Lehigh Valley Planning Commission

DR. CHRISTOPHER R. AMATO
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Vice Chair

ARMANDO MORITZ-CHAPELLIQUEN
Treasurer

BECKY A. BRADLEY, AICP
Executive Director

Planning for the Future of Lehigh and Northampton Counties at 615 Waterfront Drive, Suite 201, Allentown, PA 18102 ■ (610) 264-4544 ■ lvpc@lvpc.org ■ www.lvpc.org

COMPREHENSIVE PLANNING COMMITTEE MEETING
Tuesday, December 16, 2025, 12:00 noon
AGENDA

THE MEETING CAN BE ACCESSED AT http://www.tinyurl.com/LVPC2025 OR VIA PHONE 610-477-5793 Conf ID: 651 626 091#.

Roll Call

Courtesy of the Floor

New Staff Introductions

1. Mary Grace Collins, Community and Regional Planner
2. Peter Lantz, Environmental Engineer
3. Giovanna Rizkallah, Artificial Intelligence (AI) Engineer and Innovation Planner
4. Jacob Weinberg, Community and Regional Planner

Committee Business

1. *ACTION ITEM*: Chair and Vice Chair Elections
2. *INFORMATION ITEM:* Data Centers Presentation
3. *ACTION ITEM:* Upper Macungie Township – Land Use of Regional Significance – Cetronia Road Data Center (JS, SMyerov)
4. *INFORMATION ITEM:* South Whitehall Township – Land Use of Regional Significance – Atlas Industrial (JS)
5. *ACTION ITEM:* Palmer Township – Land Use of Regional Significance – Easton Area High School Athletic Complex (MGC)
6. *ACTION ITEM:* Wilson Borough – Land Use of Regional Significance – Wilson Area School District Athletic Improvements (JW)
7. *ACTION ITEM*: Lynn Township – Zoning Ordinance Amendment – Miscellaneous (JW)
8. *PRESENTATION & DISCUSSION ITEM*: Lehigh County Industrial Land Use Guide (EG, MG, JS, MGC, JW)
9. *INFORMATION ITEM*: Draft Housing Supply and Attainability Strategy (JS)

Next Comprehensive Planning Committee Meeting:
January 20, 2026, at 12:00 noon

Lehigh Valley Planning Commission

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December 12, 2025

Meredith Keller, Director of Community Development
Upper Macungie Township
8330 Schantz Road
Breinigsville, Pennsylvania 18031

Re: Cetronia Road Data Center – Land Use of Regional Significance
Upper Macungie Township
Lehigh County

Dear Ms. Keller:

The Lehigh Valley Planning Commission (LVPC) will consider the subject application at its Comprehensive Planning Committee and Full Commission meetings, pursuant to the requirements of the Pennsylvania Municipalities Planning Code (MPC). The virtual Comprehensive Planning Committee Meeting will occur on Tuesday, December 16 noon and the in-person Full Commission meeting will occur on Thursday, December 18 at 11:00 AM. Meeting information is available at https://lvpc.org/lvpc-meetings Substantial discussion on projects occurs at the Committee meeting, and any and all participation is welcome.

Background
The project proposes to redevelop the site of the former Air Products corporate headquarters by constructing three data center buildings totaling 2,600,100 square feet. The project site is located at 7300 Cetronia Road (parcel number 546562745585).

The proposal is considered a Land Use of Regional Significance under *FutureLV: The Regional Plan* as a Major Redevelopment. The Township's designated zoning for the site is Light Industrial District (LI), which was established to 'meet current and anticipated future regional needs for light industries, offices and limited types of related commercial development… with a campus-like setting that will aid in attracting new businesses' (Township Zoning Ordinance §27-301 J.).
FutureLV acknowledges that the advancement of technology and increased need for real-time information and data transmission makes infrastructure and connectivity increasingly important (FutureLV Future Forces Section, page 42). Data centers are essential to meeting modern digital connectivity needs and demands; however, hyperscale facilities pose unprecedented levels of impact to communities' utility infrastructure. Thorough evaluation and coordination across stakeholders are essential to ensure adequate capacity is available to meet the needs of the facility and that the project supports public health, safety and welfare. The LVPC convened a coordination meeting with external review agencies to discuss the project and inform this review.

Site Suitability and Land Use
The proposal is located in an area identified as suitable for Development in *FutureLV: The Regional Plan* due to existing development and infrastructure in the area, and redeveloping the site aligns with *FutureLV* by reusing vacant and underutilized properties (of *FutureLV* Policy 5.4).

Nearby land uses include a warehousing facility to the east, shopping centers to the south, and a mix of residential and commercial uses to the west and north. Data centers can pose health and quality of life impacts to neighboring residents and land uses if not appropriately mitigated. Potential impacts include:

- Substantial noise can result from cooling equipment and generator testing. Pre-and-post-construction professional noise studies should be conducted for both perceived and low frequency noises, and the LVPC recommends limiting noise generation to a maximum level of 55 decibels, measured at the project property line, to support community health (of Policy 5.3).
- The buildings should be aesthetically designed to minimize the visual impacts of the scale of buildings on neighboring properties. Mechanical yards common with data center land uses are not specified on the plans. Once identified, these should be fully screened or enclosed to reduce visual impacts and 'promote context-specific design solutions' (of Policy 5.4).
- Nighttime lighting levels should be designed to minimize glare, prevent spillover onto adjacent properties, and minimize environmental impacts of development (of Policy 3.2).
- The applicant should also assess potential heat-exhaust impacts from mechanical systems that may affect nearby development or pedestrian areas (of Policy 3.2).

These community impacts must be mitigated for the project to be suitable for the proposed location (of Policy 1.4). These impacts will also be discussed in greater detail in the following sections of this review.

Emergency Services

Given the unique electrical, mechanical, and security characteristics of data centers, the Township and applicant should coordinate early and continuously with local emergency service providers to ensure adequate preparedness and response capabilities. The applicant should provide fire, Emergency Medical Services, and police departments with detailed information on site access, security protocols, hazardous materials storage, backup power systems, and any specialized equipment such as battery energy storage systems. Emergency responders should be consulted on the adequacy of access points, turning radii, hydrant placement and fire-suppression systems, and should receive appropriate training or orientation prior to occupancy. This coordination is essential to safeguard responders, protect critical infrastructure, and ensure that the facility can be safely and effectively served during both routine incidents and large-scale emergencies (of Policy 5.1).

Environment and Utility Infrastructure

The submission does not provide sufficient information to evaluate the project's full electrical demand or its long-term impacts on the regional power grid. The applicant should clarify the total projected electrical load at full build-out and demonstrate coordination with PPL to confirm that the existing grid can reliably accommodate this load without degrading service to current residential or commercial users. The applicant should obtain written confirmation from PPL that identifies whether grid upgrades will be required, such as substation expansion, new feeders, or transmission enhancements, and how these improvements will be funded to promote fiscal health and sustainability (of Policy 4.6).

Additional detail is needed on how the facility will align with industry energy-efficiency standards, including anticipated Power Usage Effectiveness (PUE) targets, energy-management audits, and reporting practices. The applicant should also identify what proportion of its energy use will be met through renewable sources and whether it is willing to support new renewable-energy generation, rather than relying solely on existing supply. Information on the developer's interest or capacity for onsite or offsite renewable-energy production, such as solar, battery storage, or power-purchase agreements, is necessary to understand the project's long-term sustainability and its alignment with regional clean-energy goals (of Policy 3.4).

The site plans also do not identify locations where backup generators will be stored. The applicant should specify the number, type, and location of all proposed generators and indicate whether non-diesel or other low-emission alternatives were evaluated. LVPC recommends that Tier IV backup generators be required to minimize air quality impacts (of Policy 3.2). Clarification is also needed on whether each generator will be fully enclosed or sound-attenuated, along with expected decibel levels during testing or

emergency operation. To ensure public health and environmental safety, the Township should request detailed specifications on emissions controls and fuel storage safety measures such as spill-prevention and secondary containment. Finally, the developer should provide a generator-testing plan that outlines the frequency, duration, and timing of tests so the Township can adequately evaluate potential noise, air-quality, and neighborhood impacts (of Policies 5.2, 5.3, and 5.4).

The LVPC notes that the submitted plans indicate an intent to be served by public sewer and water, however upon coordination with Lehigh County Authority (LCA), the authority has not been approached to determine if capacity is available.

The application lacks essential information regarding the project's water demands and cooling system. The developer should identify the specific cooling technology proposed, whether air-cooled, water-cooled, evaporative, or hybrid, as each has significantly different implications for water use and infrastructure needs. The submission should also clarify whether the system incorporates water-reuse or heat-recovery measures that could reduce overall consumption. Given the region's current drought conditions, it is critical that the applicant model water use under drought-stage or peak-stress scenarios and demonstrate long-term reliability of the proposed water supply. Immediate coordination with Lehigh County Authority is recommended to evaluate potential necessary infrastructure upgrades and determine opportunities to meet the long-term water supply needs of the facility, including the feasibility of connecting with the nearby LCA Pretreatment Facility along Route 100 just north of the project site. Specifying the type of cooling technology proposed is also essential to determine whether adequate infrastructure exists for wastewater discharge, including how the volume of discharge will be managed, and the identification of appropriate discharge locations and impacts to wells, surface waters and/or groundwater levels.

Information that will be needed by LCA includes, but is not limited to:

General:

- What is the estimated commissioning date?
- What is the estimated ramp up/buildout schedule?
- What is the cooling strategy / technology planned for the data center?

Water:

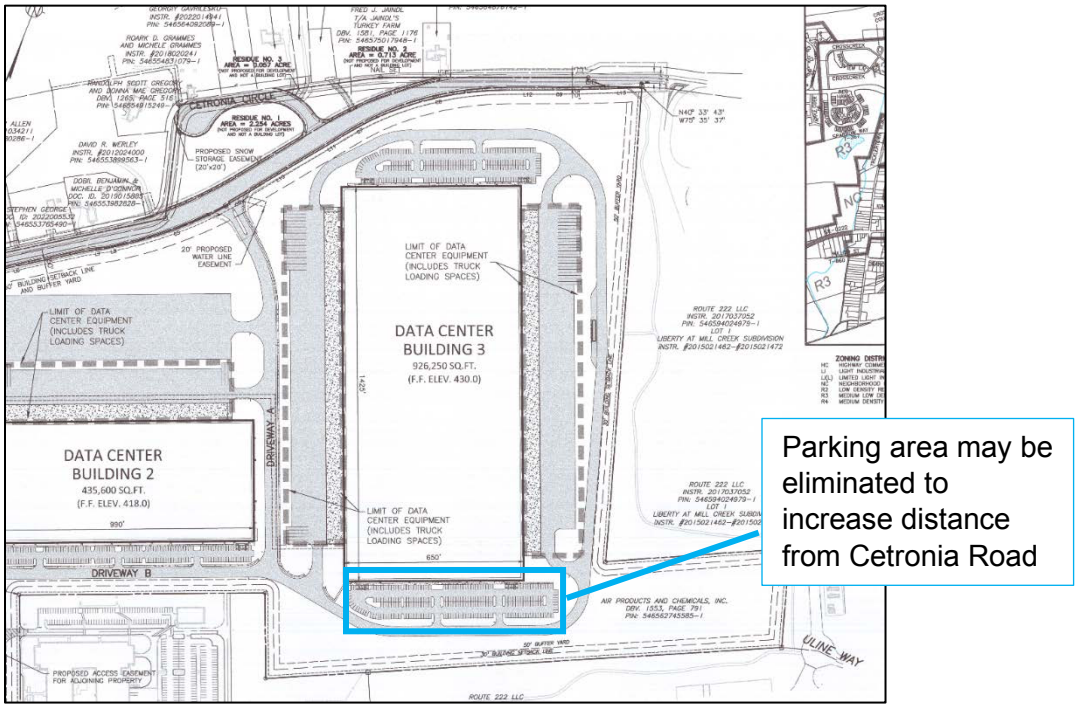
- What is the anticipated maximum day and average day water demand?
- What is the anticipated instantaneous peak water demand?
- What is the anticipated monthly water use profile?
- How much on-site water storage / fire protection systems are planned?
- Are there any specific water quality parameters that must be met by the water utility?
- Is there an interest / willingness to discuss reused water as a potential source for cooling systems, and under what conditions would water reuse be considered a viable option?

Sewer:

- What is the anticipated maximum day and average day sewer discharge?
- What is the anticipated instantaneous peak water discharge?
- What is the anticipated monthly sewer discharge profile?
- How much on-site wastewater storage / flow equalization is planned?
- What are the anticipated sewage discharge quality parameters, such as BOD, TSS, TDS, TKN, PFAS or other contaminants?

Because this project constitutes a change from the previously approved land use, that will affect the Township's Act 537 Sewage Facilities Plan, requiring coordination with DEP and timely submittal of all necessary permitting materials (of Policy 3.2).

Landscaping is provided throughout the project site and along the property boundary. A larger buffer for Building 3 could be provided by eliminating the parking area on the south side of the building, which would allow for increased distance from the residential property north of Cetronia Road (see image below). The LVPC recommends a 500-foot buffer from residential uses, though 1,000 feet is preferred. Adequate buffers, landscaping, berms, and architectural treatments are essential to ensure buildings fit in with community character and disrupt the visual impact of such large building mass (of Policies 3.2 and 3.4).



The project site is located within the Little Lehigh Creek Watershed. This watershed has a fully implemented Act 167 Stormwater Management Ordinance. Comments relative to our review of the project's stormwater management plan are included as Attachment 1.

Transportation

The LVPC previously reviewed a nearly identical site plan at the proposed project site, in a letter dated April 29, 2022. At the time, warehousing was the proposed land use,

and the LVPC review letter cited numerous transportation-related concerns from the volume of anticipated trips, including congested corridors, safety, and appropriate truck routing. The now-proposed data center land use would generate far fewer daily trips than other similarly sized industrial land uses.

From a transportation standpoint, a data center is a more appropriate use for the location because it does not pose the same transportation impacts as the previously proposed use. In the Cetronia Road corridor, where prior redevelopment proposals have included multiple warehouses and freight-intensive uses, a lower-traffic user supports the aim of *FutureLV* to 'strengthen freight mobility while minimizing quality-of-life impacts to nearby residents' (Policy 2.4).

Aspects of the site plan can be improved to better ensure adequate transportation access and movement. There appears to be substantially more passenger vehicle parking spaces than typically required for data center land uses. The amount of provided parking should be re-evaluated and right-sized to minimize impervious surfaces (of Policy 2.2). Additionally, the plan depicts paved areas that were previously proposed to be used for truck parking at the time of the last review. If these parking areas are no longer needed they should be removed from the plans. Once the appropriate amount of passenger vehicle and commercial truck parking spaces is determined, any resulting changes to the site plans should clearly separate these traffic movements to minimize conflicts. Electric vehicle charging capacity should be provided for both commercial and passenger vehicles (of Policy 2.5).

Sidewalks are proposed along all road frontages of the project site, which supports pedestrian safety and reducing fatalities towards zero (of Policies 5.1 and 5.3). Hamilton Boulevard is a bicycle commuting corridor with existing conventional bike lanes identified in the *Walk/RollLV: Active Transportation Plan*. *Walk/RollLV* recommends these bike lanes be upgraded to include a minimum five-foot wide bike lane and a two-foot buffer (page 81). The Hamilton Boulevard Corridor Study, completed by Upper Macungie and Lower Macungie Townships in 2015, also includes concept designs for this portion of Hamilton Boulevard (page 90). The LVPC encourages the Township and developer to explore implementation opportunities in conjunction with the proposed redevelopment. Connections to proposed employee parking lots should also be provided, with bicycle racks at each building, to encourage alternative transportation options and offer a seamless network for employees to safely ride to work (of Policies 2.2, 2.3 and 5.3).

The Lehigh and Northampton Transportation Authority (LANTA) currently provides fixed-route transportation directly to the southern portion of the project site along the Hamilton Boulevard corridor, with an existing westbound bus stop on the far side of the signalized intersection of Hamilton Blvd. and the main entrance to Trexlertown Plaza across the street. There are currently no sidewalks along the property frontage on Hamilton Boulevard, and LANTA appreciates efforts to include a sidewalk along the full property frontage, as well as an internal pedestrian network within the project site. LANTA requests a five-foot concrete pad in between the proposed sidewalk and

roadway curb to provide an accessible bus stop landing pad for proper boarding/alighting at the existing westbound bus stop location.

LANTA does not currently serve Cetronia Road, however the proposed sidewalks along the full length of the northern portion of the property frontage can allow for future opportunities for bus stop locations if service is feasible. A future bus stop landing pad would be recommended on the far side of the Cetronia Road and Driveway A intersection, connecting to the proposed internal sidewalk network of the project site. In addition, to better serve the large complex, LANTA recommends a thru-street connecting Hamilton Boulevard and Cetronia Road for better access to the project site, as future service plans would be dependent on this connection to improve circulation.

The LVPC has copied representatives from adjacent municipalities and review agencies to 'coordinate land use decisions across municipal boundaries' (of Policy 1.4).

Municipalities, when considering land developments, should reasonably attempt to be consistent with *FutureLV: The Regional Plan*, as required by the Pennsylvania Municipalities Planning Code (MPC) [Article 1§105, Article III§303, §304 & §306(a), Article VI§603(j)]. The LVPC review does not include an in-depth examination of plans relative to subdivision design standards or ordinance requirements since these items are covered in the municipal review.

Please let me know if there are any questions about this review.

Sincerely,

Jill Seitz
Chief Community and Regional Planner

Susan Myerov
Director of Environmental Planning

cc: Ryan Kern, HRG Inc.,Township Engineer; Stanley L. Reggie, Air Products, Applicant; Brent Tucker, The Pidcock Company, Project Engineer; Brian Carl, Weisenberg Township Manager; Mike Siegel, Lowhill Township Manager; David Manhardt, South Whitehall Township Community Development Director; Bruce Beitel, Lower Macungie Township Manager; Liesel Gross, Lehigh County Authority Chief Executive Officer; Garrett Cook, Lehigh County Conservation District Engineer; Fadia Halma, PA DCED Lehigh Valley Regional Director; Alicia Karner, PA DCED BusinessPA Lehigh Valley Regional Office Director; Dean Ritter, PA DEP Assistant Regional Director; Jane George, PPL Regional Affairs Director; Brian Boyer, PennDot District 5; Molly Wood, LANTA Planner/Land Use Specialist.

