

Shadowbox Data Center

August 27, 2026



**SHADOWBOX
DATA CENTER**

Welcome & Introductions

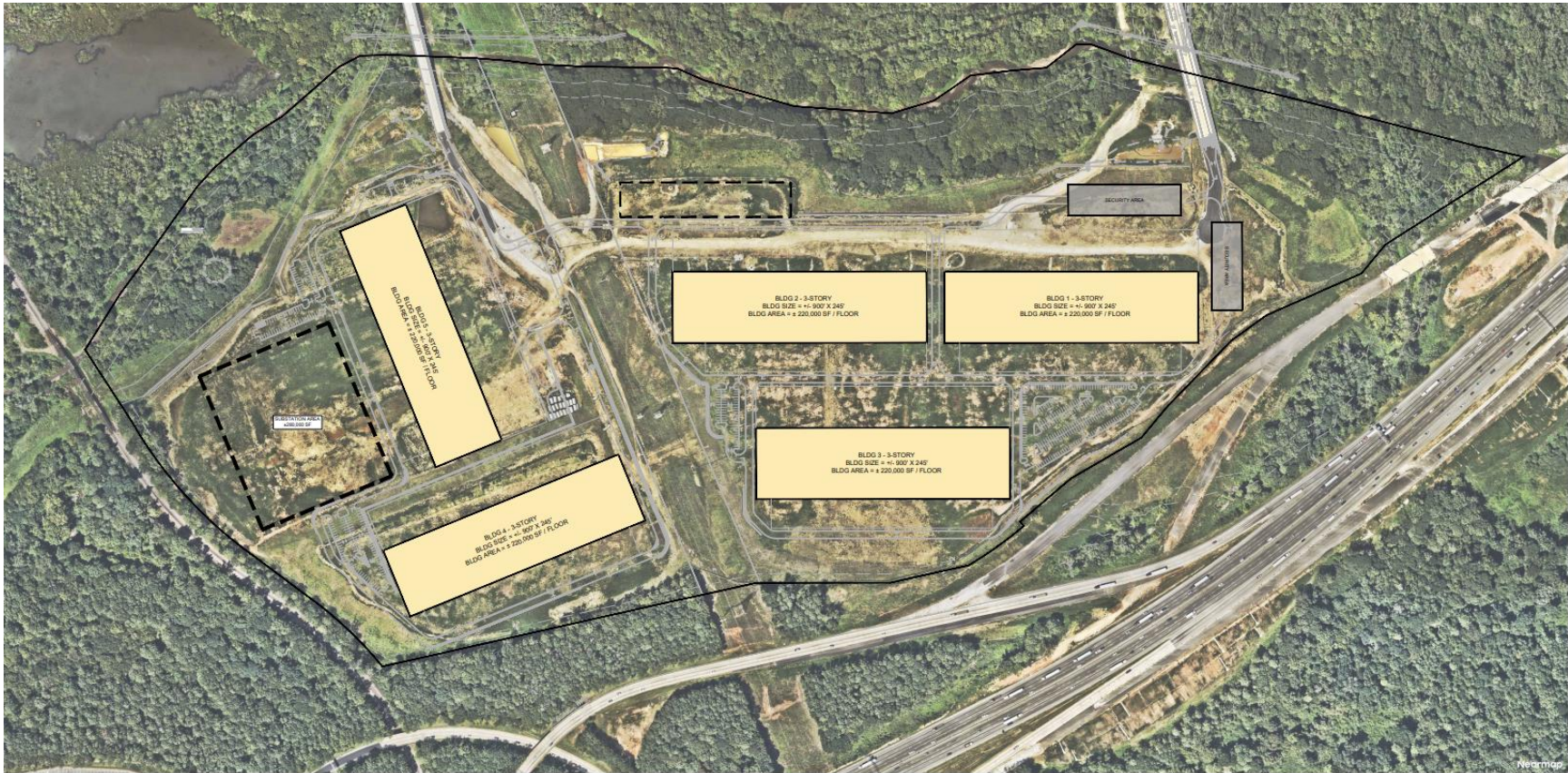
Peter Rumbold
Chief Executive Officer
Shadowbox Studios

Project Overview

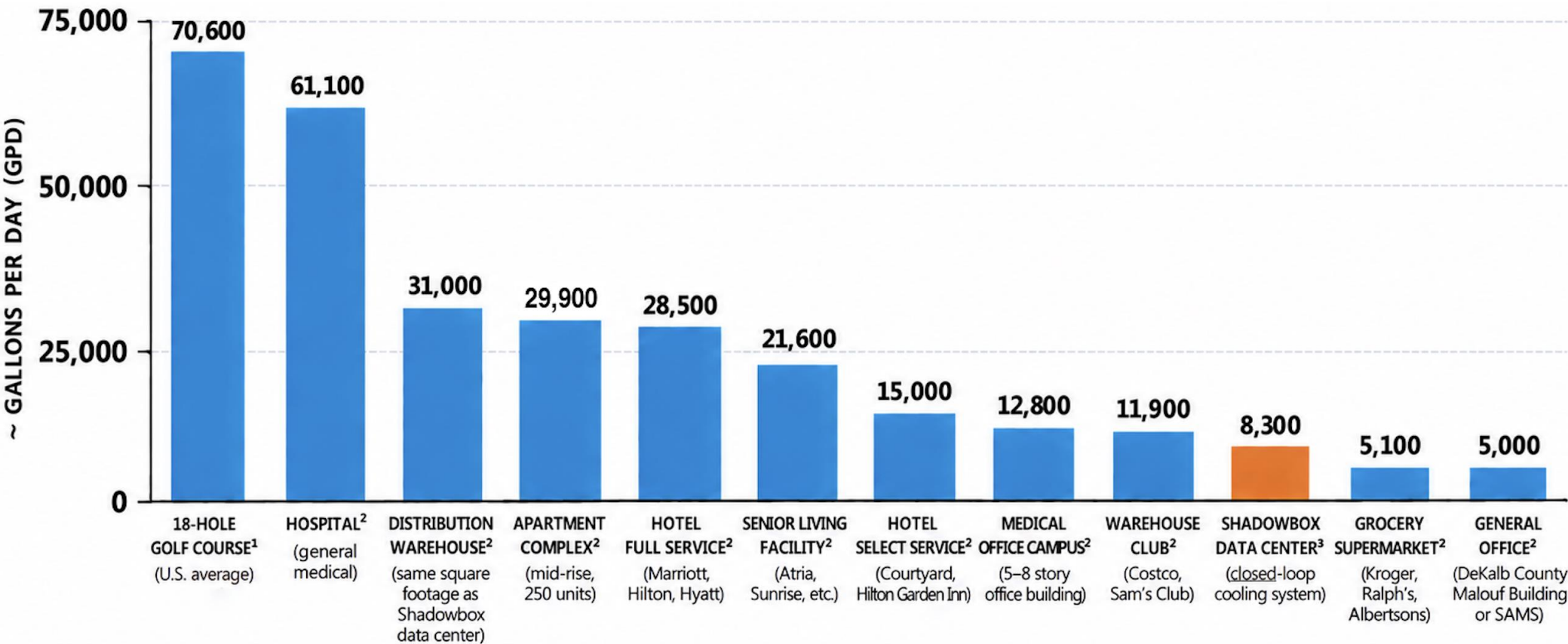
Jeff Weber
Chief Development Officer
Shadowbox Studios



Shadowbox Data Center Preliminary Site Plan



Average daily water consumption by property type



1. Golf course source: GCSAA, *Water Use and Management Practices on U.S. Golf Courses* (2022), Table 32.
2. Estimates include irrigation; based on median usage by asset class; WaterSense and ENERGY STAR water use intensity (June 2023).
3. Includes ~2,750 GPD each landscaping (assumes 1 mm GPY), FTEs (SMC, Slide No. 13), and humidification support (SMC, Slide No. 13).
*** See Notes and Assumptions in Appendix for details on sources and assumptions. ***

What does ~2,800 GPD get you?

