.com ; https://www.chevrolet.com ; https://www.carchargerspecialists.com
On-Site Solar	Commercial Solar Cost Benchmarks	Multiple Cost Ranges	Average commercial solar installation cost	Solar Reviews; Exact Solar; Sun Green Systems; Wolf River Electric; Huston Solar	https://www.solarreviews.com/blog/installing-commercial-solar-panels https://sitexas.com/commercial-solar-costs-and-pricing-factors https://exactsolar.com/how-much-do-solar-panels-cost/ https://www.sungreensystems.com/blog-posts/commercial-solar-cost-roi https://wolfriverelectric.com/faq-items/how-much-do-commercial-solar-panels-cost https://hustonsolar.com/commercial-solar-panel-costs https://ea-global.us/commercial-solar-panel-cost-the-ultimate-2025-guide-for-businesses
Heat Pump RTUs	End-Use Savings Shapes Measure Documentation: Heat Pump RTUs	Executive Summary	Site energy savings by energy source for RTUs	NREL	https://www.nrel.gov
	Current Natural Gas Cost	Sheet: Natural Gas Usage - 2024	Average cost per therm based on 2024 bills	Arcadis	{Arcadis Processed} 2024 IIPD Usage_Scope 1 &2.xlsx
	Heat Pump Payback Periods in the United States	Payback by System Type	Conservative payback assumption (maximum across system types)	Heat Pump price reviews	https://heatpumppricereviews.com

Scope 3 Decarbonization Opportunities

Strategic Importance of Scope 3 emissions

At United States ports, most GHG emissions are generated by activities outside direct port operations, including tenants, ocean-going vessels, drayage trucks, and rail; thus, these activities fall within the port's broader sphere of influence rather than direct operational control. IIPD's emissions profile reflects this pattern even more strongly: Scope 1 and Scope 2 total 226 tCO_2e, while Scope 3 Category 13 (downstream leased assets) accounts for 7,882 tCO_2e, or roughly 97% of total emissions. This distribution defines where IIPD's decarbonization efforts must focus.

Targeting Scope 3 sources will help achieve the largest emissions reductions and address localized impacts such as air pollutants, noise, traffic, and land use pressures that impact nearby neighborhoods. IIPD's Scope 3 approach must, therefore, advance climate goals while improving environmental conditions and strengthening community relationships and resilience. This approach will position IIPD to align with evolving federal and state climate disclosure requirements and funding criteria. This understanding serves as the foundation for IIPD's governance strategy and defines where the port can drive the greatest and most durable results.

Aligning planning, leasing, and capital investments to Scope 3 outcomes enables IIPD to:

- **Accelerate zero-emission (ZE) adoption** through coordinated electrification (e.g., cargo handling equipment [CHE], trucks, shore power), shared charging, and grid-ready infrastructure.
- **Access major funding** (e.g., Port Infrastructure Development Program [PIDP], Better Utilizing Investments to Leverage Development [BUILD], Multimodal Project Discretionary Grant [MPDG]) tied to measurable emissions reductions and community-beneficial outcomes.
- **Shape tenant behavior at scale** via green leases, aggregated renewable procurement, standardized reporting, and preferred vendor structures.
- **Improve local environmental conditions** by targeting carbon-intensive activities that drive air quality and noise impacts.
- **Increase resilience** to supply chain disruptions, and regulatory changes by embedding Scope 3 considerations into long-term strategy.

Scope 3 Measure Descriptions

To address the largest share of IIPD's emissions and maximize its influence as a landlord port, a suite of targeted Scope 3 decarbonization measures have been identified. These measures can be leveraged to engage tenants, align operational practices, and accelerate the transition to low-carbon and ZE technologies across the port's value chain. The following initiatives—including **aggregated renewable energy sourcing, green leasing, enhanced reporting, preferred vendor frameworks, electrification guidance, shared infrastructure investment, incentive programs, and public scorecarding**—provide a structured approach for achieving meaningful emissions reductions beyond IIPD's direct operational control. Each measure should be tailored to the unique governance structure, stakeholder landscape, and operational realities of the port, and be implemented in close collaboration with tenants, public agencies, and community partners.

Aggregated Renewable Energy Sourcing

IIPD aggregates its own electricity load with those of its tenants to procure renewable electricity through mechanisms such as utility green supply contracts, community solar subscriptions (e.g., Illinois Shines[11]), and where feasible, on-site solar and battery storage microgrids. IIPD coordinates data collection, load aggregation, and procurement; tenants commit to energy data transparency and contract participation. The roles and responsibilities for landlords and tenants under this measure are as follows:

- Landlord: Under an aggregated procurement model, IIPD acts as the convener and coordinator. The port collects energy consumption data, aggregates tenant loads, manages competitive solicitations, and aligns procurement strategies with its 2022 IIPD Master Plan and long-term infrastructure planning. This centralized approach also enables planning for grid upgrades and coordination with the local utility to ensure adequate capacity for future electrified operations.

  IIPD should also develop a load forecasting and demand management plan to match renewable procurement with port-wide electrification plans and evaluate the feasibility of virtual power purchase agreements or direct wholesale market participation as tenant demand grows.

- Operators/Tenants: Tenants and terminal operators play a critical complementary role by committing to the aggregated contract structure, sharing energy data, and adopting metering processes that enable transparent and accurate tracking. Their participation creates the scale necessary for favorable renewable energy pricing, stable contract terms, and eligibility for complementary incentive programs.

Aggregated renewable electricity sourcing has a **potentially high emissions reduction potential**, especially for tenants with energy intensive operations and for future electrified assets such as EV charging hubs, refrigerated containers (reefers), and electric CHE. As electrification accelerates, renewable power procurement becomes a foundational requirement for ZE transitions.

Technical note: To maximize actual emissions reductions, IIPD can consider a pilot test for tracking hourly RECs by 2028 and prioritize procurement from projects with verified additionality, and should assess the feasibility of integrating battery energy storage to align renewable supply with peak demand.

Aggregated renewable energy sourcing:

- Provides longterm price stability for tenants through predictable energy contracts;
- Achieves better pricing and contract terms by leveraging aggregated load rather than individual tenant procurements;
- Enhances readiness for electrification by ensuring all electrical loads are served by clean power; and
- Increases competitiveness for federal and state funding programs that prioritize renewable supply integration.

Aggregated renewable energy sourcing can be challenging because:

- Contracting structures and loads can be complex and varied, particularly in multitenant environments requiring careful forecasting and contract design;
- The measure requires robust governance, metering, and settlement processes to ensure transparent allocation of renewable attributes; and
- Matching renewable energy generation profiles to port load shapes may require additional capacity such as energy storage or RECs with high data quality.

[11] https://illinoisshines.com/

- Note that for technical robustness, all renewable procurement contracts should include performance monitoring (e.g., metering of actual renewable generation and port demand), clear environmental attribute ownership, and annual reporting of avoided carbon emissions.

Aggregated renewable energy sourcing can contribute the following environmental and community co-benefits:

- Community solar subscriptions and resilience-oriented microgrids can reduce utility costs for nearby public facilities and improve reliability during local outages. Integrating equity focused workforce strategies and siting microgrids or solar installations in collaboration with neighboring communities can channel local job creation[12], cost savings, and resilience benefits to historically underserved areas near the Lake Calumet region.

Leadership examples:

- Port of Seattle has advanced solar/microgrid[13] development and a waterfront clean energy strategy[14] through joint planning with the local utility demonstrating how coordinated siting, load analysis, and infrastructure planning can support both port operations and local resilience.
- Pacific Northwest National Laboratory's Port Electrification Handbook[15] provides national guidance on microgrids, load profiles, and program design for port electrification, offering frameworks applicable to aggregated renewable energy sources.

<u>Green Leases</u>

Green leases are a central decarbonization tool for IIPD because they embed long-term expectations for energy performance, data transparency, and ZE transitions directly into tenant agreements. As a landlord port, IIPD can shape operational practices and capital decisions over the full lease term, making leases one of the most durable mechanisms for aligning tenant actions with port wide decarbonization goals. The roles and responsibilities for landlords and tenants under this measure are as follows:

- Landlord: Under a green leasing model, IIPD integrates requirements for energy efficiency, renewable energy participation, GHG and activity data reporting, and equipment electrification timelines into new leases, amendments, and concession agreements. Key provisions may include:
- Participation in aggregated renewable procurement and/or utility green power programs and set minimum efficiency standards for lighting, heating, ventilation, and air conditioning (HVAC), and other building systems;
- Submetering and standardized data sharing; and
  - ZE transition schedules for fleets, drayage trucks, cargo handling equipment (CHE), and on-site vehicles.

  IIPD's role is to develop standardized lease templates, set performance expectations, and manage periodic compliance reviews.

  Technical note: Green lease provisions should include explicit requirements for energy benchmarking, annual reporting, and corrective action plans if targets are not met. Lease templates should be regularly reviewed (legal and technical) to ensure enforceability and to reflect new decarbonization technologies and standards. IIPD should consider a phased program for retrofitting legacy leases, including incentives for early adoption and pilot projects for innovative green lease structures.

[12] https://epa.illinois.gov/topics/ceja.html
[13] https://www.portseattle.org/projects/solar-power-port
[14] https://www.portseattle.org/sites/default/files/2025-04/Seattle%20Waterfront%20Clean%20Energy%20Strategy%20-%20FINAL.pdf
[15] https://www.pnnl.gov/projects/port-electrification-handbook

- Tenants:
- Commit to the requirements, maintain transparency on energy and equipment data.
  - Integrate the standards into their operational planning and capital cycles.

Green leases provide **medium but highly durable emissions reduction potential**. While individual measures such as lighting upgrades and HVAC replacements are influential, lease requirements influence hundreds of daily and longterm decisions that compound over time. They also provide the contractual foundation for other decarbonization levers, including shared infrastructure, renewable energy procurement, and consistent reporting.

Green leases:

- Offer ow upfront costs for the port and align incentives across landlord and operator; and
- Support funding competitiveness by demonstrating structured governance and compliance mechanisms.

Green leases can be challenging because:

- Timing constraints are tied to lease renewals or amendments;
- Legacy leases may slow adoption if provisions cannot be immediately updated;
- Split incentive challenges are inherent (e.g., landlord investment vs. tenant energy savings); and
- Green leases require administrative capacity to monitor and review performance.

Green leases can incorporate a range of environmental and community benefit provisions that address localized impacts. These may include:

- Ant idling requirements, truck routing, yard management, and traffic flow standards for trucks and equipment that reduce exposure for nearby neighborhoods;
- Noise reduction measures and operating hour buffers; and
- Requirements for local hiring and workforce development.

These provisions ensure that decarbonization and operational improvements contribute directly to better air quality, reduced diesel exposure, and improved environmental conditions around IIPD's neighboring communities.

Leadership examples:

- Northwest Ports Clean Air Strategy[16] aligns multiple ports and terminal operators around shared air quality and GHG standards through coordinated lease requirements and roadmaps.

GHG Impact Reporting

Standardized GHG reporting provides the transparency and data foundation necessary for effective Scope 3 management at IIPD. Aligning how tenants measure and disclose emissions creates a reliable dataset that supports planning, decision-making, and long-term reduction efforts across the port. The roles and responsibilities for landlords and tenants under this measure are as follows:

- Landlord: IIPD will implement a unified reporting framework requiring tenants to submit annual Scope 1 and 2 emissions, along with Scope 3 activity data such as fuel use, equipment inventories, refrigeration loads, and fleet miles. All data is reported through a common template aligned with GHG Protocol guidance and emerging International Sustainability Standards Board expectations. IIPD should:
- Define the reporting methodology, boundaries, metrics, and submission schedule;

[16] https://www.nwseaportalliance.com/environment/clean-air/northwest-ports-clean-air-strategy

- Aggregate tenant data into a consolidated Scope 3 ledger;
- Conduct sample validations and identifies emissions trends, hotspots, and yearly changes; and
- Develop a digital reporting portal and conduct annual QA/QC audits. For large tenants, third-party verification of reported data is recommended at least every three years.

- Tenants:

- Provide complete and accurate emissions and activity data.
- Participate in required metering or data sharing systems and maintain verification records.

While reporting has **low impact on GHG reductions** and does not directly reduce emissions, it provides the visibility needed to guide all decarbonization actions at IIPD and assess impact over time. It also supplies the verified data required for funding applications, disclosure expectations, and transparent progress tracking across the port complex.

GHG impact reporting:

- Establishes consistent baselines and emissions datasets;
- Supports funding eligibility and investor grade disclosure requirements;
- Creates long-term accountability and performance tracking; and
- Enhances decision-making through clear, data-driven insights.

GHG impact reporting can be challenging because:

- Gathering, tracking, and reporting additional data can be a burden for some operators;
- Defining consistent boundaries can be challenging for certain activities (e.g., shared equipment or multi-operator assets); and
- GHG impact reporting requires IIPD administrative capacity for data management and validation.

GHG impact reporting can contribute the following environmental and community co-benefits:

- Transparent emissions reporting not only supports climate planning but also provides neighboring communities with clearer insight into the port's activities and its related impacts. Emissions reporting summaries can be shared with the wider community along with air pollution indicators (e.g., NOx, $PM_{2.5}$) that directly relate to public health outcomes. Engagement structures can include community engagement briefings, accessible dashboards, or summaries with multi-lingual translation. These practices can help build trust, demonstrate progress, and help residents understand how port activities intersect with environmental conditions.

Leadership examples:

- Port of Seattle conducts annual GHG reporting across port operations and collaborates with maritime partners to develop joint inventories[17].
- The Port Authority of New York and New Jersey reports transparently on Scope 3 emissions, representing approximately 96% [18]of its total offering a model for disclosure at landlord ports[19].

[17] https://www.portseattle.org/page/measuring-greenhouse-gas-emissions-port-seattle
[18] https://www.panynj.gov/content/dam/port-authority/about/environmental-initiatives-/panynj-NetZeroRoadMap.pdf
[19] https://www.panynj.gov/port-authority/en/about/Environmental-Initiatives/reporting-and-performance---environmental-initiatives-.html

Preferred Vendor / Engineering Procurement and Construction (EPC) List

A Preferred Vendor / EPC Framework streamlines delivery of ZE and energy efficiency projects across IIPD by establishing a pool of prequalified engineering, procurement, and construction firms and publishing standardized technical requirements. This structure reduces soft costs and ensures that tenant projects meet consistent design, interoperability, and performance standards, which is an essential foundation as the port scales electrification, renewable energy deployment, and facility upgrades.

Under this lever, IIPD establishes a prequalified pool of contractors, energy service companies, and EPC firms capable of delivering energy efficiency upgrades, solar PV and battery storage systems, EV charging and CHE electrification infrastructure, shore power connections, and necessary metering, controls, and electrical upgrades. IIPD also issues standard specifications, drawings, cybersecurity requirements, and commissioning and interoperability guidelines to ensure consistent, utility-ready solutions across tenant sites. The roles and responsibilities for landlords and tenants under this measure are as follows:

- Landlord: IIPD maintains the approved vendor pool, updates technical standards, coordinates with the utility on interconnection and capacity needs, and oversees performance and quality assurance. IIPD should require vendors to demonstrate technical competency and maintain regular vendor performance reviews. Digital project tracking and post-commissioning audits are recommended.
- Tenants: Select vendors from the pool; provide site/load data; implement metering and reporting; and operate systems to performance standards.

This lever has **low but highly enabling emissions reduction potential**. By standardizing project delivery, it accelerates electrification, renewable generation, and efficiency upgrades while reducing delays, costs, and performance risk. It also ensures all systems are grid ready and interoperable, preventing stranded assets and supporting faster, more reliable Scope 3 reductions.

A Preferred Vendor / EPC Framework offers:

- Faster, more predictable procurement and project delivery;
- Consistent quality, safety, and interoperability across sites;
- Reduced design, permitting, and transaction costs;
- Improved data quality through standardized metering and commissioning;
- Support for the bundling and sequencing of projects for scale; and
- Advantaged competitiveness for grants through clear governance and capacity.

A Preferred Vendor / EPC Framework can be challenging because:

- Ongoing vendor oversight and performance monitoring is required;
- Standards must be regularly updated as technologies evolve;
- Competition and pricing transparency must be maintained;
- Tenants may need to adjust the procurement processes; and
- Attention is required to equitable access for qualified Minority/Women-owned Business Enterprises and local firms.

A Preferred Vendor / EPC Framework can contribute the following environmental and community co-benefits:

- The framework can advance local economic benefits by prioritizing local contractors, embedding apprenticeship and workforce development requirements, and encouraging designs that reduce diesel exposure, noise, and on-site impacts. Clear and multilingual communication methods and predictable contracting cycles help build long-term local capacity while linking ZE investments to community and environmental co-benefits.

Leadership examples:

- Some ports use vendor frameworks to electrify cranes (ship to shore/rubber-tyred gantry), reefer racks, and trucks (e.g., San Diego ZE truck infrastructure plan[20]).

Electrification Guidance

Electrification guidance provides consistent technical standards and design criteria to accelerate ZE adoption across asset categories, including CHE equipment, trucks and charging, and building HVAC and controls, ensuring operability and alignment with IIPD's grid and infrastructure planning. The roles and responsibilities for landlords and tenants under this measure are as follows:

- Landlord: IIPD publishes asset-specific ZE roadmaps and charging and power profiles, along with metering and commissioning specifications developed in coordination with the IIPD Board, and tenant working groups. IIPD should consider requiring all major electrification projects to submit grid impact studies and implementation schedules. Guidance should include smart charging, demand response, and microgrid readiness as standard design criteria.
- Tenants: Apply the electrification guidance standards to equipment procurement and facility upgrades, implement smart charging and load management strategies, and share interval data needed for system optimization, while utility and city partners coordinate interconnection timelines, tariffs, and grid upgrades to support growing loads.

The **impact of electrification guidance on GHG emissions is low**, with air toxics benefits ($PM_{2.5}$/NOx reductions) near the port. Electrification directly reduces tenant energy emissions and positions mobile sources (e.g., CHE, trucks) for continuous decarbonization as the grid becomes cleaner.

Electrification guidance:

- Improves adjacent community health and noise levels;
- Lowers lifecycle operation and maintenance and reduces fuel price exposure;
- Prepares IIPD for compliance readiness for evolving equipment/emissions standards; and
- Provides interoperable designs that scale across terminals and tenants.

Electrification guidance can be challenging due to:

- Upfront capex and OEM lead times;
- Workforce training needs;
- Utility interconnection and grid upgrade timelines; and
- Site constraints for charger placement and power distribution and lifecycle disposal planning.

Considerations for the Illinois grid and utility (i.e., ComEd / PJM):

- Plan charging to manage PJM capacity tags, peak shaving, and demand charges.

[20] https://maritime-executive.com/magazine/zero-emissions-ports

- Leverage ComEd's multi-year grid plan[21], the Clean and Reliable Grid Affordability Act[22] and the Climate and Equitable Jobs Act electrification[23] provisions where applicable.
- Schedule buildouts with utility interconnection milestones, preserve options for future Microgrid Control Systems and behind the meter storage for resilience and load shaping.

Electrification guidance can contribute the following environmental and community co-benefits:

- Electrification guidance can help prioritize diesel retirements along highest exposure corridors, coordinate anti-idling enforcement and truck routing standards, and provide public updates on progress and air quality indicators that matter locally. Key performance indicators may include the percentage of tenant load electrified/served by renewables, operation and maintenance costs per operating hour versus diesel, and community indicators such as tCO_2e avoided and modeled $PM_{2.5}$/NOx reductions at near port receptors.

Leadership examples:

- Port of San Diego: Program targeting 100% ZE heavy duty truck trips by 2030, with active ZE truck stop-/charging deployment[24].
- Georgia Ports Authority: Ship to shore/rubber-tyred gantry crane and reefer electrification initiatives illustrating standardized, replicable engineering packages[25].

Shared Infrastructure Investment

Shared infrastructure investment enables IIPD to deliver the large scale, multitenant assets required for ZE operations, which are assets that individual tenants cannot efficiently build on their own. As ZE equipment adoption grows (e.g., CHE, trucks, buildings), shared systems such as multitenant charging yards, microgrids, and integrated data platforms become essential to unlock Scope 3 reductions, reduce costs, and enhance grid resilience. The roles and responsibilities for landlords and tenants under this measure are as follows:

- Landlord:
- Lead planning, site selection, and right-of-way for shared infrastructure;
- Coordinate with ComEd and the City of Chicago on feeder upgrades, substations, permitting, and resiliency requirements; and
  - Oversee construction, commissioning, and long-term performance standards.
- Tenants:
- Follow metering and data sharing requirements and adhere to IIPD's standards for interoperability and safety; and
  - Provide load forecasts and integrate their operations and equipment into shared facilities.