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December XX, 2025

Craig Beavers, Director of Planning
Palmer Township
3 Weller Place
Palmer, PA 18045

Re: Easton Area High School Athletic Complex – Land Use of Regional Significance
Palmer Township
Northampton County

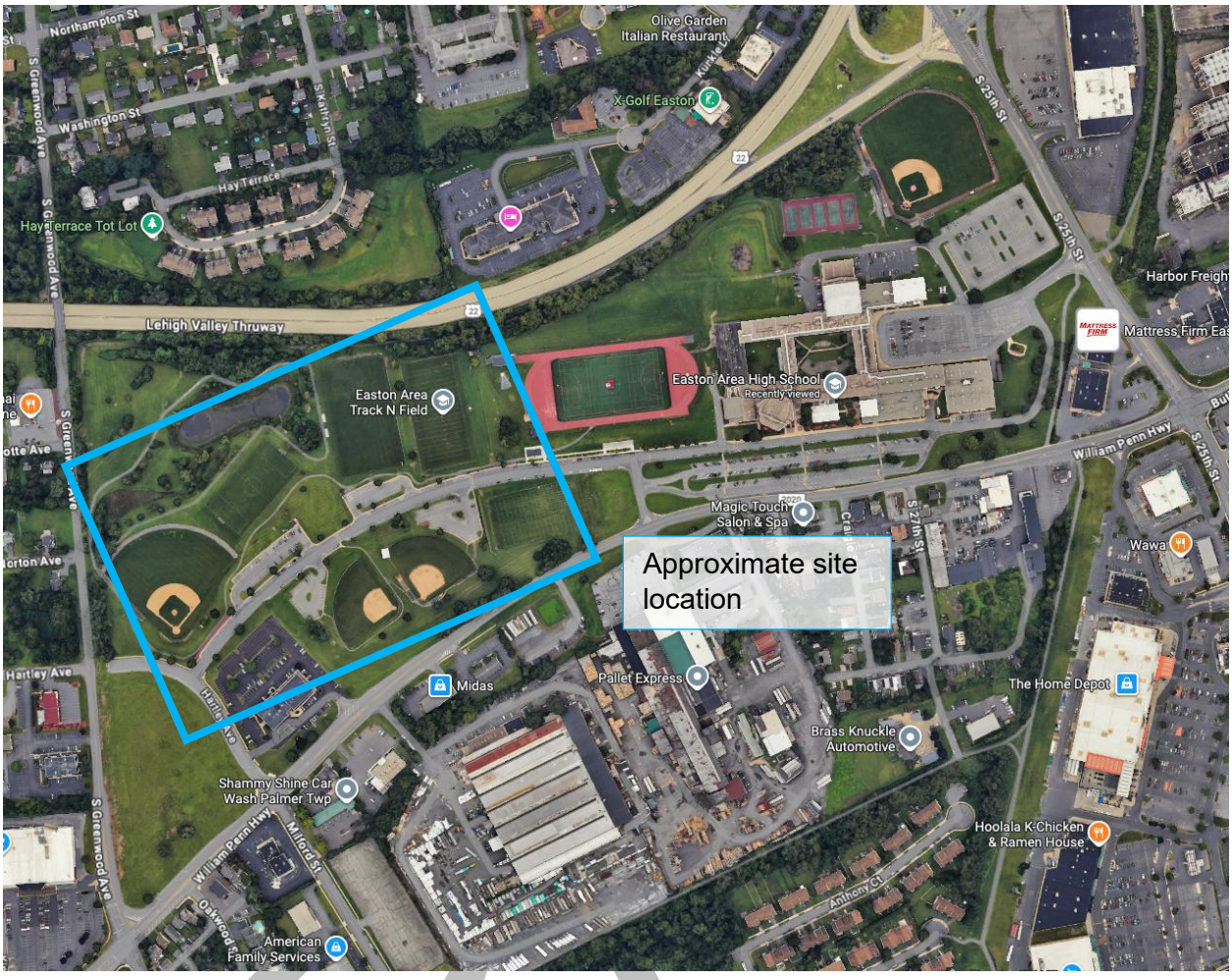
Dear Mr. Beavers,

The subject application is considered a Land Use of Regional Significance, as 'All' Education Facilities are considered land uses of regional significance in *FutureLV: The Regional Plan* (page 147). The Lehigh Valley Planning Commission (LVPC) considered the subject application at its Comprehensive Planning Committee and Full Commission meetings, per requirements of the Pennsylvania Municipalities Planning Code (MPC). The meeting dates are:

- LVPC Comprehensive Planning Committee Meeting (Virtual)
  - December 16, 2025, at 12:00 PM
  - https://lvpc.org/meetings.html
- LVPC Full Commission Meeting (In Person)
  - December 18, 2025, at 11:00 AM
  - 615 Waterfront Drive, Suite 201, Allentown, PA

The application proposes recreational and site improvements to the Easton Area High School Athletic Complex located at 2601 William Penn Highway (parcel numbers L8 24 1 and L9 44 2).

The project includes the construction of two new turf baseball fields to replace existing grass athletic fields. Supporting amenities such as concessions and ticketing facilities, dugouts, bullpens, batting cages, grandstands, stadium lighting, and a champion wall are included as part of the baseball complex. The project also includes a new field house and the addition of tennis courts, replacing an existing grass field.



Site Suitability and Land Use

The proposal aligns with multiple goals and policies of *FutureLV: The Regional Plan* by reusing and redeveloping areas of the property that already contains the existing education facility (of *FutureLV* Policy 1.1). The project 'expands access to education and job training' (of *FutureLV* Policy 4.1) and invests in schools located along corridors (of *FutureLV* Policy 4.3). Improving the existing facility serves to increase access to recreational opportunities and 'support cultural and social programs' (of *FutureLV* Policy 5.2). *FutureLV* 'encourages local institutions to invest in their surrounding communities' (of Policy 4.1). The LVPC encourages Easton Area High School to consider opportunities for the general public to access and utilize the facility to create public spaces in underserved areas (of Policies 5.2 and 5.3).

Transportation

The LVPC recommends that sidewalk networks be completed in the following areas: along the William Penn Highway frontage of the project area, along the southern portion of the project's internal access driveway, and along Hartley Avenue to close the existing gap near the Hartley Ave and William Penn Highway intersection. Ensuring adequate and complete sidewalk infrastructure promotes 'safe and secure community design' and 'safe routes to school' while 'reducing bicycle and pedestrian fatalities towards zero' (of

Policies 5.1 and 5.2). The Lehigh and Northampton Transportation Authority (LANTA) provides transit service to the project site via the William Penn at Milford EB bus stop. Completing this section of sidewalk 'improves connections between mass transit and pedestrian infrastructure' (of Policy 2.3).

Gap in sidewalk at Hartley Ave & William Penn Highway

The project also presents an opportunity to 'encourage an interconnected street network' by connecting both sides of Hartley Avenue across South Greenwood Avenue (of Policy 2.2). Given the proximity to the Greenwood at Hartley SB bus stop, a completed street network at this location would 'improve efficiency of existing infrastructure' and 'enhance public transit service and pedestrian facilities' (of Policies 2.2 and 2.3). Should these upgrades be pursued, the appropriate traffic control measures and signage should be included, such as implementing a 4-way stop or turning lanes from South Greenwood Avenue as well as school zone/speed limit signs.

Intersection of Hartley and S Greenwood Ave

Environment
The LVPC encourages educational institutions to implement environmentally sensitive building and landscape design, such as green roofs or solar panels. This would increase the cost-effectiveness of building operation and further academic endeavors related to these technologies, while enhancing the campus setting, demonstrating environmental leadership within the region, and reducing environmental impacts through mitigation and adaptation (of *FutureLV* Policy 3.4).

The project site is located in the Bushkill Creek watershed. This watershed has a fully implemented Act 167 Stormwater Management Ordinance. Comments related to our review of the project's stormwater management plan are included as attachment 1.

Municipalities, when considering subdivision/land developments, should reasonably attempt to be consistent with *FutureLV: The Regional Plan*, as required by the Pennsylvania Municipalities Planning Code (MPC) [Article 1§105, Article III§303, §304 & §306(a), Article VI§603(j)]. The LVPC review does not include an in-depth examination of plans relative to subdivision design standards or ordinance requirements since these items are covered in the municipal review.

Sincerely,

Mackenzie Geisner
GIS Planner

Jill Seitz
Chief Community and Regional Planner

Mary Grace Collins
Community and Regional Planner

cc: Ken Case, Easton Area School District, Applicant; Richard Roseberry, Colliers Engineering and Design, Project Engineer; Daniel Wilusz, Township Engineer; Geoff Reese, PE, Master Planner and Engineer, LVPC; Denjam Khadka, Senior Civil and Environmental Engineer, LVPC.

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December XX, 2025

Jill Garcia, Manager
Wilson Borough
2040 Hay Terrace
Wilson Borough, PA 18042

RE: Wilson Area School District Athletic Improvements – Land Use of Regional Significance
Wilson Borough
Northampton County

Dear Ms. Garcia:

The application is considered a Land Use of Regional Significance under *FutureLV: The Regional Plan* in the Educational Facilities category. The Lehigh Valley Planning Commission (LVPC) will consider the subject application at its Comprehensive Planning Committee and Full Commission meetings, pursuant to the requirements of the Pennsylvania Municipalities Planning Code (MPC). Discussion on agenda items primarily takes place during the Committee meeting. Both meetings will be virtual and held on:

- LVPC Comprehensive Planning Committee Meeting
  - December 16, 2025 at 12:00 PM
  - https://lvpc.org/lvpc-meetings
- LVPC Full Commission Meeting
  - December 18, 2025 at 11:00 AM
  - https://lvpc.org/lvpc-meetings

The application proposes reconstruction of a new athletic field, a 39,209-square-foot auxiliary building, a 1,600-square-foot outbuilding, and a parking lot on a 9.25-acre lot. The proposal is located at 2040 Washington Boulevard (parcel number L9SW4B 4 1) and is currently an athletic complex for the Wilson Area School District (WASD). The existing stadium and auxiliary building would be demolished, as well as an existing parking lot in northeast corner of the lot which contains the site's stormwater infrastructure. The new auxiliary building will maintain the existing catwalk that spans South 22nd Street, connecting the Wilson Area High School to the new facility and be placed on top of the old parking lot, with a planned expansion of the existing lot in the southeast corner and unimproved parking in the athletic field for additional overflow.

Google Aerial Imagery

Site Suitability and Land Use

The property is within an area identified in *FutureLV: The Regional Plan* as a Development Area. The project achieves many of the goals and policies of *FutureLV: The Regional Plan* by 'encouraging reuse and redevelopment in urban areas' (of Policy 1.1*)*, 'expanding access to education and job training' (of Policy 4.1), and 'investing in schools located along corridors (of Policy 4.3).

Further, the improvement of existing facilities 'encourages local institutions to invest in their surrounding communities' (of *FutureLV* Policy 4.1) and 'supports cultural and social programs' (of Policy 5.2). The LVPC suggests WASD consider opportunities for the general public to access and utilize the facility to create public spaces in underserved areas (of Policies 5.2 and 5.3).

Transportation

Students and staff can use a variety of transportation when traveling to and from the site, including walking and biking and the Lehigh and Northampton Transportation Authority (LANTA) provides transit service directly to the project site via Butler Street and South 22nd Street.

Access to the project site will be provided by two driveways along South 22nd Street in and out of the expanded parking facilities in the southeast corner, with both entrances allowing access in and out of the facility. In the circumstance where additional parking is needed, a gate will be installed in the southwest corner of the parking lot abutting the grass lot to allow vehicles to park on the lawn. The LVPC recommends consulting with

local emergency services to ensure access to all parts of the site including the overflow parking.

The project includes an additional loading zone and bus drop off area separated by a tree line from South 22nd Street. The LVPC commends the proposed drop off area which 'promotes safe routes to schools and playgrounds'(of *FutureLV* 5.2) by separating the drop off area from the roadway and insulating pedestrians from incoming traffic with preserved street trees from the original site plan.

The project also proposes sidewalk and crosswalk improvements along South 22nd Street, and the reconnection of a catwalk connecting the new auxiliary building and the existing high school. The LVPC commends the proposed catwalk and pedestrian improvements, helping 'promote safe and security community designs' (of Policy 5.1).

Google Street View

The LVPC recommends including restamping the crosswalk on the intersection of Butler Street & South 22nd Street in the project's scope. *FutureLV* has identified Butler Street as a High-Frequent Bus Service corridor, and the stamped side serves as the main path for pedestrians and exiting passengers coming off LANTA. Maintenance of this crosswalk supports the *FutureLV* goal of 'enhanced public transit and walk/roll facilities along corridors' (of Policy 2.3).

Environment

The LVPC encourages educational institutions to implement environmentally sensitive building and landscape design, such as green roofs or solar panels. This would increase the cost-effectiveness of building operation and further academic endeavors related to these technologies, while enhancing the campus setting, demonstrating environmental leadership within the region, and reducing environmental impacts through mitigation and adaptation (of *FutureLV* Policy 3.4).

The project site is in the Bushkill Creek watershed. This watershed has a fully implemented Act 167 Stormwater Management Ordinance. Comments related to our review of the project's stormwater management plan are included as attachment 1.

Municipalities, when considering subdivision/land developments, should reasonably attempt to be consistent with *FutureLV: The Regional Plan*, as required by the Pennsylvania Municipalities Planning Code (MPC) [Article 1§105, Article III§303, §304 & §306(a), Article VI§603(j)]. The LVPC review does not include an in-depth examination of plans relative to subdivision design standards or ordinance requirements since these items are covered in the municipal review.

Please feel free to reach out if you have any questions.

Sincerely,

Jacob Weinberg
Community and Regional Planner

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December XX, 2025

Mr. Marc Fisher
Lynn Township
7911 Kings Highway
New Tripoli, PA 18066

Re: Zoning Ordinance Amendment – Miscellaneous
Lynn Township
Lehigh County

Dear Mr. Fisher:

The Lehigh Valley Planning Commission (LVPC) will consider the subject application at its Comprehensive Planning Committee and Full Commission meetings, pursuant to the requirements of the Pennsylvania Municipalities Planning Code (MPC). Discussion on agenda items largely happens during the Committee meeting. Both meetings will be virtual, and we encourage your participation. The LVPC will issue a follow-up letter after the Commission meeting if Commission members have any additional comments. Meeting participation details are below:

- LVPC Comprehensive Planning Committee Meeting
  - December 16, 2025 at 12:00 PM
  - https://lvpc.org/lvpc-meetings
- LVPC Full Commission Meeting
  - December 18, 2025 at 11:00 AM
  - https://lvpc.org/lvpc-meetings

The proposal amends the Lynn Township Zoning Ordinance with a series of omitted revisions and missing items in the original adoption of the ordinance with the intent of supporting better processes, interpretation, and enforcement of the Township Zoning Ordinance. The proposed amendments include the requirements for site plan review for selected residential and non-residential uses, the addition of missing setbacks for some specific uses, and an update to the definitions.

Additionally, the Township proposes strengthening its 10% limit on non-agricultural development in agricultural zones by restricting how much extra acreage may be

consolidated with existing lots. The LVPC commends the Township for amending the ordinance as to ‘guide the location and intensity of development’ while they ‘preserve the agricultural and natural lands’ (of *FutureLV* Policy 1.1). Additionally, the amendment includes provisions requiring a copy of the recorded deed and recommends that applicants seeking non-agricultural development check with appropriate agencies to understand the regulations affecting their proposal which strongly supports 'coordination of land use decisions across municipal boundaries' and 'provide guidance on best practices' (of *FutureLV* Policy 1.4).

Additionally, the amendment proposes adding language to the General Standards (§27-502) to ensure that outlined standards apply to both special exceptions and conditional uses. Several standards currently reference only special exceptions, and clarification is needed on whether they also apply to conditional uses.

Municipalities, when considering ordinances and official maps, should reasonably attempt to be consistent with *FutureLV: The Regional Plan*, as required by the Pennsylvania Municipalities Planning Code (MPC) [Article 1§105, Article III§303, §304 & §306(a), Article VI§603(j)]. Please send a copy of any final amendments that are adopted, per the requirements of the MPC.

The LVPC has copied representatives of the *Northern Lehigh Multi-Municipal Comprehensive Plan* to ‘coordinate land use decisions across municipal boundaries’ (Policy 1.4). If you have any questions regarding the content of this letter, please do not hesitate to call.

Sincerely,

Jacob Weinberg
Community and Regional Planner

cc: Tammy White, Lynn Township Secretary/Treasurer: Roy Hambrecht, Slatington Borough Manager: Dawn Didra, Heidelberg Township Secretary: Jill Seymour, Lowhill Township Secretary: Wade Marlatt, Washington Township Manager: Brian Carl, Weisenberg Township Manager

Lehigh County Industrial Land Use Guide

Comment Draft
December 15, 2025
Prepared by the Lehigh Valley Planning Commission

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Introduction

Industrial development and rapid technology advancements are shaping Lehigh County's land use needs, forcing communities to evolve quickly to handle the emerging uses arriving at their doorstep. However, this region has a history of adapting because industrial development has been a defining influence on Lehigh County's economy and landscape since the 1700s, when the earliest European settlers established water-powered mills for grain processing, lumber production and iron works along creeks such as the Little Lehigh, Jordan, Coplay and Saucon. The opening of the Lehigh Canal in 1829 revolutionized the local economy by allowing goods to easily move between Lehigh County and nearby regions, and local towns like Allentown grew into industrial centers.

By the late 1800s, Lehigh County and the broader Lehigh Valley had become home to a wide array of prominent industries. Iron production expanded with the advent of anthracite-fired iron furnaces, including the Allentown Iron Works on the Little Lehigh Creek, the Thomas Iron Works in what is now Hokendauqua, and the Coplay Furnace complex, several of which still stand today as historic sites. These operations helped make the region a national center for early iron manufacturing before Bethlehem Steel's rise.

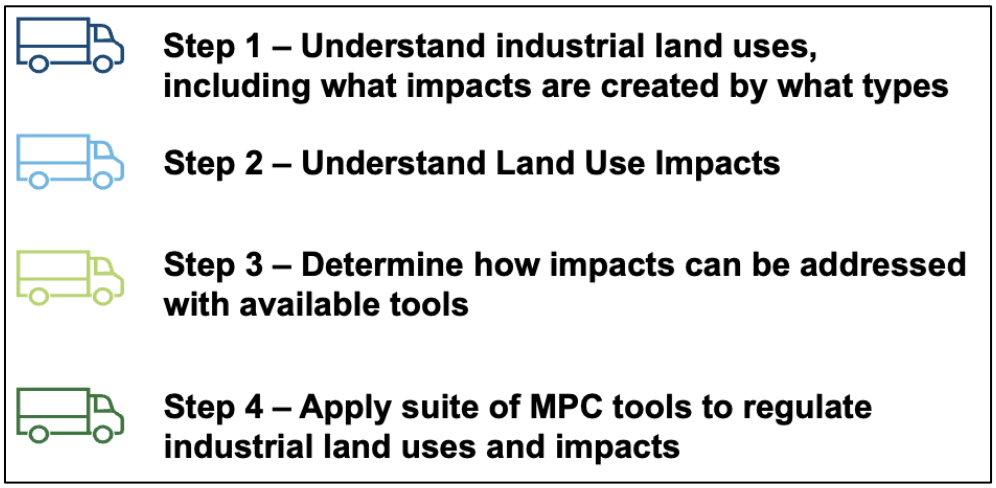
The Valley also became one of the nation's premier silk manufacturing hubs in the late 1800s, driven by mills such as the Adelaide Silk Mill in Allentown, the Hemphill and Sayre silk operations in Catasauqua, and numerous smaller mills in Emmaus, Slatington, and Alburtis. At the same time, the region's cement industry began to take shape through plants near Coplay and Egypt, laying the groundwork for the Lehigh Valley's emergence as the "Cement Belt of the United States." By the late 1800s and early 1900s, Bethlehem Steel anchored a regional economy built on heavy industry, headquartered just across the county line in Bethlehem.

Industry shifted after World War II as American steel and traditional manufacturing declined, but due to the key positioning of Lehigh County relative to adjacent regions, the County emerged as a hub for logistics uses supporting the rise of global supply chains and e-commerce. This rapid shift and expansion of large-scale warehouse development created economic opportunity but also caused traffic, environmental and quality-of-life challenges for municipalities.

Today, industry continues to rapidly evolve, as technology-based industrial uses, advanced manufacturing, and alternative energy are expanding into the region, bringing new demands for land, transportation and utility infrastructure. Communities must prepare for a changing industrial landscape to balance community, economic and environmental priorities. The Lehigh County Industrial Land Use Guide provides the resource tools, data and best practices local governments need to manage current impacts and proactively plan.

How to Use This Guide

The Lehigh County Industrial Land Use Guide is a practical reference for planners, municipal officials and other community stakeholders to better manage industrial growth and its impacts. It serves as a policy alignment and decision-support tool that helps municipalities connect data, best practices and regulatory tools to make informed, balanced decisions about existing and emerging industrial land uses.



Municipalities can use this guide to:

- **Support Comprehensive Planning**: Align local policies and future land use maps with evolving land use trends, identify suitable areas for industrial activity, and integrate industrial corridors into long-range economic and transportation strategies.
- **Inform Zoning and Land Development Regulations**: Translate best practices into zoning districts, use standards, and subdivision and land development ordinance (SALDO) criteria that balance industrial needs with community character and environmental protection.
- **Strengthen Development Review**: Reference the guide when evaluating industrial proposals for consistency with comprehensive plans, transportation access and infrastructure capacity. The guide's recommendations can also serve as technical justification in decision-making.
- **Plan Infrastructure and Transportation Improvements**: Coordinate industrial land use planning with roadway, freight, rail and utility networks; prioritize capital projects that make appropriate sites development-ready.
- **Promote Regional Coordination**: Use the guide to collaborate with neighboring municipalities on shared issues like truck routing, stormwater or infrastructure extensions that cross boundaries.
- **Engage the Public**: Reference the guide to communicate how industrial uses are evaluated, what impacts are being mitigated, and how local and regional plans align.

Industrial development continues to fuel Lehigh County's economic and population growth. By using this guide, communities can manage that growth thoughtfully while supporting jobs and tax revenue, maintaining infrastructure efficiency, protecting environmental and community assets, and positioning themselves for future funding and investment opportunities.

Municipal Engagement

On October 15 from 5:30-7 pm, representatives of Lehigh County communities gathered at the LVPC Conference Center to workshop the Lehigh County Industrial Land Use Guide and discuss common challenges and opportunities. The workshop included a presentation by LVPC on project scope and initial data findings, a facilitated discussion on local industrial land use and freight concerns, priorities for planning for industrial growth, areas of traffic impacts and tools that municipalities have available to address impacts.

The outcome of this engagement directly informed the development of the Guide. Key takeaways from participants included:

1. Managing Traffic and Transportation Impacts Is a Universal Priority
Communities cited freight traffic, congestion, truck routing and access management as their top concerns, and emphasized that freight traffic often spills onto local roads when major corridors like Route 22 or I interstate 78 (I-78) back up, creating safety and quality-of-life challenges in boroughs and townships where roads were not designed for heavy truck volumes.