DATA CENTER COOLING¹



HUMIDIFICATION SUPPORT FOR SHADOWBOX DATA CENTER

EVERYDAY WATER USE



24-UNIT APARTMENT BUILDING²



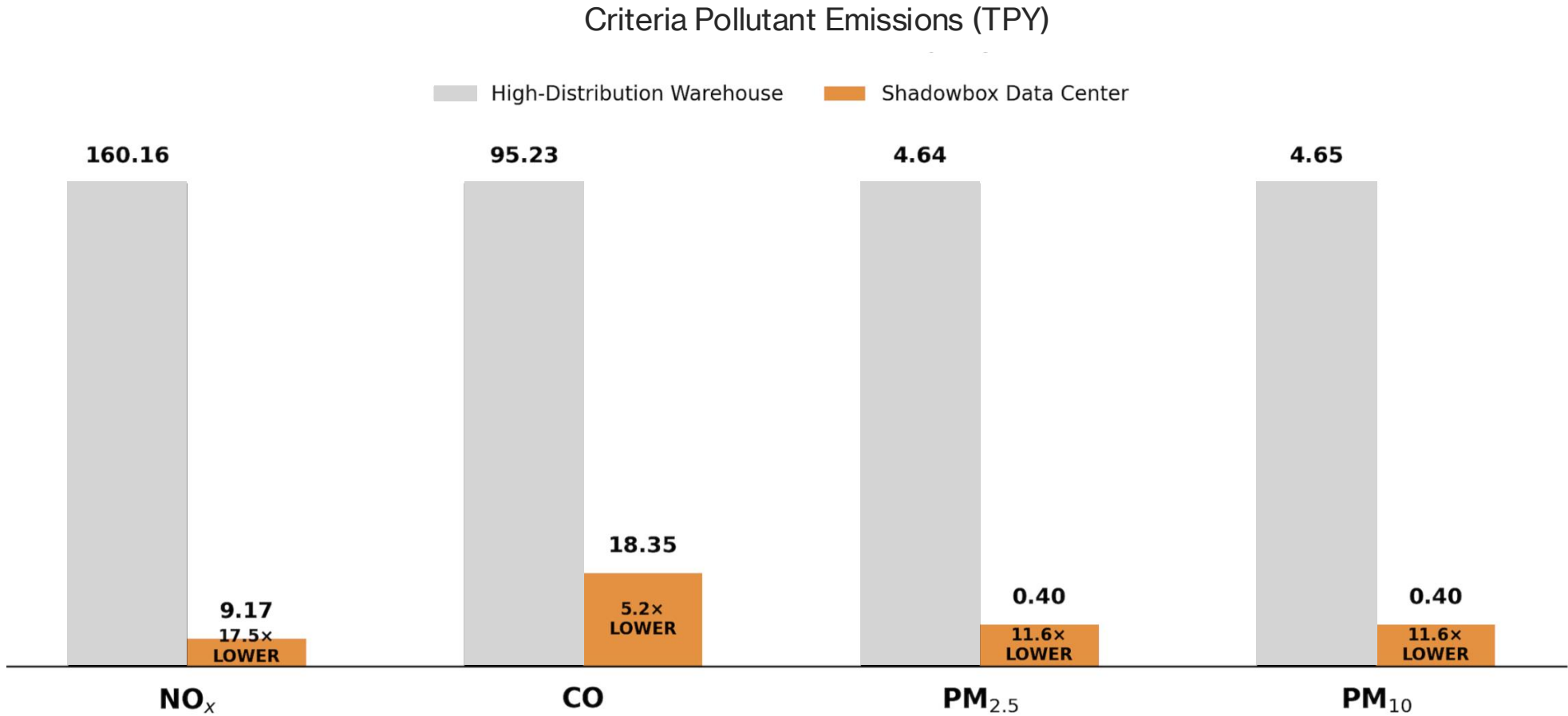
8 SINGLE-FAMILY HOMES³



1 McDONALD'S⁴

1. Project humidification estimate based on preliminary project coding calculations prepared by Strategic Mission Critical, August 2026
2. Apartment estimate based on EPA WaterSense and ENERGY STAR, U.S. Water Use Intensity by Property Type (June 2023): multifamily median = 43,600 gallons/unit/year; 24 units = 2,867 GPD.
3. Single-family estimate uses 350 GPD per home as a rounded planning average, based on EPA WaterSense, How We Use Water (<300 GPD/family/day), and Indoor Water Use in the United States (~400 GPD/family/day for a family of four).
4. McDonald's estimate based on 2024 reported water withdrawals for company-owned restaurants; 2,588 GPD per restaurant, or approximately 2,600 GPD. Source: McDonald's Corporation, 2024 water withdrawal data.
*** See Notes and Assumptions in Appendix for details on sources and assumptions. ***

Air quality emissions comparison



Each pollutant pair is scaled independently; values shown above bars are the actual emissions figures.
Source: Comparative Air Quality Study performed by Kimley-Horn, April 3, 2026

Strategic Mission Critical

Mission-critical data center expertise at scale

Since 2000

Mission-critical focused design engineering

250+

Facilities designed or advised worldwide including commissioning

2000+ MW

AI and hyperscale capacity designed and constructed since 2015

Proven across markets and cooling strategies

Market Experience

Enterprise, colocation and financial-services data centers. Includes hyperscale's and AI.

Cooling System Experience

Experience spans direct-expansion systems, evaporative cooling and closed-loop designs. Including computational fluid dynamics, energy studies, and commissioning support.

Design+ Consulting

A global portfolio of mission-critical facilities, supported by both design and advisory expertise.

What DOES / DOES NOT require daily water use in a Data Center?