Shared infrastructure with **medium-high impact on GHG emissions** enables ZE adoption at scale by removing barriers, addressing site and power constraints, and supporting operational demands that individual tenants cannot meet alone. In addition to GHG reductions, shared systems reduce diesel emissions and pollutants, thereby improving air quality and community health near the port.

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[21] https://www.businesswire.com/news/home/20260116231757/en/ComEd-Files-Four-Year-Grid-Plan-to-Sustain-Reliability-Maintain-Affordability-and-Adapt-to-Rising-Energy-Demands
[22] https://www.citizensutilityboard.org/blog/2025/11/04/illinois-passes-the-crga-act-here-are-its-key-provisions/
[23] https://epa.illinois.gov/topics/ceja.html
[24] https://www.portofsandiego.org/press-releases/general-press-releases/port-san-diego-begin-environmental-review-zero-emissions
[25] https://gaports.com/blog/sustainabilities/gpa-completed-the-installation-of-the-electrical-and-structural-infrastructure/

Shared infrastructure investment:

- Overcomes tenant capital and land use constraints;
- Ensures interoperability across terminals, equipment types, and fleets;
- Improves grid resilience and operational reliability;
- Reduces soft costs through standardized design, procurement, and permitting;
- Supports coordinated largescale electrification with ComEd; and
- Aligns with federal/state funding requirements.

Shared infrastructure investment can be challenging because:

- Complex cost allocation and governance structures are required;
- Projects can be subject to lengthy utility interconnection and permitting timelines; and
- The investment is dependent on multiparty agreements and ongoing performance management.

Shared infrastructure investment can contribute the following environmental and community co-benefits:

- Shared infrastructure expands access to ZE services and supports healthier environmental conditions for nearby communities. This includes creating dedicated charging access and prioritizing deployments in areas with the highest diesel exposure and health burdens.

Leadership examples:

- The Los Angeles/Port of Hueneme “Shore-to-Store”[26] initiative is a major multiparter effort to accelerate ZE freight by deploying integrated battery electric and hydrogen fuel cell trucks and shared charging and fueling infrastructure. Led by the Port of Los Angeles and partners including Kenworth, Toyota, Shell, and major carriers, the project funds new vehicles, develops hydrogen fueling stations, and demonstrates coordinated operations, providing a scalable model for decarbonizing port operations and regional logistics.

Recognition / Incentive Program

A recognition and incentive program allows IIPD to motivate and accelerate tenant participation in ZE and GHG reduction initiatives by linking measurable performance to rewards, visibility, and favorable terms. Incentive programs complement capital investments and technical standards by reinforcing positive behavior, strengthening engagement, and normalizing ZE practices across the port[27]. The roles and responsibilities for landlords and tenants under this measure are as follows:

- Landlord: IIPD can establish a recognition program that rewards tenants for verifiable progress on emissions reduction and ZE adoption. Incentives may include tiered environmental performance labels, public recognition through dashboards or annual reports, preferred lease terms or expedited permitting, and access to renewable energy incentives through aggregated procurement. IIPD should define program criteria and metrics, manage monitoring and verification, maintain performance dashboards, administer incentives, and ensure fairness and transparency.
- Tenants: Submit evidence of performance, comply with monitoring and verification protocols, and participate in required audits or data checks.

[26] https://kentico.portoflosangeles.org/getmedia/b86f16f7-c10c-4e3b-b7c9-ac4020a9348f/item-11_t1#:~:text=This%20Shore-to-Store%20Project%20(S2S)%20project%20will%20fund,all-electric%2C%20zero-%20emission%20cargo%20handling%20equipment.%20The
[27] https://green-marine.org/magazine/24-port-initiatives/

This is a **low-medium impact measure** but strategically important. Incentives do not directly reduce emissions, but they accelerate adoption of ZE equipment and practices, encourage consistent compliance with IIPD standards, and support culture change across operators. They also enhance the effectiveness of CAPEX-driven levers by motivating earlier participation.

Recognition and incentive programs:

- Strengthen tenant engagement, create positive competition, and signal clear expectations across the portfolio; and
- Improve transparency and accountability, encourage earlier adoption of ZE technologies and renewable energy, and enhance competitiveness by demonstrating coordinated stakeholder action.

Recognition and incentive programs can be challenging because:

- The program requires credible verification, ongoing administration, and well-defined criteria to avoid rewarding low impact actions; and
- The program must also ensure equitable access to incentives for tenants.

Recognition and incentive programs can contribute the following environmental and community co-benefits:

- The incentive framework can incorporate community focused criteria to ensure that benefits extend beyond emissions outcomes. Examples include:
- Reductions in localized exposure to pollutants (e.g., $PM_{2.5}$/NOx indicators), improved routing practices, and minimized operations within communities most impacted by industrial operations; and
- Local hiring, workforce development, apprenticeship partnerships with local organizations.

Leadership examples:

- Port Milwaukee "StewardSHIP" Program[28] provides dockage discounts and public recognition for operators who meet environmental standards through the Environmental Ship Index, Clean Ship Index, and Green Marine. This model demonstrates how structured incentives and criteria can drive participation and improve environmental performance across a diverse tenant base.

<u>Performance Benchmark (Public Scorecard)</u>

A public scorecard creates transparency, accountability, and healthy competition among tenants and other stakeholders by publishing comparable performance metrics tied to GHG reductions and ZE adoption. This lever supports IIPD's Scope 3 strategy by making progress visible, identifying leaders and laggards, and aligning the port's performance with broader regulatory and investor expectations. The roles and responsibilities for landlords and tenants under this measure are as follows:

- Landlord:
- IIPD will publish an annual Scope 3 performance scorecard with standardized metrics for each tenant or operator. Metrics may include energy intensity, percentage of renewable electricity, share of ZE CHE and truck trips, shore power utilization, GHG emissions relative to baseline, and community focused indicators such as $PM_{2.5}$/NOx proxies, anti-idling compliance, and workforce statistics. All metrics follow International Sustainability Standards Board and GHG Protocol guidance to ensure comparability and support future investor grade disclosure.

[28] https://port.milwaukee.gov/stewardSHIP

  - Conduct QA/QC, develop scorecard visuals, and publish results.
- Tenants: Submit consistent, verifiable data, participate in data reviews, and respond to performance improvement opportunities.

Scorecarding is a **low-impact GHG impact measure** and does not directly reduce emissions, but it drives behavioral change by making performance transparent.

A scorecard enables clear tracking of progress toward Scope 3 goals, fosters positive competition and continuous improvement, and strengthens funding competitiveness through transparent metrics. It also reinforces accountability across tenants and improves data quality and standardization.

Delivering a credible scorecard requires consistent engagement and reporting, careful tracking of diverse tenant operations, and clear contextual explanation to avoid misinterpretation. Maintaining the platform and publishing annual updates adds ongoing administrative effort. For technical completeness, the scorecard platform should be accessible, multilingual, and allow for real-time updates and community input. Annual benchmarking against peer ports is recommended.

Performance benchmarking (public scorecards) can contribute the following environmental and community co-benefits:

- Scorecards can reflect community priorities by incorporating metrics tied to local conditions and workforce development outcomes. Ensuring multilingual accessibility and codesigning dashboards with community partners helps to build trust and ensure the scorecard represents the lived experiences of residents near the port.

Leadership examples:

- Port of Los Angeles Clean Truck Program[29] maintains public dashboards tracking truck fleet composition, compliance, ZE adoption, and emissions trends. The program demonstrates how accessible data and simple performance categories can drive operator behavior, support grant readiness, and sustain accountability across a large drayage fleet.

By implementing these Scope 3 decarbonization levers, IIPD will create a structured, accountable process for reducing value chain emissions. Consistent data collection, technical standards, and collaborative engagement with tenants are essential for achieving measurable progress. Annual performance reviews, transparent reporting, and integration of lessons learned will ensure that Scope 3 management remains effective, resilient, and aligned with regulatory requirements. This approach will enable IIPD to track emissions reductions, meet compliance obligations, and continuously improve Scope 3 performance over time.

2.2.2 Funding Opportunities and Next Steps

U.S. Maritime Administration Port Infrastructure Development Program – fiscal year (FY) 2026

The PIDP is the U.S. Maritime Administration's competitive grant program for capital projects that improve the safety, efficiency, and reliability of freight movement at ports, including grid-capacity upgrades (feeders,

[29] https://portoflosangeles.org/environment/air-quality/clean-truck-program

switchgear, transformers, substations), multi-tenant charging/backbone power, and intermodal connections—all of which are central to IIPD's electrification plan. IIPD qualifies as an eligible public port authority under PIDP's applicant categories (which also include states, local governments, special-purpose transportation districts, multistate groups, and public entities applying jointly with private owners/operators of port facilities). Awards generally support up to 80% of project costs and applications are evaluated on meeting merit criteria that emphasize freight benefits, safety, efficiency, reliability, and environmental/emissions outcomes, enabling IIPD to pair PIDP with its Clean Ports deliverables and utility incentives to build the backbone for ZE operations.

The FY 2026 PIDP Notice of Funding Opportunity (NOFO) has set an application deadline of February 28, 2026, providing a reference point for program cadence; IIPD may target the next application window in 2027 so that scopes (e.g., yard-power expansion, substation and feeder upgrades, shared charging yards) are informed by 2026-2027 Clean Ports progress and interconnection readiness. IIPD may apply in 2027 and, if selected, design and build through 2028-2029 to align construction with grid and site works.

PIDP can utilize large electrical infrastructure and intermodal reliability (substations, feeders/switchgear, charging corridors), while Clean Ports and §30C support eligible charging/equipment, thereby creating a sequenced, fundable implementation pathway.

Illinois Shines (Block Program) – REC Revenue for On-site Solar

Illinois Shines is the State of Illinois' primary solar incentive program, offering REC contracts for new on-site solar systems up to 5 megawatts per location. The current program structure is governed by the 2025-2026 Program Guidebook, effective June 2, 2025. Applications must be submitted through an approved vendor, and REC payments begin once the solar facility is energized and approved upon inspection.

Internal Revenue Service (IRS) Direct Pay (also known as Elective Pay Under 6417)

IIPD is eligible to receive certain federal clean-energy tax credits as Direct Pay, meaning the credit value is issued as a cash refund even though IIPD does not owe federal income tax. To use Direct Pay, IIPD must complete a pre-filing registration through the IRS Energy Credits Online portal and obtain a unique registration number for each project. The IRS recommends submitting this registration approximately 120 days before filing the tax return for the year in which the project is placed in service.

Qualifying for the §48E Clean Electricity Investment Tax Credit

Under the One Big Beautiful Bill Act, solar projects remain eligible for §48E if IIPD meets one of two federal timing pathways:

1. **Begin construction (physical work) by July 4, 2026**
   Federal guidance indicates that solar projects must begin construction on or before July 4, 2026, using physical work of a significant nature to maintain §48E Clean Electricity Investment Tax Credit eligibility. This is because the One Big Beautiful Bill Act restricts reliance on the traditional 5% safe harbor, making physical work the primary qualification method. If IIPD mobilizes physical work before July 4, 2026, its solar projects could qualify for §48E even if placed in service later.
2. **Alternatively: place the project in service by December 31, 2027**
   If construction begins after July 4, 2026, §48E eligibility can still be preserved if the project is fully placed in service by December 31, 2027. This places emphasis on accelerated delivery if IIPD chooses to maintain §48E eligibility without beginning construction before July 2026.

If IIPD meets either of these pathways, solar could be eligible for §48E Direct Pay. However, if construction begins in 2027 and the project is placed in service in 2028, the project would not meet the July 4, 2026, construction deadline, nor the December 31, 2027, placed-in-service deadline, meaning it would not qualify for §48E. This timing clarification ensures IIPD can make informed planning decisions.

Energy storage still qualifies for §48E. Even if rooftop solar cannot meet the accelerated solar-specific deadlines, energy storage continues to qualify for §48E because these accelerated provisions do not apply to energy storage technologies. This gives IIPD a strong opportunity to pursue Direct Pay for resilience-focused battery storage, even if solar is installed on a different schedule.

§30C EV Charging Credit: IIPD may also apply Direct Pay to the §30C Alternative Fuel Infrastructure Credit, worth 30% of eligible EV charging costs when equipment is located in a qualifying census tract and Prevailing Wage and Apprenticeship (PWA) requirements are met. The credit is claimed when the equipment is placed in service.

ComEd Energy Efficiency Incentives

ComEd offers incentives for energy-efficient lighting, controls, HVAC upgrades, and building systems. Projects with expected incentives of $10,000 or more must submit a Track 1 reservation request before purchasing equipment, while smaller projects may proceed under Track 2 without a pre-reservation. Incentives are issued after installation and review. These incentives will support IIPD’s 2026 LED retrofits and future 2030 heat-pump RTU upgrades.

EPA Diesel Emissions Reduction Act (DERA)

DERA gives IIPD a flexible, recurring path to voluntarily retire remaining diesel equipment, funding replacements, repowers, retrofits, and idle-reduction technologies, including ZE replacements where eligible across drayage trucks and nonroad cargo-handling equipment operating on IIPD property. As a public port authority, IIPD can apply directly; private fleets typically participate through an eligible public applicant or state pass-through, which fits IIPD’s landlord model. IIPD can prepare by finalizing fleet inventories, VINs, hours/fuel baselines, near-port exposure ranking, and scrappage plans, so it can move quickly on the next DERA NOFO and stage 2027-2028 turnover tranches that dovetail with facility operations and procurement lead times. In parallel, the Clean Ports award is expected to be implemented over three to four years, allowing IIPD to use 2026–2029 to deliver EV equipment/electric vehicle supply equipment (EVSE; and any eligible clean-energy components) under Davis-Bacon Act/Build America Buy America Act, maximizing ZE impact and keeping every project eligible within EPA eligibility rules.

EPA Clean Ports Program (Existing Award)

EPA’s Clean Ports Program funds ZE equipment, electric charging infrastructure, and eligible clean-energy components. Current Clean Ports awards across the United States are being implemented over three to four years, consistent with IIPD’s ongoing deployment schedule. IIPD will continue leveraging Clean Ports funding for eligible EV charging, electrical infrastructure, and potential storage measures.

Table 13. Funding Programs Overview

Program	Eligible Entities	Criteria	Value	Timeline
PIDP FY 2026	Port authority /state/local tribes	Capital that improves goods movement or intermodal/port electrification; within port or outside but directly related	Federal share up to 80%	Apply by February 28, 2026; design 2027; build 2027–2029
Illinois Shines	Through approved vendor	On-site PV ≤ 5 megawatt DC/site; REC contracts at set prices	Utility-paid REC revenue	File 2H 2026 to queue 2027–2029 builds
IRS §48E (Direct Pay)	Tax-exempt entities	Solar + storage, placed in service 2025+; pre-file registration needed	~30% of eligible basis as cash	Claim 2028–2030 in-service
IRS §30C (Direct Pay)	Tax-exempt entities	EVSE in eligible census tracts + PWA for full value	30% per item up to $100k	Pre-file 2026; claim on 2028–2029 in-service
ComEd Energy Efficiency Incentives (LEDs/HVAC)	ComEd business customers	Track 1 reservation ≥ $10,000; LEDs paid per watt reduced; HVAC menu	Rebate at completion	LEDs in 2026; HVAC when due (2030)
DERA	State/local/tribe/ ports; nonprofits	Voluntary diesel replacement/ repower/retrofit; ZE eligible in categories	Cost-share typical; annual NOFOs	Prep 2H 2026; execute 2027–2028
Clean Ports (award)	Already selected awardees	Funds ZE equipment/ EVSE/solar;	Varies by award	Deliver 2026–2029

Table 14. Funding Strategy by Measure (2026–2030)

Decarbonization Measure	Year	Funding Source(s)	Eligibility and Key Requirements	Funding
LED Upgrades	2026	ComEd Energy Efficiency Incentives	Track 1 reservation required ≥ $10,000; technical review; final application.	After installation (2026)

Decarbonization Measure	Year	Funding Source(s)	Eligibility and Key Requirements	Funding
Rooftop Solar (PV)	2027–2028	§48E (if timing is met); Illinois Shines; Clean Ports	§48E possible if: construction begins by July 4, 2026, or place in service (PIS) by December 31, 2027. REC eligibility via Illinois Shines.	Direct Pay in PIS year (if eligible); REC payments upon energization
Stand-Alone Energy Storage	2028–2030	§48E Direct Pay	Not subject to accelerated solar deadlines; eligible under technology-neutral credit schedule.	Direct Pay after tax filing
EV Charging – Phase 1	2026–2027	§30C; Clean Ports	Charging located in eligible tracts; PWA required; claim at PIS.	2027
PIDP Grid and Charging Backbone	2027 app → 2028–2029 build	PIDP	IIPD is an eligible port authority; funds electrical upgrades, substations, charging corridors. Federal share ≤ 80%.	2028–2029 (during construction)

2.2.3 Managing Framework for Decarbonization (Scopes 1, 2, and 3)

Governance Landscape

IIPD operates within a layered governance environment that is typical of ports in the United States. GHG emissions arise not only from the port's direct operations and energy use (Scope 1 and Scope 2) but also from the activities of tenants, carriers, and other port users (Scope 3). These emissions are shaped by IIPD's role as a landlord, infrastructure provider, land-use planner, facilitator of regional stakeholders, and interface between regulatory bodies and the industrial community. Although responsibilities for decarbonization are shared across many actors, IIPD holds the greatest leverage in several key areas:

- Land use and master planning;
- Lease terms and concession agreements;
- Capital investment and shared infrastructure;
- Convening cross-sector stakeholders; and
- Setting and enforcing operational standards for both direct (Scope 1 and Scope 2) and indirect (Scope 3) emission sources.

When these levers are aligned, they form a cohesive governance structure capable of delivering coordinated and measurable GHG reductions across Scopes 1, 2, and 3. A unified approach ensures decarbonization targets, policies, and implementation mechanisms are applied consistently to direct emissions (Scope 1), purchased electricity (Scope 2), and value-chain activities (Scope 3).

To support this coordination, IIPD can establish a cross-functional Decarbonization Steering Committee responsible for monitoring progress, identifying obstacles, and ensuring stakeholder perspectives—such as from tenants, utilities, and community partners—are incorporated into decisions that affect all emission categories.

Pillars of a governance framework for successful decarbonization include:

- **Align the 2022 IIPD Master Plan with Decarbonization Goals**. Ensure that all capital planning, operational decisions, and tenant activities measurably advance and align with GHG reduction goals across Scopes 1, 2, and 3. Establish metrics, milestones, and accountability mechanisms that are reviewed annually to track progress.
- **Embed Climate and Energy Requirements into Leases and Operations**. Incorporate expectations for energy efficiency, equipment electrification, interval metering, emissions reporting, and ZE transition schedules in all new and renewed tenant agreements.
  - Apply similar standards to IIPD’s own operations and capital projects, ensuring that Port-controlled assets model best practices for decarbonization.
  - Use lease terms and internal policies to set minimum performance standards for retrofits, fleet upgrades, facility improvements, and reporting.
- **Coordinate Policies, Procurement Standards, and Incentives**. Align procurement policies, preferred vendor frameworks, shared infrastructure investments, and both financial and non-financial incentives to accelerate decarbonization across all GHG scopes. Ensure that technical assistance, capacity-building, and compliance support are available to both IIPD staff and tenants.

Collectively, these governance pillars translate IIPD’s influence and operational authority into practical mechanisms that can drive consistent, measurable reductions in GHG emissions across Scopes 1, 2, and 3.

Roles and Responsibilities

Clear roles and responsibilities are essential for effective implementation of decarbonization and climate-resilience actions. GHG emissions across Scopes 1, 2, and 3 requires coordinated action by the Port authority, tenants, public agencies, and community partners. This section outlines the primary responsibilities and expectations for each key stakeholder group to ensure accountability, streamline decision-making, and support successful implementation of decarbonization initiatives.

Port Authority (capital and operational control) – IIPD leadership, capital planning, operations, and asset management will:

- Implement and monitor energy efficiency and emissions reduction programs for IIPD-controlled operations (Scope 1 and Scope 2).
- Lead capital planning and shared infrastructure delivery (e.g., EV hubs, shore power, solar arrays, energy management systems).
- Set technical standards, master planning requirements, and lease terms for both port-operated and tenant-operated assets.
- Align incentives and procurement pathways with decarbonization goals.

- Maintain responsibility for transparent reporting, performance tracking, and periodic public disclosure for all GHG emissions sources.

Port users (tenants, terminal operators, shipping lines, carriers, rail) will:

- Implement operational changes (e.g., fleet electrification, energy efficiency retrofits) and adopt green lease clauses and sustainable procurement practices.
- Report emissions and activity data to support IIPD's comprehensive GHG accounting, including electricity, fuel use, and process data relevant to Scopes 1, 2, and 3.
- Participate in technical working groups and pilot projects and collaborate on shared infrastructure and data initiatives.