Participants expressed interest in stronger coordination on Highway Occupancy Permits (HOPs), improved truck management tools, and better access to AADT data, turning volumes and freight routing patterns to make informed decisions.

2. Infrastructure Capacity, Especially Energy, is Emerging as a Critical Limiting Factor
Participants commented on the growing need for electric capacity to support data centers, cold storage and advanced manufacturing. Several communities questioned whether local grids have the infrastructure to handle large-scale users without compromising service to existing residents and businesses.

3. Communities Need Guidance on Emerging Industrial Uses
Municipalities reported a high level of uncertainty about the unique impacts of data centers and other new industrial uses. Key themes included:

- Understanding noise, cooling systems, backup power generation and utility intensity.
- Clarifying decommissioning expectations and life-cycle impacts.
- Ensuring local zoning standards are consistent with state legislation.

Several communities are researching emerging uses or revising ordinances, but they also expressed the need for consistent regional data and best practices to support their efforts.

4. Brownfield Reuse and “Best Use of Existing Space” Remain Strong Values
Many municipalities voiced a desire to direct industrial growth to brownfields, existing industrial districts and redevelopment areas rather than greenfields.

Townships and boroughs emphasized:

- Leverage existing regional assets such as the Lehigh Valley International Airport and FedEx Ground logistics hub.
- Aligning industrial development with long-term community visions, including housing and commercial growth priorities.

5. Land Use Conflicts Are Becoming More Nuanced

Local leaders expressed concern that new industrial users -- especially large energy-intensive ones -- could crowd out desired residential or commercial development by consuming disproportionate shares of available infrastructure capacity or land supply.

Municipalities are navigating how to balance:

- The need for economic growth
- Maintaining community character
- And avoiding over-concentration of industrial uses in certain areas

6. Communities Need Practical Tools, Examples and Clear Data

Across municipalities the most requested supports from LVPC included:

- Case studies that illustrate impacts, such as utility consumption, traffic generation and project timelines
- Regional studies, guidance documents and examples from peer communities
- Support in developing or updating comprehensive plans, zoning, and Subdivision and Land Development Ordinances (SALDOs)
- Technical assistance in capital improvement planning
- Assistance in funding frequent ordinance updates, and planning and code modernization

7. Urban Communities Have Distinct Concerns

City of Allentown representatives highlighted challenges around adapting pre-war industrial buildings for modern manufacturing and freight demands. Questions included how to incorporate modern loading, circulation and safety requirements into dense, historic settings.

The workshop made clear that industrial land use in Lehigh County is evolving rapidly, and municipalities are eager for coordinated regional guidance. Participants are facing a mix of long-standing issues -- like freight traffic and redevelopment -- as well as new, complex challenges around utility capacity, digital infrastructure and emerging industrial uses.

The feedback from this engagement directly shaped the structure of the Guide, ensuring it addresses the real-world issues communities are facing and provides the tools, insights, and resources needed to support informed, proactive planning for Lehigh County’s industrial future.

Industrial Market Evolution and Development Trends

Once known for its steel manufacturing and heavy industries like slate and cement, the Lehigh Valley has evolved into an e-commerce and logistics hub for the Northeastern United States. Situated along the I-78 and Interstate 80 (I-80) corridors, the Valley is within a day's drive of roughly one-third of the nation's population. This geographic advantage has made Lehigh County a competitive location for distribution and warehousing, supporting sustained growth in the industrial real estate market.

Warehousing and Logistics
The surge in online shopping during and after the COVID-19 Pandemic accelerated demand for large distribution facilities across the Lehigh Valley. Nearly every available building was quickly leased, and vacancy rates fell to around 3% in 2022 -- an extremely low level for the market. With space scarce, rental prices more than doubled in just a few years, climbing from about $5 per square foot in 2021 to over $11 per square foot by the end of 2024.

As of mid-2025, the market has begun to stabilize. Vacancy rates have risen to about 7%, and lease rates have leveled off, signaling a transition from rapid expansion to a more sustainable balance of supply and demand. This shift reflects a healthy market adjustment rather than a broader decline.

The logistics sector is also diversifying. Subleasing activity has increased as companies reassess space commitments made during the pandemic, creating new opportunities for smaller businesses. Flex space, which can accommodate light manufacturing, assembly, storage, and administrative functions, is becoming more common.

Manufacturing
Manufacturing in Lehigh County is becoming increasingly high-tech, driven by automation, robotics and digital systems that reduce labor needs but heighten demands for skilled technicians, reliable power and broadband. These technological advancements require less space to operate, leading to a shift toward smaller facilities, typically between 20,000 and 50,000 square feet. Emerging manufacturers are producing electronics and medical devices, while reshoring trends are returning production of semiconductors, pharmaceuticals and other goods to the United States to shorten supply chains.

Together, warehousing and manufacturing trends illustrate a regional industrial market that remains active but is beginning to stabilize after a period of rapid growth.

Industrial Market Conditions
Following years of record expansion, the Lehigh Valley's industrial market is entering a period of stabilization as demand begins to balance with available supply. Net

absorption -- the difference between space leased and vacated -- has slowed, while new construction has declined to its lowest level since 2013, with just 743,000 square feet breaking ground along the Interstate 78/ Interstate 80 corridor in early 2025, according to international real estate firm CBRE.

Both declining absorption and reduced construction reflect a market realignment after the pandemic-era surge in warehouse development. As fewer large-scale projects are proposed, the total industrial square footage added to the market each year has moderated.

Lease rates, which more than doubled between 2021 and 2023, have since stabilized around $11.50, remaining among the highest along the corridor. Nationally, 2024 marked the 15th consecutive year of industrial expansion across the United States, though at its slowest pace since 2010. Within this context, the Lehigh Valley has demonstrated steady performance and resilience, maintaining near-zero changes in inventory, absorption and rent growth, even as larger metros experienced sharper swings.

Recent trade policies and executive actions have introduced some uncertainty, prompting many companies to delay expansion decisions until costs and supply chain implications become clearer. This cautious, strategic approach is visible nationwide, including in the Lehigh Valley, where developers are taking a longer-term view of new industrial investment.

Regional Development Patterns

Development patterns across the Lehigh Valley over the past decade reflect a region in transition -- shifting from rapid industrial expansion toward more balanced, mixed-use growth. Between 2015 and 2022, multi-family housing approvals rose steadily, reflecting increased demand for higher-density living near employment and service centers. Public and quasi-public uses such as healthcare facilities also expanded, signaling broader investment in community infrastructure.

During the pandemic, municipalities such as Bethlehem, and the townships of Lower Macungie, South Whitehall and Whitehall experienced a temporary spike in non-residential square footage as businesses sought space outside dense urban areas. That surge has since receded, while steady growth continues in Upper Macungie Township, Allentown and Bethlehem, where strong transportation access, workforce proximity and established infrastructure continue to attract investment.

Meanwhile, warehouse and industrial development peaked during the pandemic and has since returned to pre-pandemic levels. Office and retail construction have declined since 2018, influenced by remote work, e-commerce, and automation. These changes highlight an evolving regional identity -- one that increasingly emphasizes livability, resilience and sustainable economic diversity.

Importantly, the industrial surge was accompanied by parallel residential

growth. Municipalities including Allentown, Bethlehem, Emmaus Borough and South Whitehall Township experienced simultaneous increases in both housing and non-residential development, underscoring the close link between industrial expansion and housing demand. As both sectors stabilize, the Lehigh Valley appears to be entering a post-boom phase defined by moderate, sustainable growth that supports long-term economic strength and regional balance.

Evolving Industrial Needs

Looking ahead, Lehigh County's industrial landscape will continue evolving as new technologies, energy systems, and logistics models reshape how and where industries operate. Traditional warehousing and manufacturing will increasingly intersect with technology-driven production -- such as biofabrication, microchip manufacturing and large-scale 3D printing -- that demand smaller, more specialized facilities supported by high-capacity utilities and broadband. Digital and automated industrial operations, including data centers, cryptocurrency mining, and autonomous vehicle hubs, will expand the region's role in the national digital economy but will also heighten energy and infrastructure demands. Simultaneously, energy generation and storage facilities from solar and battery installations to advanced grid management systems will become more common as Pennsylvania's energy market modernizes and industries seek sustainable, resilient power sources. The freight and logistics sector is also expected to transform with the adoption of electric and autonomous trucks, increased intermodal connectivity, and the redevelopment of aging warehouse stock for more efficient operations.

Together, these shifts point toward an industrial future defined by smaller footprints, higher energy intensity, greater digital integration, and closer ties between industrial land use, infrastructure and community planning. For municipalities, this means planning proactively, by updating zoning, infrastructure, and comprehensive plans to ensure that future industrial growth remains compatible with community character, resource capacity and long-term regional goals.

Tools for Local Governments

The foundation for how Pennsylvania municipalities guide growth and development is established by the Pennsylvania Municipalities Planning Code (MPC). The MPC grants local governments the authority to adopt comprehensive plans, zoning ordinances, and subdivision and land development ordinances, which together form the framework for managing land use and development.

Many municipalities in Lehigh County have adopted these planning and regulatory tools provided under the MPC, but too often these tools are developed and maintained in silos. A municipality may prepare a comprehensive plan, write a zoning ordinance, and adopt a subdivision and land development ordinance (SALDO), yet over time the connection between the three becomes blurred. Outdated zoning may not reflect the vision set forth in the comprehensive plan, and SALDO provisions may drift away from the standards needed to support zoning districts. When this happens, municipalities are left reacting to development proposals instead of proactively guiding them, particularly as new or unfamiliar industrial uses emerge.

The comprehensive plan, zoning, and subdivision and land development ordinances are tools most effective when used together, with each reinforcing the others:

Comprehensive Plan: Provides the long-term vision and identifies areas best suited for different types of industrial uses.

Zoning: Translates the Comprehensive Plan vision into mapped districts and regulatory standards that shape where industrial uses are permitted and how they function.

Subdivision and Land Development Ordinance: Ensures that the details of site design are consistent with both the zoning framework and the broader goals of the comprehensive plan.

For industrial land uses in particular, integration is critical. Industrial facilities often come with large site footprints, significant infrastructure demands, and potential community impacts on traffic, environment, and quality of life. If zoning regulations are not aligned with SALDO standards, municipalities may miss opportunities to manage truck circulation, buffer adjacent neighborhoods, or ensure adequate utility capacity. Likewise, if zoning diverges from the comprehensive plan, municipalities may find themselves facing development in areas that conflict with community goals.

When used together intentionally, these tools allow municipalities to stay ahead of market trends, set clear expectations for developers, minimize conflicts between industrial development and surrounding land uses, ensure that industrial growth aligns with local priorities, and protect quality of life while supporting economic opportunity. The sections that follow provide guidance on how each tool can be applied to help communities make informed, forward-looking decisions about industrial land use.

Comprehensive Plans

A comprehensive plan is the highest-level policy document a municipality has under the MPC. While not regulatory on its own, it establishes the vision, goals, and framework that zoning ordinances and subdivision and land development ordinances (SALDOs) should implement.

How Comprehensive Plans Can Address Industrial Land Uses:

Identify Suitable Locations – Analyze transportation networks, utility capacity, environmental features and land availability to guide where industrial development is most appropriate. Set policies that clearly determine the outcomes of development, avoiding conflicts with residential areas, schools or sensitive natural resources. Designate industrial growth areas, and highlight opportunities for reuse or redevelopment.

Balance Land Use Priorities – Consider housing, agriculture, open space and economic development together to ensure that industrial growth is accommodated without displacing other community priorities.

Anticipate Emerging Trends – Include policies for new or evolving uses to proactively set expectations before proposals arrive.

Set Transportation and Infrastructure Policies – Identify where infrastructure upgrades may be needed; outline strategies for coordinating with utility providers and transportation agencies; include policies to elevate the quality of developments and minimize impacts (truck driver necessities, parking, etc.); reference other municipal planning documents such as Official Sewage Facilities Plans and Capital Improvements Plans.

Promote Design and Mitigation Standards – While zoning and SALDO carry the enforceable requirements, the comprehensive plan can establish policies for enhanced built environments through buffering, landscaping, sustainable building practices, renewable energy, architectural treatments and building aesthetics.

Support Regional Coordination – Align local goals with *FutureLV: The Regional Plan* to support regional coordination, as industrial markets and freight traffic cross municipal boundaries.

Zoning

Zoning is the most direct regulatory tool municipalities must manage industrial land uses. As authorized by the MPC, zoning ordinances establish where industrial uses are permitted, the standards they must meet, and how they relate to surrounding land uses. Zoning regulations are created to implement the visions of comprehensive plans and are legally enforceable.

How Zoning Ordinances and Maps Can Address Industrial Land Uses:

Differentiate Between Types of Industry – Ordinances should include clear definitions that establish separate uses based on their types and resulting impacts, including manufacturing, technology industry, warehousing and logistics.

Designate Appropriate Districts – Zoning maps identify where industrial uses can go, typically near highways, rail corridors, or other infrastructure, and away from residential neighborhoods and sensitive environmental areas.

Set Dimensional and Site Standards – Requirements for setbacks, buffering and building height reduce conflicts with adjacent uses, especially when near residential or mixed-use areas.

Require Screening and Design Features – Landscaping, berms, façade requirements and green building practices can help reduce the visual and environmental footprint of large industrial buildings.

Mitigate Operational Impacts – Performance standards address noise, lighting, emissions, truck circulation, hours of operation and other potential impacts, ensuring industrial activity does not create nuisances for neighbors.

Address Transportation and Parking – Truck routes, loading areas and parking requirements can be tailored to industrial uses, keeping heavy vehicle traffic off local streets and ensuring adequate but not excessive parking.

Encourage Redevelopment and Reuse – Flexible zoning provisions can make it easier to reuse or redevelop obsolete industrial sites and reinvest in brownfield sites to support community revitalization.

Protect Natural Resources – Overlay districts, environmental performance standards, and conservation design techniques can ensure that industrial development avoids or mitigates impacts on critical habitats, farmland or water resources.

Subdivision and Land Development

While zoning determines *where* industrial uses may be located, Subdivision and Land Development Ordinances (SALDOs) establish detailed requirements for *how* land is divided and developed. These ordinances as authorized by the MPC allow municipalities to ensure that new industrial sites are designed safely, efficiently and in ways that minimize impacts on surrounding communities, working in tandem with zoning and comprehensive plans to create a predictable, consistent framework of plan submission and review for both municipalities and developers.

How SALDOs Can Address Industrial Land Uses:

Transportation and Access Management – Require traffic impact studies to assess infrastructure needs and ensure safe and efficient truck circulation, including designated entrances, on-site truck parking and turning radius requirements.

Infrastructure and Utilities – Require adequate sewer, water, stormwater, and broadband capacity before approval of plans. Incorporate modern infrastructure needs, such as electric vehicle charging or redundant power for high-tech uses.

Stormwater and Environmental Management – Encourage green infrastructure approaches such as rain gardens. Protect floodplains, wetlands and steep slopes through development standards that minimize site disturbance. Require landscaping and tree plantings in parking areas and throughout sites to improve air quality and mitigate heat island effects.

Site Layout and Design Standards – Establish minimum requirements for parking, loading areas and internal circulation that reflect industrial needs without overbuilding. Require screening of loading docks, outdoor storage and mechanical equipment from public rights-of-way and adjacent residential areas. Require pedestrian and bicycle infrastructure to support workforce mobility and safety, including sidewalks, lighting, bus shelters, and safe crossings.

Worker and Driver Amenities – Encourage or require workforce amenities such as break areas, green space and driver facilities.

Regional Coordination – Incorporate external agencies including the Lehigh and Northampton Transportation Study (LANTA) and LVPC early and often in review processes.

Strategies for Addressing Industrial Land Uses

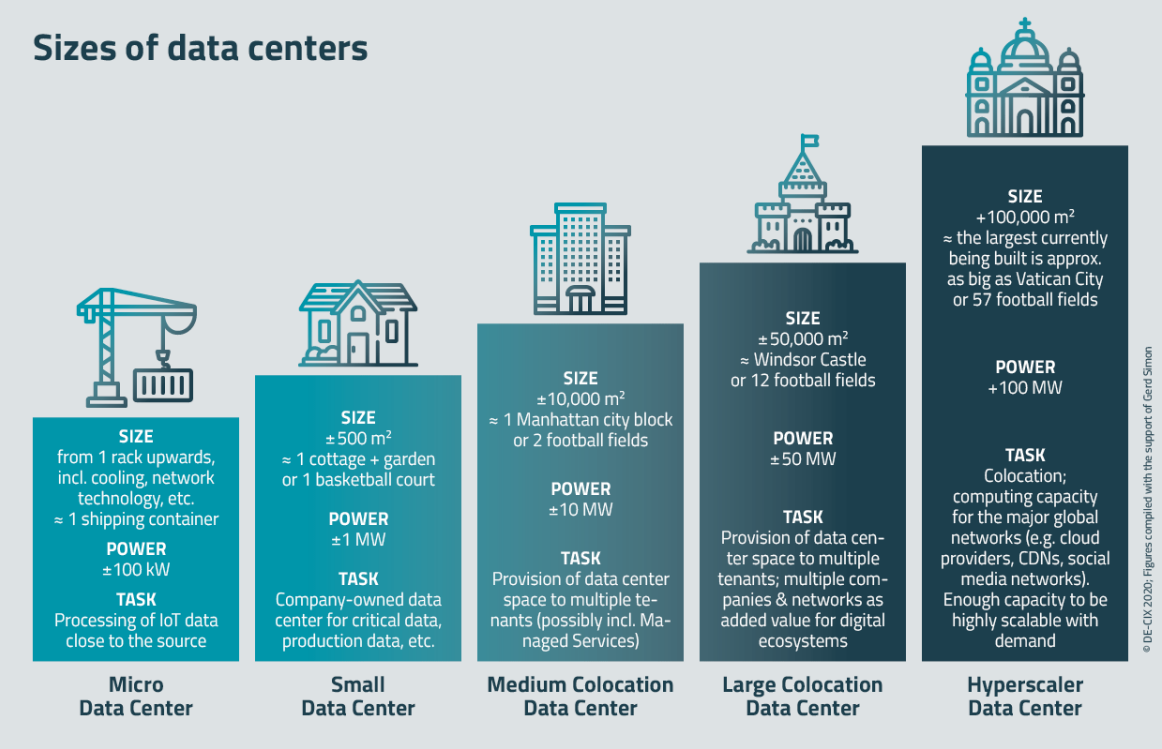
Emerging and Evolving Industrial Land Uses

Evolving and emerging industrial land uses are grouped into several categories: Digital Infrastructure and Tech Facilities driven by modern-day use of computers and data exchange, Advanced Manufacturing driven by technological advancements, Freight, Logistics and Supply Chain as systems increasingly incorporate automation to maximize efficiency, Energy Generation and Storage to power these utility-intensive land uses, and Resource Extraction as the industry's materials needs shift.

Digital Infrastructure and Tech Facilities

Data Centers

Data centers are facilities that house physical hardware, like computer servers and telecommunications and storage systems, that enable the digital world. When you use devices such as a smartphone or laptop, it's not the device itself that processes your requests. The device sends your request to a data center, where data is accessed, processed, and returned to your device to complete the request, typically within a fraction of a second. Hyperscale Data Centers are growing rapidly across the country in tandem with the proliferation of artificial intelligence and cloud computing.



Data centers must be operational 24 hours a day, seven days (24/7) a week and require uninterrupted electricity supply. The equipment produces a lot of heat, and robust

cooling systems are required for proper functioning. Most of these cooling systems are water-based and may require between 20,000 gallons per day for smaller data centers to over 500,000 gallons per day for large data centers.

Photo Credit: TierPoint.Com

TierPoint Allentown Data Center, Upper Macungie Township, Lehigh County is a medium-sized colocation center of 122,000-square-feet. *(See Ex. 1 Photo)*

Photo Credit: Morning Call

Cumulus Data, Salem Township, Luzerne County, is a hyperscale data center on a 1,200-acre campus that is tied to Talen Energy's neighboring nuclear power station.

Cryptocurrency Mining

Cryptocurrency mining facilities operate high-powered computers that validate blockchain transactions and generate digital currency. Unlike data centers, which process and store information for many users, cryptocurrency mines are single-purpose computing operations designed to solve complex mathematical equations. These facilities are often housed in warehouses or modular container units and rely on constant electricity supply and heavy-duty cooling systems to maintain safe operating temperatures.