Daily Water Use

RESTROOMS • BREAKROOMS



Seasonal Water Use

HUMIDIFICATION • IRRIGATION

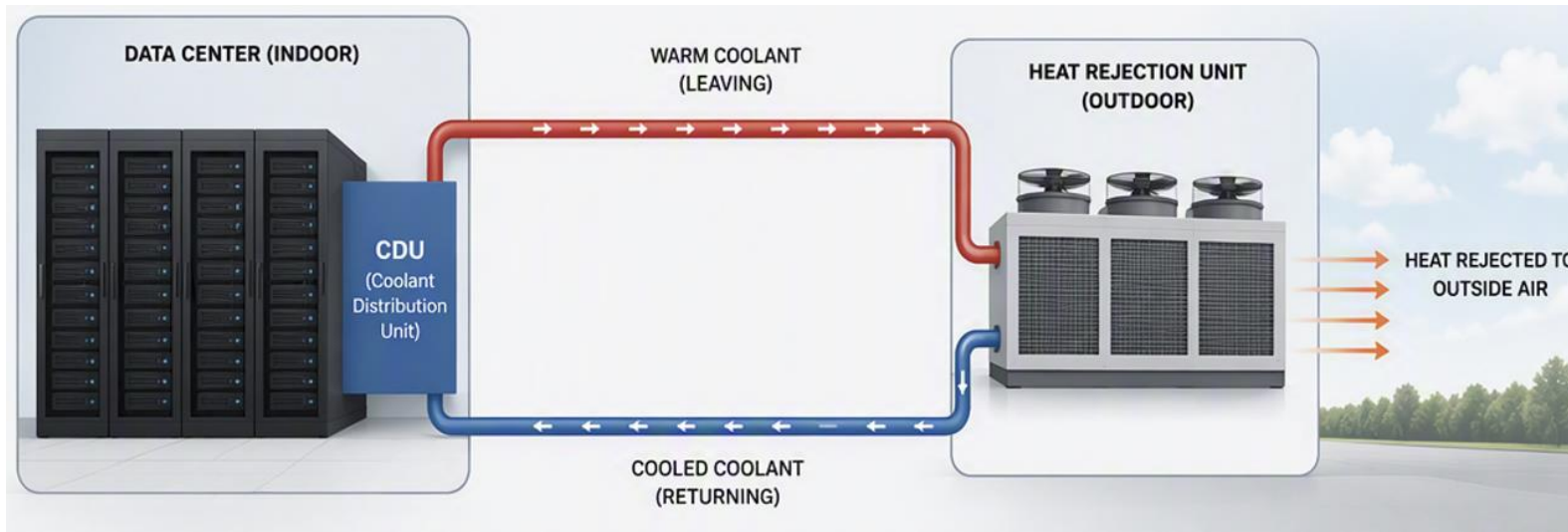


Does NOT Use Water Every Day

AIR COOLED CHILLERS • DRY COOLERS • CDUs • CRAHs



Closed-loop cooling rejects heat – without consuming water



A sealed coolant circuit that carries heat from the data hall to outdoor heat-rejection units.



Sealed Loop

Coolant continuously recirculates through a closed piping network.

Outdoor Heat Rejection

Heat from indoors moves outdoors and dissipates into the atmosphere.

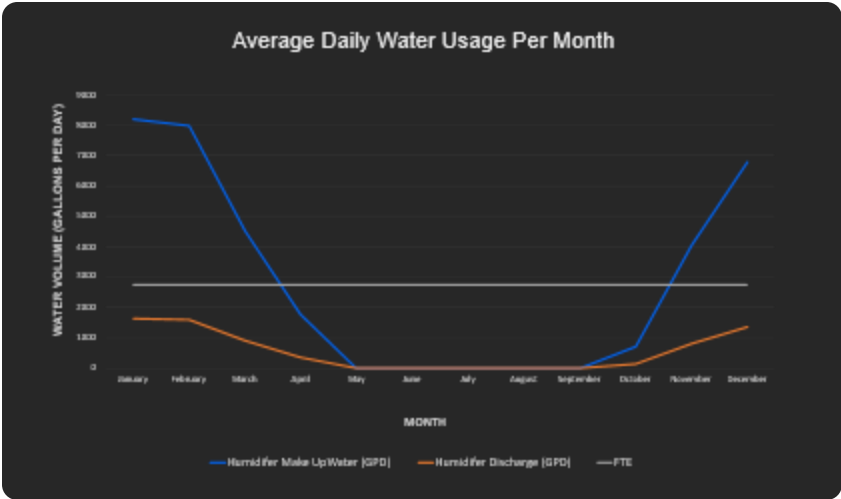
Annual facility water usage

Daily water usage – Full-Time Employee Driven
– Restrooms/Breakrooms

Season water usage – Outdoor Weather Driven
– Humidification / Irrigation

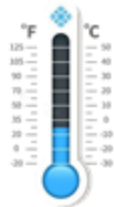


Campus Water Usage Summary		
Peak 24-hour Water Consumption	20268.67	Gallons/Day
Average daily water consumption	2806.36	Gallons/Day
Peak 24 sewer discharge	4053.73	Gallons/Day
Average daily discharge	561.27	Gallons/Day
Peak Make Up Water Flow	175.94	Gallons/Day
Number of Employee	275.00	People
Daily Water per Full-Time Employee (10GPD/FTE)	2750.00	Gallons/Day



How are Data Center mechanical systems improving?

Past Data Center Design Options



Colder space temps =
Less economization



Evaporative cooling =
High water usage



Inefficient compressor technology =
Increased power consumption

Today's Data Center Design



Warmer space temps =
More economization



Direct liquid-to-chip cooling =
Less fan energy



Efficient compressor technology
(oil-free, magnetic bearing) =
Decreased power consumption



Dry coolers =
No water usage

1. Project humidification estimates based on preliminary project cooling review, Strategic Mission Critical, August 2026
2. Apartment estimate based on EPA WaterSense and ENERGY STAR, U.S. Water Use Intensity by Property Type, June 2023 (multifamily median =43,600 gal/unit/year; 24 units = 2,800 GPD).
3. Single-family estimate uses 350 GPD per home as a rounded planning average, based on EPA WaterSense, How We Use Water (~300 GPD/family/day), and Indoor Water Use in the United States (~400 GPD/family/day for a family of four).
4. McDonald's estimate based on McDonald's Purpose Impact Report 2024-2025: 7,332 thousand m³ water withdrawn in 2024, extrapolated to 2,045 company-owned and operated restaurants =2,595 GPD per restaurant.

Kimley-Horn and Associates

Kimley-Horn and Associates

- Started in 1967, Kimley-Horn has grown to over 10,000 employees
- Ranked #8 on ENR's 2026 Top 500 Design Firms list and #4 on ENR's Top 100 Pure Designers list
- Ranked #6 nationally for data centers and #3 for general building by ENR in 2026
- Kimley-Horn has a strong Georgia presence, with multiple offices in the Atlanta region and across the state
- We provide engineering, planning, entitlement, and environmental clearance for mission critical projects nationwide
- We serve both public- and private-sector clients



Heidi Rous, Senior Environmental Lead

- Certified Permitting Professional (CPP) with the SCAQMD
- Over 35 years of experience
- Served on the Air & Waste Management Association's Health Effects Technical Review Committee
- Expertise in air pollutant estimation, control technology determination, dispersion modeling, and health effect analyses



Tad Hardy, Senior Noise Specialist



- Professional Engineer
- Member of Institute of Noise Control Engineers (INCE)
- Nearly 15 years of experience
- Expertise in ambient noise data collection, noise modeling, and noise mitigation design / implementation
- Has performed hundreds of data collection and noise modeling efforts across the country

Air Pollutant Emissions from Data Centers



Why Are Generators Needed?

- Standby generators provide backup power during electrical outages and help data centers maintain reliable operations.
- During normal conditions, the facility is served by the electrical grid, and the standby generators do not routinely supply operating power.

How Is Compliance Enforced?

- Emergency generators are regulated by the U.S. EPA and the Georgia EPD.
- Operating hours, fuel use, maintenance, and testing are documented to demonstrate compliance with applicable emission standards and permit conditions.

How Are Emissions Reduced?

- EPA-certified engines use improved combustion and exhaust-control technologies to reduce particulate matter and other pollutants.
- Depending on the engine and permit requirements, controls may include particulate filters, oxidation catalysts, selective catalytic reduction, and ultra-low sulfur diesel fuel.

When Do They Operate?

- Permits to Operate limit the time these generators can be run up to 100 hours annually for periodic testing and maintenance (required by the engine manufacturer) and other prescribed reasons and can otherwise be operated **only for emergencies** outside of the operator's control.