Wider ecosystem partners (regulators, utilities, community stakeholders) will:

- Support systemic change via policy, grants, renewable energy procurement, grid modernization, and circular economy initiatives.
- Contribute to workforce development, resilience-building, and environmental justice efforts.
- Collaborate on regional decarbonization and climate adaptation initiatives, supporting consistency in emissions calculation and reporting.

3 Climate Vulnerability Assessment and Action Plan

The climate is changing faster today than at any other time in modern history, and the impacts of a changing climate are felt more directly and intensely at the local level. IIPD facilities are already experiencing the impacts of climate-change related hazards, including flooding from rainfall and more frequent extreme heat days. These hazards will increase in frequency and severity in the future as a result of climate change, which will have increasingly disruptive implications for operations at both Lake Calumet and Iroquois Landing. A changing climate and related natural disasters can create lasting impacts on economic vitality, human health, and ecosystems. Even if rapid collective action is taken to immediately and dramatically reduce GHG emissions at the global scale, impacts from climate change in the near-term will still occur. For this reason, it is essential that IIPD understand and take measures to address location-specific climate risks.

To address these challenges, IIPD's approach to climate resilience is grounded in risk assessment, data-driven scenario planning, and the integration of climate considerations into asset management and capital investment decisions. The port's climate resilience strategy is structured to prioritize critical infrastructure, maintain business continuity, and safeguard the health and safety of workers and communities. As best practice, IIPD should adopt an adaptive management approach, regularly updating its climate risk assessments and resilience plans as new climate science, projections, and local impact data become available.

This resilience focused framework is a key part of a broader climate strategy that also includes decarbonization and emissions reduction. In this context, resilience means the ability to adapt and grow in the face of challenges. Building resilience to climate impacts refers to using tools such as collaboration, programming, and infrastructure to prepare for changing conditions. This section considers how IIPD facilities are likely to be impacted by climate-related hazards. It begins with a climate vulnerability analysis that integrates data from a variety of sources to illustrate potential impacts. Building on this analysis, the Resilience Action Plan provides recommendations for steps that IIPD can take to increase its climate resilience.

3.1 Climate Vulnerability Analysis

3.1.1 Introduction

Climate change presents a variety of impacts to communities across the globe physically, socially, and economically. These impacts are only expected to intensify and will affect nearly all aspects of human society including, but not limited to, transportation, business operations, air quality, and health. Extreme storms and natural disasters negatively affect the reliability of infrastructure, energy supply, freight and passenger transportation, and other key systems and assets. Additionally, social systems are challenged by climate impact; for example, outdoor workers are likely to be subjected to extreme heat which has significant health implications. Finally, ecosystem services can act as a natural buffer to the impacts of climate change phenomena, but changes in temperature and precipitation also threaten existing ecosystems and reduce their capacity to mitigate climate change impacts.

To ensure a robust assessment, IIPD's vulnerability analysis incorporates both quantitative geospatial modeling and qualitative stakeholder engagement, using current climate science and regionally downscaled projections.

Climate Change in Chicago

Analysis of climate impacts at IIPD facilities is grounded in a broader understanding of how climate change will affect the surrounding Chicago region. A variety of agencies have worked to compile the best available information on localized climate impacts to Chicago and Illinois, including the City of Chicago, the State of Illinois Environmental Protection Agency and Emergency Management Agency, CMAP, and the Cook County Department of Emergency Management and Regional Security. Reports from these agencies show a strong consensus that Chicago is already experiencing the impacts of climate change, and that these impacts will increase in the future.

Due to its geography, Chicago is less impacted by climate change than many other major American cities. However, a variety of climate-related hazards will impact Chicago, both directly (e.g., flooding) and indirectly (e.g., degraded air quality due to wildfires elsewhere).

Among climate-related hazards, flooding and extreme heat are likely to have the most significant impacts on Chicago. Taken together, climate change projections suggest a hotter and wetter future climate for Chicago with increases in the frequency and intensity of extreme weather events. The City of Chicago's Climate Action Plan (2022)[30] identified "hotter summers and more frequent and intense heat waves" as the "most obvious change" the city faces. More frequent drought conditions, punctuated with intense rainfall flooding are likely to exacerbate rainfall flooding and are likely to exacerbate runoff and stormwater management challenges. CMAP's Transportation Resilience Improvement Plan[31] found that flooding is the dominant climate hazard affecting transportation, with a significant portion of road miles, regional trails, and a substantial share of transit assets and rail stations projected to face significant flood exposure by midcentury. The plan also highlights extreme heat as a growing and inequitable risk, with more frequent and intense heatwaves disproportionately affecting transit riders, particularly in more dense, urban areas of Chicago.

Current Climate Hazards

The Federal Emergency Management Agency (FEMA) publishes a National Risk Index that identifies and assesses natural hazards for each county in the United States. It includes 18 natural hazards and considers them in the context of the county's existing level of resilience to develop a risk rating for each. The index takes the product of expected annual loss and social vulnerability and divides this value by community resilience to calculate an overall risk rating for a given geography. FEMA's risk assessment provides initial risk ratings in classifications between "very low" and "very high" to guide further research in exploration of local climate hazards. Cook County, which includes Chicago, has the highest expected annual loss and risk index rating in the State of Illinois.

[30] https://www.chicago.gov/city/en/sites/climate-action-plan/home.html
[31] https://engage.cmap.illinois.gov/transportation-resilience-improvement-plan

Table 15. FEMA National Risk Index Ratings for Cook County, Illinois

Rating Categoriess	Cook County Risk Rating
Risk Index	Very High
Expected Annual Loss	Very High
Social Vulnerability	Relatively High
Community Resilience	Relatively High

Natural Hazard	Frequency (Annual)	Risk Rating
Cold Wave	4.32	Very High
Tornado	1.04	Very High
Heat Wave	2.90	Very High
Inland Flooding	5.89	Very High
Winter Weather	14.60	Very High
Strong Wind	5.70	Very High
Ice Storm	0.58	Very High
Lightning	41.58	Very High
Hail	3.95	Relatively High
Drought	3.86	Very Low

As illustrated by National Risk Index ratings, consideration of a variety of climate impacts in the Chicago area suggest that IIPD is already exposed to impacts from natural hazards. Projections show that impacts from at least some of these hazards are likely to increase in the future. As a result, adverse effects to many aspects of IIPD, such as infrastructure and property, services, and the health and well-being of IIPD staff may occur with increasing frequency moving forward.

3.1.2 Previous and Ongoing Efforts

IIPD has undertaken efforts to address climate change through federal and state-funded programs. Most notably, IIPD received a significant portion of funds from the $92 million EPA Clean Ports Program grant awarded to the

Illinois Environmental Protection Agency in October 2024.[32] This funding will support deployment of ZE locomotives and other freight-handling equipment, EV chargers, solar power, and on-site battery storage.

IIPD also participated in the Climate Pollution Reduction Grant implementation program, which provided Illinois with $430 million in total funding announced in July 2024.[33] These investments align with IIPD's broader vision to transform into a sustainable "Multimodal Hub of the Future."

Beyond emissions reduction, IIPD has partnered with the Delta Institute to assess and implement green infrastructure projects along the Lake Calumet shoreline to capture stormwater and improve water quality in the Calumet River.[34] The Delta Institute has helped the IIPD secure more than $70 million in federal and state investment and supported the development of the 2022 IIPD Master Plan. IIPD has also achieved Green Marine Certification, an environmental certification program for maritime companies to benchmark and then reduce their environmental footprint.

Numerous state, local, and non-governmental organizations in the Chicago area have additionally taken steps to prepare for climate change and related impacts. These include:

- The Chicago Climate Action Plan (City of Chicago 2022) – Chicago's Climate Action Plan prioritizes GHG mitigation strategies, including a section on adaptation and resiliency. The plan focuses on community-centered goals, such as increased climate hazard and risk education, protecting critical infrastructure, and the need for policies surrounding emergency preparedness.
- The Comprehensive Climate Action Plan for Greater Chicago (CMAP, In Progress[35]) – CMAP's Climate Action Plan focuses on the Greater Chicago area, including areas in Wisconsin and Michigan along Lake Michigan's coastline. The objective of the plan is to build upon previous action plans, considering most recent climate projections up to 2050. Emissions reductions are prioritized in the plan's goals but also mentions land use and adaptation as other elements of the plan.
- Efforts to address stormwater flooding on roadways (IDOT, In Progress) – IDOT has an ongoing Storm Water Management Plan[36] that aims to mitigate roadway flooding and runoff pollution. The plan includes efforts to redevelop roadways to reduce flooding, engage in public outreach efforts, and provide stormwater education to communities in the state.
- Illinois Climate Change Assessment (The Nature Conservancy 2021[37]) – The Nature Conservancy, in collaboration with multiple public and private institutions in Illinois, developed an assessment of climate change impacts. The report centers around impacts to ecosystems, water resources, agriculture, and public health using climate projections developed for Illinois by the North Carolina Institute for Climate Sciences and the University of Edinburgh.
- Cook County Multi-Jurisdictional Hazard Mitigation Plan (2024 Update[38]) – Cook County updated its Multi-Jurisdictional Hazard Mitigation Plan in accordance with FEMA guidelines to meet the standards of the Disaster Mitigation Act, which requires jurisdictional authorities to update every five years. The

[32] The State of Illinois Newsroom
[33] Illinois International Port District Celebrates Clean Ports Funding - The Waterways Journal
[34] Protecting Water Quality on Chicago's Southeast Side via Green Infrastructure at Lake Calumet - Delta Institute
[35] https://engage.cmap.illinois.gov/comprehensive-climate-action-plan
[36] https://idot.illinois.gov/programs-and-projects/environment/stormwatermanagementprogram.html
[37] https://www.nature.org/content/dam/tnc/nature/en/documents/IL_Climate_Assessment_2021.pdf or https://databank.illinois.edu/datasets/IDB-1260194
[38] https://www.cookcountyemergencymanagement.org/hmp

plan identifies existing hazard risk, strategies, and planning goals, making hazard-mitigation projects eligible for federal funding programs.

- Multiple Other Projects by CMAP:
- Transportation Resilience Improvement Plan – CMAP's Transportation Resilience Improvement Plan is an ongoing effort to identify transportation assets vulnerable to climate change, enabling prioritization of projects eligible for funding under Federal Highway Administration grant programs. The plan informs transportation planning with an overall goal to build Chicago's resilience to flooding, extreme heat, and severe storms.
  - Flood Resilience Investment – CMAP's Flood Resilience Investment report provides guidance for engineers, planners, and decision-makers on how to incorporate equity into flood mitigation, stormwater, and resilience investments, with a focus on addressing the disproportionate flood impacts experienced by historically marginalized and disinvested communities in Chicago. It outlines goals, strategies, data, and case studies that help local governments and planners' direct resources equitably, and ensure long-term, inclusive benefits from flood resilience investments.
- Flood Susceptibility Indexes[39] – CMAP developed urban and riverine flood susceptibility indexes to identify priority areas across the region for flooding mitigation planning and activities, using local inputs and federal flood data.
  - Stormwater Management Resources – CMAP developed a Guide to Flood Susceptibility and Stormwater Planning[40], using the CMAP Flood Susceptibility Indexes and 100-year floodplains from FEMA and the Metropolitan Water Reclamation District of Greater Chicago (MWRD). The guide informs local entities and residents on standards and strategies for stormwater mitigation efforts.
- Climate Adaptation Guidebook for Municipalities in the Chicago Region[41] – This CMAP guide outlines how climate change is affecting the region and identifies key projected risks, including flooding, extreme heat, and impacts including infrastructure and public health. Its purpose is to equip Chicago municipalities with a framework and strategies to assess local vulnerabilities and adapt their planning, policies, and investments to build long-term resilience.

Successful action to build resilience across the city and region will enhance the resilience of IIPD facilities. In both understanding impacts and developing recommended actions, this report aims to complement aligned efforts such as those noted above.

Technical suggestion: IIPD should establish a mechanism to regularly coordinate and share lessons learned with these regional planning initiatives, ensuring that future vulnerability assessments and resilience actions are harmonized with city, county, and state priorities, and that IIPD can leverage external data, resources, and funding opportunities.

3.1.3 Methodology

Study Area

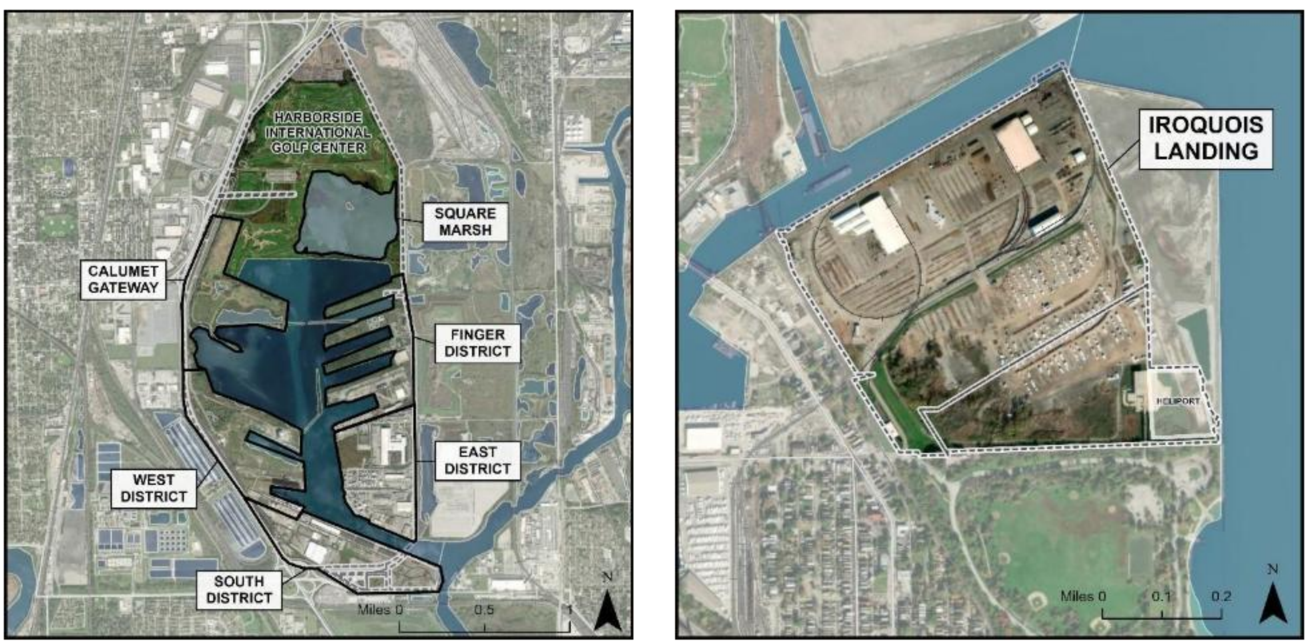
Analysis as part of this study considered two facilities owned by IIPD: Lake Calumet (including Senator Dan Dougherty Terminal and Harborside International Golf Center) and Iroquois Landing. Lake Calumet constitutes

[39] https://cmap.illinois.gov/data/environmental/flood-susceptibility-indexes/
[40] https://cmap.illinois.gov/wp-content/uploads/FSSP_072318.pdf
[41] https://cmap.illinois.gov/wp-content/uploads/FY13-0119-Climate-Adaptation-toolkit-lowres.pdf

approximately 1,500 acres of land 6 miles inland from Lake Michigan, immediately downstream of the junction of the Grand Calumet and Little Calumet Rivers. Iroquois Landing is an approximately 190-acre facility located on Lake Michigan at the mouth of the Calumet River. Multiple tenants and land uses, including industrial manufacturing facilities, oil and gas distributors, and freight storage are present at Lake Calumet while Iroquois Landing has one major tenant, North America Stevedoring Co. (NASCO), utilizing the space for open-air freight storage.

Boundaries for analysis of impacts to both facilities were based on parcel boundaries sourced from the Cook County Global Information System (GIS) Open Data Portal ("Cook Central"). To ensure alignment with other IIPD planning efforts, boundaries were considered alongside maps of both sites included in the 2022 IIPD Master Plan. Boundaries noted and considered in this report reflect the project team's understanding of site extents based on available data, but do not necessarily reflect the legal boundaries of the facilities. The 2022 IIPD Master Plan notes that additional surveying is needed to formalize facility boundaries for future climate resilience and planning activities. For future assessments, it is recommended that IIPD pursue a high-resolution boundary and asset geodatabase, including facility and utility coordinates, to enable detailed asset-level risk modeling and future insurance or funding applications.

Figure 7. IIPD Study Areas and Sub-Districts Identified by the 2022 IIPD Master Plan



Analytical Framework

Hazard Categories

The initial step in hazard analysis was identifying relevant climate risks for the study area. Potential climate hazards were determined through a literature review of authoritative climate documents, local and regional reports, and publicly available online tools. This review identified three main categories of hazards to serve as the foundation for analysis: flooding, weather extremes, and additional hazards (including wildfire, invasive species risk, fog, and snow squalls.

Exposure and Impact

In evaluating how climate hazards could affect IIPD facilities, both exposure and impact were considered. Exposure refers to the presence of assets (facilities, infrastructure, operations) in areas susceptible to specific climate-related threats. For example, a building within FEMA's 100-year floodplain is classified as exposed to flooding risk. Exposure analysis allows identification of at-risk assets and supports the assessment of impact–that is, the direct and indirect consequences of climate hazards such as physical damage, service disruptions, and operational downtime. Asset-level impact assessment considers operational specifications, asset condition, and adaptive capacity, allowing for evaluation of effects on facility functionality, safety, financial performance, and infrastructure integrity.

Assigning quantitative risk scores to assets based on both vulnerability (likelihood of damage/disruption) and criticality (importance for business continuity and safety) enhances prioritization of resilience measures.

Data Sources

For each hazard, the most recent and highest-resolution spatial data available were used, consistent with current scientific consensus and best practices for local analysis. All spatial data sources are publicly accessible and summarized in Table 16.

Table 16. Spatial Data Sources

Name	Hazard	Author	Year	Accessed Via
The Climate Explorer	Precipitation, temperature	U.S. Climate Resilience Toolkit (managed by NOAA)	2025	Climate Explorer
Bluespots Model	Flooding	Adapted by Arcadis. Initial tool developed by the Danish Road Institute.	2025	ArcGIS Pro toolbox
FEMA National Flood Hazard Layer	Flooding	FEMA	2021	FEMA Flood Map Service Center
Lake Level Rise Projections	Lake Level Rise /Flooding	Michigan Technological University	2022	Future rise of the Great Lakes water levels under climate change
Urban Island Heat Severity	Extreme Heat	The Trust for Public Land	2023	Urban Heat Island Severity
U.S. Drought Monitor	Drought	U.S. Department of Agriculture, NOAA	2025	U.S. Drought Monitor
Wildfire Risk to Communities	Wildfire	U.S. Forest Service	2024	U.S. Forest Service Research Data Archive

Note: NOAA = National Oceanic and Atmospheric Administration

Analysis

A comprehensive geospatial analysis was conducted using ArcGIS Pro to spatially assess the vulnerability of IIPD assets to multiple climate hazards including flooding, extreme temperatures, and extreme weather events. The analysis integrated geospatial datasets for key climate threats with the spatial footprint of IIPD sites and infrastructure. Advanced spatial analysis techniques (e.g., spatial joins, raster reclassification) were used to identify where infrastructure assets intersect with high-risk zones. The resulting impact maps are provided in their respective sections below.

A structure inventory from the CMAP was used to identify all buildings, structures, and rail lines. Sub-districts within IIPD were defined using the 2022 IIPD Master Plan. Individual structure details, tenant information, and operational activities were cross-referenced with IIPD's public records and GIS data to assess potential site-specific impacts.

Table 17. IIPD Structures

Area	Number of Structures
Lake Calumet	230
East District	127
Finger District	48
South District	27
West District	28
Iroquois Landing	6
Total IIPD Structures	236

Some climate projections are only available at regional, not local, scales, such as increases in temperature and precipitation. These regional projections were used alongside local spatial analysis to provide a comprehensive view of impacts over time.

Finally, the project team validated and enhanced the quantitative data analysis described through qualitative approaches, including stakeholder engagement via the project Steering Committee and Community Advisory Team, and site visits. Site visits were conducted both in-person (January 2026) and virtually using Google Streetview and Google Earth imagery from 2023 to 2025. Site visits were used to confirm desktop data collection and gain an on-the-ground understanding of site operations—and therefore impacts.