Cryptocurrency mining is extremely energy-intensive and can create substantial strain on local power grids. While some operations locate near renewable energy sources, many depend on fossil-fuel-based electricity, leading to measurable air quality and climate impacts. The number of large-scale cryptocurrency mines in the United States remains relatively small but is expected to grow as digital currencies gain acceptance and the technology becomes more commercially viable.

Photo Credit: Morning Call

Panther Creek Power Plant, Nesquehoning Borough, Carbon County, is owned by a cryptocurrency mining operation and powers its facilities by burning waste coal for power.

Telecommunications Hubs

Telecommunications hubs, sometimes called network exchange points, carrier hotels, or telecom switching facilities, are specialized sites that house the equipment and infrastructure enabling digital communication networks. These facilities connect internet service providers, mobile carriers, data centers and cloud platforms, allowing data to move efficiently across regional, national and international systems.

While data centers primarily store and process large volumes of digital information for cloud computing, telecommunications hubs focus on transmission and routing -- the physical interconnection points that keep networks operational. Telecom hubs often occupy smaller buildings than data centers but require similar infrastructure, such as redundant power supply, advanced cooling and robust security systems.

Image Credit: Google Aerial Imagery
60 HUDSON, Manhattan, New York City, is 24-story telecommunications building that was the former headquarters of Western Union, providing telegraph services and leased office space until 1973, that is now one of the most important internet hubs worldwide.

Key Impacts Across Digital Infrastructure Uses

Energy Demand and Grid Reliability	• High and constant electricity demand • Potential strain on local substations and transmission networks • Need for redundancy and emergency power
Cooling, Water Use and Heat Generation	• Significant heat output from information-processing equipment • Cooling systems that may use water, large air-handling units or mechanical chillers • Potential opportunities for heat recovery or reuse
Noise and Environmental Factors	• Persistent noise from fans, chillers, air-handling units, transformers and generators • Air emissions from backup generators or on-site fossil-fuel power sources (more common in crypto mining) • Stormwater impacts from large impervious surfaces and roof areas
Visual and Design Considerations	• Windowless or utilitarian buildings, equipment yards, outdoor containerized units • Need for screening, buffering and architectural standards • Antenna structures and small-cell nodes at telecom hubs
Emergency Response and Resiliency	• Hazard mitigation for electrical systems, batteries and fire suppression • Requirements for 24/7 access and operations continuity • Elevated risk considerations due to heat, high voltage and redundant power systems
Community Compatibility	• Siting concerns near residential areas • Public perceptions about electromagnetic frequency (telecom), fossil-fuel dependency (crypto) or noise (all uses)
Construction Traffic	• Increased passenger vehicle traffic due to construction workers accessing site • Heavy equipment traffic when building is under construction • Truck traffic to transport data center equipment

Mitigation Strategies & Best Practices

Comprehensive Plans Should:

- Inventory and establish goals and policies for the protection of existing natural and historic resources
- Inventory, analyze and project existing and future community facilities and utility needs. Establish goals and policies directing digital infrastructure land uses to adequate utility capacity
- Establish goals and policies supporting the expansion of broadband and fiber internet infrastructure

- Identify the economic development potential of digital infrastructure facilities, as emerging industrial land uses with impacts that must also be mitigated if encouraged to locate in the community
- Establish policies that encourage protection of residential areas and community-centered land uses from environmental impacts of land uses adverse to public health and quality of life
- Establish sustainability goals and policies encouraging renewable or carbon-neutral energy usage
- Reference other planning documents such as Sewage Facilities Plans, Hazard Mitigation Plans, Energy Conservation Plans, Capital Improvement Plans; and/or identify creating or updating such documents as Comprehensive Plan implementation steps

Zoning Ordinance Considerations

- Definitions
    - Include a broad definition for “Data Centers” that encompasses all aspects of digital infrastructure land uses
    - Differentiate “Data Centers” as a primary use from an accessory data center
- Districts
    - Direct Data Centers to appropriate areas with:
        - Compatible land uses such as technology/innovation districts, light or heavy industrial districts, business parks or highway commercial areas
        - Adequate electrical capacity
        - Public water service availability
        - Public sewer service availability
        - Access to broadband and/or fiber networks
        - Adequate transportation access for construction and emergency vehicles.
    - Avoid siting in or near:
        - Areas with inadequate infrastructure, such as rural areas
        - Floodplains, wetlands and other natural constraints
        - Residential neighborhoods or community facilities
    - Consider creating overlay districts to ensure adequate siting
- Regulations and Performance Standards
    - Permit “Data Center” as a conditional use to establish criteria and a process for additional oversight
    - Specify building scale and design standards, including building height, orientation and façade treatments
    - Establish adequate setbacks and buffering
    - Establish standards limiting noise levels at property lines
    - Establish standards limiting light levels at property lines and projected onto adjacent properties
    - Specify a contextual parking requirement, such as one space per employee

Subdivision & Land Development Ordinances Should:

- Utility Capacity & Infrastructure
    - Demonstrate adequate water, sewer and electric capacity, with confirmation from utility provider.
- Site Design
    - Require Pennsylvania-native landscaping throughout sites and within buffer areas
    - Require visually aesthetic enclosures around outdoor equipment
    - Require adequate site access for emergency vehicles
        - Incorporate emergency service provides in the development review process
- Impact assessments should require community and environmental impact statements evaluating:
    - Energy and water demand
    - Emissions and air quality impacts
    - Noise levels
    - Emergency service requirements
    - Municipal fiscal impacts

Advanced Manufacturing

Biotechnology

Biotechnology or Biotech is a field using living organisms or systems to develop products, processes or services. The field includes biofabrication, which can produce lab-grown meats and animal-free materials such as leather or fur, create bio-based fuels and plastics, and manufacture advanced medical products like implantable organs and 3D tissue models for drug testing. These industries collectively hold potential to transform manufacturing, energy and healthcare while addressing global challenges such as sustainability, ethical production and resource scarcity.

In Lehigh County, the region's strong healthcare sector, higher education institutions, and established manufacturing base position it well for future growth. Facilities typically resemble research laboratories or small-scale production sites and require reliable utilities, advanced ventilation, temperature control and specialized waste management systems. As the sector evolves, municipalities will need to plan for the unique spatial, environmental and regulatory requirements of this rapidly developing field.

Example

Image Credit: Google Aerial Imagery
OraSure Technologies, in Bethlehem, manufactures medical diagnostic testing and collection devices.

3D and Large-Scale Printing

3D printing, also called *additive manufacturing*, uses computer-guided equipment to build three-dimensional objects layer by layer from digital models. While small-scale 3D printing is already common in prototyping and component fabrication, large-scale additive manufacturing applies this technology to produce full-size building elements, bridges, vehicles, and industrial components. These operations often utilize materials such as concrete, metal, polymer or composite blends and may locate within light industrial or research and development facilities.

Unlike traditional manufacturing, which removes material from a solid block, additive processes use only what is needed, significantly reducing waste and allowing greater design flexibility. As costs decrease, large-format printers are expected to become more common in construction, infrastructure and custom manufacturing sectors, changing the spatial and infrastructure needs of industrial areas.

Photos Credit: Black Buffalo 3D Corporation

Black Buffalo 3D Corporation, formerly located in East Stroudsburg Borough, Monroe County PA, 3D prints construction materials and built the first internationally code compliant 3D-printed home (located in Fort Worth, TX).

Microchip Manufacturing

Microchip manufacturing facilities, also known as semiconductor fabrication plants or “fabs”, produce the chips that power everything from smartphones and vehicles to medical devices and national defense systems. The industry includes both front-end wafer fabrication, where silicon wafers are imprinted with microcircuits, and back-end assembly, testing and packaging (ATP), where chips are cut, tested and prepared for integration into finished products.

Driven by global supply chain shifts and national security priorities, the CHIPS and Science Act of 2022 has spurred new investment in domestic semiconductor production to reduce reliance on overseas manufacturing. The Lehigh Valley’s existing logistics infrastructure, workforce base and proximity to major metropolitan markets make it a competitive location for semiconductor investment -- illustrated by proposals such as the Infinera packaging facility in Bethlehem.

These facilities typically require large-scale buildings, extensive water and energy resources, high-skill labor, and robust transportation networks for inbound materials and outbound products. Their complexity and scale make proactive planning essential to ensure compatibility with community goals, infrastructure capacity, and environmental standards.

Image Credit: Google Aerial Imagery
Coherent Corp., Palmer Township, produces materials for semiconductors.

Key Impacts Across Advanced Manufacturing Uses

Infrastructure & Utility Demand	• High and potentially continuous electric demand • Significant water demand, especially for bioengineering and semiconductor fabrication • High-capacity cooling • Potential need for substantial utility upgrades
Environmental Factors	• Air emissions and ventilation needs • Specialized waste streams • Significant heat generation from processing equipment • Noise from machinery, ventilation systems and freight activity
Freight, Logistics & Transportation	• Frequent deliveries of specialized materials • Passenger vehicle traffic associated with workforce shifts • Freight traffic from shipping materials and product
Building Scale & Site Characteristics	• Varying building footprints • High-clearance interior spaces for some 3D processes. • Outdoor equipment yards and mechanical systems
Hazard Management & Emergency Response	• Complex hazard profiles including biological materials, combustible powders/metal dust, or hazardous chemical agents • Heightened fire-suppression needs

Mitigation Strategies & Best Practices

Comprehensive Plans Should:

- Inventory and establish goals and policies for protecting natural and historic resources that may be affected by high-intensity advanced manufacturing operations.
- Inventory, analyze and project community facility and utility needs, including water, sewer, electric, broadband, and emergency service capacity. Establish policies directing advanced manufacturing uses to areas with adequate infrastructure.
- Identify the economic development potential of advanced manufacturing, particularly sectors such as bioengineering, 3D printing, and semiconductor fabrication, while recognizing the need to mitigate their utility, environmental and freight impacts.
- Designate suitable areas for advanced manufacturing within industrial, technology, or research corridors, especially near workforce, higher education institutions transportation networks, and existing utility infrastructure.
- Support sustainability and innovation goals, including energy efficiency, renewable or low-carbon energy use, waste minimization, and opportunities for material reuse or circular manufacturing processes.
- Integrate workforce and training initiatives by referencing or coordinating with higher education, technical training centers, and industry partnerships supporting biotechnology, robotics, fabrication, and semiconductor disciplines.
- Reference related planning documents (Sewage Facilities Plans, Hazard Mitigation Plans, Energy Conservation Plans, Capital Improvement Plans, etc) and identify updates to these plans as Comprehensive Plan implementation steps.

Zoning Ordinances Considerations

Definitions

- Include clear definitions for Bioengineering/Biofabrication Facilities, Additive or 3D Manufacturing Facilities, and Microchip/Semiconductor Manufacturing Facilities to distinguish them from general manufacturing or research laboratories.
- Differentiate primary manufacturing operations from accessory research, testing, or prototyping uses.

Districts

- Direct advanced manufacturing uses to districts with:
    - Compatible industrial, technology, innovation or business-park land uses
    - Adequate and reliable electric capacity
    - Adequate public water and sewer capacity (especially for biotech and semiconductor fabrication)
    - Access to freight routes and goods-movement corridors
    - Sufficient broadband or fiber-optic infrastructure

    - Adequate transportation access for deliveries, workforce and emergency services
- Avoid siting in or near:
    - Residential neighborhoods or sensitive community facilities
    - Areas with inadequate utility infrastructure
    - Floodplains, wetlands, and environmental constraint areas
- Consider overlay districts for advanced manufacturing clusters to standardize siting, design, and impact-mitigation requirements.

Regulations and Performance Standards

- Permit advanced manufacturing uses as conditional uses or special exceptions to establish evaluation criteria and provide additional oversight of facility intensity, environmental impacts, and freight activity.
- Specify building scale and design standards, including height, façade treatments, screening of mechanical equipment, and building orientation.
- Establish setbacks and buffering to protect adjacent uses.
- Establish noise and light standards at property lines.
- Require contextual parking requirements, scaled to workforce needs.
- Require compliance with specialized codes where applicable, such as biosafety regulations (bioengineering), fire and ventilation codes for industrial robotics (3D printing), or cleanroom and chemical-handling standards (semiconductors).

Subdivision & Land Development Ordinances Considerations

Utility Capacity & Infrastructure

Require applicants to demonstrate, with utility-provider confirmation:

- Adequate water capacity, critical for biotech and semiconductor fabrication.
- Adequate sewer capacity for process discharge and wastewater flows
- Adequate electric capacity, with documentation of continuous power needs and redundancy
- Adequate broadband/fiber capacity for digitally intensive manufacturing
- Identification of required infrastructure upgrades, with developer responsibility where appropriate
-

Site Design

- Require Pennsylvania-native landscaping and buffer plantings.
- Require aesthetic enclosures around outdoor equipment, mechanical systems, chemical storage areas, and utility yards.
- Require adequate emergency vehicle access, including turning radii, drive aisle widths, and fire-suppression system access.
    - Incorporate local emergency service providers into the review process.
- Require plans showing ventilation exhaust locations, emissions-control systems, and equipment requiring special containment.

Impact Assessments

Require Community and Environmental Impact Statements evaluating:

- Energy demand and reliability requirements
- Water demand and wastewater generation
- Emissions, chemical usage, and air-quality impacts
- Noise and vibration levels
- Hazardous or specialized waste streams, such as biological, chemical, particulate
- Emergency service requirements
- Municipal fiscal impacts
- Freight and truck movement patterns, especially for semiconductor and additive manufacturing

Freight, Logistics and Supply Chain

Freight is an essential function of every economy, connecting producers, suppliers and consumers both within the region and far beyond. The facilities that support freight movement vary widely in size and purpose, and accommodate a diverse range of activities, including manufacturing, assembly, storage, staging and distribution. Freight-based land uses in Lehigh County depend on efficient connectivity by road, rail and air, and can take many forms such as distribution centers, fulfillment centers, truck terminals, industrial or business parks and light manufacturing operations.

Many modern freight facilities are multi-tenant or multi-purpose, designed for flexibility so different users can cycle in and out as business needs evolve. This adaptability allows the regional industrial market to respond quickly to economic shifts but can also complicate local planning, as turnover in tenants may lead to changing traffic, infrastructure, and environmental impacts. Inside the walls of these facilities, operations are often highly integrated. Production, assembly, packaging and distribution may occur under one roof or across multiple buildings within the same business park. In some cases, adjacent or nearby facilities operate in synergy, forming industrial ecosystems that depend on proximity and shared infrastructure.

Municipalities are encouraged to align definitions for all freight-based land uses with the Institute of Transportation Engineers (ITE) Trip Generation Manual, provided below. The ITE is the industry standard for estimating the traffic impacts of land uses, and aligning definitions helps ensure that facilities with freight impacts address transportation infrastructure needs. Freight-Based Facilities can be generally classified into the following high-level categories:

- Manufacturing
- Warehousing (with subsets)
- Fulfillment Center
- Industrial/Business Parks
- General Light Industrial

Manufacturing

ITE Definition: “A manufacturing facility is an area where the primary activity is the conversion of raw materials or parts into finished products. Size and type of activity may vary substantially from one facility to another. In addition to the actual production of goods, a manufacturing facility typically has an office and may provide space for warehouse, research, and associated functions.”

Manufacturing facilities focus on producing finished goods, often with supporting functions such as research, warehousing and office operations. While manufacturing sites generate freight movements, the majority of trips are typically employee-related. Truck volumes depend on whether raw materials are stored on-site or off-site and on the scale of distribution operations. Because operational intensity and floor area use can vary by tenant or industry, zoning and land development standards should allow flexibility to accommodate different manufacturing processes over time.

Image Credit: Google Aerial Imagery
Keurig Dr. Pepper Manufacturing/Distribution Center, Upper Macungie Township, manufactures packaged beverages in one building and robotically moves items to the adjacent warehouse and staging building.

Warehousing
ITE Definition: “A warehouse is primarily devoted to the storage of materials, but it may also include office and maintenance areas.”
Related uses include *high-cube transload and short-term storage warehouses (Land Use 154)*, *high-cube fulfillment centers (155)*, *parcel hub warehouses (156)*, and *cold storage warehouses (157).*

Warehouses are primarily storage and logistics facilities that may include limited office or employee support space. Transportation impacts depend on the type of operation -- short-term storage, transload, or specialized high-cube warehousing for e-commerce and parcel distribution. These facilities often generate moderate to heavy truck traffic, particularly during peak shipping hours. Zoning should distinguish among warehouse subtypes to ensure appropriate performance standards for circulation, access and buffering.

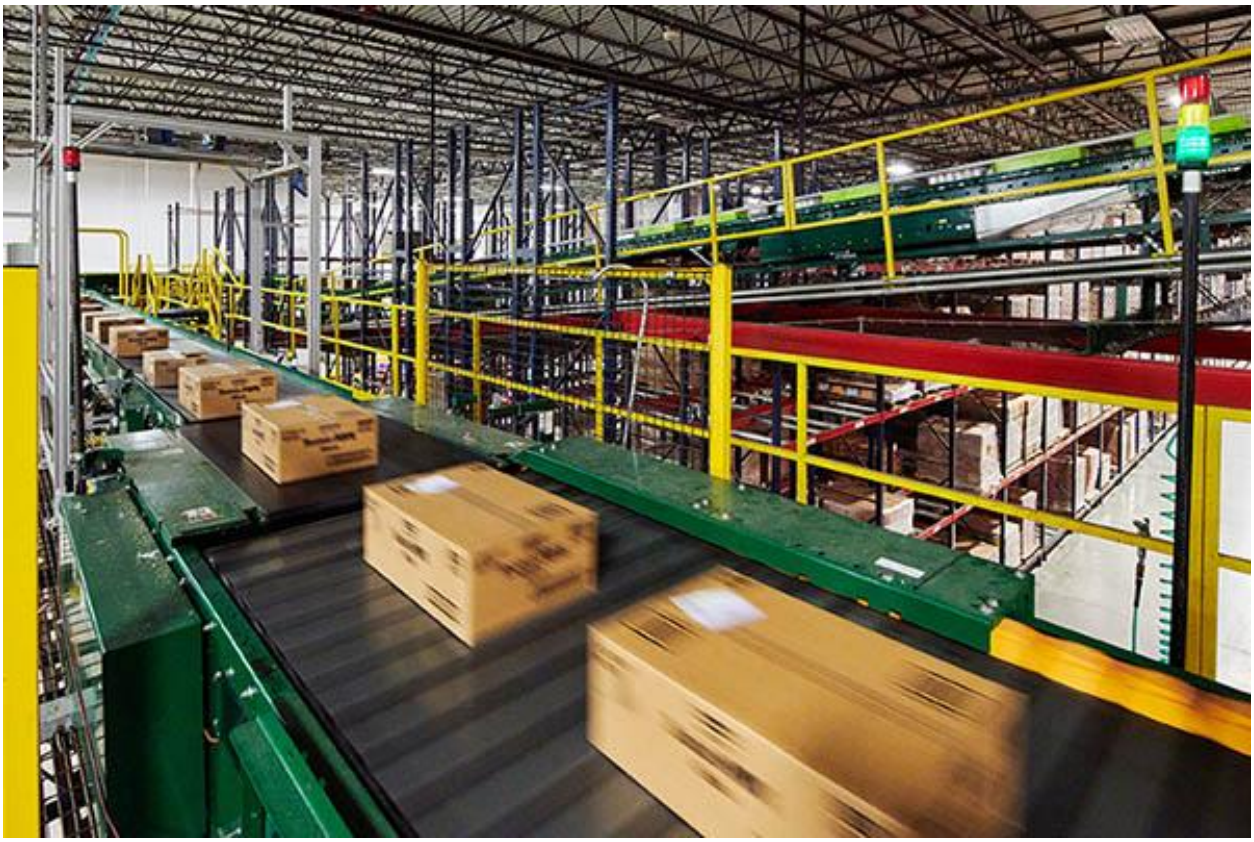


Photo Credit: Prologis

Prologis Park 33, Lower Nazareth Township, has an automated system that demonstrates advancements in smart buildings to lower carbon footprints and make supply chain and logistics systems more sustainable.

Fulfillment Centers

ITE Definition: Fulfillment centers are categorized as sort or non-sort facilities.

- *Sort facilities* handle smaller items requiring extensive manual sorting, typically with high employee counts and greater vehicle trip generation.
- *Non-sort facilities* process larger items primarily through automated systems, resulting in fewer employees per square foot but similar freight activity.

Fulfillment centers represent the most logistics-intensive subset of warehousing, driven by e-commerce operations. These facilities often operate 24/7, generating high truck volumes and employee traffic during shift changes. Because of their size and transportation impacts, municipalities should require traffic impact studies, manage truck routing and ensure adequate infrastructure capacity through the land development process.

Photo Credit: Google Aerial Imagery
Amazon Fulfillment Centers, Upper Macungie Township.