Permitting and Oversight of Emergency Generators



Georgia EPD Review

- Reviews applications to install and operate emergency generators
- Evaluates criteria pollutants and hazardous air pollutants
- Requires compliance with applicable emission limits and health-based impact criteria, when required



Permit Requirements

- Applicable emission-control technology
- Operating and emission limits
- Monitoring and maintenance
- Recordkeeping and reporting



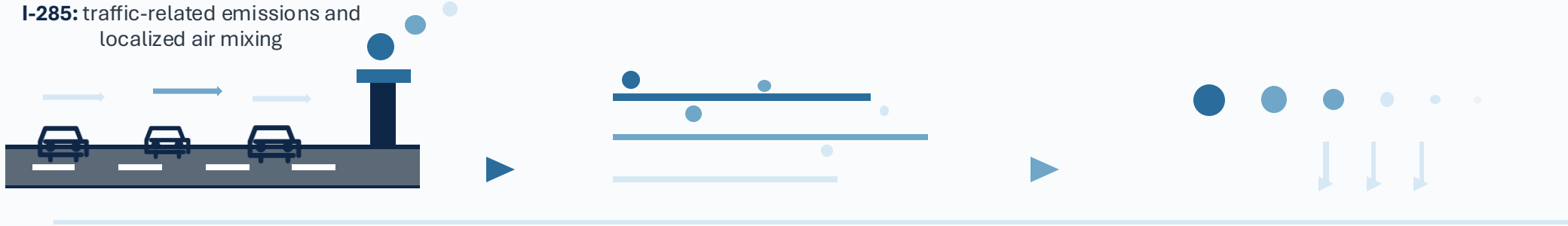
Enforcement Authority

- Permit conditions are legally enforceable
- Georgia EPD may take action for permit violations, failure to comply with a final order, or violation of applicable regulations
- For cause, Georgia EPD may revoke, suspend, modify, or amend an air permit

Approval is only the beginning—permit requirements remain enforceable throughout facility operation.

Dispersion of Pollutants

I-285: traffic-related emissions and localized air mixing



1 | Exhaust Is Released

Generator exhaust is released through elevated stacks.

Traffic on I-285 creates vehicle-induced turbulence that can increase localized air mixing near the roadway.

2 | Pollutants Mix and Disperse

Wind and atmospheric turbulence transport and dilute emissions.

Particles can be removed by wet deposition (rainfall).

3 | Concentrations Decrease

Ground-level concentrations generally decrease with distance.

Site-specific dispersion modeling evaluates stack design, buildings, weather conditions, and nearby receptors.

How Generator Emissions Are Reduced.



Cleaner Engines

- Tier 4 standards reduce PM and NOx by **approximately 90%** compared with earlier standards.

Exhaust Controls

- Diesel particulate filters can remove up to **90% of PM** in qualifying applications.
- Catalysts reduce CO, hydrocarbons, and NOx.

Reduced Operation

- Battery-backed systems bridge brief disturbances and may reduce unnecessary generator starts.

Compliance Measures

- Ultra-low sulfur diesel, maintenance, operating limits, and recordkeeping support compliance.

Cleaner engines, exhaust controls, and limited operation work together to reduce generator emissions.

Reductions vary by engine, control technology, and operating conditions.

Noise – Understanding the Existing Environment



Existing Conditions

- The existing noise environment in the vicinity of the site is comprised of multiple transportation-related sources (vehicles on I-285, airplanes going to/from Hartsfield-Jackson, and trains along nearby railroad tracks)
- Additional sources of noise include surrounding industrial and commercial development

Noise – How Sound Levels Combine and Change



Noise Does Not Add Linearly

- Decibels use a logarithmic scale. Two sound levels are not added using ordinary arithmetic
- For example, **60 dB(A)** of existing sound plus **50 dB(A)** from a new source equals approximately **60.4 dB(A)**, not **110 dB(A)**

$$60 + 50 \approx 60.4 \text{ dB(A)}$$

What Would People Notice?

- A 3 dB change is generally considered barely perceptible, while a 5 dB change is more readily noticeable
- A new source that is 65 dB at the receptor increases the total sound level by approximately 5 dB

$$60 + 64 < 5 \text{ dB increase}$$

The project-specific noise model will determine the sound contribution at nearby properties. If the modeled project contribution remains substantially below existing ambient levels, the resulting change in total sound would be minimal.

How Data Center Sound Is Reduced.

Quieter Equipment

- Variable-speed, low-noise fans adjust to cooling demand.

Source Controls

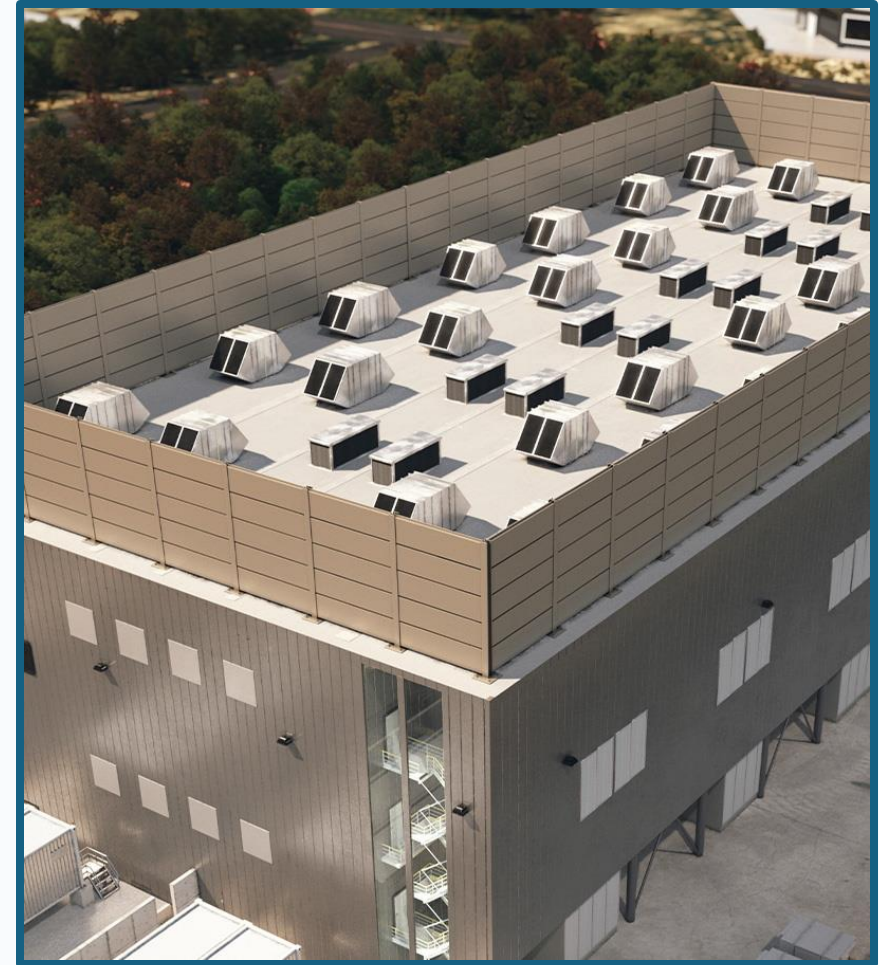
- Enclosures, silencers, acoustic louvers, and vibration isolation control sound at its source.