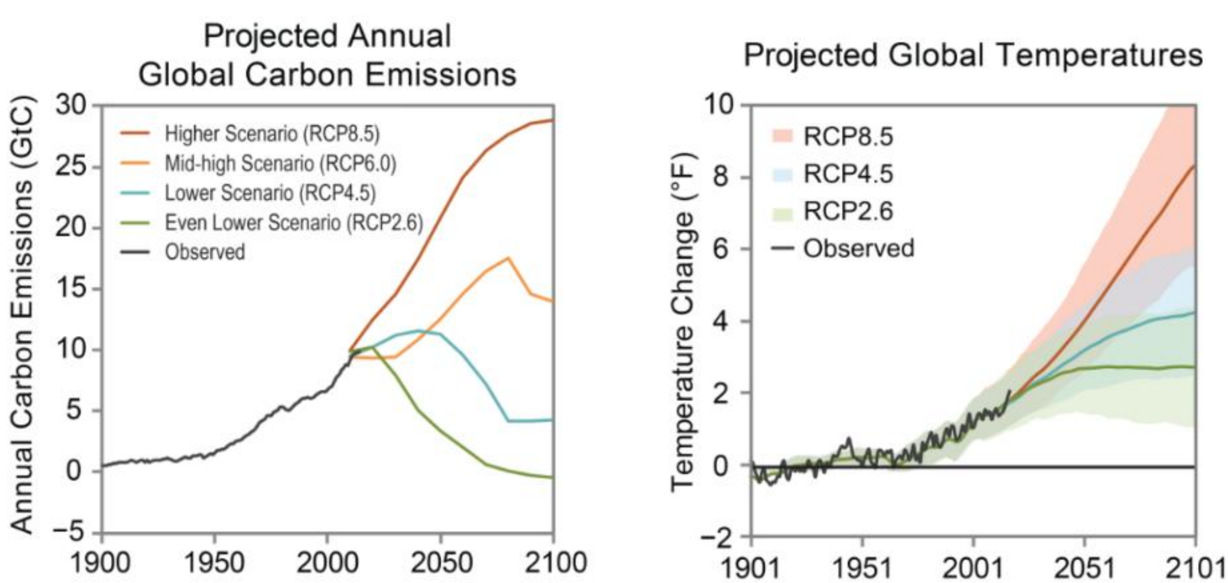
Climate Scenarios

Assessing future climate impacts requires scenario modeling that combines local conditions (e.g., geography, land use) with global trends (e.g., GHG emissions trajectories). Although the modeling uses the best available data and scientific practices, all projections contain uncertainty—larger-area and near-term projections are generally more certain than small-area, long-term forecasts. Long-term climate outcomes will depend on global policy and emissions trajectories, but near-term impacts are largely locked in due to historical and current emissions.

Hazard exposure was quantified through downscaled Coupled Model Intercomparison Project Phase 5 (CMIP5) climate data for historical and projected climate for the IIPD. The vulnerability analysis relied on a literature review of the most authoritative data sources and scientific toolkits. Climate models provide essential decision support but contain uncertainty from downscaling, emissions pathway assumptions, and the rate of climate mitigation. To address this, projections are presented as a range of potential futures, or scenarios.

The Intergovernmental Panel on Climate Change (IPCC) uses Representative Concentration Pathways (RCPs), which describes four scenarios for climate futures up to 2100. The RCPs are named for their projected radiative forcing levels (watts per square meter) by 2100: RCP2.6, RCP4.5, RCP6.0, and RCP8.5.[42] Figure 8 shows annual carbon emissions and projected average global temperature change for each pathway.

Figure 8. Representative Concentration Pathway Scenarios: Global Carbon Emissions and Correlated Projected Temperatures[43]



RCP8.5 represents a worst-case or business-as-usual scenario with continued high emissions, resulting in a global temperature increase of up to 8.8 degrees Fahrenheit (°F; 4.9 degrees Celsius) by 2100. RCP4.5 and RCP6.0 are intermediate scenarios, while RCP2.6 is closest to pre-industrial conditions. The scenario lines represent possible outcomes depending on variables such as population, land-use change, fossil fuel use, and climate policy.[44]

42 The representative concentration pathways: an overview | Climatic Change
43 Images and Media: projected_emissions_temperature_CSSP_lrg.png | NOAA Climate.gov
44 https://www.carbonbrief.org/explainer-the-high-emissions-rcp8-5-global-warming-scenario

CMIP5 data use three downscaling techniques: Bias Correction and Constructed Analogs (BCCA), Localized Constructed Analogs (LOCA), and Bias Correction and Spatial Disaggregation (BCSD). BCCA and LOCA provide daily data; BCSD is monthly. This study used LOCA-downscaled data for yearly climate data in the IIPD area.

Climate Explorer Tool

The Climate Explorer Tool[45] is part of the U.S. Climate Resilience Toolkit and analyzes 19 different climate indicators related to temperature and precipitation changes at the downscaled level, modeling future projections for both the RCP4.5 and RCP8.5 climate scenarios.

For this study, all available data were downloaded for the period January 1950 through December 2099. Daily values were averaged to produce means for three timeframes: historical (1976–2005), mid-century (2035–2064), and late-century (2065–2094). Each 30-year average was used to statistically capture long-term climate trends, rather than short-term weather variability.

Extreme heat was defined as the annual number of days exceeding 95°F, based on downscaled projections. For winter weather, only days with minimum daily temperatures below 32°F (the freezing threshold for water) were considered. This approach enables robust comparison of projected temperature and precipitation extremes across scenarios and supports targeted planning for both heat and cold weather impacts at IIPD facilities.

3.1.4 Results

3.1.4.1 Results: Flooding

Flooding is one of the most significant hazards that IIPD facilities face, under both current and projected future conditions. Flooding occurs when the water in a given area exceeds that area's ability –natural or artificial– to store or convey it. Flooding may be chronic or intermittent and may occur suddenly (flash flooding) or gradually over time. Multiple sources of flooding exist, including precipitation and overflow of adjacent water bodies. For IIPD, rainfall-related flooding and flooding from elevated Lake Michigan water levels are the most relevant hazards to evaluate due to their recurring impact on site operations and infrastructure.

Existing Conditions

Stakeholders engaged as part of this study reported intermittent flooding at IIPD facilities and surrounding neighborhoods under current conditions, with most flooding attributed to rainfall, but some events related to lake water levels. Field verification and virtual site visits confirmed ponding at multiple locations, consistent with stakeholder reports and indicating that surface drainage and storage infrastructure may be insufficient in several areas. These flooding types are interrelated, as lake flooding is often exacerbated by heavy rainfall that causes elevated lake and river levels. In recent years, Lake Michigan has experienced near-record highs and lows in water levels.[46]

FEMA Flood Insurance Study

The FEMA Flood Insurance Study (FIS) for Cook County, revised in 2021, developed flood insurance rate maps (FIRMs) for the City of Chicago's watersheds. The FIS compiles information on flood risks for coastal and riverine

[45] Climate Explorer Tool
[46] Future Rise of the Great Lakes Water Levels Under Climate Change | GLRC

flooding, including floodplain boundaries, base flood elevations, and floodways, which can support flood risk management planning for IIPD, ensuring compliance with the National Flood Insurance Program and eligibility for other federal grant programs.

The FIS provides a historical overview of past flooding events, as well as a summary of their drivers and physical impacts. Notably, both the Chicago River and Little Calumet River regions have experienced flooding, driven primarily by rainfall and urbanization. High impervious surface cover in the region increases both the frequency and severity of flooding events, while limited stormwater drainage capacity amplifies impacts. These factors contribute to frequent fluvial (riverine) flooding and streambank erosion in the area, both of which are concerns at IIPD during both frequent and less common storm events. The FIRM maps developed by FEMA identify both coastal and riverine flood zones, providing regulatory boundaries and base flood elevations for long-term planning and compliance.

Flooding shown on FEMA FIRM maps reflects designated flood zones based on historical and modeled riverine and coastal areas. These maps offer regulatory guidance for development and insurance but may underestimate emerging risks driven by changing precipitation patterns and rising lake levels. In contrast, the analysis described below identifies specific local depressions where surface water may accumulate during rainfall events, providing a preliminary, site-specific view of potential flooding hotspots.

Rainfall

A warming atmosphere increases the capacity for moisture, leading to more significant precipitation events and extreme storms.[47] This feedback loop (higher temperatures → more evaporation → more atmospheric moisture → heavier rainfall) is expected to intensify extreme rainfall and flooding.

Total average annual precipitation in the Chicago area is projected to rise. Projections show an average of 1.05 additional inches of annual precipitation by mid-century and 1.51 additional inches by late century under RCP4.5, and up to 2.65 inches by late century under RCP8.5 (Table 18).

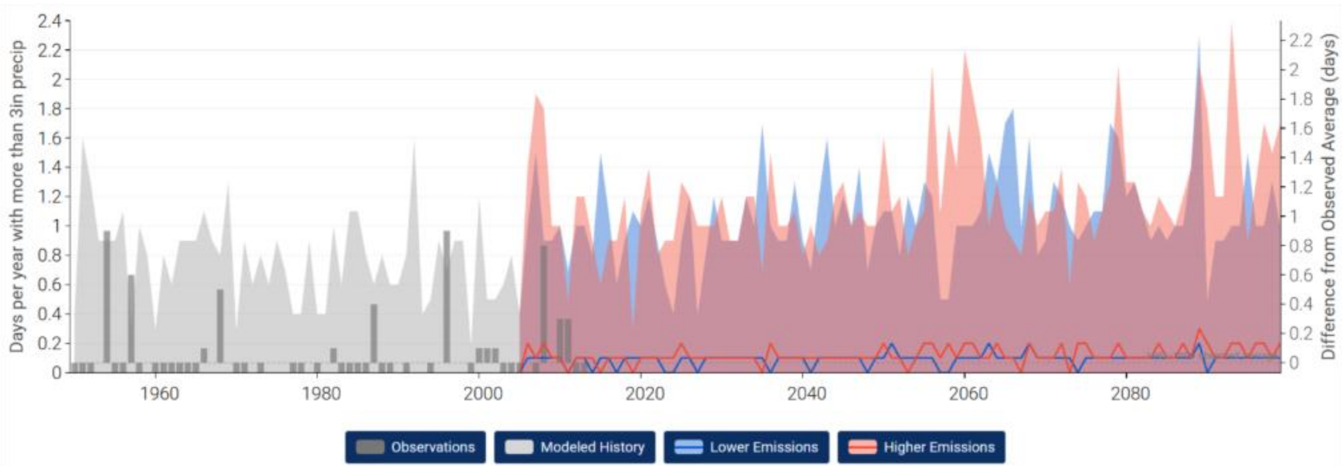
Table 18. Summary Table of Projected Total Average Annual Precipitation at IIPD

Total Annual Precipitation (inches)				
Historical (1976-2005)	RCP4.5		RCP8.5	
	Mid-Century (2035-2064)	Late-Century (2065-2094)	Mid-Century (2035-2064)	Late-Century (2065-2094)
36.66	37.71	38.10	38.17	39.31

NOAA's Climate Explorer Tool outlines the projected number of days in Cook County with more than three inches of precipitation (Figure 9). According to NOAA Atlas 14, three inches of precipitation is equivalent to a two-year, 24-hour storm event for the county.

[47] Air & Water | Understanding Climate – Ocean Surface Topography from Space

Figure 9. Projected Number of Days With More Than 3 Inches of Precipitation at IIPD[48]



The solid red and blue lines in Figure 9 represent the weighted mean of all model projections, while the shaded areas indicate the range of variability (uncertainty) in the predictions. The analysis shows that the higher emissions scenario (RCP8.5) results in both higher peaks and greater variability, with more days annually exceeding three inches of precipitation compared to the lower-emissions scenario (RCP4.5).

According to NOAA Atlas 14, a two-year, 24-hour storm in Cook County corresponds to approximately three inches of precipitation. Assessing the projected frequency of days at or above this threshold is important, since these events are expected to produce substantial flooding impacts for IIPD infrastructure. Events with rainfall above this threshold will likely overwhelm local stormwater systems, leading to increased risk of road closures, property damage, and operational disruptions. Large and intense rainfall events in excess of three inches will pose even greater risks to both site operations and critical infrastructure.

Table 19. Projected Number of Days with More Than 3 Inches of Precipitation in Chicago, Illinois

Project Number of Days over 3 inches of Precipitation				
Historical (1976-2005)	RCP4.5		RCP8.5	
	Mid-Century (2035-2064)	Late-Century (2065-2094)	Mid-Century (2035-2064)	Late-Century (2065-2094)
0.1	0.09	0.11	0.11	0.13

"Bluespots" Analysis

To screen for areas most vulnerable to flooding, the project team used the Bluespot tool in ArcGIS Pro (developed by the Danish Road Institute) to identify landscape depressions (bluespots) susceptible to water accumulation. The tool analyzes digital elevation maps to find natural bowls with no drainage outlet. This method identifies worst-case accumulation zones, and actual flood volumes will depend on surface runoff, drainage, and

[48] Climate Explorer_Cook County_Total Precipitation

local conveyance. Bluespots that intersect with buildings are flagged as structural risk areas. The analysis focused on bluespots larger than 500 square feet to prioritize high-impact risk zones.

Rainfall flooding occurs when intense or prolonged precipitation exceeds the capacity of drainage systems, leading to temporary surface water accumulation. As climate change increases the frequency and intensity of rainfall events, these flooding hotspots may become more persistent and disruptive.

Figure 10. Lake Calumet Project Area with Areas Vulnerable to Rainfall Flooding

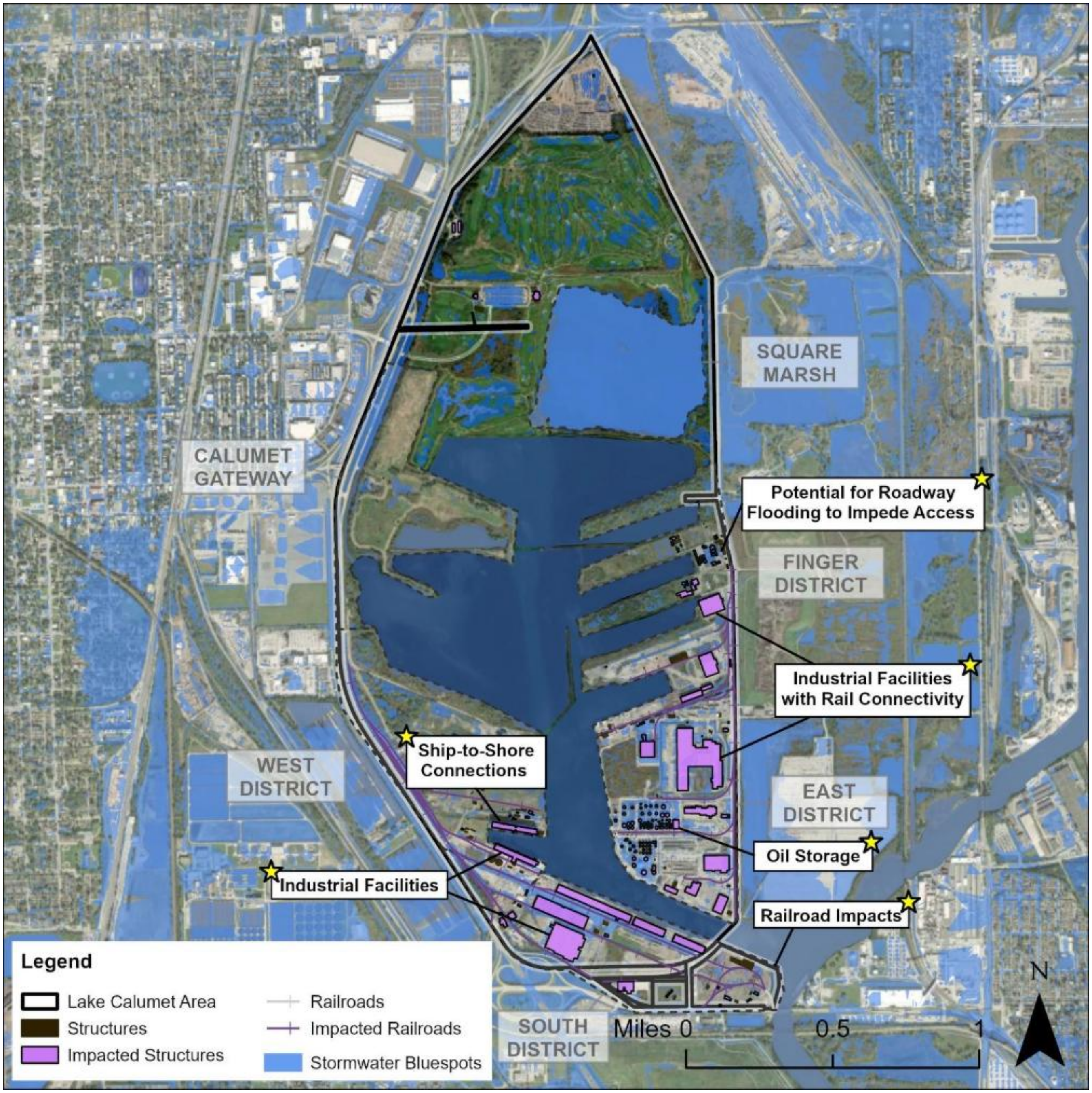
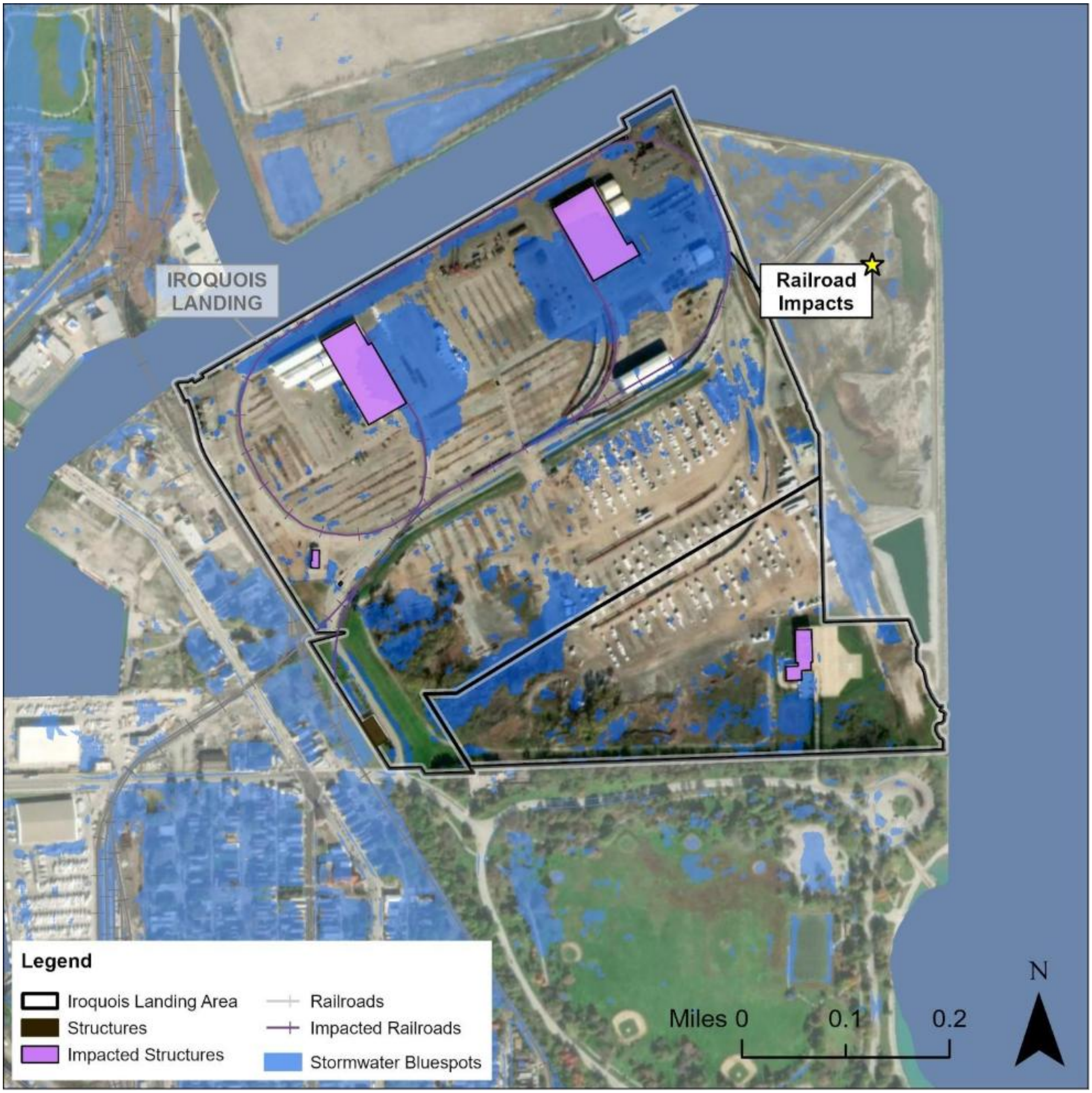


Figure 11. Iroquois Landing Project Areas Vulnerable to Rainfall Flooding



Key Impacts to IIPD

Lake Calumet impacts:

- **103** structures impacted in the **East District**, tenants include oil and gas distribution, industrial services and manufacturing, and storage
- **32** structures impacted in the **Finger District**, including steel and metal processing/manufacturing;
- **18** structures impacted in the **South District**, including industrial suppliers, packaging manufacturing, and metal suppliers; the Chicago Fire Department is also within the district; and
- **9** structures impacted in the **West District**, including a cement supplier and the Illinois International Port shipping company.

