

PREPARED FOR:

Northwest Commission
395 Seneca Street
Oil City, PA 16301

PETROCHEMICALS SUPPLY CHAIN OPPORTUNITY STUDY

NORTHWEST PENNSYLVANIA
REGION

APRIL 2019



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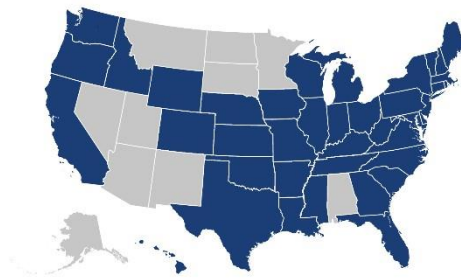
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EXECUTIVE SUMMARY

Northwest Pennsylvania is well poised to capitalize on the economic spillover effects of the burgeoning petrochemical industry within the Appalachia region. With its strong manufacturing history, existing concentration of plastics and rubber manufacturers, training programs in plastics, proximity to production facilities across the petrochemical supply chain, and transportation access via road, rail, and water, Northwest Pennsylvania has the foundation of critical assets needed to capture the growing economic activity associated with petrochemicals.

Recognizing this potential, the Northwest Commission has engaged the team of Camoin 310 and CEC PLANNING to assess economic development opportunities and chart a path to lead the region forward. The result of this effort are targeted recommendations that position Northwest Pennsylvania to reap the benefits of the flourishing petrochemicals supply chain.

WORK COMPLETED

The primary components of the study included the following:

- ◆ Regional economic base analysis
- ◆ Petrochemical supply chain research
- ◆ Opportunities assessment
- ◆ GIS-based regional assets analysis
- ◆ Recommendations

ECONOMIC DEVELOPMENT OPPORTUNITIES

Key economic development opportunities identified for Northwest Pennsylvania relate to the Pennsylvania Shell complex under construction in Monaca, Beaver County, and the polyethylene supply chain. Ready access to Shell-produced polyethylene pellets creates advantages for certain downstream businesses, which are strong targets for attraction and expansion within Northwest Pennsylvania. These industries include:

- ◆ Pelletized plastic compounders and converters
- ◆ Polyethylene-utilizing plastics manufacturers
- ◆ Plastics wholesalers and distributors

DEVELOPMENT “HOT SPOT” ANALYSIS

The Regional Assets Analysis was designed to identify geographic “Hot Spots” that could likely be associated with these development opportunities. This was achieved by documenting areas where multiple site characteristics typically required by petrochemical facilities “converge.” The results of this analysis enable the identification of site areas that can accommodate a range of land use typologies typically associated with petrochemical supply chain companies.

A comprehensive GIS (Geographic Information Systems) data set was prepared as part of this project. The 8-county NWC territory maps included in this report represent snapshot views generated from the GIS data set. The GIS data set, however, contains significant additional information beyond that shown in this report document. The GIS data

set is designed for use as a valuable interactive tool for future analyses involving searches for sites to accommodate the needs of specific business attraction/expansion prospects. [Click here to access the interactive tool.](#)

RECOMMENDATIONS

This report culminates in a set of recommendations designed to set the Northwest Commission and its partners on a path to capturing the opportunities identified. These recommendations are summarized as follows:

1 | Identify and Prepare Physical Sites

- ◆ Identify specific candidate sites/parcels
- ◆ Determine candidate site shortfalls and mitigation costs
- ◆ Prioritize candidate sites for market offering

2 | Attract and Retain Investment

- ◆ Implement a petrochemicals-related business retention and expansion initiative
- ◆ Develop a workplan to actively promote candidate sites and attract investment
- ◆ Prepare branding/marketing collaterals, promotional tools, & methodologies

3 | Build Organizational Capacity

- ◆ Secure a “champion” to unify and lead the NWC initiative
- ◆ Establish a “one-stop shop” to facilitate prospect enquiries
- ◆ Continue and augment workforce development efforts within the region ◆ Collaborate with regional and state partners