Site Design

- Barriers, rooftop parapets, and strategic placement reduce sound at nearby properties.
- Modeling evaluates expected sound levels before construction.

Cooling Advances

- Emersion cooling technology and improved airflow can reduce fan requirements.



Source: iac acoustics, Data Center Noise Control Solutions
<https://www.iacacoustics.com/markets/data-centers>

Community Q&A

To learn more about the project,
visit our website:

<https://www.shadowboxdatacenter.com>



Appendix

Notes & Assumptions

Re: Slides 6 and 7:

Comparative Water-Use Methodologies and Calculations

GENERAL RULES & QUALIFICATIONS

- Representative prototypes. Building sizes describe the substantial institutional or branded examples used in the comparison. They do not represent the median of every U.S. building in each broad category.
- Annualized daily use. GPD equals an annual water use benchmark divided by 365 days unless stated otherwise. GPD is a daily average of the annual water usage and does not represent peak-day design demand.
- Appropriate denominator. Area-based benchmarks use gross floor area. Apartments use dwelling-unit count. Golf courses use annual applied-water volume. Shadowbox uses project components.
- Whole-property consistency. Gross floor area follows the applicable ENERGY STAR property definition.
- Project estimate. Strategic Mission Critical slide 13 supports the 2,806 GPD Shadowbox humidification component.
- NOTE: Shadowbox Data Center metrics are preliminary estimates only based on current design; other figures are representative of relevant asset classes, not of specific projects.

AREA-BASED PROPERTY

Median Gallons Per Year (GPY)
(referenced by EPA as Water Usage Index, or WUI) × representative gross floor area ÷ 365

MULTIFAMILY

Annual gallons per dwelling unit × unit count ÷ 365

18-HOLE GOLF COURSE

Median acre-feet/year × 325,851
gallons/acre-foot ÷ 365

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Landscape irrigation + employee domestic use + SMC humidification

Re: Slides 6 and 7:

Representative Property Prototypes

Property type	Representative scale	Benchmark	Annualized ~GPD
18-hole golf course	U.S. 18-hole facility	79.1 acre-ft/yr	70,600
Acute-care hospital	250 beds, 400,000 ft ²	55.71 gal/ft ² /yr	61,100
Distribution warehouse	3.3 million ft ²	3.43 gal/ft ² /yr	31,000
Apartment community	250 units, wrap/midrise	43,600 gal/unit/yr	29,900
Full-service hotel	~300 rooms; 200,000 ft ²	52.02 gal/ft ² /yr	28,500
Senior living	Branded community; 140,000 ft ²	56.41 gal/ft ² /yr	21,600
Select-service hotel	~145 rooms; 105,000 ft ²	52.02 gal/ft ² /yr	15,000
Medical-office campus	5–8 stories; 200,000 ft ²	23.40 gal/ft ² /yr	12,800
Warehouse club	Costco/Sam's; 140,000 ft ²	31.00 gal/ft ² /yr	11,900
Shadowbox Data Center	Current plan, 3.3 million ft ²	Component-based (See APPENDIX Page IV)	8,300
Conventional supermarket	Kroger/Albertsons; 60,000 ft ²	31.00 gal/ft ² /yr	5,100
Administrative office	Private/civic; 125,000 ft ²	14.48 gal/ft ² /yr	5,000

Values are rounded for communication. Unrounded calculations remain in the working file. Apartment water use is calculated per dwelling unit.

Re: Slides 6 and 7:

Property Type Assumptions

18-HOLE GOLF COURSE

GCSAA Table 32 reports 79.1 acre-feet/year for U.S. 18-hole facilities in 2020. This equals 25.77 million gallons/year and approximately 70,600 GPD. [2]

HOSPITAL

250-bed acute-care prototype at 400,000 ft². U.S. Energy Information Administration (EIA) data for the 4–9-story inpatient cohort imply about 436,000 ft², supporting the selected scale. [3]

DISTRIBUTION WAREHOUSE

To facilitate direct comparison with Shadowbox Data Center, the prototype uses the same 3.3 million ft² as the current Shadowbox plan. EPA's 3.43 gal/ft²/year benchmark yields 31,011 GPD, rounded to 31,000. The 3.3 million ft² figure supports scale parity, not a national-average claim. [1]

MULTIFAMILY

250 units × 43,600 gal/unit/year ÷ 365 = 29,863 GPD, rounded to 29,900. Unit count controls the calculation. [1]

HOTELS

EPA reports one hotel WUI. Prototype scale creates the difference: 200,000 ft² for full service and 105,000 ft² for select service. Marriott materials support about 300 and 145 rooms, respectively. [4][5]

SENIOR LIVING

The 140,000-ft² prototype represents a modern, purpose-built, branded senior living community offering independent living, assisted living and/or memory care. A published Sunrise Senior Living example contains approximately 130,000 ft², supporting the selected order of magnitude. [6]

MEDICAL-OFFICE CAMPUS

The 5–8-story, 200,000-ft² prototype aligns closely with the roughly 201,000-ft² average implied by EIA's 4–9-story health-care-complex cohort. [3]

WAREHOUSE CLUB

Costco reports about 147,000 ft² on average and Walmart reports about 134,000 ft² for Sam's Club. The selected 140,000-ft² prototype provides a rounded midpoint. [7][8]

Re: Slides 6 and 7:

Property Type Assumptions (continued)

CONVENTIONAL SUPERMARKET

The 60,000-ft² prototype represents a modern full-line store. Albertsons averages about 49,900 ft², with 56.8% of its stores exceeding 50,000 ft²; Kroger reports average store size of more than 66,000-ft². [9][10]

SINGLE-FAMILY HOME

EPA benchmark: approximately 300 GPD for an average American family [14]. USGS benchmark: approximately 400 GPD for a four-person household [15]. The comparison assumes the midpoint of 350 GPD.

McDONALD’S RESTAURANT

Basis	Calculation / qualification	~ Ave. GPD
Implied current average	7,332,000 m³ × 264.172 ÷ 2,045 restaurants ÷ 365 days [18]	~2,595
Industry benchmark	Published fast-food benchmark [19]	~2,900
McDonald’s design range	Onsite treatment-system design flow [20]	~3,000–5,000
Exhibit assumption	Representative comparison; not a published “typical store” statistic [18–20]	~2,800

ADMINISTRATIVE OFFICE

The 125,000-ft² prototype represents a substantial civic or private administrative building. DeKalb County records support a comparable scale: the Maloof Administration Building and Annex imply approximately 131,900 ft², while the Sams Street administrative-office complex contains 135,517 ft². [11][12]

SHADOWBOX DATA CENTER

Component calculation for the current plan, approximately 3.3 million ft².