Parcel Hubs/Distribution Centers

ITE Definition: A form of high-cube warehouse that serves as a regional and local freight-forwarder facility via airfreight and ground carriers.
Parcel Hubs/Distribution Centers are high intensity freight-based land uses that often have very large building footprints and generate significant peak-hour traffic.

Photo Credit: Google Aerial Imagery
Fedex Ground Hub Lehigh Valley, Allen Township.

Key Impacts Across Freight-Based Land Uses

Transportation & Freight Movement	• High truck traffic volumes • Increased passenger vehicle traffic during employee shift changes • Need for safe truck routing from site to interchanges • Need for multiple transportation modes, especially transit, to meet workforce needs
Site Circulation & Access	• Tractor-trailer movements require large parking and circulation areas, truck staging, employee parking, and loading docks. • Internal circulation conflicts between passenger vehicles and trucks
Infrastructure & Utility Demand	• Roadway infrastructure demand, including pavement wear from heavy truck loads • Need for adequate public utilities to support industrial operations. ○ Cold storage and increased automation increase utility demand
Environmental Factors	• Noise from trucks, loading docks and refrigeration units. • Air quality impacts from truck emissions and generators. • Light pollution from loading dock areas and security lighting. • Impervious surface coverage contributing to stormwater runoff and heat generation.
Land Use Impacts	• Large buildings with significant height and massing • Tenant turnover may change impacts and operational intensity

Mitigation Strategies & Best Practices – Freight-Based Land Uses

Comprehensive Plans Should:

- Inventory and analyze existing transportation, utility and community facility capacity that support freight-based development.
- Identify appropriate areas for freight-based uses, such as industrial districts and areas with direct access to major roadways, rail or airports.
- Set goals and policies that protect residential and community-centered uses from freight-based land use impacts.
- Align future land use designations with regional freight networks, focusing on corridors with adequate capacity and multimodal goods-movement opportunities.
- Support economic resilience by recognizing the role of freight-oriented businesses, while balancing this with policies that mitigate transportation and environmental impacts.
- Incorporate sustainability goals, including reducing emissions, managing stormwater from large impervious surfaces, and encouraging renewable or energy-efficient systems.
- Reference related planning documents, such as Transportation Improvement Programs, Act 209 Traffic Impact Fee Studies, Hazard Mitigation Plans,

Comprehensive Parks and Recreation Plans, and Capital Improvement Plans. Identify any necessary updates as Comprehensive Plan implementation steps.
- Promote intermunicipal coordination, especially where freight activity crosses municipal boundaries or relies on shared roadway and infrastructure systems.

Zoning Ordinance Considerations:

Definitions
- Align definitions for Manufacturing, Warehousing, High-Cube Warehouses, Fulfillment Centers, Parcel Hubs, Industrial Parks, and Light Industrial Facilities with the ITE Trip Generation Manual to support accurate transportation impact evaluation.
- Differentiate primary freight-based uses from accessory functions such as small-scale storage, incidental shipping, or on-site fleet parking.

Districts
- Direct freight, logistics, and supply chain uses to zoning districts with:
  - Adequate truck access to highways and key freight corridors
  - Appropriate roadway capacity and turning geometry
  - Public water and sewer availability
  - Suitable electric and broadband infrastructure
  - Safe multimodal access for employees and emergency services
- Avoid siting freight-intensive uses in or near:
  - Residential neighborhoods
  - Schools, parks, and community facilities
  - Areas with inadequate roadway capacity or geometric constraints
  - Environmental constraint areas, such as floodplains and wetlands
- Use overlay districts to direct high-intensity uses to strategic areas.

Regulations and Performance Standards
- Permit major freight-based uses as conditional uses to allow additional oversight of traffic, noise, lighting and environmental impacts.
- Establish building design and site-scale standards, including height, façade treatments and orientation of loading docks away from sensitive uses.
- Require adequate setbacks and buffering from adjacent properties.
- Establish and enforce noise limits at property lines, especially near residential or mixed-use districts.
- Establish lighting standards that limit glare and light spillover onto adjacent properties.
- Require adequate parking, loading and queueing spaces.
  - Specify the inclusion of electrified tractor-trailer stalls and employee parking spaces.

Subdivision & Land Development Ordinances Considerations
Utility Capacity & Infrastructure
- Require site access via specified level of roadways with adequate capacity.

- Require applicants to demonstrate adequate public water and sewer service with confirmation from utility or infrastructure providers.

Site Design

- Require Pennsylvania-native landscaping and buffering, especially along building edges, loading areas, and property lines near non-industrial uses.
- Require visually aesthetic enclosures for loading docks, trailer parking, dumpsters, utilities, and mechanical equipment.
- Ensure safe and adequate site access for emergency vehicles, considering turning radii, drive aisle widths, and multiple access points for very large sites.
    - Incorporate emergency service providers in the development review process.
- Require on-site circulation plans that prevent on-road queueing and ensure safe separation between truck traffic and employee or visitor traffic.

Impact Assessments

Require Community and Environmental Impact Statements evaluating:

- Trip generation, including truck volumes and peak-hour movements
- Traffic impacts on surrounding roadways and intersections
- Noise levels from trucking, mechanical systems, and 24/7 operations
- Emissions and air-quality impacts
- Emergency service needs and response requirements
- Municipal fiscal impacts, including infrastructure maintenance
- Freight routing patterns and mitigation of cut-through traffic in residential areas

Autonomous Vehicles and Freight-Based Land Uses

Autonomous vehicles (AVs) are self-driving technologies that use sensors, cameras, radar, and artificial intelligence to navigate without or with limited human input. Within the freight and logistics sector, autonomous technologies are emerging most rapidly in long-haul trucking, last-mile delivery, and yard or warehouse operations.

Freight AVs range from autonomous tractor-trailers operating on major highway corridors to automated yard tractors, forklifts, and delivery robots functioning within controlled industrial environments. Fully autonomous trucking is permitted on public roads, with the Pennsylvania Legislature signing Act 130 into law in 2022, which authorizes automated vehicles on roadways with PennDOT certification. As technology advances, logistics companies are investing heavily in AV-ready infrastructure, such as smart distribution centers, digitally connected loading areas, and logistics corridors designed for safe, efficient automation.

In the Lehigh Valley, where freight volumes are among the highest in Pennsylvania, autonomous vehicle technologies are expected to play a growing role in improving efficiency and addressing labor shortages in trucking and warehouse operations. However, these innovations will also have land use, infrastructure, and safety implications that municipalities should anticipate in local planning and regulatory frameworks.

Best Practices

Comprehensive Plans Should:

- Recognize autonomous freight technology as a long-term trend in goods movement and incorporate related infrastructure and workforce implications into transportation, land use, and economic development elements.
- Identify AV-ready freight corridors and industrial districts where connected infrastructure can be prioritized, particularly near interstates, intermodal facilities, and business parks.
- Encourage partnerships with PennDOT, LVPC, and private-sector logistics operators to coordinate pilot programs and share data on automation impacts.

Zoning Should:

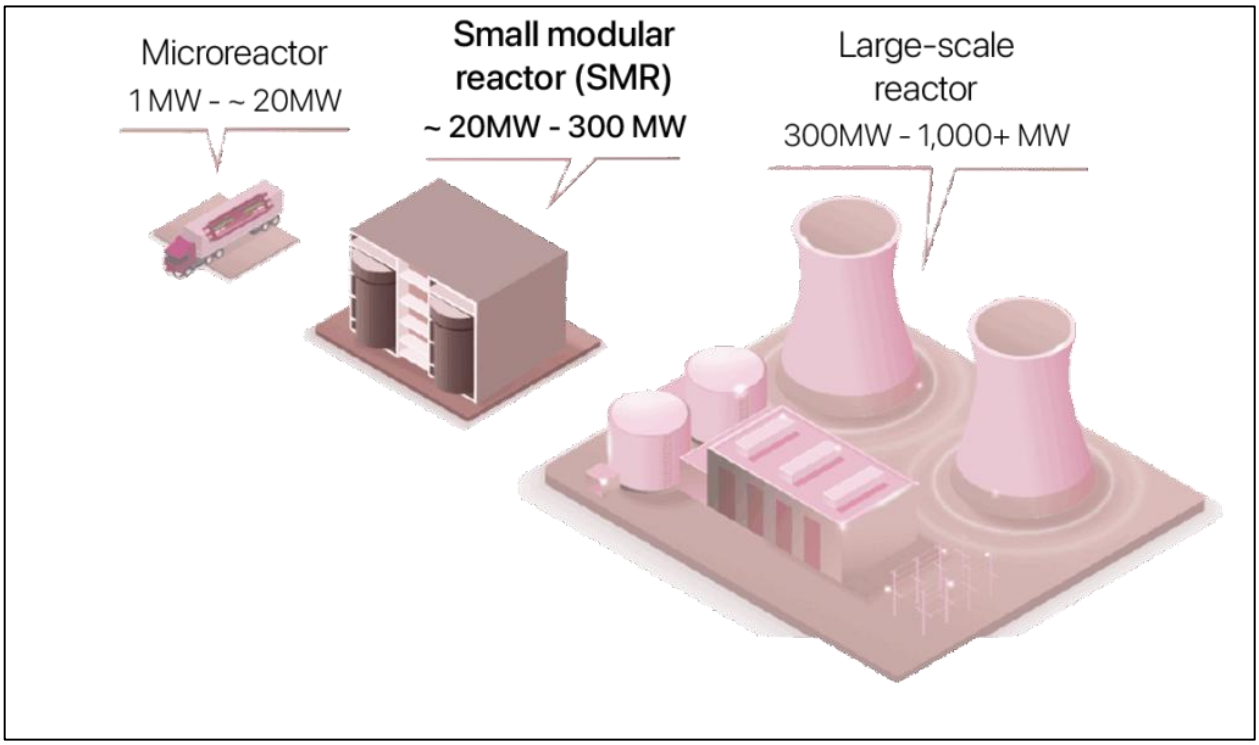
- Define autonomous vehicle facilities (such as AV truck hubs, testing centers, or charging depots) as specific use categories within industrial or logistics districts.
- Require performance standards for noise, lighting, and safety systems associated with continuous automated operations.
- Support adaptive reuse of existing freight facilities for AV staging, fleet charging, and maintenance, ensuring compatibility with surrounding uses.

Subdivision and Land Development Ordinances Should:

- Require site plans to account for automated circulation patterns, vehicle staging, and emergency access routes within industrial developments.
- Encourage the integration of smart infrastructure—including sensors, fiber optic connectivity, and electric vehicle (EV) charging stations—into new industrial park designs.
- Coordinate with PennDOT and regional planning agencies to ensure new development aligns with connected-vehicle infrastructure standards and emerging statewide AV policies.

Energy Generation, Storage and Management

Nuclear Energy
Nuclear facilities generate electricity through controlled nuclear reactions that produce heat. Although Pennsylvania hosts large regional facilities, future trends may include small modular reactors (SMRs) designed to serve regional grids, or microreactors suitable for industrial campuses.



Graphic Credit: Stanford University, adapted from U.S. Department of Energy

Impacts:
- Require extensive siting buffers for safety and security
- Large cooling water demands and potential thermal discharges to waterways
- Transportation of nuclear fuel and waste presents regional logistics and safety considerations
- Visual and psychological impacts due to public perception and security infrastructure

Best Practices

Comprehensive Plans should:
- Identify appropriate regional-scale energy generation areas near transmission infrastructure.
- Address emergency preparedness, evacuation routes, and coordination with state and federal agencies.

Zoning should:

- Establish nuclear energy generation as a conditional use or special exception, requiring review for safety, setback, and emergency coordination.
- Require substantial setbacks from residential districts, public facilities, and water supplies.
- Consider overlay zones for large-scale energy infrastructure that encompass utilities, transmission, and supporting facilities.

Subdivision & Land Development Ordinances should:

- Require detailed site plans including stormwater management, cooling water systems, and transportation access.
- Coordinate with emergency management agencies for construction and operations planning.

Solar Energy

Solar energy systems convert sunlight into electricity using photovoltaic (PV) panels or solar thermal technologies. Systems range from small rooftop installations to utility-scale solar farms spanning dozens or hundreds of acres.

Photo Credit: Morning Call

A 30-acre solar array could generate enough power for approximately 10,000 homes depending on conditions.

Impacts:

- Large ground-mounted arrays may alter rural landscapes, consume farmland and affect stormwater runoff.
- Reflectivity and glare can impact nearby roads or airports.
- Decommissioning and recycling of panels require long-term management plans.

Best Practices

Comprehensive Plans Should:

- Designate suitable areas for solar energy, prioritizing brownfields, rooftops, parking lots and other previously disturbed lands.
- Integrate solar siting goals into future land use and energy resilience planning.

Zoning Should:

- Define solar energy systems by types, such as accessory, community-scale, and utility-scale.
- Establish performance standards for glare, screening, setbacks, fencing and pollinator-friendly groundcover.
- Consider agricultural zoning flexibility for dual-use “agrivoltaics” projects that combine farming and energy production.

Subdivision & Land Development Ordinances Should:

- Require plans for grading, drainage and soil stabilization under arrays.
- Include decommissioning and financial assurance requirements to restore land to pre-development conditions.
- Ensure access roads and fire lanes meet emergency service needs.

Hydroelectric

Hydroelectric power uses flowing or stored water to turn turbines and produce electricity. While large dams are uncommon in Lehigh County, smaller run-of-river and micro-hydro projects may emerge on existing waterways or dam retrofits.

Photo Credit: Google Maps – at Riverview Park, Palmer Township, a hydroelectric plant is conceptualized adjacent to the Chain Dam along the Lehigh River that could produce two megawatts of power, enough to energize 1,000 homes.

Impacts:

- Alteration of aquatic habitats and stream flow
- Fish migration barriers and sedimentation changes
- Potential flooding, erosion, or downstream water quality effects
- Safety considerations for public recreation and access near facilities

Best Practices

Comprehensive Plans should:

- Identify opportunities for renewable energy production using existing dams or water infrastructure.
- Incorporate watershed and ecological protection objectives in energy planning.

Zoning should:

- Limit siting to areas with existing hydrologic infrastructure or previously altered waterways.
- Require coordination with the Pennsylvania Department of Environmental Protection (DEP) and U.S. Army Corps of Engineers.
- Include riparian buffer and floodplain protection requirements.

Subdivision & Land Development Ordinances should:

- Require hydrologic and environmental studies prior to approval.
- Evaluate impacts on public access, recreation, and streambank stabilization.
- Incorporate erosion and sedimentation control standards specific to water-based facilities.

Wind Energy

Wind energy facilities convert the kinetic energy of wind into electricity using turbines. Projects may be utility-scale, with large towers on ridgelines or open plains, or small-scale for agricultural or commercial sites.

Photo Credit: Morning Call

Approximately 100 acres of wind turbines powers 10,000 homes.

Potential Impacts:

- Visual and aesthetic changes to landscapes and ridgelines.
- Noise and shadow flicker effects on nearby residences.
- Bird and bat mortality, especially in migratory corridors.
- Construction access impacts on rural roadways and hillsides.

Best Practices

Comprehensive Plans should:

- Map ridgelines, open plains and other areas with sufficient wind resources while protecting scenic and environmental resources.
- Incorporate policies for renewable energy production and community benefit sharing.

Zoning should:

- Define wind energy systems by scale (small, community, utility).

- Require setbacks from dwellings, property lines, and public rights-of-way based on turbine height.
- Include performance standards for noise, shadow flicker, and decommissioning.
- Require visual impact assessments and coordination with FAA and state aviation agencies for turbine height compliance.

Subdivision & Land Development Ordinances should:

- Require construction access and grading plans that minimize erosion on steep slopes.
- Include decommissioning and site restoration requirements with financial guarantees.
- Ensure turbine foundations and electrical systems meet local and national safety codes.

Storage of Power

Battery Energy Storage Systems (BESS) capture and hold energy for later use, improving grid reliability and supporting renewable integration. Systems may include battery storage (lithium-ion or flow batteries)**,** thermal storage**,** or compressed air systems**,** ranging from small on-site installations to large standalone “battery farms.”

Photo Credit: Energy Storage News
EOS Energy Enterprises manufactures battery storage systems in Turtle Creek Borough, Allegheny County PA.

Impacts:

- Fire safety and explosion risks from battery failures
- Noise and heat generation from cooling and ventilation systems
- Visual and compatibility issues in residential or mixed-use areas
- Decommissioning and disposal of batteries requiring specialized handling

Best Practices

Comprehensive Plans should:

- Integrate microgrids into community resilience strategies for storms, grid failures, and critical facilities (e.g., hospitals, data centers)
- Plan for integration with the utility grid, broadband, and emergency management systems.

Zoning should:

- Allow in industrial, commercial, institutional or mixed-use zones where more energy-consumptive land uses are located.
- Provide expedited permitting or density/intensity bonuses for renewable-powered facilities.
- Establish energy storage as a distinct use, separate from general utilities or manufacturing.
- Require compliance with National Fire Protection Association (NFPA) 855: Standard for the Installation of Stationary Energy Storage Systems.
- Include setbacks, screening and fire safety access standards.
- Consider requiring special exception review for large standalone systems to ensure compatibility.

Subdivision & Land Development Ordinances should:

- Require plans to show electrical connections, battery storage enclosures, emergency access, fire suppression systems and noise buffers.
- Require fire safety measures, hazardous material handling protocols and coordination with local first responders.
- Include decommissioning and recycling plans for spent batteries or equipment.

Alternative Fueling

As the transportation and industrial sectors transition toward cleaner and more efficient technologies, alternative fueling infrastructure is becoming a critical component of local and regional energy systems. These facilities support vehicles powered by electricity, hydrogen, and compressed natural gas (CNG), each with unique siting, safety, and infrastructure needs.

For municipalities, planning for these land uses helps reduce emissions, strengthen regional competitiveness, and ensure the local road network and utility systems are ready for the next generation of freight and passenger vehicles.

Electric Vehicle Charging Stations

Electric vehicle (EV) charging stations deliver electrical power to recharge battery-electric or plug-in hybrid vehicles. Facilities range from Level 1 and Level 2 chargers in parking lots or garages to Direct Current (DC) fast-charging hubs serving fleets or highway travelers.

Photo Credit: Morning Call

Impacts:

- Increased electrical load on local grids and potential need for utility coordination.
- Parking layout changes and accessibility requirements.
- Potential site design conflicts with pedestrian or traffic circulation.

Best Practices

Comprehensive Plans should:

- Incorporate EV infrastructure into transportation and sustainability elements.
- Identify strategic corridors and community destinations for charging investment (downtowns, employment centers, freight routes).
- Encourage integration with renewable energy or battery-storage systems for grid resilience.
-

Zoning should:

- Define EV charging stations as a principal or accessory use depending on scale.

- Allow Level 1 and 2 chargers by right in most zoning districts; require conditional or special exception review for large DC fast-charging plazas.
- Establish standards for signage, lighting, screening, and Americans with Disabilities Act-compliant accessibility.
- Encourage shared-use parking and integration with existing commercial or public lots.

Subdivision & Land Development Ordinances Should:

- Require site plans showing electrical connections, conduit placement, and protective bollards.
- Coordinate with utility providers early in design.
- Ensure drainage, landscaping, and pedestrian circulation maintain safety and accessibility.

Hydrogen Fueling Stations

Hydrogen fueling stations store and dispense compressed hydrogen gas used to power fuel-cell vehicles. These may serve heavy-duty fleets, transit vehicles, or long-haul trucks and often co-locate with industrial or freight facilities.

Image Credit: Air Products

Air Products, headquartered in Upper Macungie Township, is the world's largest hydrogen producer and builds hydrogen fueling stations across the globe.

Impacts:

- High-pressure gas storage presents fire and explosion risks.
- Requires significant setbacks, emergency access, and ventilation.

- Visual and compatibility concerns near residential or commercial areas.
- High capital cost and reliance on specialized supply chains.

Best Practices

Comprehensive Plans Should:

- Incorporate hydrogen fueling infrastructure into transportation and sustainability elements.
- Establish policies directing hydrogen fueling to appropriate corridors, particularly near interstate interchanges or distribution centers.
- Coordinate with regional transportation and energy providers to ensure safety and supply reliability.
- Include hydrogen infrastructure in climate and clean-energy strategies.

Zoning Should:

- Define hydrogen fueling as a distinct use under “Alternative Fueling Facilities.”
- Limit siting to industrial, highway commercial or heavy commercial districts.
- Require compliance with NFPA 2: Hydrogen Technologies Code and local fire-safety standards.
- Establish minimum setbacks from occupied structures and public rights-of-way.
- Require emergency access and signage consistent with hazardous-material regulations.