Iroquois Landing:

- **3** structures impacted, all tenants are freight storage facilities.

Overall Impacts

- Rainfall flooding may significantly impact operations at both IIPD sites by reducing ingress/egress due to flooded roads, limiting access for employees, deliveries, and emergency responders. Increased maintenance will likely be required to address water damage and clean up affected areas. Floodwaters may cause property damage, especially to outdoor storage and ship-to-shore operations. Industrial manufacturing facilities may experience operational disruptions as production is halted or delayed due to flooding. Obstructions for fire department deployment and damage to storage areas further increase risk, highligh;ting the need for robust flood management and emergency response planning.

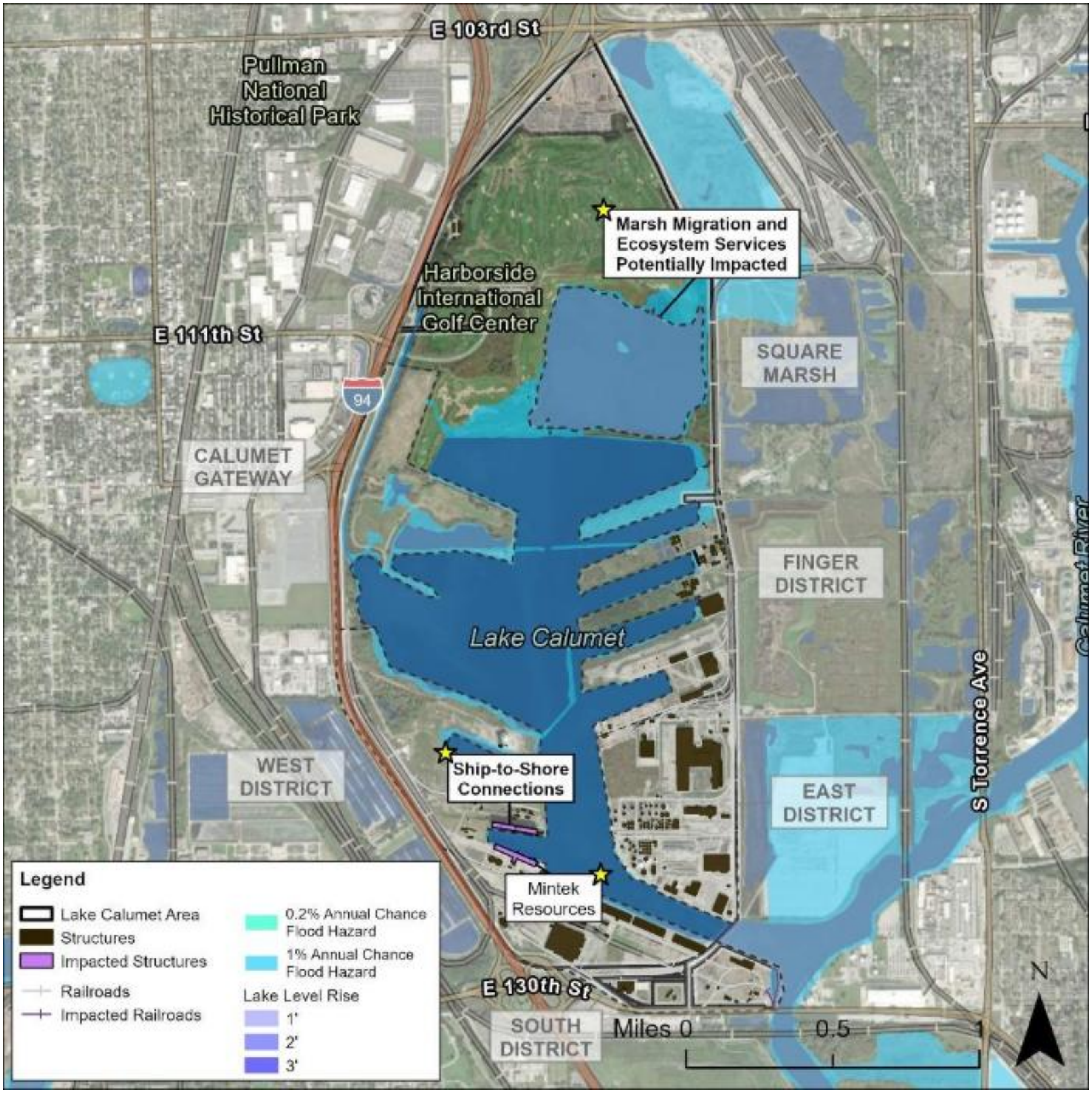
Lake Flooding

Lake flooding in Chicago occurs when elevated water levels in Lake Michigan result in inundation along the shoreline and connected waterways. Unlike rainfall-driven flooding, which results from local precipitation overwhelming drainage systems, lake flooding is primarily influenced by broader Great Lakes hydrology, including prolonged precipitation, reduced evaporation rates, seasonal lake cycles, and wind-driven water movement. Although precipitation often contributes to lake flooding, such flooding can also persist without heavy local rainfall due to shoreline overtopping, erosion, and sustained high lake levels. In the Great Lakes context, the distinction between riverine and lake flooding can be blurred, as high lake levels often cause backflow into river systems, raising water levels throughout the Chicago Rivers and complicating floodplain boundaries. For example, FEMA FIS for Cook County designates some shoreline areas as riverine flood zones, but these may also experience coastal or lake-driven flooding.

Coastal and Riverine Flooding

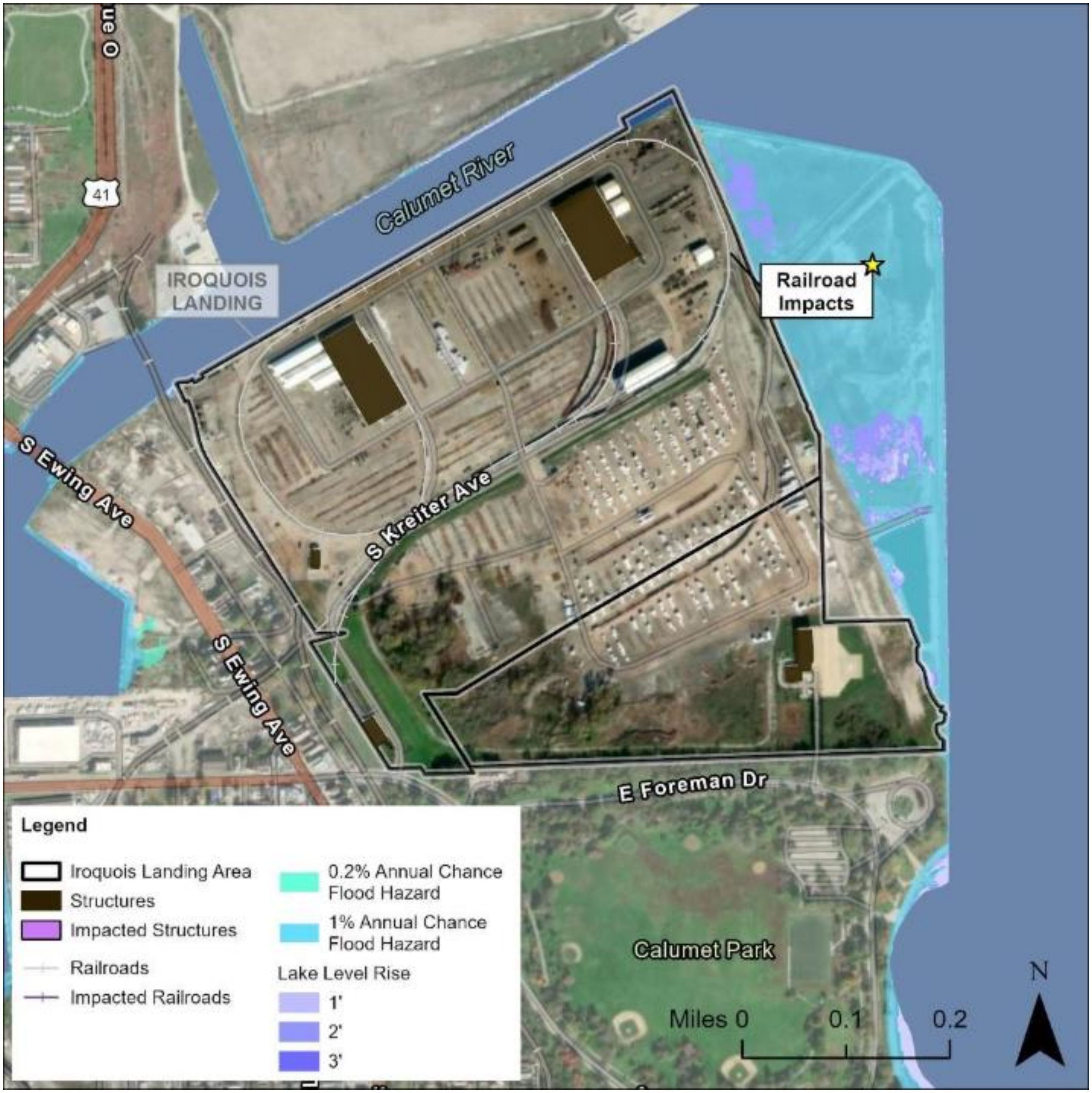
The FIS assigns some areas within IIPD to Zone AE and A, corresponding to a 1% annual flood hazard (100-year storm); Zone A is used where base flood elevation data are not available. A small area near Iroquois Landing is classified as Zone X, which represents a 0.2% annual flood hazard (500-year storm). The FIS indicates that heavy rainfall and high lake levels are the main contributors to fluvial (riverine) flooding in the Lake Calumet and Iroquois Landing areas. As climate change drives lake-level rise and alters floodplain landscapes, these flood hazard zones may expand, increasing exposure for port facilities and infrastructure.

Figure 12. Lake Calumet Project Area with Areas Potentially Exposed to Lake Flooding using FEMA Floodplain Data and Michigan Technological University Future Lake Level Projections via NOAA Modeling



Data Source: Kayastha et al. 2022.

Figure 13. Iroquois Landing Project Area with Areas Potentially Exposed to Lake Flooding using FEMA Floodplain Data and Michigan Technological University Future Lake Level Projections via NOAA Modeling



Data Source: Kayastha et al. 2022.

Storm Surge and Wave Phenomena

The FIS primarily links flooding events to rainfall and riverine sources and does not explicitly address lake flooding events driven by storm surge or wave phenomena. However, in other Great Lakes regions, seiche and meteotsunami events, waves caused by rapid air-pressure disturbances, have resulted in significant coastal flooding, such as those observed in Detroit (2024),[49] and on Lake Superior (2025), affecting Michigan and Minnesota.[50] In Chicago, the last documented meteotsunami event on Lake Michigan was in 1954 and is considered rare.[51] While these events are infrequent, future risk may increase, and there are currently no standardized methods to predict meteotsunamis or integrate them into climate projections.[52] Until research advances, FEMA flood zones remain the best available reference for lakeshore flooding risk.

Lake Level Rise

Climate change is projected to influence average Lake Michigan water levels, with the latest research suggesting an increase due to changes in over-lake precipitation, evaporation, and regional hydrology.[53] Recent models project that the Lake Michigan–Lake Huron system may see average water levels rise by 1.44 feet between 2040–2049 compared to 2010–2019. Such flooding is likely to be chronic, though extreme highs and lows will still occur. To visualize these risks, the project team used NOAA's modeling to map flood extents under increased water levels.

Modeling results indicate that very few areas within Lake Calumet or Iroquois Landing are vulnerable to chronic inundation from projected long-term lake level rise. Only two structures at Lake Calumet are identified as potentially affected; none at Iroquois Landing are exposed under these scenarios. Therefore, chronic inundation risk is low, though periodic flooding during extreme high-water events remains a concern and should factor into future resilience planning.

Key Impacts to IIPD

Portions of IIPD's Lake Calumet facility fall within FEMA Zone A, indicating a 1% annual flood hazard. Two structures in the Finger District and three in the West District are directly intersected by the floodplain and may face heightened flood risk. At Iroquois Landing, while the site is bordered by Zone AE (1% annual hazard) and a small area is designated as Zone X (0.2% annual hazard), no IIPD structures currently overlap with the floodplain. However, future expansion of floodplain areas due to rising lake levels could increase the number of exposed assets. Rail segments in the floodplain serving IIPD tenants may also be at higher risk, threatening overall operations.

Lake Calumet Impacts:

- **2** structures in the **Finger District** (freight storage tenants); and
- **3** structures in the **West District** (Illinois International Port, cement suppliers).

Overall Impacts:

- Similar to rainfall, lake-related flooding can restrict ingress and egress, increase maintenance needs, and cause property damage, especially to outdoor storage facilities. Chronic high-water levels may reduce usable

[49] Meteotsunami hit Lake Michigan: What it is
[50] June 21, 2025 Storm Causes Significant Meteotsunami and Seiche on Lake Superior |
[51] The Lake Michigan meteotsunamis of 1954 revisited | Natural Hazards
[52] New study shows promise of forecasting meteotsunamis - NOAA Research
[53] Future rise of the Great Lakes water levels under climate change - ScienceDirect

storage areas and disrupt site layouts. Industrial tenants, such as cement suppliers, may experience significant operational delays or losses as equipment, materials, and processes are impacted by flooding.

Additional Studies Needed

A comprehensive survey of the existing sewer and drainage network at IIPD, followed by a detailed hydrologic and hydraulic (H&H) analysis, is needed to better quantify flood volumes, assess system capacity, and design mitigation measures for a range of storm and lake level scenarios.

The U.S. Army Corps of Engineers (USACE) Great Lakes Coastal Resiliency Study (completion expected 2028) will provide more precise projections for lake-level rise and coastal storms, enabling more targeted adaptation planning for IIPD facilities.

3.1.4.2 Results: Weather Extremes

Climate-related extreme weather conditions such as extreme heat, cold, high winds, and drought are notable hazards at IIPD facilities. Each presents unique threat profiles and challenges. These hazards can result in direct impacts, including physical damage to buildings and infrastructure, as well as indirect effects such as operational disruptions, increased maintenance needs, and health and safety risks for staff and visitors. For example, extreme heat can stress building systems and affect outdoor workers, while extreme cold can cause frozen pipes and increase energy demand. High winds can result in structural damage or power outages, and drought can strain water resources essential for facility operations. With climate change projected to increase the frequency and intensity of such extremes, it is increasingly important for IIPD to assess vulnerabilities and implement strategies to maintain resilient, reliable operations.

Existing Conditions

Chicago experiences a continental climate characterized by significant seasonal variation in temperature and weather conditions.[54] Summers can be hot and humid, with heatwaves that pose health and operational risks, while winters are typically cold, often bringing sustained freezing temperatures, snow, and occasional extreme cold events. The city is also susceptible to periods of drought, which can stress water resources and landscaping. Additionally, strong winds, including both frequent gusts and occasional severe events, can cause localized damage, especially along the lakefront. Together, these factors create a highly dynamic and varied weather environment for IIPD.

Extreme Heat and Urban Heat Island Effect

Projections for Increased Temperatures

Downscaled LOCA climate data from the Climate Explorer Tool for Cook County indicate that average daily maximum temperatures will increase in both RCP4.5 and RCP8.5 scenarios by mid-century and late-century. RCP4.5, a moderate emissions scenario, projects a 4.6°F warming by mid-century and 5.9°F by late-century. RCP8.5, the worst-case scenario, projects 5.7°F warming by mid-century and 9.5°F by late-century (Table 20).

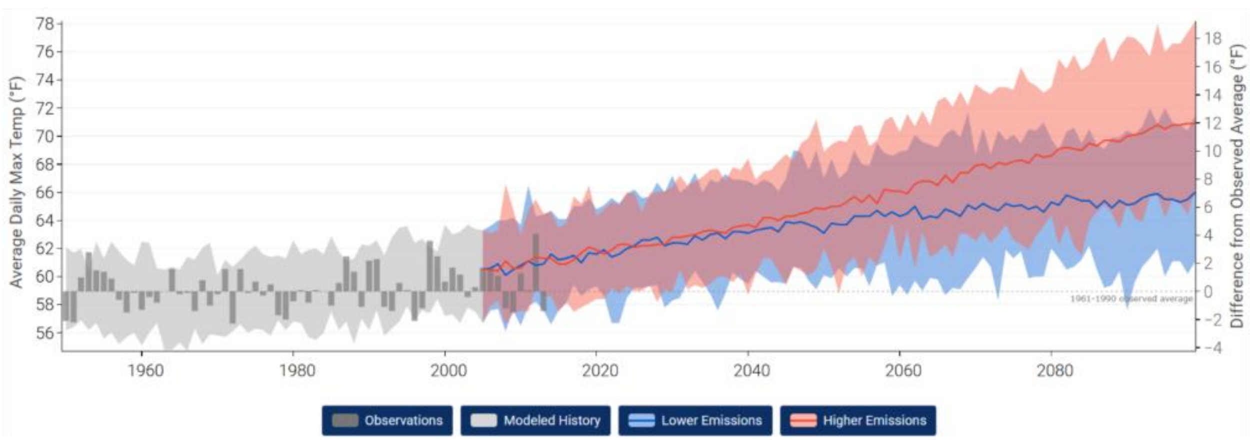
[54] Climate of Chicago – Illinois State Climatologist

Table 20 Summary Table of Projected Average Daily Maximum Temperature at IIPD

Average Daily Maximum Temperature (°F)				
Historical (1976-2005)	RCP4.5		RCP8.5	
	Mid-Century (2035-2064)	Late-Century (2065-2094)	Mid-Century (2035-2064)	Late-Century (2065-2094)
59.2°F	63.8°F	65.1°F	64.9°F	68.7°F

The general trend in projected maximum temperature from 1950 to 2099 is shown in Figure 14.

Figure 14. Projected Average Daily Maximum Temperature at IIPD Project Sites[55]



For this analysis, extreme heat is defined by the annual number of days exceeding 95°F. Climate projections indicate that the number of extreme heat days will increase under both scenarios, with the greatest increases in RCP8.5. Mid-century projections show a 591% increase (from 2.28 to 15.8 days above 95°F) under RCP4.5, and an 870% increase (from 2.28 to 22.15 days) under RCP8.5. Late-century projections show even larger increases.

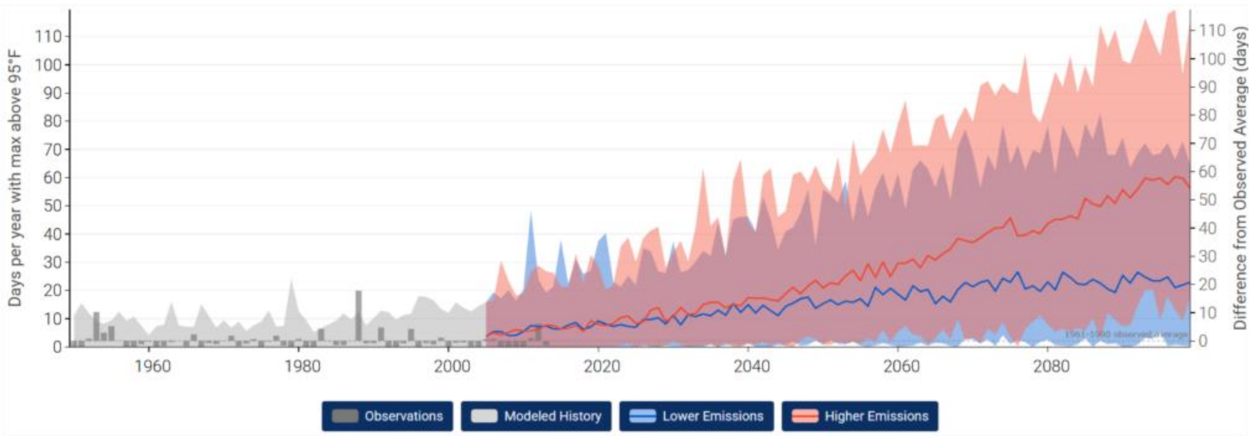
Table 21. Summary Table of Projected Annual Days above 95°F

Annual Days above 95°F				
Historical (1976-2005)	RCP4.5		RCP8.5	
	Mid-Century (2035-2064)	Late-Century (2065-2094)	Mid-Century (2035-2064)	Late-Century (2065-2094)
2.28	15.78	22.08	22.15	44.92

The trend in annual number of days above 95°F is shown in Figure 15.