Component	Calculation / qualification	~ Ave. GPD
Landscape irrigation	Estimate is an irrigation buffer of 1.0mm GPY ÷ 365 days above anticipated rainwater harvesting from roofs dedicated to irrigation of manicured landscaping	2,740
Employee domestic use	275 employees × 10 gal/employee/day [13]	2,750
SMC Cooling-related humidification support	Preliminary MEP calculation per SMC, slide 13 [13]	2,806
Total	2,740 + 2,750 + 2,806 = 8,296	8,300

Re: Slides 6 and 7:

Sources

1. U.S. EPA, ENERGY STAR and WaterSense. [U.S. Water Use Intensity by Property Type: Technical Reference](#). June 2023. National WUI table (pg. 3)
2. Golf Course Superintendents Association of America. [Water Use and Management Practices on U.S. Golf Courses](#). 2022. (Table 32, pg. 58)
3. U.S. Energy Information Administration. [2018 CBECS Table B10: Number of floors, number of buildings and floorspace](#). Inpatient 4–9-story cohort (pg. 1) and health care complex 4–9-story cohort (pg. 3).
4. Marriott International, Inc. [2023 Marriott Domestic Franchise Disclosure Document](#). Newly constructed 300-room hotel prototype, cover page (pg. 1)
5. Hospitality Properties Trust. [Annual Report on Form 10-K](#). Typical Courtyard described as 145 guestrooms (Part I, pg. 1)
6. Welltower Inc. [Sunrise at East 56th Street press release](#). The purpose-built Sunrise Senior Living community contains approximately 130,000 ft² and provides assisted living and memory care. This example supports the 140,000-ft² representative assumption for a branded senior living community. (pg. 1, para. 1)
7. Costco Wholesale Corporation. [2025 Form 10-K](#). Average warehouse space approximately 147,000 ft² (pg. 20)
8. [Walmart Inc. 2025 Form 10-K](#). Sam's Club average approximately 134,000 ft², Item 1, "Sam's Club U.S.," (pg. 9)
9. [Albertsons Companies, Inc. 2026 Form 10-K](#). 2,244 stores and 112.0 million retail ft², "Stores" table (pg. 34)
10. [The Kroger Co. 2026 Form 10-K](#). Supermarket store count and square footage, Supermarket Storing Activity table, (pg. 42)
11. DeKalb County Government. [Malooof Administration and Annex reroofing project letter](#). June 22, 2012. Six-story Administration Building with 17,589-ft² footprint plus 26,360-ft² Annex; implied combined area approximately 131,900 ft² (pg. 1)
12. DeKalb County Board of Assessors. [Real Property Record](#), Parcel 15 234 04 015, 178 Sams Street, Decatur, Georgia. Commercial Property Summary, Card 1: gross and net leasable area of 135,517 ft²
13. [Strategic Mission Critical](#). Preliminary Shadowbox cooling-equipment humidification calculation. 2,806 GPD, Strategic Mission Critical preliminary design calcs (08-27-26 presentation, Slide 13)
14. U.S. EPA WaterSense. [How We Use Water](#). "Water in Daily Life" section: average American family uses more than 300 gallons/day at home (article para. 5)
15. U.S. Geological Survey, Water Science School. [How Much Water Do I Use at Home Each Day?](#) "How much water..." section: approx. 80–100 GPD per person for indoor home use (pg. 1, para. 1)
18. McDonald's. [SASB Index 2024–2025](#). Water Management metric FB-RN-140a.1, 7,332 thousand m³ extrapolated to 2,045 Company-owned restaurants (pg. 2)
19. [CleanLink](#). 2014 fast-food facility benchmark of approximately 2,900 GPD (article para. 3)
20. McDonald's. [Building Systems Guide](#). Version 1.0, November 2012. Onsite wastewater-treatment section: 3,000–5,000 GPD design-flow range (pgs. 121,126)
21. Michigan Department of Environment, Great Lakes, and Energy. [Criteria for Subsurface Sewage Disposal](#). Appendix F, "Food Service Design Criteria," fast-food example (pg. 28)

Click any underlined source title to open the reference.

Re: Slide 8:
Source



MEMORANDUM

To: Jeff Weber, Chief Real Estate Development Officer, Shadowbox Studios

From: Sophia La Herran, Technical Lead
Heidi Rous, CPP, Sr. Reviewer

Date: April 3, 2026

Subject: Shadowbox Data Center Project – Air Quality Comparison

PURPOSE

The purpose of this memorandum is to provide a basis for understanding the magnitude of air quality impacts associated with the Shadowbox Data Center Project (Project) located in DeKalb County, Georgia. Specifically, this analysis documents the air impacts associated with the Project and compares them with the impacts of a hypothetical high industrial distribution center, another a permitted use on the Project site. This assessment has been prepared for reference only and contains no actual project information or permitting determinations.

AIR QUALITY

Pollutants of Concern

The air pollutants emitted into ambient air by stationary and mobile sources are regulated by State and federal laws. These regulated air pollutants are known as “criteria air pollutants” and are categorized into primary and secondary pollutants.

Primary air pollutants are emitted directly from sources. Carbon monoxide (CO), reactive organic gases (ROG), nitrogen oxide (NO_x), sulfur dioxide (SO₂), coarse particulate matter (PM₁₀), fine particulate matter (PM_{2.5}), and lead are primary air pollutants. Of these, CO, NO_x, SO₂, PM₁₀, and PM_{2.5} are primary criteria pollutants. ROG and NO_x are criteria pollutant precursors and form secondary criteria pollutants through chemical and photochemical reactions in the atmosphere. For example, the criteria pollutant ozone (O₃) is formed by a chemical reaction between ROG and NO_x in the presence of sunlight. O₃ and nitrogen dioxide (NO₂) are the principal secondary pollutants. Sources and health effects commonly associated with criteria pollutants are summarized in **Table 1**.



Table 1: Air Contaminants and Associated Public Health Concerns		
Pollutant	Major Man-Made Sources	Human Health Effects
Particulate Matter (PM ₁₀ and PM _{2.5})	Sources include power plants, steel mills, chemical plants, unpaved roads and parking lots, wood-burning stoves and fireplaces, automobiles and others.	Increased respiratory symptoms, such as irritation of the airways, coughing, or difficulty breathing; asthma; chronic bronchitis; irregular heartbeat; nonfatal heart attacks; and premature death in people with heart or lung disease. Impairs visibility.
Ozone (O ₃)	Formed by a chemical reaction between reactive organic gases/volatile organic compounds (ROG or VOC) ¹ and nitrogen oxides (NO _x) in the presence of sunlight. Sources include motor vehicle exhaust industrial emissions, gasoline storage and transport, solvents, paints and landfills.	Irritates and causes inflammation of the mucous membranes and lung airways; causes wheezing, coughing, and pain when inhaling deeply; decreases lung capacity; aggravates lung and heart problems. Damages plants; reduces crop yield.
Sulfur Dioxide (SO ₂)	A colorless gas formed when fuel containing sulfur is burned and when gasoline is extracted from oil. Examples are petroleum refineries, cement manufacturing, metal processing facilities, locomotives, and ships.	Respiratory irritant. Aggravates lung and heart problems. In the presence of moisture and oxygen, sulfur dioxide converts to sulfuric acid which can damage marble, iron and steel. Damages crops and natural vegetation. Impairs visibility. Precursor to acid rain.
Carbon Monoxide (CO)	An odorless, colorless gas formed when carbon in fuel is not burned completely; a component of motor vehicle exhaust.	Reduces the ability of blood to deliver oxygen to vital tissues, affecting the cardiovascular and nervous system. Impairs vision, causes dizziness, and can lead to unconsciousness or death.
Nitrogen Dioxide (NO ₂)	A reddish-brown gas formed during fuel combustion for motor vehicles and industrial sources. Sources include motor vehicles, electric utilities, and other sources that burn fuel.	Respiratory irritant; aggravates lung and heart problems. Precursor to O ₃ . Contributes to global warming and nutrient overloading which deteriorates water quality. Causes brown discoloration of the atmosphere.
Lead (Pb)	Lead is a metal found naturally in the environment as well as in manufactured products. The major sources of lead emissions have historically been motor vehicles (such as cars and trucks) and industrial sources. Due to the phase out of leaded gasoline, metals processing is the major source of lead emissions to the air today. The highest levels of lead in air are generally found near lead smelters. Other stationary sources are waste incinerators, utilities, and lead-acid battery manufacturers.	Exposure to lead occurs mainly through inhalation of air and ingestion of lead in food, water, soil, or dust. It accumulates in the blood, bones, and soft tissues and can adversely affect the kidneys, liver, nervous system, and other organs. Excessive exposure to lead may cause neurological impairments such as seizures, mental retardation, and behavioral disorders. Even at low doses, lead exposure is associated with damage to the nervous systems of fetuses and young children, resulting in learning deficits and lowered IQ.
1. Volatile Organic Compounds (VOCs or Reactive Organic Gases [ROG]) are hydrocarbons/organic gases that are formed solely of hydrogen and carbon. There are several subsets of organic gases including ROG and VOCs. Both ROG and VOCs are emitted from the incomplete combustion of hydrocarbons or other carbon-based fuels. The major sources of hydrocarbons are combustion engine exhaust, oil refineries, and oil-fueled power plants; other common sources are petroleum fuels, solvents, dry cleaning solutions, and paint (via evaporation).		
Source: U.S. EPA. <i>Criteria Air Pollutants</i>. https://www.epa.gov/criteria-air-pollutants. Accessed March 2026.		