Subdivision & Land Development Ordinances Should:

- Require engineered site plans detailing storage tanks, dispensing equipment, containment and ventilation.
- Coordinate review with fire marshals and emergency management officials.
- Include drainage and containment design to prevent runoff contamination.
- Require decommissioning and inspection protocols for storage vessels.

Compressed Natural Gas (CNG) Fueling Stations

CNG stations store and dispense natural gas that has been compressed to less than 1% of its volume at standard atmospheric pressure. CNG is used by municipal fleets, buses, and freight vehicles as a lower-emission alternative to gasoline or diesel.

Photo Credit: Morning Call

The Lehigh and Northampton Transportation Authority (LANTA) runs its fleet of buses on CNG generated by landfills, and fuels buses at their facility located in the City of Allentown.

Impacts:

- Safety risks from pressurized gas storage and handling.
- Increased truck or bus traffic at fueling depots.
- Odor, noise, and visual impacts from compressors and venting equipment.
- Potential conflict with adjacent sensitive land uses if not properly sited.

Best Practices

Comprehensive Plans Should:

- Include policies supporting suitable corridor locations for CNG fueling, especially near transit or logistics facilities.
- Integrate CNG planning with municipal fleet-conversion or clean-transportation goals.
- Encourage co-location with maintenance yards or industrial parks to reduce land-use conflicts.

Zoning Should:

- Define CNG fueling as a specific land use under “Alternative Fueling” or “Utility and Energy Uses.”
- Limit to highway commercial or industrial districts with adequate buffering.
- Include standards for noise, lighting, odor, and equipment screening.
- Ensure adequate distance from residential or institutional uses.

Subdivision & Land Development Ordinances Should:

- Require detailed site plans showing compressors, storage cylinders, piping, and emergency shut-off locations.
- Include ventilation and containment systems in design review.
- Coordinate with utilities for gas-line pressure requirements and emergency response planning.
- Require ongoing maintenance and inspection documentation for compliance.

Resource Extraction

While heavy industries like mining, quarrying and raw material processing have declined in many regions, demand for certain materials is surging again due to the technologies driving today's economy.

Resource extraction and material supply industries encompass the mining, quarrying, and processing of raw materials such as stone, cement, slate, and sand that form the backbone of construction and manufacturing. In the Lehigh Valley, these industries have long shaped regional identity and economic development. The Valley's abundant limestone and cement deposits supported the rise of the American cement industry in the 19th and 20th centuries, while nearby slate, iron and aggregate operations drove industrial growth that laid the foundation for today's economy.

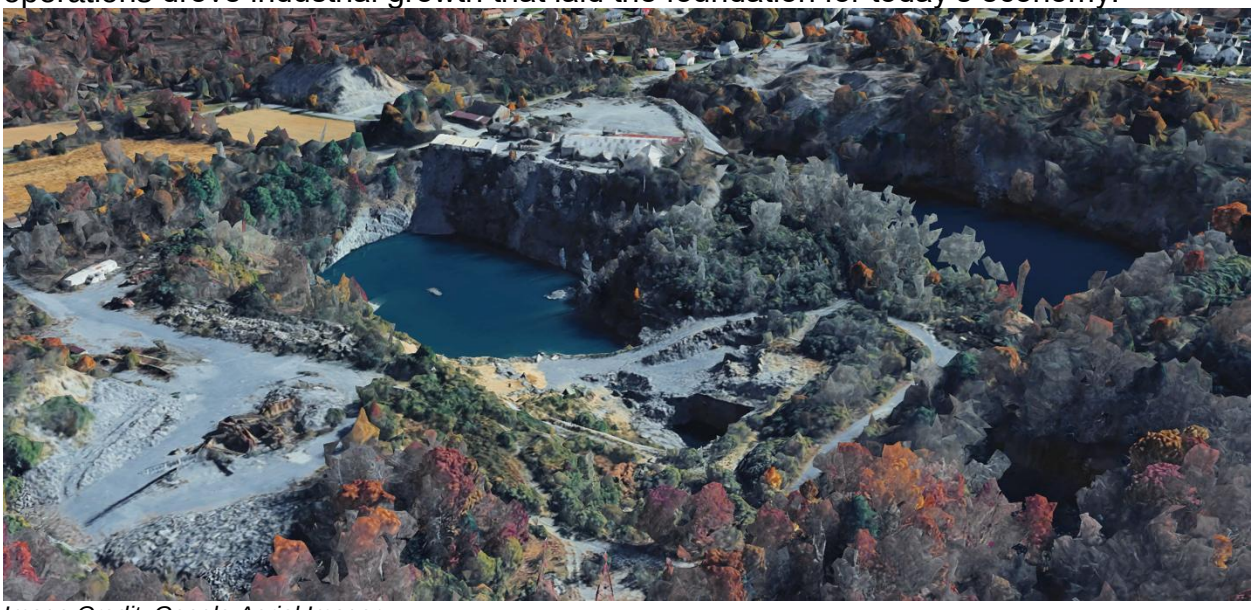


Image Credit: Google Aerial Imagery
Penn Slate operates an active slate mine in Washington Township just outside of Slatington Borough.

Although large-scale extraction has declined, this sector is transforming, not disappearing. Modern operations are becoming more efficient, technology-driven, and environmentally responsible, with greater emphasis on reclamation, material recycling, and circular-economy practices. Many active quarries now integrate aggregate recycling, soil blending, or material recovery operations to reduce waste and extend the life of local resources.

At the same time, global industrial evolution is reshaping material demand. The transition to clean energy, electric vehicles, advanced manufacturing, and digital infrastructure is fueling a worldwide surge in demand for minerals such as lithium, nickel, copper, and rare earth elements. While Pennsylvania is not a major source of these critical minerals, it remains a significant supplier of construction materials and cement and participates in national supply chains that depend on stable domestic sources. As U.S. policy increasingly prioritizes domestic resource security and recycling, Pennsylvania's material-processing and reclamation industries will play a key supporting role.

Locally, this means that even as new extraction slows, municipalities may see growth in material handling, secondary processing and recycling operations that function much like traditional resource extraction uses. These activities -- such as concrete and asphalt recycling, metals reclamation, or the reuse of byproducts from energy or manufacturing -- represent the modern evolution of the same land use category.

Impacts

- Environmental: Dust, noise, vibration and water quality impacts from extraction or crushing operations. Habitat disturbance and visual impacts in rural and scenic areas.
- Infrastructure: Heavy truck traffic, roadway wear and safety concerns on local roads serving quarry or processing sites.
- Land Use Compatibility - Conflicts with nearby residential or agricultural uses due to noise, hours of operation, or aesthetics.
- Post-Use Challenges: Long-term management of inactive or reclaimed sites, including safety and redevelopment readiness.
- Opportunities: Adaptive reuse of reclaimed sites for recreation, renewable energy, stormwater management, or redevelopment.

Best Practices

Comprehensive Plans should:

- Recognize existing and historic mining, quarrying and cement production areas within the Future Land Use Map.
- Designate mineral resource overlay areas consistent with the Pennsylvania Municipalities Planning Code (§603(i)) to protect known deposits and ensure compatibility with nearby uses.
- Plan for post-extraction reuse of sites for recreation, open space, energy generation (e.g., solar installations) or redevelopment.
- Address connections between resource extraction, freight routes, and industrial supply chains to ensure safe and efficient goods movement.
- Incorporate recycling, reclamation, and circular-material industries as emerging components of the regional economy.

Zoning Should:

- Define extraction-related uses clearly (e.g., *mineral extraction*, *quarrying*, *aggregate recycling*, *material processing*) to distinguish between traditional extraction and modern reclamation or recycling.
- Limit these uses to industrial or mineral-resource districts with adequate buffering from residential or institutional uses.
- Establish performance standards for blasting, dust, truck routing, and hours of operation to minimize community impacts.
- Require landscaping, berming and visual screening to reduce aesthetic impacts.
- Support transitional and circular economy uses within existing industrial areas that handle, recycle, or repurpose materials.

Subdivision & Land Development Ordinances Should:

- Require site and reclamation plans addressing grading, erosion control, stormwater management and future site reuse.
- Coordinate with Pennsylvania DEP permitting under the *Noncoal Surface Mining Conservation and Reclamation Act* and related regulations.
- Include truck circulation and access management standards to reduce conflicts with local roads.
- Require bonding or financial assurance for reclamation and long-term maintenance.
- Encourage redevelopment-ready reclamation that aligns with future land use and economic goals

Managing Industrial Land Use Impacts

Lehigh County's industrial landscape has already been shaped by decades of growth in manufacturing, warehousing and logistics. These uses remain vital to the regional economy, but they also generate ongoing impacts on infrastructure, utilities, the environment, community character and quality of life. Municipalities can address these challenges not only when new projects are proposed but also as part of managing the day-to-day realities of existing industrial operations. The following topics outline key areas of concern and provide best practices that local governments can use to manage existing industrial land uses more effectively.

The following section outlines ways municipalities can address specific impacts.

Transportation Infrastructure

Roads and Bridges

Industrial development in Lehigh County depends heavily on the regional road network. Warehousing, logistics and manufacturing generate substantial truck traffic that affects local roads and bridges, particularly near highway interchanges and industrial corridors. As freight volumes grow, municipalities must balance the economic benefits of access with the costs of maintenance, congestion, and safety.

Mitigation Strategies and Best Practices

- **Comprehensive Plans**: Identify key freight routes and roadways suitable for truck access. Discourage industrial development along local streets not built for heavy vehicles.
- **Zoning**: Require industrial sites to locate near arterial roads or highway interchanges, with clearly designated truck access points.
- **SALDO**: Mandate traffic impact studies for new or expanded industrial projects and require developers to fund off-site roadway or intersection improvements.
    - Require on-site design that safely accommodates truck turning movements, staging, and parking without impacting public roads.
- Implement local truck routing ordinances or signage to keep heavy vehicles on preferred corridors.
- Coordinate with PennDOT and Lehigh Valley Transportation Study (LVTS) to prioritize freight-related infrastructure investments.

Air Travel

Air travel infrastructure, especially Lehigh Valley International Airport (ABE), is an integral part of the region's freight network, supporting time-sensitive shipments and specialized cargo. Industrial and logistics growth around the airport creates both opportunity and planning challenges, including noise exposure, airspace protection, and land use compatibility. Municipalities near flight paths or airport influence areas must balance economic development with community impacts and aviation safety.

Mitigation Strategies and Best Practices

- **Comprehensive Plans**: Include airport influence areas and flight paths in land use maps to guide compatible development.
- **Zoning**: Establish airport overlay districts to limit building height, lighting and electromagnetic interference. Ensure compatible land uses near airports.
    - Encourage logistics and industrial uses that directly benefit from proximity to the airport, while maintaining appropriate buffering from residential areas.
- **SALDO**: Require Federal Aviation Administration (FAA) and airport authority coordination for developments within defined approach or transition zones.
    - Support multimodal connections between air freight facilities, roadways, and rail to reduce congestion and improve efficiency.

Rail

Rail remains a key component of Lehigh County's industrial and freight network, connecting local industries to regional and national markets. Industrial development near existing rail lines can improve efficiency and reduce truck dependency, but it also presents unique safety, noise and access challenges. Municipalities can play a role in protecting rail corridors, supporting rail-served development, and ensuring that rail-adjacent uses are compatible with surrounding communities.

Mitigation Strategies and Best Practices

- **Comprehensive Plans**: Identify and protect existing rail corridors and sidings for industrial and freight uses; encourage redevelopment of brownfield or obsolete industrial sites with rail access.
- **Zoning**: Create or update industrial districts that support rail-served uses, with appropriate setbacks and buffering from sensitive land uses.
    - Promote adaptive reuse of older industrial properties near rail for modern, rail-compatible industries.
- **SALDO**: Require coordination with rail operators for developments adjacent to rail lines or crossings; ensure safe design for truck and employee access.
    - Support grade separation projects and safety enhancements at rail crossings where feasible.
- Encourage rail as part of multimodal freight planning to reduce truck dependency and roadway impacts.

Utility Infrastructure

Water

Industrial facilities can place significant demands on local water systems, whether through high-volume users like food and beverage manufacturing, cold storage, or data centers, or by expanding into areas without adequate infrastructure. In Lehigh County, where communities rely on a mix of municipal systems, private wells, and regional authorities, these pressures can strain capacity or create costly infrastructure needs.

Mitigation Strategies and Best Practices

- **Comprehensive Plans**: Map existing and planned water infrastructure to guide industrial growth to serviceable areas.
- **Zoning:** Require water-intensive uses (e.g., data centers, food processors) to locate in districts with adequate public water service.
- **SALDO:** Mandate proof of adequate water supply and capacity before plan approval, including coordination letters from water providers.
- Require developers to fund necessary extensions or upgrades to municipal water systems as opportunities present themselves, rather than shifting costs to the community.
- Incorporate water conservation and efficiency requirements into zoning performance standards, especially for high-demand uses.
- Encourage industrial users to adopt alternative water systems (graywater reuse, rainwater harvesting) to reduce reliance on potable supplies.

Sewer

Industrial growth can overwhelm existing sewer systems, especially when large-scale facilities concentrate in areas not built for high wastewater flows. In Lehigh County, many municipalities with development areas rely on local sewer authorities with aging infrastructure that may already be near capacity. Uncoordinated expansion can lead to capacity shortfalls, costly upgrades and water quality risks, and service extensions may drive unplanned sprawl or conflict with preservation goals.

Mitigation Strategies and Best Practices

- **Comprehensive Plans:** Identify areas with sufficient sewer capacity for industrial growth and avoid designating sewer-dependent uses in areas without planned service.
    - Update Official Sewage Facilities Plans (Act 537)
- **Zoning:** Direct intensive industrial uses to districts with existing or expandable sewer infrastructure. Require pretreatment facilities for high-strength or specialized waste streams.
- **SALDO: Require developers to demonstrate available sewer capacity before approval, including written confirmation from the sewer authority.**
- Condition approvals on necessary upgrades or expansions being funded by the developer rather than the municipality or ratepayers.
- Establish clear standards for industrial wastewater discharge, including pretreatment requirements where needed.
- Coordinate land use approvals with regional sewer authorities early in the review process to avoid service conflicts or capacity shortfalls.

Stormwater

Industrial facilities create large impervious surfaces that increase stormwater runoff, flooding and pollution risks. In Lehigh County, where stormwater management is regulated at both the local level by the municipality and at the watershed level by LVPC, and many communities have older systems that weren't designed for today's scale of

development combined with increasing rainfall. Without proactive management, stormwater can degrade streams, overwhelm infrastructure, heighten local flood risks.

Mitigation Strategies and Best Practices

- **Comprehensive Plans**: Identify flood-prone and environmentally sensitive areas, steering industrial development away from high-risk locations.
- **Zoning:** Require stormwater management practices that reduce peak runoff, protect water quality and encourage green infrastructure (bioswales, rain gardens, permeable pavement).
- **SALDO:** Mandate detailed stormwater management plans with development applications, ensuring compliance with state MS4 and Act 167 watershed requirements.
- Require developers to establish long-term maintenance agreements for stormwater facilities, with clear responsibilities and funding mechanisms.
- Encourage retrofitting of older industrial sites with improved stormwater controls during redevelopment.
- Promote site design that minimizes impervious coverage through shared parking, reduced pavement, and compact building footprints.

Waste Disposal

Industrial uses generate solid and hazardous waste that can strain local systems if not properly managed. High volumes of packaging, pallets, and other materials from warehouse and logistics operations can overwhelm local disposal and recycling systems, and certain manufacturing processes produce specialized wastes requiring pretreatment or off-site disposal. In Lehigh County, improper storage or disposal risks contaminating groundwater, impacting neighboring land uses, or burdening municipal services.

Mitigation Strategies/Best Practices

- **Comprehensive Plans**: Establish policies for sustainable waste management, including recycling and reduction goals, that industrial land uses should support.
- **Zoning**: Require on-site waste and recycling storage areas to be screened from public view and designed to prevent nuisances.
- **SALDO**: Mandate inclusion of adequate waste handling, storage and pickup facilities in site plans, sized appropriately for the scale of industrial operations.
- Coordinate with county and regional solid waste management plans to ensure capacity and compliance with broader goals.
- Encourage or require recycling and reuse programs for common industrial materials such as pallets, cardboard and plastics.
- For specialized or hazardous waste generators, require proof of compliance with Pennsylvania DEP and federal disposal standards as part of land development approval.

Electricity

Industrial operations are among the largest consumers of electricity, and demand is growing as energy-intensive uses like data centers, cold storage, and advanced manufacturing or logistics hubs expand in Lehigh County. Reliable, resilient power is essential for these facilities, and high demand can cause service disruptions and costly upgrades if siting and use is not coordinated.

Mitigation Strategies and/ Best Practices

- **Comprehensive Plans:** Coordinate future land use designations with areas that have sufficient electrical infrastructure or where upgrades are planned.
- **Zoning:** Require siting standards for substations and generators, including screening, setbacks and noise/emission controls.
- **SALDO:** Mandate documentation from utility providers confirming service capacity before project approval.
- Require developers to finance necessary electrical system upgrades rather than shifting costs to the municipality or ratepayers.
- Encourage or require energy-efficient building design and renewable energy integration, such as solar-ready rooftops and EV charging infrastructure.
- Coordinate with utilities and regional grid operators early in the planning process to align infrastructure planning with industrial growth.

Broadband

Modern industries depend on high-speed broadband for logistics, operations, and advanced technologies. In Lehigh County, gaps in broadband coverage or capacity can limit industrial growth, and if new land uses outpace broadband infrastructure, that may leave facilities and surrounding communities without reliable service.

Mitigation Strategies and Best Practices

- **Comprehensive Plans:** Identify broadband access as critical infrastructure, mapping service availability and prioritizing industrial development in connected areas.
- **Zoning:** Require new data centers or high-tech facilities to demonstrate broadband redundancy and reliability as part of approval.
- SALDO: Mandate installation of conduit or fiber-ready infrastructure in new industrial subdivisions and developments.
- Coordinate with broadband providers early in the land development review process to ensure capacity and timely installation.
- Encourage or require “dig once” policies so that when roads or utilities are opened for construction, broadband conduit is installed concurrently.
- Partner with county and regional broadband initiatives to align industrial growth with long-term digital infrastructure investments.

Community Safety

Emergency Response

Industrial facilities can pose heightened risks for fire, hazardous materials and worker safety incidents. In Lehigh County, where many municipalities rely on volunteer emergency services and regional coordination, industrial land uses can stretch local response capacity. Ensuring that emergency services can access sites quickly and safely, and that facilities have appropriate safety plans in place, is essential to protecting workers and nearby residents.

Mitigation Strategies and Best Practices

- **Comprehensive Plans**: Include coordination with emergency services in land use policies; identify response time gaps and plan for mutual aid agreements.
- **Zoning**: Require safety and hazard mitigation plans for high-risk industrial uses, including materials storage, evacuation routes, and suppression systems.
- **SALDO**: Mandate review of site plans by local fire and emergency services to ensure adequate access, hydrant placement, and water flow.
- Require industrial developers to provide on-site fire protection infrastructure, such as hydrants, sprinklers, or water storage where public supply is limited.
- Coordinate with local emergency management agencies for training and response planning tailored to facility operations.
- Encourage or require developers to contribute to emergency service infrastructure or equipment needs when projects significantly increase risk exposure.

Access

Safe, efficient site access is a key factor in managing industrial land use impacts. Facilities generate frequent truck and employee traffic, and poorly designed entrances or internal circulation can create hazards for both site users and the public. In Lehigh County, industrial access design plays a critical role in maintaining safety, reducing congestion and ensuring emergency responders can reach facilities when needed.

Mitigation Strategies and Best Practices

- **Comprehensive Plans**: Identify preferred access routes for industrial areas, linking them to major corridors while minimizing neighborhood impacts.
- **Zoning**: Require separate truck and passenger vehicle access points where feasible and set minimum driveway spacing and turning radius standards.
- **SALDO**: Mandate transportation impact studies that evaluate access design, intersection function and safety improvements. Require developer-funded mitigation.
- Require adequate turning radii, internal circulation loops and designated truck staging areas to prevent queuing on public streets.
- Coordinate access design with PennDOT and county agencies to ensure consistency with highway occupancy and freight movement standards.
- Require signage, lighting and pavement markings that clearly separate truck, employee, and visitor routes within large sites.

Parking

Visitor Parking

Visitor parking at industrial sites supports business operations, meetings, and deliveries but is often overlooked during site planning. While visitor traffic is typically lower than employee or truck traffic, inadequate parking or poor placement can create safety conflicts and accessibility issues, especially when visitors must navigate active loading or truck areas.