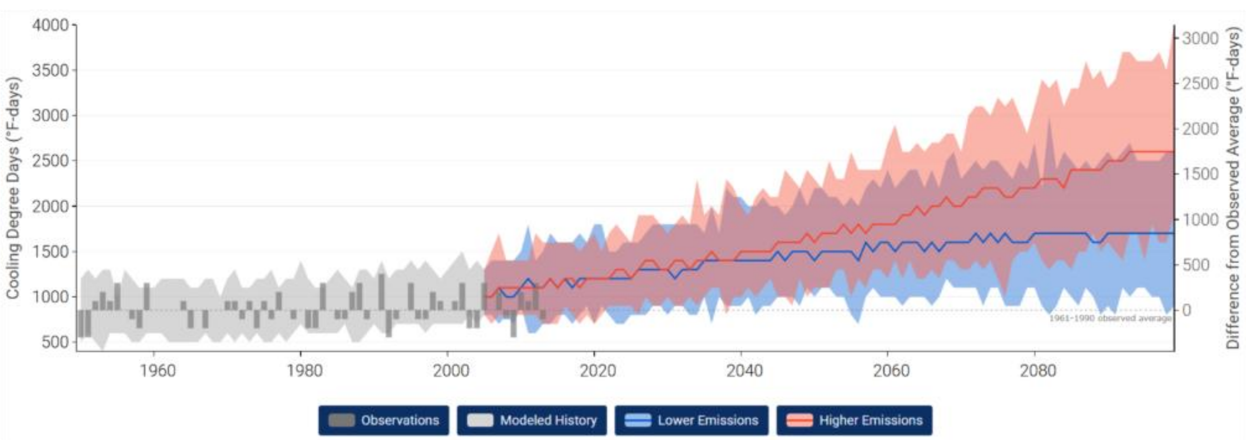
[55] Climate Explorer_Cook County_Average Daily Max Temp

Figure 15. Projected Annual Number of Days above 95F at IIPD Project Sites[56]



Extreme heat can pose health and safety risks to individuals and will also drive up cooling costs for indoor spaces. Cooling degree days (CDDs) quantify this demand, measuring how much (and for how long) outside temperatures exceed a base of 65°F. Figure 16 shows the projected increase in CDDs at IIPD.

Figure 16. Projected Number of Cooling Degree Days[57]



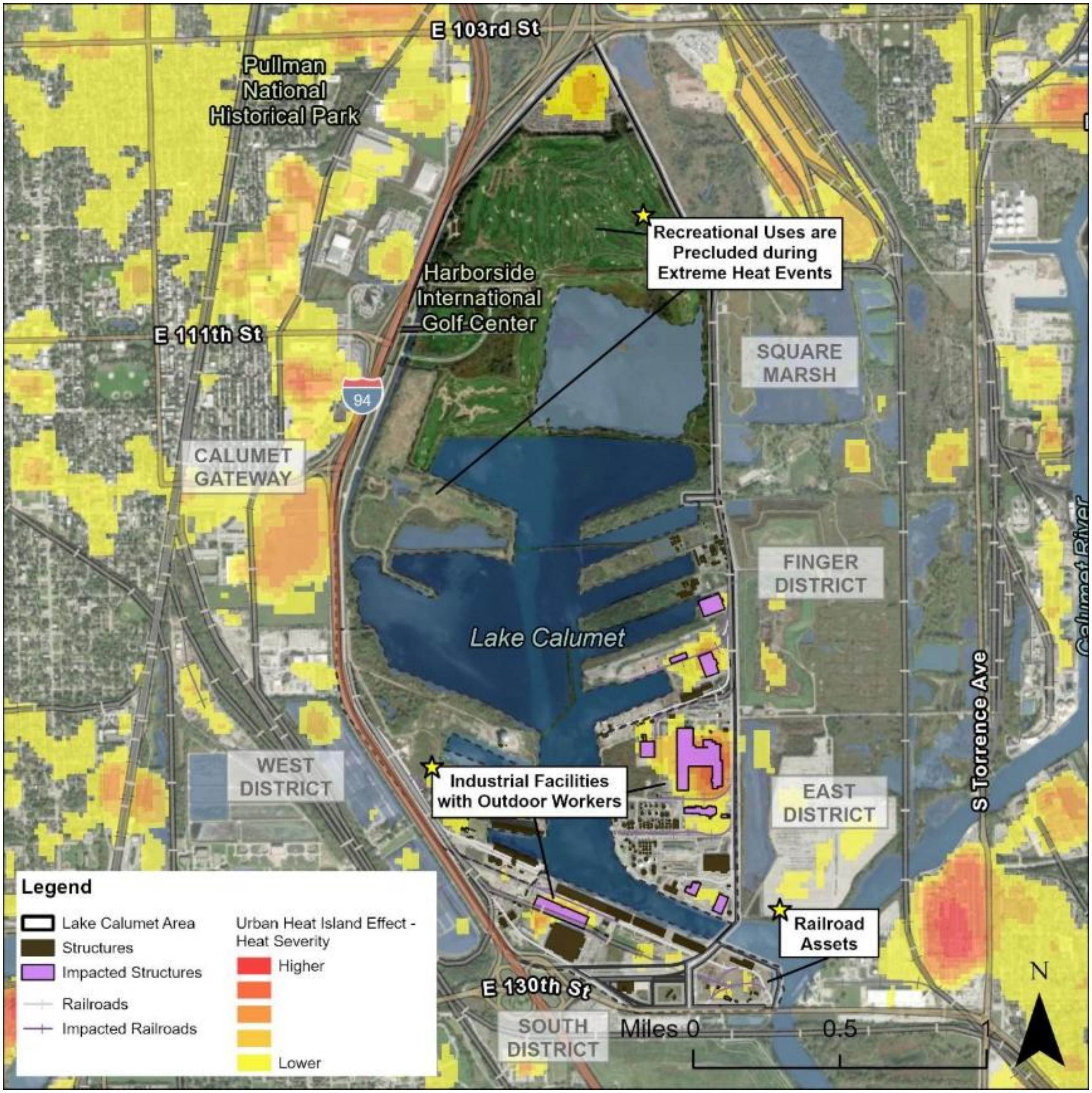
Projections indicate a 69% increase in CDDs (603.4 more per year) for RCP4.5 and an 89% increase (773.4 more per year) for RCP8.5 by mid-century, with even larger increases by late-century.

Table 22. Summary Table of Projected Number of Cooling Degree Days

Projected Number of Cooling Degree Days				
Historical (1976-2005)	RCP4.5		RCP8.5	
	Mid-Century (2035-2064)	Late-Century (2065-2094)	Mid-Century (2035-2064)	Late-Century (2065-2094)
873.3	1,476.7	1,646.7	1,646.7	2,246.7

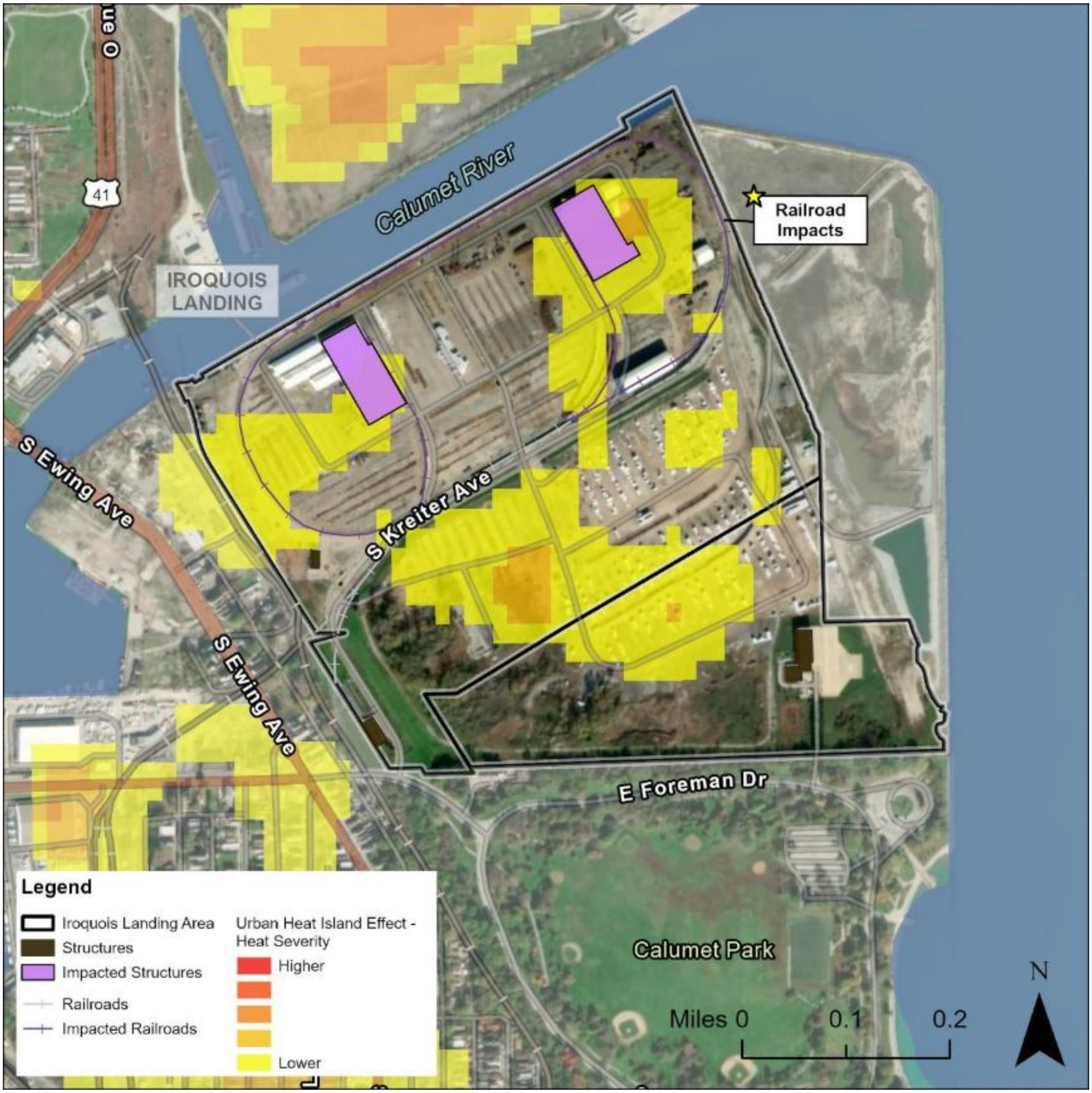
56 Climate Explorer_Cook County_Annual Days Above 90F
57 Climate Explorer_Cook County_Cooling Degree Days

Figure 17. Lake Calumet Project Area with Areas Exposed to Urban Heat Island Effect



Note: Darker orange represents hotter areas.

Figure 18. Iroquois Landing Project Area with Areas Exposed to Urban Heat Island Effect.



Key Impacts to IIPD

Lake Calumet:

- **7** structures impacted in the **East District**, including steel, industrial material manufacturing, and oil and gas distribution;
- **3** structures in the **Finger District**, including metal and steel processing/distribution;
- **3** structures impacted in the **South District**, including container storage and iron welding; and
- **12** structures impacted in the **West District**, all occupied by the Illinois International Port.

Iroquois Landing:

- **2** structures impacted, both occupied by freight storage facilities.

Overall Impacts:

- Rising temperatures can worsen air pollution, particularly ground-level ozone, increasing respiratory health risks and risk of non-compliance with air quality standards.[58] Higher temperatures accelerate oxidation and degradation of outdoor metal supplies and industrial materials, and lengthen pollen seasons affecting worker health and productivity. Prolonged heat can disrupt outdoor operations through worker fatigue, heat stress, and safety concerns, compounding operational challenges for IIPD and its tenants.

Extreme Cold

Chicago has a well-documented history of severe winter weather, including extreme cold, heavy snowfall, and dangerous blizzard conditions that have disrupted city operations and threatened public safety. Historical events include the Deep Freeze of January 1985 (temperatures down to -27°F, wind chills -57°F),[59] the 2011 Groundhog Day Blizzard (21.2” snow, 50+ miles per hour [mph] winds), and the Great Blizzard of 1967 (23” snow in 29 hours, 53 mph winds). These events have repeatedly paralyzed transportation, required massive emergency response, and caused significant infrastructure damage.[60] The Blizzard of 1979 (the "Groundhog Day" storm) similarly crippled the region with 21 inches of snow despite forecasts calling for only 2-4 inches, while the Blizzard of 1999 brought 21.6 inches accompanied by 60 mph winds and required National Guard activation. [61]

While Chicago has had extreme winter weather events, according to the National Weather Service at O’Hare International Airport, Chicago’s average annual snowfall is 38.4 inches, based on 30-year climate data (1991-2020), with substantial year-to-year variability.[62]

Projections for Decreased Temperatures

The number of days below freezing (32°F) is projected to decrease under both RCP4.5 and RCP8.5. Mid-century projections show a reduction of 18.2 days (RCP4.5) and 23.9 days (RCP8.5), while late-century projections show a decrease of 26 days (RCP4.5) and 45.8 days (RCP8.5).

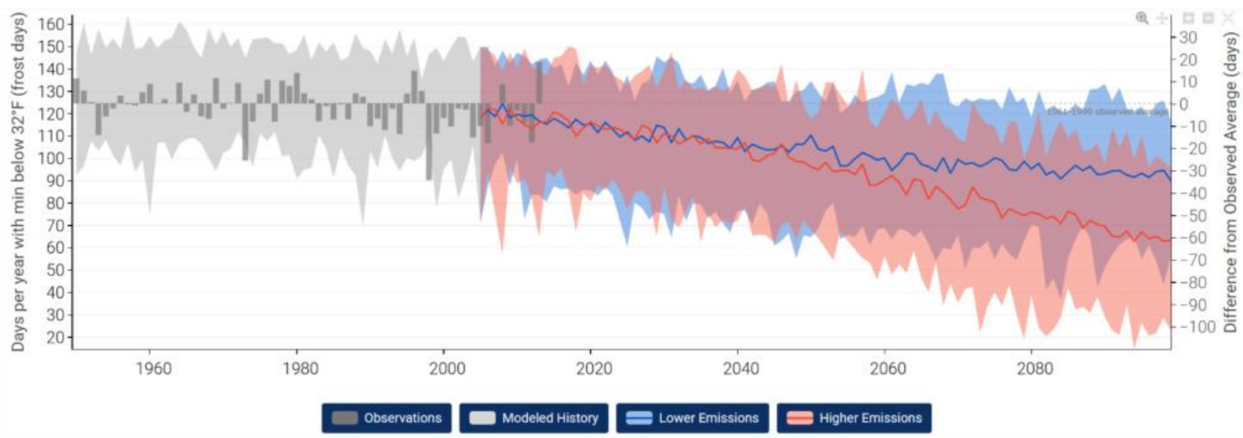
[58] How Climate Change May Impact Ozone Pollution and Public Health through the 21st Century | US EPA
[59] Coldest day ever recorded in Chicago history was 41 years ago today, on Jan. 20, 1985 - CBS Chicago
[60] Chicago Blizzard 2011: Looking back on 'Snowmageddon' 10 years later - ABC7 Chicago
[61] The 6 Worst Snowstorms in Chicago History | Great Lakes Snow
[62] 1991-2020 Monthly and Yearly Normals for Chicago and Rockford

Table 23. Projected Annual Days Below Freezing at IIPD

Annual Days Below Freezing				
Historical (1976-2005)	RCP4.5		RCP8.5	
	Mid-Century (2035-2064)	Late-Century (2065-2094)	Mid-Century (2035-2064)	Late-Century (2065-2094)
121.5	103.3	95.5	97.6	75.7

The long-term trend of fewer freezing days is shown in Figure 19.

Figure 19. Projected Annual Number of Days Below 32°F [63]



These projections indicate that, as temperatures rise, the seasonal duration of freezing temperatures will decrease. However, because a warmer atmosphere holds more moisture, the potential for intense snowfall events may actually increase, even as overall snowstorm frequency decreases. Emerging research suggests that lake-effect snowstorms may become more intense in a warming climate, even with fewer cold days overall.[64]

Key Impacts to IIPD

Reduced periods of extreme cold are likely to lower the risk of cold-related damage (e.g., frozen pipes, ice accumulation on roofs) and may decrease operational disruptions from snow and ice removal. However, the risk of intense snowstorms remains, requiring continued preparedness. Changes in freeze-thaw cycles could also affect building materials, landscaping, and site drainage. IIPD should ensure that its winter maintenance, emergency response, and infrastructure design adapt to less frequent but potentially more severe cold weather events.

[63] Climate Explorer_Cook County_Days Below 32F
[64] How Could Future Climate Conditions Reshape a Devastating Lake-Effect Snow Storm? - Kayastha - 2024 - Earth's Future - Wiley Online Library

Extreme Wind

Damaging winds are a major vulnerability for Chicago and IIPD. The wind hazard category includes routine winds and gusts as well as severe events (tornadoes, derechos, tropical storms). While local modeling of future wind patterns is limited, studies suggest increasing variability and intensity of extreme wind events in a changing climate, though trends remain uncertain. Stakeholders at IIPD report strong winds and damaging wind events in recent years, resulting in operational disruptions and damage to structures.

Wind Speeds

Some evidence suggests changing wind speeds across the Midwest due to climate change, but there is not yet scientific consensus on the direction of the trend. Regardless, exceptions to any general pattern are likely, and individual extreme wind events will continue to pose operational risks.

Extreme Wind Events (Tornadoes, Derechos/Straight-line Winds, Tropical Storms)

Wind phenomena are significant severe weather hazards in the Midwest, including at IIPD facilities, though their frequency and intensity can vary from year to year. Among such phenomena, tornadoes and derechos are the most notable.

A tornado is a rapidly rotating column of air extending from a thunderstorm to the ground, capable of producing extremely strong winds and causing significant damage along its path. Tornadoes can uproot trees, destroy buildings, overturn vehicles, and pose severe risks to life and property within their path of destruction.

A derecho is a widespread, long-lived windstorm associated with a band of rapidly moving showers or thunderstorms. Derechos are capable of producing damaging straight-line winds over large areas, sometimes exceeding 80 mph, and can lead to extensive power outages, infrastructure damage, and disruption of port operations. Unlike tornadoes, which have a concentrated path, derechos can impact hundreds of miles with damaging winds.

Straight-line winds refer to any thunderstorm winds not associated with rotation (i.e., not tornadoes) and can be just as destructive as tornadoes, especially when occurring in clusters or bands.

While tropical storms and hurricanes rarely make direct landfall in the Chicago area, their remnants can still bring damaging winds, heavy rainfall, and flooding far inland, affecting regional infrastructure and port operations. Historically, Chicago and surrounding areas have experienced the impacts of tropical systems that have traveled northward after landfall elsewhere, with notable examples such as the remnants of Hurricane Ike in 2008. That event brought wind gusts exceeding 60 mph and significant rainfall, resulting in widespread power outages, flooded roadways, and disruptions to transportation and logistics throughout the city. Although the frequency of tropical storm impacts in the Midwest is low, the potential for intense wind and rain from these systems remains a concern, particularly as climate change may alter storm tracks.

There is ongoing scientific investigation into how climate change may influence these wind events. Current research suggests that warming temperatures and changing atmospheric conditions could contribute to shifts in the timing, location, and intensity of tornadoes and derechos, but consensus on these trends remains limited, and further study is needed to clarify the long-term impacts of climate change on these high-impact wind events.

Stakeholders at IIPD facilities have noted that tornadoes and derechos, while relatively rare, have the potential to cause widespread damage to infrastructure, disrupt operations, and threaten occupant safety. As these severe wind events are expected to remain a threat regardless of overall climate trends, emergency planning and structural resilience will be crucial for minimizing risks and ensuring rapid recovery when such events occur.

Notable historical extreme wind events are summarized in chronological order in Table 24.

Table 24. Historical Extreme Wind Events in the Chicago, Illinois Area

Extreme Wind Event	Date	Wind Speeds	Notable Impacts
Dust Storm with Severe Winds[65]	May 16, 2025	60+ mph	Chicago's first-ever dust storm warning; visibility dropped to near-zero; ground stops at O'Hare
Derecho[66]	August 9-10, 2020	70+ mph	Costliest thunderstorm in United States history; 13 tornadoes in Chicago area
Northern Illinois Derecho[67]	July 11, 2011	80 mph	Widespread wind damage across northern Illinois; six injuries in Chicago from festival tent collapse; 860,000 power outages
Hurricane Ike Remnants[68]	September 14, 2008	49 mph	Widespread power outages, road closures, transportation disruptions
Chicago Derecho[69]	July 17, 2006	90 mph	460,000 without power; eight tornadoes (up to EF2); significant tree/power line damage; one fatality
Chicago F5 Tornado[70]	August 28, 1990	261-318 mph	29 fatalities, 353 injured; $160M damages in Plainfield, Illinois (southwest suburb of Chicago)
Chicago F4 Tornado[71]	April 21, 1967	200+ mph	Most severe recorded wind event; 33 fatalities, 500+ injuries; $27.5M damage, destroyed homes/businesses

Key Impacts to IIPD

Extreme wind events threaten utility services (especially electricity), critical for port and tenant operations. Major winds can cause structural damage, asset loss, increased maintenance costs, and operational delays. Debris from wind events may impede access and emergency response, while disruptions can delay vessel operations and impact supply chains. Tornadoes and derechos require robust emergency preparedness, rapid response protocols, and structural resilience strategies.