Re: Slide 8:

Source
(Continued)



ANALYSIS

Data Center Operations

Data center projects result in emissions of numerous regulated air pollutants, primarily NO_x, PM, and CO from emergency generators. For the purposes of this analysis, the hypothetical data center would consist of 5 data center buildings each encompassing a total built area of approximately 220,000 square feet. Each building would be designed with a maximum power demand of 130 megawatts (MW) of power capacity, for a total facility capacity of 650 MW.

To accommodate this demand, the data center would be supported by 217 diesel-fueled emergency back-up generators, each rated at 3 MW. Additional generators are typically installed to provide redundancy and operational flexibility in the event of equipment failure, maintenance outages, or unexpected load fluctuations. This analysis therefore includes 53 diesel-fueled redundant generators, each rated at 3 MW. This analysis also includes 10 smaller “house” generators (2 per building) assumed to be rated at 1.75 MW, that would support back of house (BOH) operations for the data center.

This analysis assumes an annual operation of 15 hours per year per generator. Generators may be utilized for longer in emergency situations, but for regular testing and maintenance, 15 hours per year is an industry standard. This practice is consistent with National Fire Protection Association (NFPA) guidance pertaining to minimum load tests, recommending at least monthly 30-minute tests at not less than 30 percent load, which would account for at least six (6) hours per year.¹

This analysis also assumes the use of Tier 4 Final-certified generators. Tiers are different levels of emissions standards set by the U.S. Environmental Protection Agency (U.S. EPA), with Tier 4 Final being the most stringent. Tier 4 Final-certified generators include features such as selected catalytic reduction and oxidation catalysts that reduce exhaust emissions, primarily NO_x, PM, and CO. Emissions associated with the data center generators are summarized in Table 2.

Table 2: Data Center Operational Emissions				
Source	Criteria Pollutant Emissions (tpy)			
	NO _x	CO ¹	PM _{2.5}	PM ₁₀
<i>Data Center</i>				
Primary Engines	7.22	14.43	0.32	0.32
Redundant Engines	1.76	3.53	0.08	0.08
House Engines	0.19	1.01	0.01	0.01
Total Facility	9.17	18.35	0.40	0.40

Refer to Appendix A for detailed calculations.

¹ NFPA, NFPA 110 Standard for Emergency and Standby Power Systems, 2025, pp. 24.



High Distribution Warehouse Operations

Heavy-duty diesel truck operations associated with warehouses and distribution centers result in emissions of numerous regulated air pollutants, primarily NO_x, CO, and PM from exhaust and brake and tire wear. For the purposes of this exercise, the facility consists of 3,300,000 square feet of warehousing, based on information provided by the Client. Operational emissions associated with truck travel to and from the site, internal circulation within the facility, and truck idling during loading and unloading activities are considered in this analysis. These mobile source emissions represent the primary operational air quality impact associated with warehouse and distribution center uses due to the high volume of heavy-duty diesel truck activity typically required to support freight movement and logistics operations. While warehouse uses may also generate additional emissions from other operational sources, such as on-site landscaping equipment, employee vehicle trips, architectural coatings, maintenance activities, and other minor area or stationary sources, those emissions are not quantified as part of this comparative analysis.

Truck travel emissions are based on Institute of Transportation Engineers (ITE) truck trip generation rates for the Warehousing land use. An average trip length of 100 miles was assumed, consistent with the typical freight truck trip lengths as reported in a U.S. Department of Transportation (DOT) 2021 study.² Idling emissions are also based on ITE trip generation, with an assumed idling time of 15 minutes for each truck trip. There are no state or county-wide idling time limits in the project area, but this assumption is consistent with the nearby City of Atlanta Ordinance limiting truck idling to no more than 15 minutes (in most weather conditions) at a single location.³ Emissions associated with warehouse truck travel and idling are summarized in Table 3.

Table 3: High Distribution Warehouse Operational Emissions				
Source	Criteria Pollutant Emissions (tpy)			
	NO _x	CO	PM _{2.5}	PM ₁₀
<i>High Distribution Warehouse</i>				
Travel	155.37	91.59	4.48	4.48
Idling	4.79	3.64	0.16	0.17
Total Mobile	160.16	95.23	4.64	4.65

Refer to Appendix A for detailed calculations.

² U.S. DOE. U.S. Truck Freight Tonnage Was Shipped Less than 250 Miles. 2023. <https://www.energy.gov/eere/vehicles/articles/ftotw-1302-august-7-2023-2021-87-us-truck-freight-tonnage-was-shipped-less>. Accessed March 2026.

³ City of Atlanta. Code of Ordinances. Section 150-97. 2026.

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Source
(Continued)



Air Quality Emissions Comparison

Emissions associated with the high distribution warehouse and data center are summarized in **Table 4** for comparison.

Table 4: High Distribution Warehouse vs. Data Center Operational Emissions				
Source	Criteria Pollutant Emissions (tpy)			
	NO _x	CO	PM _{2.5}	PM ₁₀
High Distribution Warehouse				
Total Mobile	160.16	95.23	4.64	4.65
Data Center				
Total Facility	9.17	18.35	0.40	0.40
Refer to Appendix A for detailed calculations.				