Mitigation Strategies and Best Practices

- **Comprehensive Plans**: Promote safe, accessible design for visitor parking areas as part of overall site circulation policies.
- **Zoning**: Require visitor parking to be located near primary entrances and separate from loading and truck areas.
- **SALDO**: Mandate pedestrian connections from visitor spaces to building entrances that are ADA-compliant and well-lit.
- Encourage clear signage and wayfinding to distinguish visitor parking from employee and truck areas.
- Allow reduced visitor parking requirements where demand is low or shared parking arrangements are appropriate.
- Require landscaping or green buffers to soften visual impacts along road frontages.

Employee Parking

Employee parking directly influences site design, land use efficiency and transportation patterns. Industrial facilities often operate multiple employee shifts, leading to varying parking demands and concentrated traffic peaks during shift changes. Large parking lots can consume significant amounts of land, increase stormwater runoff and reduce space available for buildings, landscaping, or sustainable site features. At the same time, insufficient parking can affect employee accessibility and operations, especially in areas without robust transit service.

Mitigation Strategies and Best Practices

- **Comprehensive Plans**: Encourage right-sizing parking to balance availability with land conservation; promote safe and efficient site access and use of alternative transportation modes.
- **Zoning**: Establish employee parking minimums and maximums by industrial use type.
- **SALDO**: Require site plans to demonstrate safe pedestrian circulation between employee parking and building entrances; require separation of employee parking from loading areas.
- Encourage alternative transportation options such as carpooling, public transit, biking and walking to lower parking demand.
- Support transit-oriented development and shared mobility infrastructure near industrial employment centers to reduce the need for large surface lots.

Truck Parking

Truck parking, loading, and staging are among the most critical and challenging aspects of industrial site design in Lehigh County. The region's role as a major freight and logistics hub means that industrial facilities depend on the safe and efficient movement of heavy vehicles. When on-site truck parking or loading areas are insufficient, drivers often resort to idling or parking along public roads, creating congestion, safety hazards, and community concerns. Truck parking and loading facilities also consume large land areas, influencing site layout, traffic circulation, and the overall efficiency of industrial land use. Poorly planned or oversized facilities can generate noise, air pollution and visual impacts that affect nearby residents, workers and property values.

Mitigation Strategies and Best Practices

- **Comprehensive Plans**: Identify freight infrastructure as part of goods-movement planning; map preferred industrial corridors and suitable sites for truck parking facilities that minimize neighborhood impacts.
- **Zoning**: Require industrial developments to provide dedicated on-site truck parking and staging areas separated from employee and visitor parking.
- **SALDO**: Mandate circulation plans that include designated truck entrances, queuing areas, and turning radii suited to large vehicles. Minimize community impacts by prohibiting truck parking and loading areas from facing residential districts. Require aesthetic, noise and light mitigation strategies such as downward lighting, buffering, berms and landscaping, and sound level restrictions and monitoring. Require electric plug-in infrastructure or anti-idling measures to reduce emissions at parking and loading areas.
- Support regional initiatives, such as the Eastern Pennsylvania Freight Infrastructure Plan (EPFA) which emphasize expanding overnight truck parking capacity to meet growing freight demands.

Environmental Factors

Noise

Noise is one of the most common community concerns associated with industrial land uses. Truck movements, loading docks, refrigeration units, cooling systems, backup generators and around-the-clock operations can create constant or intermittent noise that affects nearby residents and businesses. In Lehigh County, where industrial areas are often close to residential neighborhoods or mixed-use corridors, managing noise is essential to maintaining quality of life and community compatibility.

Mitigation Strategies and Best Practices

- **Comprehensive Plans**: Identify noise-sensitive land uses like residential neighborhoods, schools, healthcare facilities, and high-priority natural habitats to guide industrial growth away from these areas.
- **Zoning**: Establish clear noise performance standards and maximum decibel levels at property lines. Require noise mitigation strategies such as setbacks, sound walls, or landscaped buffers between industrial and non-industrial uses.

- **SALDO**: Require proposals to submit acoustic studies and/or noise impact assessments and encourage orientation of loud equipment, loading docks, and truck parking away from nearby non-industrial uses.
    - Encourage applicants to incorporate insulated and soundproofing building materials into site design.
- Monitor and enforce noise standards.

Light

Industrial facilities require exterior lighting for safety, security and operations. Excessive or poorly directed lighting can spill into neighboring properties, disrupt wildlife habitats, and degrade nighttime visibility. In Lehigh County, industrial growth near residential and rural areas causes concern for light pollution.

Mitigation Strategies and Best Practices

- **Comprehensive Plans**: Encourage dark-sky compliant lighting policies and balance safety/operations needs with environmental quality.
- **Zoning:** Establish maximum illumination levels at property lines and require lighting standards such as height limits for lighting poles, maximum illumination levels at property lines and cutoff fixtures that direct light downward.
- **SALDO:** Require lighting plans with photometric data to evaluate impacts and compliance.
    - Incorporate landscaping or fencing to screen light from adjacent properties.

Air Quality

Industrial operations can affect local and regional air quality through emissions from both stationary sources such as generators, boilers, and manufacturing processes, and mobile sources like trucks, forklifts, and equipment. The most common pollutants include volatile organic compounds (VOCs)**,** nitrogen oxides (NOx)**,** particulate matter (PM) such as dust, and greenhouse gases (GHGs) from fuel combustion. While modern facilities are increasingly efficient and regulated, cumulative emissions from industrial sites and freight activity can still impact public health, visibility, and environmental quality, particularly in areas with high concentrations of industrial and transportation uses.

Mitigation Strategies / Best Practices

- **Comprehensive Plans**: Recognize air quality as a health and environmental priority. Specify that high-emission uses should be located away from sensitive areas. Incorporate goals to minimize emissions that reduce air quality.
- **Zoning:** Require air quality performance standards for emissions and dust control. Regulate outdoor storage, truck idling, and the location of exhaust vents to minimize community exposure.
- **SALDO:** Require air quality impact assessments for large-scale or high emission uses.
    - Encourage or require installation of electric vehicle charging infrastructure to support clean fleets.

- Encourage and/or incentivize alternative energy sources such as solar panels or green roofs to reduce energy needs for industrial buildings.

Building Form and Aesthetics
The mass, height and design of industrial buildings can have a profound impact on the visual character and identity of surrounding communities. Large-scale warehouses, logistics centers and production facilities often feature tall, box-like forms, expansive façades, and wide parking areas that can dominate the landscape. When located near residential, commercial or rural areas, these visual and spatial differences can create a sense of imbalance and affect perceptions of neighborhood quality and property values. Thoughtful building design, orientation and screening can help integrate industrial development into the community form while maintaining operational efficiency and supporting high-quality economic growth.

Mitigation Strategies and Best Practices

- **Comprehensive Plans:** Identify design and aesthetic goals for industrial structures as part of broader placemaking and community character objectives. Identify gateways, corridors and transition areas where design quality and landscaping are especially important. Promote site and building design that reflect local identity.
- **Zoning:**
  - Establish bulk, height and setback requirements appropriate to the surrounding context, ensuring smooth transitions between industrial and non-industrial areas.
- **SALDO:**
  - Require façade articulation, roofline variation and architectural detailing to reduce the monotony of large walls and enhance visual interest.
  - Limit or screen outdoor storage, loading docks, and mechanical equipment from public view through fencing, landscaping, and building placement.
  - Require site plans to show how building orientation, service areas, and loading docks are placed to minimize visibility from public roads and neighboring properties.
  - Encourage or require enhanced landscaping along public rights-of-way, including tree rows, berms, and pollinator-friendly vegetation to soften views and reduce environmental impacts.
  - Promote building materials and color palettes that complement local character and minimize visual contrast with surrounding landscapes.
  - Require pedestrian-scale design features, lighting and signage standards that contribute to safe and attractive site environments.

Unknown End Users and Shifting Users

Industrial buildings are often constructed speculatively, without a confirmed end user or tenant at the time of development approval. These speculative projects allow for rapid occupancy once demand arises but can present challenges for municipalities when evaluating site impacts, infrastructure needs and compatibility during the review

process. Because the ultimate user may have operational characteristics different from those assumed in the original design -- such as higher truck volumes, longer hours of operation, or more intensive energy use -- unknown or changing tenants can lead to unanticipated community or environmental impacts.

Even after occupancy, industrial buildings frequently change users or shift functions over time as markets evolve. A warehouse may become a light manufacturing facility, or an assembly operation may expand distribution activity. These shifts can significantly alter traffic patterns, utility demands and emissions, underscoring the importance of adaptable regulations and ongoing coordination between municipalities, developers and operators.

Mitigation Strategies and Best Practices

- **Comprehensive Plans:** Encourage flexible land use designations that allow for the evolution of industrial and employment centers over time. Identify infrastructure corridors capable of supporting a range of industrial activities -- from light manufacturing to logistics or high-tech uses -- without overburdening surrounding neighborhoods.
    - Incorporate policies promoting adaptive reuse and building design flexibility to extend the life and usefulness of industrial structures as market demands change.
- **Zoning:** Define performance standards that apply regardless of tenant, focusing on measurable outcomes such as truck trips per day, noise thresholds or hours of operation.
    - Consider use classification systems that group industrial activities by intensity or impact rather than narrow use type (e.g., “low-impact manufacturing,” “high-intensity logistics”), giving flexibility to assess future users without constant ordinance amendments.
- **SALDO:** Require applicants to identify anticipated user types and conservatively estimate operational characteristics, while maintaining flexibility for future occupancy.
    - Include conditions of approval or occupancy permit triggers requiring municipal review when a new user significantly changes the operational intensity of a site.
    - Encourage property owners to maintain ongoing communication with municipalities regarding user changes to ensure continued compliance with zoning and performance standards.

Addressing Existing Land Use Impacts

While the MPC tools are targeted to regulating development proposals, there are numerous approaches municipalities can take to address the impacts already being created by existing industrial land uses:

1. **Use Existing Ordinances for Operations and Maintenance**
   Zoning Ordinance Enforcement: Municipalities can enforce ongoing compliance with conditions of approval (e.g., landscaping, lighting, noise limits).

Property Maintenance Codes: If adopted, these codes can be used to address blight, nuisance and unsafe site conditions.
Nuisance Ordinances: Municipalities can regulate excessive noise, odor, dust or vibrations that impact nearby residents.

2. **Targeted Infrastructure Partnerships**
   Work with water and sewer authorities to manage capacity and monitor impacts from high-demand users.
   Coordinate with PennDOT and county agencies for roadway improvements near freight clusters.
   Seek funding (PennDOT Multimodal Fund, DCED grants, federal programs) for infrastructure that mitigates existing strain.
3. **Monitoring and Data Collection**
   Use traffic counts**,** air quality monitoring**,** or noise studies to document ongoing impacts. This data supports enforcement, future planning and funding applications.
   Require periodic reporting from facilities with high truck volumes or energy/water usage, where legally feasible.
4. **Community Engagement and Complaint Tracking**
   Establish hotlines or online reporting systems for residents to log issues such as truck idling, noise, litter or drainage problems.
   Tracking complaints over time provides leverage for working with operators and shows trends that can justify ordinance updates.
5. **Intergovernmental and Regional Coordination**
   Partner with adjacent municipalities to address impacts that cross borders such as truck traffic or utility demand. Enter into intergovernmental agreements to share costs and enforcement capacity, particularly for infrastructure and stormwater.
6. **Incentives and Voluntary Compliance**
   Work with operators to implement best practices like truck idling limits, electric vehicle hookups or improved landscaping to reduce visual and environmental impacts. Explore recognition programs for businesses that adopt sustainability measures (LEED certification, renewable energy use).
7. **Amend Local Plans and Ordinances to Minimize Future Impacts**
   While ordinances typically regulate new development proposals, municipalities can update ordinances with retrofit standards that would apply if a use changes or a building redevelops. For example, requirements for stormwater upgrades or truck circulation improvements can be added into SALDOs for when expansions or major renovations are proposed.

In general, municipalities should monitor the impacts of existing development and continuously update regulations to improve performance and ensure new or future land uses align with community goals.

Reusing Brownfields and Existing Industrial Sites
Brownfields are former industrial properties where redevelopment or reuse is complicated by the presence or potential presence of hazardous pollutants or contaminants. In Lehigh County, legacy sites such as former rail yards, manufacturing or processing facilities have the potential for reuse. Sites are often strategically located near highways and population or employment centers and redevelopment can direct growth to areas with existing infrastructure, reduce pressure on farmland and open space, and deliver jobs, tax revenue and environmental cleanup.

How Brownfield Reuse Can Address Industrial Land Uses:
Promote Revitalization and Economic Growth: Reuse of underutilized industrial sites brings new employers, creates long-term jobs, and expands the local tax base by increasing property values and signaling that a community is “investment ready.”
Support Environmental Cleanup and Public Health: Remediation of contaminated sites prevents pollution, improves soil, water and air quality, and restores environmental functions to degraded lands.
Reduce Development Pressure on Greenfields: Channeling redevelopment to existing industrial areas conserves farmland and open space while strengthening established urban and suburban centers.
Leverage Existing Infrastructure: Brownfield redevelopment utilizes existing water, sewer, road and energy networks, reducing the cost and environmental impacts of new extensions.
Encourage Adaptive Reuse through Zoning: Zoning provisions that allow flexible redevelopment options, mixed-use conversions or performance-based standards make reuse more feasible for property owners and developers.
Coordinate Planning and Mapping Efforts: Maintain a community inventory of vacant and underutilized industrial parcels. Align these locations with comprehensive plan goals to target infrastructure investment and guide redevelopment priorities.
Coordinate with the Lehigh County Redevelopment Authority (RALC): RALC is focused on repurposing blighted properties in Lehigh County’s boroughs and townships, and partners with communities to pursue a variety of financing and incentives.
Address Barriers Early: Conduct site assessments to identify contamination risks, evaluate cleanup needs and clarify liability issues. Incorporate demolition, asbestos abatement, or historic preservation costs into redevelopment planning.

Resources

- Questions to ask developers
- Funding strategies
- Comprehensive Plan Best Practice Policies
- Industrial Land Use Definitions

Questions To Ask Developers

Asking questions during the plan review process positions municipalities to be proactive rather than reactive and is one of the most important ways to ensure that industrial projects align with community goals, protect public health and safety and comply with local ordinances. Developers are experts in their own projects, but municipalities are the guardians of community interests. Without asking the right questions, local governments may miss opportunities to identify impacts, negotiate improvements or require conditions that make a development compatible with its surroundings.

Written plans don't always show the full picture. Asking the right questions will:

- **Clarify project details** – How operations will affect traffic, infrastructure, utilities, and nearby residents
- **Ensure compliance** – Confirm that municipal requirements are correctly interpreted and met by applicants
- **Identify impacts early** – Issues are less costly to address during the review process than after construction
- **Encourage transparency** – Build trust between local government, applicants, and residents
- **Promote collaboration** – Open a dialogue that can lead to creative solutions and community benefits
- **Plan for emerging uses** – Understand unique needs and impacts that may not yet be reflected in ordinances

Site Location and Compatibility

- Why was this site chosen for the proposed industrial use, and how does it align with the municipality's zoning and comprehensive plan?
- Is there an identified end user? If not, are there particular end users speculated?
- What adjacent land uses exist, and what potential impacts could the project have on those uses (e.g., noise, lighting, traffic, environmental)?
    - What noise levels will be generated (vehicular traffic, load/unloading, manufacturing, utility)?
    - What light will be emitted, in what directions (parking areas, building lighting/security lighting, signage lights)?
- How will the development affect nearby (not adjacent) land uses, including residential areas, schools, businesses or community facilities?

Workforce and Operations

- How many employees will work at the site, and what shifts or hours of operation are anticipated?
- What workforce amenities (sidewalks, break areas, transit connections, driver facilities) are provided to support safety and quality of life?
- Will multiple tenants occupy the building (e.g., flex space or subleases), and how will operations be coordinated to comply with zoning?

Transportation and Freight Impacts

- What is the anticipated volume of truck and passenger vehicle traffic at peak and average levels?
- What routes will trucks use to access highways, and how will you minimize impacts on local streets?
- Have traffic impact studies been conducted, and what improvements or mitigations are proposed?
- Will on-site truck parking, loading and staging areas prevent trucks from queuing on public roads?

Utilities and Infrastructure

- What are the utility needs of the facility, such as amount of electricity usage, water consumption, wastewater disposal, etc.
- Does the site have adequate water, sewer, power and broadband capacity to support the proposed use?
- Will the project require infrastructure upgrades, and who will pay for them?
- Are backup systems, such as generators for data centers or cooling for cold storage, designed to minimize noise, emissions or neighborhood disruption?

Environmental Considerations

- How will stormwater runoff be managed, and what low-impact development or green infrastructure techniques will be used?
- Are there wetlands, floodplains, or steep slopes on site, and how will they be protected?
- What measures will be taken to minimize air, noise, light, and vibration impacts?
- What steps are being taken to reduce the building's energy consumption and carbon footprint?

Site and Building Design

- How will building design and landscaping reduce visual impacts, especially for large-scale facilities?
- How will the site accommodate pedestrian and bicycle access, both within the site and connections to nearby transit or roads?
- Where will outdoor storage, loading docks, and mechanical equipment be located, and how will they be screened?

Emerging Uses and Safety

- For specialized facilities, such as data centers, battery storage, cold storage or indoor agriculture, what unique infrastructure or safety needs should the municipality be aware of?
- What emergency response coordination has been conducted with local fire, EMS, and police departments?
- Are hazardous materials or alternative energy systems involved, and how will risks be mitigated?

- What is the size of the proposed building (height and lengths), and does the municipality have adequate equipment and training to provide emergency services?

Funding Strategies

Addressing the impacts of industrial development and preparing for emerging industrial land uses requires not only sound planning and policy but also strategic investment. Municipalities often face financial constraints when updating land use regulations, maintaining and upgrading infrastructure, or mitigating impacts associated with industrial activity. A range of funding and financial incentive tools are available at the federal, state, regional and local levels to provide community assistance.

Regional: Lehigh Valley Transportation Study (LVTS)

- The Metropolitan Transportation Plan (MTP) is a multi-billion-dollar transportation investment plan that spans 25 years. The program opens every four years, and only projects that apply are eligible to be listed for funding.
- Funding categories include Bridges, Road, Road Reconstruction, Modernization, and Automation, Roadway Expansion, Multimodal, Planning + Research, Safe Routes to School, Rail, and Transit.
- Project funding is determined by a Project Selection Process:

Project Selection Process: Tips for Communities/Developers Applying for Industrial Land-Use Funding

Communities/developers pursuing federal, state, or regional funding for industrial land-use projects, including manufacturing, logistics, warehousing, light industry, and emerging technology, can increase their competitiveness by following the recommendations below. This guidance applies to standalone development proposals as well as local government infrastructure improvements that support future industrial growth.

1. Align Your Project with Regional and Local Plans
Tip for Applicants:
Demonstrate clear consistency with adopted plans, such as:

- *FutureLV: The Regional Plan*
- *Eastern PA Freight Alliance Freight Infrastructure Plan*
- *Walk/Roll LV: The Active Transportation Plan*
- *Priority Climate Action Plan for Transportation Decarbonization*
- Your municipality's comprehensive plan, zoning ordinance, capital improvement plan or official map

Funding agencies want assurance that proposed investments support long-term regional goals and fit into an integrated land-use and transportation strategy. Projects explicitly tied to adopted plans score higher and are viewed as lower risk.

2. Understand Key Evaluation Criteria and Prepare to Address Each One
Most funding programs evaluate projects using several common criteria. Communities should tailor their applications to address the following:

Economic Impact

- Potential for job creation and workforce development

- Support for key sectors such as manufacturing, logistics, clean tech, emerging industries
- Long-term effects on local tax base and economic resilience

Transportation Efficiency

- Site access to interstate highways, freight corridors, rail connections, ports and airports
- Reduction of bottlenecks or congestion on regional routes
- Ability to improve freight mobility and reduce travel times

Land Use Compatibility

- Siting near existing industrial clusters or economic hubs
- Adequate buffering from neighborhoods, schools, parks and environmentally sensitive areas
- Alignment with zoning, future land-use maps, and local development standards

Environmental Sustainability

- Brownfield remediation and adaptive reuse
- Emissions reduction, decarbonization strategies, and clean-energy technologies
- Stormwater management and green infrastructure
- Minimization of impacts on wetlands, waterways and habitats

Community Impact

- Access to employment via transit, walking and biking
- Reduced impacts on overburdened or vulnerable populations
- Opportunities for upskilling, training and equity-focused benefits

Project Readiness

- Site control secured
- Engineering and design progress
- Zoning compliance
- Committed funding partners
- Public engagement completed

Tip for Applicants:
Organize your narrative around these topics. Clear, structured responses make your application easier to evaluate and more competitive.