[65] May 16, 2025: Significant Dust Storm Impacts the Region, Including the Chicago Metro
[66] A history of severe weather in Chicagoland – Kaneland Krier
[67] July 11, 2011 Severe Weather Summary
[68] Which hurricane has had the biggest effect on Chicago? | WGN-TV
[69] Severe storms in Midwest kill one, leave over 460,000 without power
[70] The August 28, 1990 Plainfield F-5 Tornado
[71] https://firststreet.org/city/chicago-il/1714000_fsid/wind

Drought

Chicago does not have a significant history of extreme drought, but periods of moderate to low drought have occurred in recent decades. Periods of drought can constrain water resources, decrease water levels, and cause supply chain disruptions, a particular concern for IIPD's tenants utilizing waterways for transportation. Although drought is not currently a major climate hazard in the area, climate projections and reports such as the Chicago 2008 Climate Action Plan suggest an increased probability of drought with rising temperatures, supported by an increase in the average number of consecutive dry days experienced in past years.[72] The University of Illinois also produced a more recent study in 2021, analyzing statewide climate impacts and projecting that climate change is likely to result in more intense rainfall events paired with longer stretches of days without precipitation.[73]

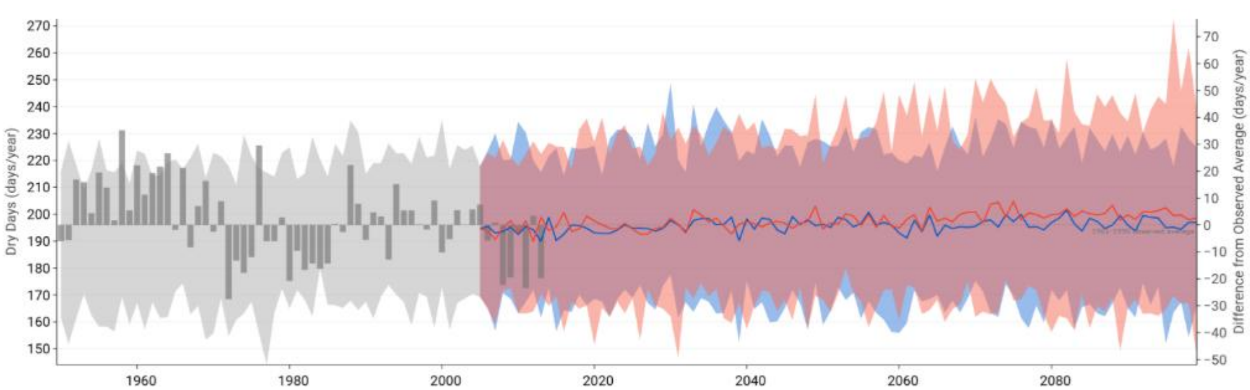
Projections

Table 25. Annual Dry Days (0 Precipitation / 24 hours)

Annual Dry Days				
Historical (1976-2005)	RCP4.5		RCP8.5	
	Mid-Century (2035-2064)	Late-Century (2065-2094)	Mid-Century (2035-2064)	Late-Century (2065-2094)
195.43	196.35	196.69	197.15	200.17

The trend in annual dry days from 1950 to 2099 is shown in Figure 20.

Figure 20. Projected Annual Number of Dry Days at IIPD[74]



The projected increase in annual dry days suggests a higher potential for drought conditions in coming decades. Although total rainfall may increase, intensified summer temperatures may also raise the frequency of short-term, flash droughts, as reflected by the increase in consecutive dry days.

72 City of Chicago: Chicago Climate Action Plan
73 An Assessment of the Impacts of Climate Change in Illinois
74 Climate Explorer_Cook County_Dry Days

Key Impacts to IIPD

Water resources and supply play a significant role in drought risk. As intense summer temperatures increase, short-term droughts become more likely as water supply demand rises, affecting water scarcity and quality of life. All studies assessed, including the Chicago Climate Action Plan (2022), Illinois Climate Change Assessment (The Nature Conservancy 2021), and Climate Explorer, consider it likely that drought risk will increase with climate change due to the compounding effect of rising temperatures and increased water demand.

During periods of drought, IIPD and its tenants may experience operational challenges such as reduced water supply for industrial processes, increased demand for dust suppression and cooling, and potential limitations on vessel navigation if water levels fall in the Calumet River or Lake Michigan. Drought conditions may also impact landscaping, stormwater management, and overall site maintenance.

Additional Studies Needed

Further research is needed to refine drought risk at the site level, including asset-specific water demand analysis and scenario planning for extended dry periods. IIPD should prioritize staying informed about emerging scientific consensus and advancements in modeling and projections related to these extreme weather trends. By actively monitoring updates from regional and national research efforts, IIPD can incorporate new insights into its assessments of localized impacts and integrate these findings into future adaptation and resilience planning for its facilities.

3.1.4.3 Results: Additional Climate-Related Hazards

Wildfire

Existing research and analysis on wildfires in the Chicago region is relatively limited compared to other extreme weather events. The U.S. Forest Service's Wildfire Risk to Communities dataset classifies the majority of the district as very low to low wildfire risk overall and for structures. In the Lake Calumet area, a small section is classified as "very high," likely due to existing vegetation and fuel loads.[75]

However, the predominant impacts experienced from wildfires in Chicago relate to decreased air quality from surrounding wildfires in broader Illinois and in the Great Lakes region. Rising temperatures and more frequent droughts are expected to increase the severity of wildfires, both of which contribute to higher concentrations of particulate matter (PM_{10} and $PM_{2.5}$) in the air. A recent study found that the annual average of maximum daily $PM_{2.5}$ concentrations increased from 14.1 micrograms per cubic meter in 2019 to 15.1 micrograms per cubic meter in 2023.[76] There has also been a rise in the magnitude of outlier $PM_{2.5}$ values, meaning Chicago is now seeing higher maximum concentrations each year than in previous years. This upward trend in extreme $PM_{2.5}$ events is primarily driven by the transport of wildfire smoke from other parts of North America.[77] In general, increased precipitation, when combined with rising temperatures, can also indirectly contribute to reduced air quality.

[75] Wildfire Risk to Communities | US Forest Service
[76] Wildfire smoke and PM2.5 pollution in Chicago: Evidence from 2019 to 2023
[77] Climate Change and Wildfire in the Great Lakes Region

Figure 21. Lake Calumet Project Area with Wildfire Risk

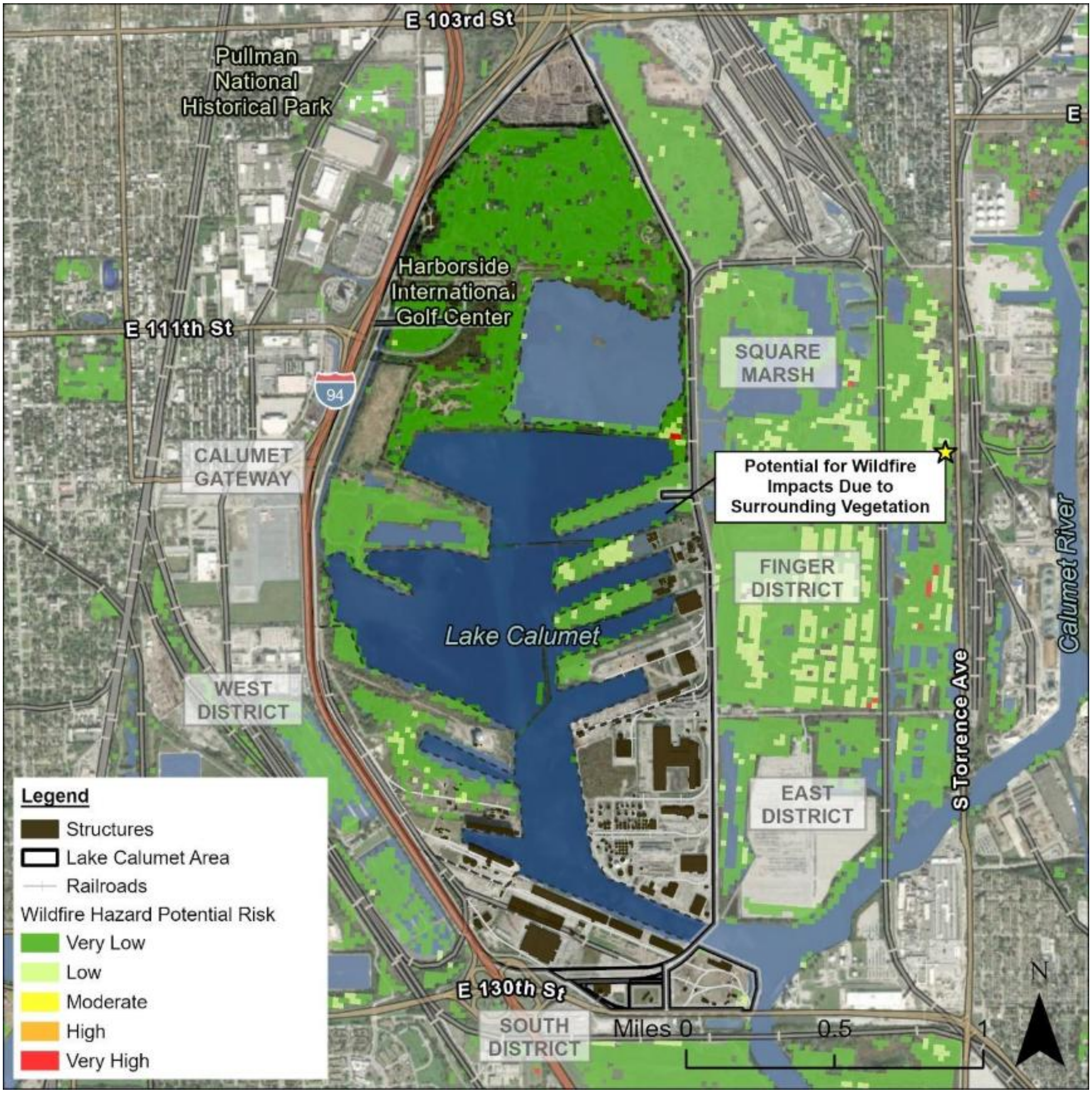
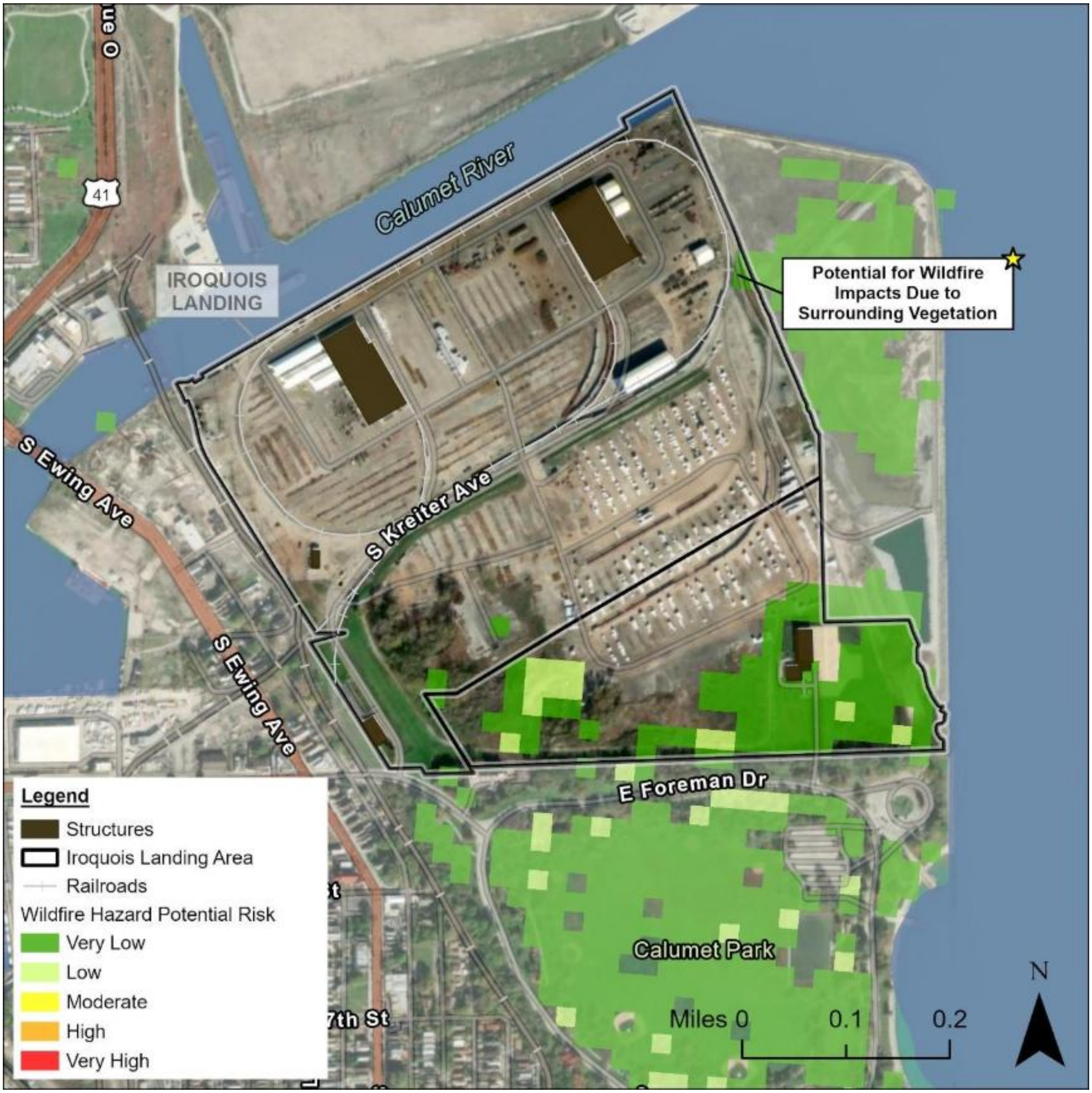


Figure 22. Iroquois Landing Project Area with Wildfire Risk



Although wildfires are not projected to be a predominant risk for IIPD, degraded air quality from wildfire smoke can significantly disrupt outdoor activities, cause delays in transportation, and present health risks to those working outside. Prolonged exposure to reduced air quality may require operational modifications, such as limiting outdoor work or adjusting schedules. Continuous air quality monitoring and real-time notification systems can help safeguard worker health during regional wildfire events.

Invasive Species

Warmer air and water temperatures may increase the prevalence of certain invasive species in Illinois. Examples include pathogenic insects like the emerald ash borer and invasive, non-native plants such as Amur honeysuckle, Johnson grass, oriental bittersweet, and Japanese stilt grass.[78] Wetlands and native grasslands are most likely to experience further degradation with warmer conditions, due to the spread of invasive species that benefit from mild winters and longer growing seasons.

Lake Calumet, which includes wetland ecosystems, may face increased degradation from invasive species, potentially affecting plans for recreational development and export activities. The 2022 IIPD Master Plan describes goals to maximize land use through expanding recreational area, engage in ecosystem restoration, and promote wildlife presence. A higher prevalence of invasive species can disrupt efforts to restore native vegetation, decrease wetland quality, and require greater maintenance of planted areas. Regular monitoring of flora and fauna, as well as proactive management and restoration of native species, is recommended.

Snow Squalls

Snow squalls are brief, intense bursts of heavy snowfall accompanied by strong winds and rapidly falling temperatures, often causing sudden whiteout conditions and hazardous flash freezes on roadways. In the Chicago area, snow squalls most commonly occur as cold air moves rapidly over Lake Michigan, producing localized but severe visibility reductions and dangerous driving conditions. While climate change is expected to bring generally warmer winters and reduce the total number of snowfall days in the Midwest, the frequency and severity of snow squalls remain difficult to predict, as they depend on specific atmospheric conditions. Some research suggests that, while long-duration snowstorms may become less common, abrupt, high-impact events like snow squalls could persist or even intensify as the climate shifts.

For IIPD, snow squalls can disrupt port operations, delay vessel movements, and create safety risks for workers and cargo transport, particularly during flash freeze events. Maintaining robust winter weather protocols, real-time alert systems, and emergency preparedness training are essential to manage operational risks from these unpredictable hazards.

Fog

Fog is a common meteorological phenomenon in the Chicago area, especially near large bodies of water like Lake Michigan and the Calumet River, both of which border IIPD. Fog typically forms when moist air cools rapidly, leading to condensation near the ground. Reduced visibility from fog can impact vessel navigation, cargo handling, and ground transportation, increasing the risk of collisions and slowing operations.

In the context of port operations, fog can pose operational and safety challenges, but it is generally not considered a major climate change concern compared to other hazards such as extreme heat, flooding, and severe wind. There is limited research on how climate change will specifically impact fog frequency or intensity in the Chicago region. While fog can disrupt IIPD operations on a day-to-day basis, it does not represent a major long-term climate risk for port infrastructure or business continuity. However, ongoing attention to safety protocols, navigation technology, and worker training is important to mitigate the impacts of fog when it does occur.

[78] IL Climate Assessment

3.2 Resilience Action Plan

3.2.1 Introduction

Building resilience to climate hazards at IIPD will require coordinated actions by IIPD, tenants, adjacent landowners, government agencies, and surrounding communities. This section outlines a toolkit of potential resilience strategies that IIPD and stakeholders can pursue to increase resilience to climate change. The toolkit includes physical infrastructure measures, nature-based solutions, policy and programmatic recommendations, and initiatives for education and capacity building. Some actions are suitable for near-term implementation, while others are best advanced over a longer time horizon. Strategies were developed based on the vulnerabilities identified in the prior section, a review of existing local and regional efforts, the Arcadis team's expertise in resilience planning, and input from the Steering Committee and ICAT in December 2025. This section provides recommended actions over the next 10 years and identifies near-term priority actions, selected based on analysis of immediate vulnerabilities and alignment with ongoing projects and investments.

3.2.2 Stakeholders and Ongoing Efforts

In addition to IIPD, which owns and manages the port, other key stakeholders in building resilience include the following agencies and organizations, many of which have already made significant progress toward identifying climate vulnerabilities and implementing resilience projects in the region:

- **CMAP** is the Metropolitan Planning Organization for the Chicago region. CMAP develops plans and advocacy tools for planning issues in the region and is responsible for allocating federal transportation funds.
- **IDOT** manages and maintains the state's transportation infrastructure, including major highways and bridges. Recent efforts include repairs to the Interstate 94 Bishop Ford Expressway culverts and bridges to address flood risk and improve resilience. IDOT's Stormwater Management Plan outlines measures to improve drainage infrastructure and reduce roadway flooding, supporting regional transportation resilience.
- **Cook County** develops and implements its Multi-Jurisdictional Hazard Mitigation Plan, which identifies strategies to reduce the impacts of natural and man-made disasters across the county, including flooding and extreme weather events.
- **MWRD** is a special purpose government agency responsible for treating wastewater and managing stormwater in Cook County. It establishes policies and regulations for water management, and provides educational resources and programs aimed at improving stormwater management and reducing flood risks in the region.
- **USACE** leads the Great Lakes Coastal Resiliency Study, which assesses vulnerabilities and develops strategies to increase resilience to coastal hazards, such as flooding and erosion, along the Great Lakes shoreline.
- **City of Chicago (various departments)** including the Department of Transportation, Police, Fire, and the Office of Emergency Management and Communications collaborate on emergency response and climate adaptation efforts. The City of Chicago Climate Action Plan guides broader sustainability and resilience initiatives. The Department of Water Management is the water utility for the area including IIPD.
- **University of Illinois** conducts research, such as the Illinois Climate Change Assessment (The Nature Conservancy 2021), that informs local and regional planning for climate adaptation and risk mitigation.

- **Illinois Emergency Management Agency** coordinates statewide preparedness, response, and recovery efforts for natural disasters and emergencies, promoting hazard mitigation and resilience planning.
- **Illinois Environmental Protection Agency** regulates environmental protection programs, focusing on water quality, air pollution, and hazardous waste management to safeguard public health and the environment.
- **ComEd** supplies electricity to the Chicago region including IIPD facilities and should pursue resilience upgrades to critical energy infrastructure, ensuring reliable service during extreme weather events.
- **Railroad Companies** operate and maintain freight rail services and infrastructure in the region and on IIPD property. They play a key role in transportation resilience and emergency response coordination.
- **IIPD Tenants** are responsible for managing site-level operations and as such may, implement site-specific resilience measures. Coordination with IIPD on climate adaptation efforts will be important moving forward.