As shown above, the data center results in substantially lower emissions across all evaluated pollutants (NO_x, CO, PM_{2.5}, and PM₁₀). NO_x and CO are primarily associated with acute respiratory and cardiovascular effects, including airway irritation, inflammation, and reduced oxygen delivery in the bloodstream. Short-term exposure to these pollutants can exacerbate asthma and other respiratory conditions, while longer-term exposure has been linked to increased risks of cardiovascular disease and mortality.⁴

PM_{2.5} and PM₁₀ is of greater concern from a chronic health risk perspective. PM_{2.5} can penetrate deep into the lungs and enter the bloodstream, contributing to systemic inflammation, cardiovascular disease, and premature mortality, while both PM_{2.5} and PM₁₀ have been associated with increased respiratory morbidity and mortality.⁵ ⁶ Furthermore, studies have also linked long-term PM exposure to increased cancer risk, particularly lung cancer, due to the ability of fine particles to carry toxic compounds into sensitive regions of the respiratory system.⁷

Importantly, potential health effects are a function of both pollutant concentrations and the level and duration of exposure at nearby sensitive receptor locations. While NO_x, CO, and PM are associated with adverse health outcomes, the magnitude of risk depends on resulting ambient concentrations rather than emissions alone. Emissions from the analyzed uses would be subject to atmospheric dispersion, resulting in decreasing pollutant concentrations with increasing distance from the source due to dilution, atmospheric

⁴ Syrek-Gerstenkorn, Z.; Syrek-Gerstenkorn, B.; Paul, S. A Comparative Study of SO_x, NO_x, PM_{2.5} and PM₁₀ in the UK and Poland from 1970 to 2020. <https://doi.org/10.3390/app14083292>
⁵ Pryor JT, Cowley LO and Simonds SE (2022) The Physiological Effects of Air Pollution: Particulate Matter, Physiology and Disease. <https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2022.882569/full>
⁶ USEPA, Health and Environmental Effects of Particulate Matter (PM), May 2025. <https://www.epa.gov/pm-pollution/health-and-environmental-effects-particulate-matter-pm>
⁷ Meo, S. A. (2021). Effect of Environmental Pollutants PM_{2.5}, CO, NO₂, and O₃ on the Incidence and Mortality of SARS-CoV-2 Infection in Five Regions of the USA. International journal of environmental research and public health. <https://doi.org/10.3390/ijerph18157810>



mixing, and deposition processes. Air dispersion modeling and empirical studies indicate that ground-level concentrations from localized sources typically decline rapidly within the first several hundred meters and continue to decrease toward background levels within approximately 1 kilometer under typical meteorological conditions.⁸ Additionally, emissions associated with mobile sources, such as heavy-duty diesel truck traffic for warehouse operations, are inherently distributed along roadway networks rather than concentrated at a single location, which promotes further dispersion. As such, the proposed data center use represents a lower-emitting operational scenario and would be expected to result in reduced potential air quality and associated health impacts relative to other feasible development options.

DISCLAIMER

This report is based on publicly accessed data sources obtained through desktop research of hypothetical scenarios. No site visits or agency consultations were conducted, and no project-specific information was utilized. Kimley-Horn and Associates, Inc. appreciates the opportunity to provide you with these services.

⁸ Roostaei, V., Gharibzadeh, F., Shamsipour, M., Faridi, S., & Hassanvand, M. S. (2024). Vertical distribution of ambient air pollutants (PM_{2.5}, PM₁₀, NO_x, and NO₂): A systematic review. *Heliyon*, 10(21), e39726. <https://doi.org/10.1016/j.heliyon.2024.e39726>

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Source
(Continued)



APPENDIX A
Emission Calculations

Land Use						
Land Use	Number of Buildings	Capacity/Building (MW)	Facility Capacity (MW)			
Data Center	5	130	650			

Backup Generation						
Generator Type	Number of Generators	Rating/Generator (kW)	EPA Certification	Total Capacity (MW)	Hours/Year/Generator ²	Total Production (kWh)
Primary	217	3,000	Tier 4 Final	651	15	9,765,000
Redundant	53	3,000	Tier 4 Final	159	15	2,385,000
House	10	1,750	Tier 4 Final	18	15	262,500
Total						12,412,500

Emission Rates ¹						
Unit	VOC	NO _x	CO	SO ₂	PM ₁₀	PM _{2.5}
g/hp-hr	0.140	0.500	1.000	0.006	0.022	0.022
g/kw-hr	0.188	0.671	1.341	0.007	0.030	0.030
lb/kw-hr	0.0041	0.00148	0.00296	0.00002	0.00007	0.00007

Criteria Pollutant Emissions (tons/year)						
Source	VOC	NO _x	CO	SO ₂	PM ₁₀	PM _{2.5}
Primary Generators	2.02	7.22	14.43	0.08	0.32	0.32
Redundant Generators	0.49	1.76	3.53	0.02	0.08	0.08
House Generators	0.05	0.19	0.39	0.00	0.01	0.01
Total Facility	2.57	9.17	18.35	0.10	0.40	0.40

Conversions			
1 kW =	1.341	hp	
1 lb =	453.592	g	
1 ton =	2000	lb	

Notes:

¹Emission factors set at Tier 4 final emissions standards (<https://files.efnet.com/standards/ku/hornred.php>)

²Assuming annual operation of 15 hours per generator as an industry standard, consistent with National Fire Protection Association (NFPA) guidance pertaining to minimum load tests, recommending at least monthly 10-minute tests, which would account for at least 6 hours per year.

Land Use							
Facility Type	Total Square Feet						
High Distribution Warehouse	3,300,000						

Truck Trip Generation						
Facility Type	ITE Code	ITE Category	Truck Trips/1000 SF/Weekday ¹	Truck Trips/Weekday	Weekdays/Year	Trips/Year
High Distribution Warehouse	155	Warehousing	0.6	1980	260	514,800

Fleet Mix						
Vehicle Classification	Percentage of Truck Trips ²	Trips/Year	Miles/Trip ³	VMT/Year	Idling Hours/Trip ⁴	Idling Hours/Year
Heavy-Duty Trucks	100%	514,800	100	51,480,000	0.25	128,700

Travel Emission Rates (grams/mile) ⁵					
Unit	HC	NO _x	CO	PM ₁₀	PM _{2.5}
Heavy-Duty Trucks	0.178	2.738	1.614	0.079	0.079

Idle Emission Rates (grams/hour) ⁶					
Unit	HC	NO _x	CO	PM ₁₀	PM _{2.5}
Heavy-Duty Trucks	3.503	33.763	25.628	1.196	1.100

Criteria Pollutant Emissions (tons/year)					
Source	HC	NO _x	CO	PM ₁₀	PM _{2.5}
Heavy-Duty Travel	10.10	155.37	91.59	4.48	4.48
Heavy-Duty Idling	0.50	4.79	3.64	0.17	0.16
Total	10.60	160.16	95.23	4.65	4.64

Conversions			
1 lb =	453.592	g	
1 ton =	2000	lb	

Notes:

¹Truck trip generation per 1000 square feet (weekday average rate) from ITE Trip Generation Appendix: 100+ Industrial - Truck Data Plots (<https://www.itsa.org/tripgenappendix/>)

²Assuming 100% heavy-duty trucks, consistent with available EPA emission rates.

³Truck trip distance based on typical freight truck trip distance in 2021 U.S. DOT study (<https://www.energy.gov/eere/vehicles/articles/fovw-1302-august-3-2023-2021-87-us-truck-freight-tonnage-was-shipped-less>).

⁴Although no state or county-wide limit, assuming 15 minutes of idling per trip, consistent with nearby Atlanta idling ordinance (City of Atlanta Code of Ordinances, Section 150-97).

⁵Heavy-duty diesel vehicle emission factors for 2026 from EPA's MOVES4 (<https://www.bts.gov/content/estimated-national-average-vehicle-emissions-rates-vehicle-type-using-gasoline-and>). Assuming PM₁₀ equal to PM_{2.5}.

⁶Heavy-duty diesel vehicle idling emission factors from EPA Idling Vehicle Emissions for Passenger Cars, Light-Duty Trucks, and Heavy-Duty Trucks (2008) (<https://nepis.epa.gov/epa/tex/z/pdfr/cg/FP100EVVX.PDF>) (<https://www.epa.gov/epa/tex/z/pdfr/cg/FP100EVVX.PDF>)