3. Build a Strong, Evidence-Based Application
Use both quantitative data (e.g., vehicle counts, freight volumes, crash patterns, job projections) and qualitative insights (e.g., community priorities, local lived experience). Strengthen your application with:

- Geospatial analysis showing proximity to freight networks, workforce clusters or brownfields
- Cost-benefit and life-cycle analyses
- Environmental screening or preliminary engineering

- Letters of support from businesses, residents and agencies such as the LVPC
- Documentation of community outreach and stakeholder feedback

Tip for Applicants:
Most programs use weighted scoring. Reviewers compare applications side-by-side, so data clarity, completeness, and consistency make a substantial difference.

4. Engage Stakeholders Early and Often
Tip for Applicants:
Before submitting, coordinate with:

- Municipal leadership and planning commissions
- Industrial facility operators or developers
- PennDOT/Federal Highway Administration and Metropolitan Planning Organization staff
- Workforce development boards
- Local emergency responders
- Environmental and community organizations

Projects that demonstrate multi-sector alignment and community backing tend to score higher and move more efficiently through review.

5. Leverage Technical Assistance and Data Resources
Tip for Applicants:
Use external support to collect data, document conditions and identify improvements. The PennDOT Local Technical Assistance Program (LTAP), with support from LVPC, can help municipalities by providing:

- Corridor, intersection, and school zone safety reviews
- Traffic counts, speed studies, and freight movement analysis
- Pavement, drainage, and signage/marking assessments
- Walkability and bikeability audits
- Heavy-vehicle impact evaluations
- Analysis of land-development impacts and traffic circulation needs
- Recommendations for short-term and long-term roadway improvements
- Staff training, workshops, and follow-up assistance

LTAP-supported data can significantly strengthen funding applications, demonstrating due diligence and professional validation.

6. Plan for Transparency and Public Engagement
FYI About the Process:
Many funding programs require public transparency as a condition of award. Communities with existing communication channels, websites, boards and public meetings are better positioned to meet these expectations.

Tip for Applicants:
Prepare to publish evaluation results and project information on your municipal website or through community outreach.

7. Stay Updated on Evolving Criteria and Regional Priorities
FYI About the Process:
Criteria change as regional freight plans, climate plans, and transportation strategies evolve.
Tip for Applicants:
Check program guidance every cycle. Update your data, language, and design to reflect new state or federal directives.

8. Prepare Local Government Infrastructure to Support Industrial Land Uses
To increase project readiness and strengthen funding applications communities should proactively invest in infrastructure that supports industrial development.

Transportation Infrastructure
- Upgrade intersections to handle heavy trucks (signal timing, radii, geometric design)
- Improve last-mile freight connections from industrial parks to major corridors
- Replace weight-restricted bridges or culverts
- Enhance roadway pavement design for heavy-vehicle loads
- Expand or improve rail sidings, transload facilities, or spur connections

Utility and Site Infrastructure
- Expand water and sewer capacity for industrial-intensive uses
- Modernize stormwater and drainage systems to manage large impervious areas
- Upgrade electrical capacity to support advanced manufacturing and clean-tech facilities
- Evaluate broadband needs for technology-driven industries

Active Transportation and Transit
- Add sidewalks, trails, bike lanes, or shared-use paths connecting workers to job sites
- Coordinate with transit providers to serve industrial parks with job-access routes
- Improve pedestrian safety near industrial driveways and corridors

Environmental and Resilience Investments
- Conduct brownfield assessments and environmental due diligence
- Include green infrastructure for stormwater mitigation
- Improve tree canopy and buffer plantings around industrial edges
- Plan flood-resilient design for sites in risk-prone areas

Land Use and Policy Tools
- Update zoning to permit target industries while ensuring compatibility with neighbors
- Create overlay districts or special industrial corridors
- Adopt an official map to reserve key road, trail, or utility corridors
- Develop capital improvement plans (CIPs) identifying infrastructure gaps

- Use tax increment financing (TIF), LERTA, or other tools to support project feasibility

Tip for Applicants:
Infrastructure investments, even preliminary ones, signal readiness to funding agencies and make your industrial project far more competitive.

The next section details some assistance programs at all levels that these tips and processes can help communities utilize.

State Assistance

- Municipal Assistance Program (MAP):
  Offers grants for comprehensive plans, zoning and SALDO updates, and multi-municipal planning to manage industrial growth and mitigate impacts.
- Local Share Account (LSA):
  Funded by gaming revenues for local infrastructure improvements supporting industrial or brownfield redevelopment.
- Brownfield Cleanup and Industrial Site Reuse Program (ISRP):
  For remediation and redevelopment of industrial or contaminated sites.
- Energy Programs (Alternative Fuels Incentive Grant, etc.):
  For the applicants and developers of industrial sites incorporating cleaner technologies or energy-efficient operations.
- Community Conservation Partnerships Program (C2P2):
  Supports green buffers, trail connectivity, and open space preservation near industrial zones to mitigate environmental impacts.

Federal Assistance

- BUILD **/** INFRA **Grants (USDOT):**
  Large-scale, competitive grants that municipalities can pursue jointly with LVPC or counties for freight and industrial corridor improvements.
- Brownfields Assessment and Cleanup Grants (USEPA):
  For planning, assessment and remediation of former industrial sites.
- Climate Pollution Reduction Grants (CPRG):
  Can support planning for industrial decarbonization or energy transition strategies.

Local Fiscal Tools and Resources

Transportation Impact Fees + Capital Improvement Plans (MPC Tools)

- Municipalities can adopt impact fee ordinances under the MPC to recover costs from industrial traffic impacts (Section 501-A).
- Capital Improvement Plans (CIPs) can strategically fund long-term infrastructure to support or mitigate industrial growth (Section 504-A).

Tax Increment Financing (TIF) and Local Development Districts

- Through county or municipal authorities, TIFs can help pay for infrastructure and remediation needed for industrial redevelopment.

Lehigh Valley Government Academy Local Technical Assistance Program (LTAP)

- Free training and technical assistance designed to help with roadway maintenance.

Lehigh County Redevelopment Authority

- Partners with municipalities with the goal of remediating and repurposing blighted properties in Lehigh County's Boroughs and Townships.

Comprehensive Plan Best Practices Checklist for Industrial Land Uses

Identify Suitable Locations that Balance Land Use Priorities

- Designate industrial growth in areas with direct access to major highways, freight corridors or rail facilities to minimize truck traffic through residential neighborhoods.
- Preserve agricultural and environmentally sensitive lands by steering industrial development toward brownfields, underutilized sites and already serviced land.
- Cluster industrial uses to maximize infrastructure efficiency and reduce conflicts with other land uses.

Ensure Adequate Design and Compatibility

- Require site design standards that buffer industrial operations from adjacent residential and community uses through landscaping, setbacks, berms and architectural treatments.
- Encourage context-sensitive building design to minimize visual impacts of large-scale warehouses and manufacturing facilities.
- Promote sustainable site planning that incorporates green infrastructure, low-impact stormwater management and energy-efficient building design.

Set Transportation and Freight Management Policies

- Plan for roadway networks that separate truck traffic from local streets, schools and pedestrian areas.
- Coordinate with PennDOT, LANTA and regional planning partners to ensure freight movement is efficient and safe.
- Support the development of truck parking facilities and driver amenities in appropriate locations to reduce illegal or unsafe parking.

Set Infrastructure and Utilities Policies

- Direct new industrial development to areas with adequate sewer, water, energy and broadband capacity.
- Establish policies for coordinating infrastructure investment with anticipated industrial demand to prevent overextension of services.
- Encourage the use of renewable energy and on-site energy generation where feasible.

Anticipate Emerging and Evolving Uses

- Anticipate new industries such as data centers, cold storage, advanced manufacturing and alternative energy facilities by including them in land use planning policies.
- Support flexible industrial spaces that can accommodate multiple tenants or hybrid uses, while ensuring zoning and site standards address parking, noise and safety impacts.

- Monitor evolving technologies such as additive manufacturing, life sciences and battery storage, and update policies regularly to stay current.

Facilitate Economic and Workforce Development

- Align industrial land use planning with workforce development initiatives to ensure facilities are accessible to employees by transit, bike and pedestrian routes.
- Encourage industrial employers to provide amenities that support employee well-being, such as safe break areas, mobility options and sustainable workplaces.
- Promote redevelopment of older industrial areas to support new job growth and modern business needs.

Leverage Regional Coordination

- Coordinate industrial land use planning with neighboring municipalities to manage shared impacts of traffic, infrastructure, and environmental systems.
- Support consistency with *FutureLV: The Regional Plan* and county economic development goals.
- Partner with agencies such as LVEDC, PennDOT, and Pennsylvania DCED to leverage resources for industrial site readiness and infrastructure improvements.

Industrial Land Use Definitions

These are definitions that may be necessary to craft an effective municipal ordinance.

A

Additive Manufacturing or 3D Printing Facility
A facility where the primary activity is the fabrication of objects by additive processes such as 3D printing, typically using plastics, metals, concrete, resins or composites. Operations may include design, prototyping, limited production runs, finishing, assembly and associated office or research space. Additive manufacturing may occur as a stand-alone use or as part of a larger manufacturing, research or industrial operation.

Advanced Manufacturing
High-tech production facilities using automation, robotics, 3D printing, or clean rooms for industries such as aerospace, medical devices or electronics.

Alternative Energy Generation
Facilities generating renewable energy such as solar farms, wind turbine assembly sites, hydrogen plants or biofuel refineries.

Autonomous Vehicle Support Facility
A facility or area designed to support automated or semi-automated vehicles serving freight, logistics or industrial operations, including staging areas, calibration zones, equipment storage, charging or fueling infrastructure, maintenance bays, and control rooms. This use may be accessory to a truck terminal, distribution center, warehouse, or industrial park.

B

Battery Energy Storage Facility
A facility where electrochemical energy storage systems, such as large-scale batteries or battery containers, are installed to store and discharge electricity to the grid or to serve one or more principal uses on the site. The facility may include inverters, transformers, control equipment, fire suppression systems and security fencing. This use excludes small, building-integrated storage serving a single principal use as an accessory component.

Bioengineering or Biofabrication Facility
A facility where biological materials, cells, tissues or bio-based products are engineered, produced or fabricated for commercial, medical, industrial or research purposes. Operations may include laboratory functions, controlled-environment production, quality control, warehousing of inputs and outputs, and associated office or research space. Facilities may handle biological, chemical, or hazardous materials subject to applicable biosafety and environmental regulations.

Business Park
A planned development containing one or more buildings on a common internal roadway network, designed for flexible tenant space that may include offices, light manufacturing, warehousing, research and development, laboratories and related uses. Buildings are typically one or two stories, with shared access, parking, utilities, stormwater management and landscaping.

C

Cold Storage Warehouse
A warehouse primarily devoted to the storage and handling of refrigerated or frozen goods, including food products and temperature-sensitive materials, generally consistent with the cold storage warehouse land use in the ITE Trip Generation Manual. The facility may include loading docks, limited processing or packaging areas and associated office space, and typically requires mechanical refrigeration and higher energy demand.

Cryptocurrency Mining Facility
A facility where specialized computers or servers perform cryptographic calculations to validate blockchain transactions or generate digital assets, with high ongoing electricity demand and cooling requirements. The facility may be located within a building or in modular or containerized units and may include associated office, security and electrical infrastructure.

D

Data Center
An establishment engaging in the storage, management, processing or transmission of digital data, and housing computer network equipment, systems, servers, appliances, and other associated components related to digital data operations.

Data Center Mechanical Equipment
On-site exterior machines used to sustain and/or provide energy for the operations of a Data Center.

Decibel
A unit for measuring the volume of sound using the A-weighting network on a sound level meter. Decibel may be expressed as dB, dB(A), dBA, dba, or db(A).

Distribution Center, High-Cube
A warehouse or distribution facility characterized by a large building footprint, high ceiling clearances and high-bay racking designed for the storage and distribution of goods, consistent with high-cube warehouse/distribution land use categories in the ITE Trip Generation Manual. The facility primarily handles palletized or containerized goods, with frequent truck loading and unloading and limited retail or customer activity.

E

Electric Vehicle Charging Space
An automobile parking space that includes an electrical component assembly or cluster of component assemblies (battery charging station) designed and intended to transfer Level 2 charging, as defined by the United States Department of Energy, electric energy by conductive or inductive means from the electric grid or other off-board electrical source to a battery or other energy storage device within a vehicle that operates, partially or exclusively, on electric energy, and is marked to indicate that such spaces are reserved for the sole use by plug-in electric vehicles.

Electric Vehicle Supply Equipment (EVSE)

Devices that provide electric power to a vehicle to recharge the vehicle's batteries. EVSE systems include the electrical conductors, related equipment, software and communications protocols that deliver energy to the vehicle.

Energy Storage Facility

Energy storage equipment or technology that can absorb energy, storing such energy and redelivering energy after it has been stored.

A. **Energy Storage, Utility Scale:** One or more devices, assembled together, capable of storing energy to supply electrical energy at a future time, greater than 600kWh in nameplate capacity.
B. **Energy Storage, Site-Specific:** One or more devices, assembled together, capable of storing energy to supply electrical energy at a future time, less than or equal to 600kWh in nameplate capacity. Storage devices are an accessory use located on the property providing the energy generation source. This does not include energy storage facilities or devices associated with Solar Facility, Utility Scale.

F

Façade

The exterior wall of a building exposed to public view or a wall viewed by persons not within the building.

Flex Industrial or “Flex Space”

A building or group of buildings designed with adaptable floor plans that can accommodate a mix of uses such as light manufacturing, warehousing, research and development, small-scale assembly, laboratories and office space. Interior spaces may be reconfigured over time without substantial exterior changes. Flex space is typically located in business or industrial parks and is intended for low- to moderate-intensity industrial and commercial activity.

Fulfillment Center, High-Cube

A specialized high-cube distribution facility serving e-commerce or direct-to-customer operations, generally aligned with high-cube fulfillment center categories in the ITE Trip Generation Manual. The facility may include automated storage and retrieval systems, sorting and packaging operations and high employee densities. Fulfillment centers typically generate significant truck and delivery vehicle traffic and may operate extended or continuous hours.

G

General Industrial Use

A facility engaged in manufacturing, processing, assembly, repair, storage or similar industrial activities. General industrial uses may involve the use of machinery, handling of raw or finished materials, truck traffic and associated office or warehouse functions, but do not rise to the intensity of heavy manufacturing or hazardous industrial operations.

H

Hours of Operation:

The time period during which an activity or enterprise is active, including any times during which the activity is open to customers or other members of the public, employees are present and working, deliveries are made, or equipment (other than utilities or ordinary indoor appliances) is being actively operated on the site.

I

Indoor Vertical Farming/Ag-Tech
Warehouses or controlled-environment structures used to grow crops year-round with advanced hydroponic or aeroponic systems.

Industrial Park
A planned development containing multiple industrial, manufacturing, warehousing, logistics or related facilities served by a shared internal roadway and utility network, generally consistent with the industrial park land use category in the ITE Trip Generation Manual. Uses within an industrial park may include manufacturing, distribution, research and development, support services and accessory office space.

Industrial Storage
A fixed installation where any of the following are stored, either for subsequent transshipment to a smaller fixed installation or for pick-up by truck for transport to the site where the product will be used by the consumer:

A. Oil and gas storage
B. Petroleum products
C. Natural gas
D. Coal
E. Lumber
F. Building material
G. Construction equipment
H. Empty solid waste vehicles and containers
I. Building materials.

Intermodal Freight Terminal
A facility where freight is transferred between at least two modes of transportation, such as truck-to-rail or truck-to-air. The facility includes associated loading areas, container storage, staging tracks, maintenance areas and administrative offices. Intermodal terminals typically generate high truck, rail, or cargo activity and require direct access to major transportation corridors.

L

Last-Mile Distribution Centers
Logistics and warehouse facilities closer to population centers that facilitate rapid delivery of goods ordered online.

Light Industrial Facility
A free-standing building or complex used for lower-intensity industrial activities such as assembly, packaging, testing, small-scale fabrication or craft production, generally consistent with light industrial land use categories in the ITE Trip Generation Manual. These uses typically have limited heavy truck traffic, minimal outdoor storage, and lower noise and emissions than heavy manufacturing, and may be suitable at transitions between industrial and commercial or mixed-use areas.

Logistics Center
A facility or complex primarily devoted to coordinating the movement, storage and distribution of goods in the supply chain. A logistics center may include one or more warehouses, cross-dock or transload facilities, truck terminals, fleet parking and associated office or dispatch functions. The use is characterized by significant freight activity and connections to regional highway, rail or air networks.

M

Manufacturing, Heavy
A facility where raw materials or basic commodities are converted into finished products through intensive industrial processes that may involve large machinery, high energy use, outdoor storage, or more significant noise, vibration or emissions. Heavy manufacturing may include metal fabrication, chemical processing, large-scale fabrication or similar operations and typically requires greater separation from residential or sensitive uses.

Manufacturing, Light
A facility where raw materials, parts or components are assembled, processed or fabricated into finished products using relatively clean and quiet processes with limited emissions, outdoor storage or heavy truck traffic. Light manufacturing operations often occur within enclosed buildings and may include associated office, research and warehousing functions.

Microchip or Semiconductor Manufacturing Facility
A facility where semiconductor wafers, microchips, or related components are fabricated, processed, assembled, tested, or packaged. Operations may include cleanrooms, specialized equipment, and the use of chemicals, gases and ultrapure water. The facility may consist of front-end wafer fabrication, back-end assembly, test and packaging, or a combination thereof, along with support, utility and office areas.

Micro-Fulfillment Centers
Highly automated, compact warehouse facilities designed to speed up grocery and retail deliveries within urban and suburban areas.

O

Outdoor Storage Yard, Industrial
An area used for the outdoor storage of equipment, vehicles, materials or containers associated with industrial, construction, utility or logistics operations. The use may be a principal use or accessory to a permitted industrial use and typically includes fencing, screening and surfacing for vehicle and equipment maneuvering.

P

Parcel Hub Warehouse
A freight facility, generally consistent with parcel hub or parcel sorting land use categories in the ITE Trip Generation Manual, where parcel carriers receive, sort and dispatch packages for regional or local delivery. Operations may include conveyor systems, loading docks, staging areas for delivery vehicles and associated office or dispatch space, with high trip generation by trucks and smaller delivery vehicles.

R

Recycling and Materials Recovery Facility
A facility where recyclable materials such as paper, cardboard, plastics, metals, glass, or construction and demolition debris are received, sorted, processed, baled or temporarily stored for shipment to end users. The facility may include enclosed processing areas, outdoor storage of containers or baled materials and associated office space. This use does not include landfills, waste incineration or hazardous waste treatment facilities.

T

Telecommunications Hub or Network Facility
A facility where telecommunications, broadband, fiber-optic or data network equipment is housed to route, switch or process communications signals. The use may include server rooms, switching equipment, backup power systems, cooling equipment and associated office or maintenance space. It does not include broadcast towers, which may be separately regulated.

Truck Stop or Travel Plaza
A facility designed primarily to serve truck drivers and long-distance motorists, providing services such as fuel, parking, restrooms, showers, food service and limited maintenance. The facility may include convenience retail and ancillary uses and typically generates frequent truck movements and 24-hour activity.

Truck Terminal or Truck Freight Station
A facility, generally consistent with truck terminal or truck freight station land use categories in the ITE Trip Generation Manual, where freight is staged, sorted, or transferred between trucks, or between trucks and local delivery vehicles. Operations may include fleet parking, loading docks, cross-docks, dispatch offices and minor maintenance areas, and are characterized by high truck traffic and frequent vehicle movements.

U

Utility-Scale Energy Generation Facility
A facility used to generate electricity for delivery to the electric grid or to serve multiple off-site users, using renewable or non-renewable energy sources. This may include gas-fired peaker plants, solar or wind farms, combined heat and power plants or similar installations, along with associated equipment such as inverters, transformers, substations, control buildings, access drives and security fencing. Small-scale systems serving a single principal use as an accessory component are not included.

W

Warehouse, General
A facility primarily used for the storage of goods, materials or merchandise, generally consistent with general warehouse land use categories in the ITE Trip Generation Manual. The facility may include office, maintenance or limited processing areas, and is

characterized by truck loading and unloading, indoor storage and minimal customer or retail activity.

Warehouse, High-Cube Storage

A warehouse facility with a large footprint and high interior clear heights designed for high-bay racking and high-density storage, consistent with high-cube storage land use categories in the ITE Trip Generation Manual. High-cube warehouses may be used for long-term storage, transload operations or as part of larger logistics or business parks.

Wholesale Trade Establishment

A facility where goods, merchandise or equipment are sold or distributed primarily to retailers, contractors or other businesses rather than to the general public. Wholesale trade establishments may include indoor storage, showrooms, loading docks and associated offices, with regular truck traffic and limited walk-in customer activity.