3.2.3 Overview of Resilience Strategies

Based on the vulnerabilities identified and Arcadis' national experience in resilience planning, the following strategies are recommended to address key risks and increase IIPD's resilience to climate change over both the near and long term.

Physical and Nature-Based Infrastructure

The following physical and nature-based strategies can reduce impacts from flooding, extreme heat, and high winds:

- **Stormwater Management and Drainage**: Upsizing drainage infrastructure and using nature-based solutions (e.g., bioswales, vegetated roofs) to manage flooding from heavy rain, enhance conveyance, retention, filtration, and support biodiversity;
- **Coastal Resilience**: Designing bulkheads, seawalls, and other coastal infrastructure to manage lake level rise; monitoring and managing tidal wetlands to keep pace with rising lake levels;
- **Perimeter Flood Protection**: Use of permanent or deployable floodwalls to protect from stormwater or lake-driven flooding;
- **Cooling Structures**: Installing shade structures and selecting materials that reduce the urban heat island effect, including tree and vegetation planting;
- **Rail Design for High Heat**: Using materials and designs that withstand higher temperatures and thermal expansion;
- **Fire Resistant Site Design**: Selecting fire-resistant materials and vegetation to minimize wildfire risk and fuel availability;
- **Power Resilience**: Ensuring redundancy and reliability of power supply through back-up generators, microgrids, and battery storage; and
- **Resilient Building Design and Adaptation**: Designing buildings to withstand climate events through:
- Dry Floodproofing: Waterproofing exteriors and using flood barriers at entry points;
- Wet Floodproofing: Elevating critical equipment and using saltwater-tolerant materials;
- Envelope/HVAC: Designing for improved thermal performance and ventilation; and
    - Stronger Structures: Roofs, windows, and other elements engineered for higher wind loads.

Programs and Policies

- **Improving Understanding of Climate Vulnerabilities**: Conduct risk assessments, scenario modeling, and data analysis to identify and prioritize areas most at risk from climate-driven hazards such as flooding, heat, and severe storms; integrate findings into ongoing planning and decision-making.
- **Sensors for Critical Systems**: Install environmental for real-time monitoring and early warning of high temperatures, flood threats, and poor air quality; supporting rapid response and maintenance actions.
- **Resilient Design Guidelines**: Develop and adopt standards that specify resilient materials, systems, and layouts for new construction and renovations to withstand more frequent flooding, extreme heat, and other hazards.
- **Emergency Operations:** Update protocols for disaster preparedness, response, and recovery, including coordination of personnel, resources, and communications to ensure business continuity and safety during climate emergencies.

Outreach and Capacity Building

- **Outreach to Tenants:** Engage tenants to share climate risk information, resilience strategies, and available resources; foster collaboration on preparedness planning and encouraging site-specific adaptation.
- **Outreach to Surrounding Communities:** Communicate with neighboring residents and organizations to build awareness of climate hazards and resilience initiatives; provide education and opportunities for community involvement in adaptation and emergency planning.

3.2.4 10-Year Action Plan and Priority Actions

Based on the hazard exposure and climate impacts identified in the climate vulnerability analysis, the project team identified 15 priority actions for IIPD to enhance resilience. These actions are tailored to the specific context of IIPD sites and directly address the most significant climate risks highlighted in this chapter. The actions are presented in no particular order and should be treated as equally important for implementation. Many of these actions are synergistic, meaning that the more actions IIPD and its stakeholders implement, the greater the cumulative resilience benefits will be. However, each action can also deliver value independently and may be pursued as program needs, resources, and funding allow. All recommended actions build on IIPD's previous and ongoing efforts to strengthen resilience, protect critical infrastructure and operations, and support the long-term sustainability of Lake Calumet, Iroquois Landing, and neighboring communities.

Table 26 summarizes all priority actions and identifies specific steps to implement these actions over the next 10 years. Following the summary table, each priority action is described in more detail, with priority actions to take over the next one to three years identified.

Table 26. Priority Action Summary

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Action 1: Assess and Improve Capacity of Drainage Infrastructure											
Study capacity of existing system	X	X									
Identify opportunities to integrate green infrastructure into planned projects	X	X	X	X							
Identify and implement stormwater system upgrades			X	X	X	X	X	X	X	X	X
Action 2: Collaborate to Improve Resiliency of Tenant Facilities											
Tenant Outreach	X										
Launch awareness campaign to connect tenants with technical assistance		X	X								
Coordinate with tenants on implementation of measures				X	X	X	X	X	X	X	X
Action 3: Assess and Improve Emergency Operations											
Initiate conversations with first responder agencies	X										
Review current emergency operations protocols at IIPD facilities	X	X									
Update and enhance response plans as needed			X	X	X						
Action 4: Mitigate Urban Heat Island “Hotspots”											
Identify initial target heat islands at IIPD sites	X										
Identify opportunities to integrate heat mitigation measures	X	X	X	X	X	X	X	X	X	X	X
Action 5: Mitigate Climate Impacts to Rail Infrastructure											
Engage railroads owners and operators and share results of analysis	X										
Integrate vulnerability with railroads’ asset information and capital planning		X	X	X							
Collaborate to implement mitigation needs					X	X	X	X	X	X	X
Action 6: Prepare for Power Outages											
Begin conversation with tenants regarding power outage preparedness	X	X									
Identify steps tenants have already taken related to backup power systems		X									
Identify critical operations and infrastructure where back-up power is lacking		X									
Implement policy updates and physical improvements			X	X	X	X	X	X	X	X	X
Explore opportunities for nature-based and energy-efficient solutions			X	X	X	X	X	X	X	X	X

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Action 7: Develop Resilient Design Guidelines for IIPD Facilities											
Convene working group to develop resilient design guidelines	X	X									
Establish comprehensive resilient design guidelines			X	X							
Update design guidelines on regular basis					X	X	X	X	X	X	X
Action 8: Collaborate with Surrounding Communities on Education											
Integrate climate change into the Calumet Gateway project.	X	X									
Identify and partner with local organizations and schools	X	X									
Develop and pilot educational workshops and resource materials		X	X	X							
Action 9: Integrate resilience into master plan and asset management											
Review master plan and capital planning for opportunities to add resilience	X	X									
Provide training to planning staff on resilience integration		X	X	X							
Establish regular review and updates of procedures					X	X	X	X	X	X	X
Action 10: Integrate climate resilience into decarbonization measures											
Review decarbonization projects for climate vulnerabilities	X	X									
Update project guidelines to include resilience considerations			X	X							
Action 11: Integrate climate resilience into marsh restoration											
Evaluate current marsh restoration projects for adaptation opportunities	X	X	X								
Update restoration plans to include climate-resilient practices			X	X	X	X	X				
Monitor marsh health and climate changes and adapt plans as needed								X	X	X	X
Action 12: Monitor Lake Level Rise and Develop Adaptation Plans											
Install or connect to lake level monitoring stations	X	X									
Develop a protocol for regular data review and adaptation planning		X	X								
identify and implement adaptation measures as needed				X	X	X	X		X	X	X
Action 13: Align Local and Regional Planning Efforts											
Assign staff to track relevant planning processes	X										
Attend regional resilience workshops and coordination meetings		X	X	X	X	X	X	X	X	X	X

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Action 14: Smart Sensors for Flooding, Temperature, and Air Quality											
Identify priority locations for sensor deployment	X	X									
Pilot installation and establish data management protocols			X	X							
Expand monitoring network					X	X	X	X	X	X	X
Action 15: Convene a Tenant Coordinating Committee on Resilience											
Identify tenant representatives and convene initial committee meeting	X										
Develop a committee charter and meeting schedule	X										
Implement resilience into tenant operations and upgrades		X	X	X	X	X	X	X	X	X	X

These priority actions are grouped in three categories: physical and nature-based infrastructure, programs and policies, and outreach and capacity building. Each action is described as a long-term goal supported by near-term steps to enable immediate progress. For each, we provide information on potential lead entities, climate hazards addressed, co-benefits, and a high-level cost estimate ($ = low, $$ = middle, and $$$ = high). “Co-benefits” refer to positive outcomes beyond the primary goal of the action—such as improved recreation, greater operational efficiency through modernization, or enhanced air quality for surrounding neighborhoods.

Action 1: Assess and improve capacity of drainage infrastructure.	
Action Type	Physical and Nature-Based Infrastructure
Lead Entity(ies)	IIPD; IDOT, City of Chicago Department of Transportation, MWRD
Description	Evaluate existing drainage systems within IIPD sites to identify vulnerabilities to increased precipitation and flooding driven by climate change. Upgrade infrastructure where necessary to address capacity gaps, including through, pipe upsizing, stormwater storage, and nature-based solutions such as bioswales and vegetated roofs to enhance stormwater conveyance, retention, and filtration. Prioritize improvements that not only reduce localized flooding and protect critical assets but also improve water quality and support biodiversity.
Near-Term Actions	Carry out a study to survey and assess capacity of existing drainage systems at both Lake Calumet and Iroquois landing. Identify opportunities to integrate green infrastructure into imminently planned projects.
Hazards Addressed	Flooding
Co-Benefits	Potential for improved water quality, improved site aesthetics, and reduced flooding in surrounding neighborhood.
Costs	$$

Action 2: Collaborate to improve physical resiliency of tenant facilities.	
Action Type	Outreach and Capacity Building
Lead Entity(ies)	IIPD; Tenants
Description	Engage with tenants across IIPD sites to assess the specific vulnerabilities of their facilities and operations to climate hazards such as flooding, extreme heat, and high winds. Seek to understand steps that tenants have already taken to enhance resilience. Work jointly to develop and implement tailored resilience strategies, including facility retrofits, elevation of critical equipment, and use of resilient building materials. Facilitate knowledge sharing and provide technical guidance to support tenants in strengthening their adaptation measures.
Near Term Actions	Begin outreach to tenants.

Action 2: Collaborate to improve physical resiliency of tenant facilities.	
Hazards Addressed	All
Co-Benefits	Improved lines of communication with and among tenants
Costs	$

Action 3: Assess and improve emergency operations for natural hazards.	
Action Type	Programs and Policies
Lead Entity(ies)	IIPD; Chicago Police Department; Chicago Fire Department; Chicago Office of Emergency Management and Communications
Description	Review current emergency operations protocols at IIPD facilities to identify gaps in preparedness for climate-related events such as extreme heat, flooding, and high winds. Ensure awareness of potential access limitations due to roadway and railroad flooding are considered. Update and enhance response plans to ensure robust power resilience, occupant safety, and continuity of operations during severe weather events. Incorporate measures such as communications protocols and staff training for extreme conditions. Strengthening emergency operations will minimize disruption, protect personnel and assets, and improve the overall capacity of IIPD to respond effectively to an evolving hazard landscape.
Near Term Actions	Initiate conversations with first responder agencies. Review current emergency operations protocols at IIPD facilities.
Hazards Addressed	All
Co-Benefits	Increased preparedness to all hazards, including those not directly related to climate change
Costs	$

Action 4: Mitigate urban heat island "hotspots".	
Action Type	Physical and Nature-based Infrastructure
Lead Entity(ies)	IIPD; Tenants
Description	Based on the vulnerability analysis, target areas within IIPD sites most affected by elevated temperatures due to the urban heat island effect. Implement mitigation strategies such as installing shade structures and utilizing high-albedo materials for pavement and roofing to reduce surface and ambient temperatures. Integrate nature-based solutions, such as expanded vegetation and green infrastructure where feasible to further enhance cooling. These interventions will help safeguard worker health and create more comfortable and sustainable environments for tenants and nearby communities.
Near Term Actions	Based on the climate vulnerability analysis, identify initial target heat islands at IIPD sites. Identify opportunities to integrate heat mitigation measures into current and ongoing projects.
Hazards Category	Extreme Weather
Co-Benefits	Improved site aesthetics; reduced energy costs; reduced urban heat island effect in surrounding community
Costs	$$

Action 5: Mitigate climate impacts to rail infrastructure.	
Action Type	Physical and Nature-based Infrastructure
Lead Entity(ies)	IIPD; Railroads; Tenants
Description	Use railroads' proprietary asset information to expand the Vulnerability Analysis's identification of rail infrastructure assets within IIPD sites that are vulnerable to climate hazards such as flooding and extreme heat. Upgrade rail design and materials to withstand high temperatures and water exposure and implement targeted interventions like improving drainage near tracks and using heat-resistant components. Integrate ongoing monitoring and maintenance to quickly identify and address emerging risks. These measures will minimize service disruptions, protect critical transportation assets, and ensure reliable rail operations that support port activities.
Near Term Actions	Engage railroads owners and operators and share results of analysis. Integrate understandings of vulnerability with railroads' asset information and capital planning.
Hazards Addressed	Flooding; Extreme Weather

Action 5: Mitigate climate impacts to rail infrastructure.	
Co-Benefits	Enhanced resilience of regional supply chains
Costs	$$

Action 6: Prepare for power outages.	
Action Type	Programs and Policies; Physical and Nature Based Infrastructure
Lead Entity(ies)	IIPD; ComEd; Tenants
Description	Identify critical operations and infrastructure within IIPD sites that are vulnerable to power disruptions caused by climate-related events. Implement a combination of policy updates and physical improvements, including the installation of backup power systems such as generators, microgrids, or battery storage, to ensure operational continuity during outages. Explore opportunities to incorporate nature-based and energy-efficient solutions—such as solar panels paired with storage—to further enhance resilience and sustainability. Regularly review emergency power protocols and train staff to respond effectively to outages, minimizing service interruptions and protecting both assets and personnel.
Near Term Actions	Begin conversation with tenants regarding power outage preparedness. Identify steps tenants have already taken related to backup power systems. Identify critical operations and infrastructure where back-up power is lacking.
Hazards Addressed	All
Co-Benefits	Potential identification of energy efficiency opportunities
Costs	$$

Action 7: Develop resilient design guidelines for IIPD facilities.	
Action Type	Programs and Policies
Lead Entity(ies)	IIPD; Tenants
Description	Establish and implement comprehensive resilient design guidelines for all new construction and major renovations at IIPD sites. Integrate climate adaptation principles by specifying standards for floodproofing, enhanced thermal performance, durable materials, and wind-resistant structures based on industry best practices. Incorporate of both grey and green infrastructure solutions—such as elevated equipment, reinforced building envelopes, and increased natural landscaping—to address a range of climate hazards. Regularly update guidelines based on evolving risks and best practices, ensuring that all future development supports long-term operational resilience, cost efficiency, and environmental sustainability. Encourage adoption of these principles by tenants.
Near Term Actions	Convene working group to develop resilient design guidelines.
Hazards Addressed	All
Co-Benefits	Improved site aesthetics; reduced energy use
Costs	$

Action 8: Collaborate with surrounding communities on education related to climate risk.	
Action Type	Outreach and Capacity Building
Lead Entity(ies)	IIPD; Tenants; local schools, Community Organizations, Local Government
Description	Work with local schools, neighborhood organizations, and municipal partners to develop and deliver educational programs on climate risks affecting the surrounding communities. Increase public awareness of flood, heat, and extreme weather hazards, while promoting community preparedness and resilience-building practices. Education and outreach will include accessible materials and inclusive engagement to reach diverse audiences.
Near Term Actions	Integrate climate change education and risk awareness into the Calumet Gateway project. Identify and partner with local organizations and schools. Develop and pilot educational workshops and resource materials.
Hazards Addressed	All
Co-Benefits	Strengthened community relationships; increased local preparedness; support for vulnerable populations

Action 8: Collaborate with surrounding communities on education related to climate risk.	
Costs	$

Action 9: Integrate climate resilience into master plan and asset management/capital planning.	
Action Type	Programs and Policies
Lead Entity(ies)	IIPD; CMAP; 2022 IIPD Master Plan Steering Committee
Description	Embed climate resilience principles into all updates of the 2022 IIPD Master Plan and asset management/capital planning processes. Ensure that project prioritization, budgeting, and lifecycle management account for climate risks and adaptation needs. Incorporate climate resilience into all development recommendations for the future at IIPD and IIPD strategies and actions within the 2022 IIPD Master Plan. Incorporate resilience screening and adaptation requirements for new and existing assets.
Near Term Actions	Review current master plan and capital planning guidelines for opportunities to add resilience criteria. Provide training to planning staff on resilience integration.
Hazards Addressed	All
Co-Benefits	Reduced long-term costs; resilient infrastructure
Costs	$

Action 10: Integrate climate resilience into decarbonization measures.	
Action Type	Programs and Policies
Lead Entity(ies)	IIPD; Tenants
Description	Ensure that decarbonization initiatives – such as ZE vehicles, renewable power sources, and energy efficiency upgrades – are designed and implemented with climate resilience in mind. Assess vulnerabilities of low-carbon technologies to climate hazards and incorporate adaptation features, such as flood-proofed solar arrays or heat-tolerant equipment.
Near Term Actions	Review current and planned decarbonization projects for climate vulnerabilities. Update project guidelines to include resilience considerations.
Hazards Addressed	All
Co-Benefits	Reduced emissions

Action 10: Integrate climate resilience into decarbonization measures.	
Costs	$$

Action 11: Integrate climate resilience into marsh restoration.	
Action Type	Physical and Nature-Based Infrastructure
Lead Entity(ies)	IIPD
Description	Incorporate climate adaptation strategies into ongoing and future marsh restoration efforts at the Lake Calumet site. Address risks such as fluctuating water levels, impaired water quality, and increased storm intensity by selecting resilient native species, enhancing hydrologic connectivity, and designing for future climate scenarios.
Near Term Actions	Evaluate current marsh restoration projects for adaptation opportunities. Update restoration plans to include climate-resilient practices.
Hazards Addressed	Flooding; air quality; extreme weather
Co-Benefits	Improved habitat; enhanced water quality; increased ecological resilience
Costs	$$

Action 12: Monitor lake level rise and develop adaptation plans as needed.	
Action Type	Programs and Policies
Lead Entity(ies)	IIPD
Description	Establish a systematic approach to monitor lake level trends and projections specific to IIPD sites, utilizing the latest data and studies to anticipate future changes. Use this information to regularly assess potential risks to infrastructure and operations from rising lake levels and associated flooding. Develop and update adaptation plans that outline site-specific responses, such as modifying coastal infrastructure, enhancing wetland resilience, or adjusting land use practices, to proactively address emerging threats. This ongoing process will enable IIPD to respond dynamically to changing lake conditions, protect critical assets, and ensure long-term site sustainability.
Near Term Actions	Install or connect to lake level monitoring stations. Develop a protocol for regular data review and adaptation planning.
Hazards Addressed	Flooding
Co-Benefits	Improved risk forecasting; enhanced operational planning; reduced emergency response costs

Action 12: Monitor lake level rise and develop adaptation plans as needed.	
Costs	$

Action 13: Monitor and participate in aligned local and regional planning efforts.	
Action Type	Programs and Policies
Lead Entity(ies)	IIPD; CMAP; USACE
Description	Stay actively engaged in local and regional climate, infrastructure, and emergency planning initiatives including the USACE Great Lakes Coastal Resiliency Study and CMAP Comprehensive Climate Action Plan for Greater Chicago. Monitor developments and participate in working groups to align IIPD strategies with broader efforts, leverage shared resources, and ensure coordinated responses to climate risks affecting the region.
Near Term Actions	Assign staff to track relevant planning processes. Attend regional resilience workshops and coordination meetings.
Hazards Addressed	All
Co-Benefits	Improved coordination; access to funding and technical support
Costs	$

Action 14: Strategically install smart sensors to monitor on-site flooding, temperature, and air quality.	
Action Type	Programs and Policies
Lead Entity(ies)	IIPD; Tenants
Description	Deploy smart sensor technologies across IIPD sites to provide real-time monitoring of key climate-related parameters, including flood levels, temperature, and air quality. Use sensor data to inform adaptive management, trigger early warnings, and support ongoing evaluation of resilience measures.
Near Term Actions	Identify priority locations for sensor deployment. Pilot installation and establish data management protocols.
Hazards Addressed	All
Co-Benefits	Improved awareness of air quality conditions and opportunities; improved health and safety; data-driven decision making
Costs	$$

Action 15: Convene a tenant coordinating committee on resilience.	
Action Type	Outreach and Capacity Building
Lead Entity(ies)	IIPD; Tenants
Description	Establish a formal committee of tenant representatives to coordinate resilience actions, share best practices, and provide input on IIPD climate adaptation initiatives. Facilitate regular communication, joint problem-solving, and collaborative implementation of site-wide resilience measures.
Near Term Actions	Identify tenant representatives and convene initial committee meeting. Develop a committee charter and meeting schedule.
Hazards Addressed	All
Co-Benefits	Enhanced tenant engagement
Costs	$

Appendix A

Greenhouse Gas Inventory Management Plan

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