1 | INTRODUCTION

Northwest Pennsylvania is well poised to capitalize on the economic spillover effects of the burgeoning petrochemical industry. To the south, the Pennsylvania Shell complex in Beaver County is currently under construction, and to the northwest across Lake Erie, petrochemical complexes in Sarnia–Lambton, Ontario, are undergoing expansion. With its strong manufacturing history, existing concentration of plastics and rubber manufacturers, training programs in plastics, proximity to production facilities across the petrochemical supply chain, and transportation access via road, rail, and water, Northwest Pennsylvania has the foundation of critical assets needed to capture the growing economic activity associated with petrochemicals. In light of the region’s challenges to retain and attract industry and residents amid the evolving global economic landscape, Northwest Pennsylvania has a critical opportunity to pivot and reposition itself to reap the benefits of a flourishing industry.

Recognizing this potential, the Northwest Commission has engaged the team of Camoin 310 and CEC PLANNING to assess economic development opportunities and chart a path to lead the region forward. The result of this effort is a targeted strategy that positions Northwest Pennsylvania to reap the benefits of the flourishing petrochemicals supply chain.

WORK COMPLETED

The major components of the project included the following:



1. Regional Economic Base Analysis – analysis of employment and other economic data to understand the competitive advantages of Northwest Pennsylvania in attracting and expanding industry
2. Petrochemical Supply Chain Research – examination of the entire petrochemicals supply chain, from upstream to downstream; research into trends and growth potential for individual industries comprising the supply chain; and the importance of geographic location
3. Opportunities Assessment – discussion of how the region can benefit from growth in the petrochemicals sector in the broader region and position itself to compete with adjacent regions and states
4. Regional Assets Analysis – GIS-based analysis of existing physical assets in Northwest Pennsylvania’s eight counties, including transportation, utilities, natural gas pipelines, and development sites, as well as economic development and workforce development assets
5. Recommendations – strategic goals, actions, and tactics for exploiting the opportunities identified

As part of this process, the project team conducted extensive research, including desktop investigation, several visits to Northwest Pennsylvania, and interviews with various stakeholders. These stakeholders included Shell and other petrochemical industry experts, regional economic and workforce development professionals, and representatives of transportation and logistics operations. The team also conducted a plastics manufacturers roundtable event in Erie that gathered representatives from plastics companies located throughout the region to elicit their input on how regional developments in petrochemicals might impact their supply chain and growth potential.

A key component of the analysis was identifying geographic “Hot Spots” that could likely be associated with petrochemical supply chain business attraction and development opportunities. A comprehensive GIS (Geographic Information Systems) data set was prepared. The 8-county NWC territory maps included in this report in Section 5 and Appendix C: GIS Drawings represent snapshot views generated from the GIS data set. The GIS data set, however, contains significant additional information beyond that shown in this report document. The GIS data set is designed for use as a valuable interactive tool for future analyses involving searches for sites to accommodate the needs of specific business attraction/expansion prospects.

The entire process was guided through a series of meetings with a Steering Committee assembled by the Northwest Commission and comprised of the region’s planning and economic development leadership and stakeholders.



Figure 1: Northwest Pennsylvania Region

2 | REGIONAL ECONOMY OVERVIEW

The Northwest Pennsylvania region, referred to throughout the report as “NW PA,” is comprised of eight counties in the extreme northwest corner of the state, including (from most populous to least):

- ◆ Erie County
- ◆ Mercer County
- ◆ Lawrence County
- ◆ Crawford County
- ◆ Venango County
- ◆ Warren County
- ◆ Clarion County
- ◆ Forest County

The NW PA region is roughly equidistant from the major metro areas of Pittsburgh, Cleveland, and Buffalo. As of 2018, the total population of the region is approximately 693,000. The City of Erie and its suburbs make up the largest urban area within the region, by far. Erie County, at the region’s northernmost edge accounts for 39% of population and 41% of employment in the region. Other population and job centers include Sharon/Hermitage, New Castle, Meadville, Oil City/Franklin, Warren, Grove City, and Clarion, which are dispersed throughout the region.

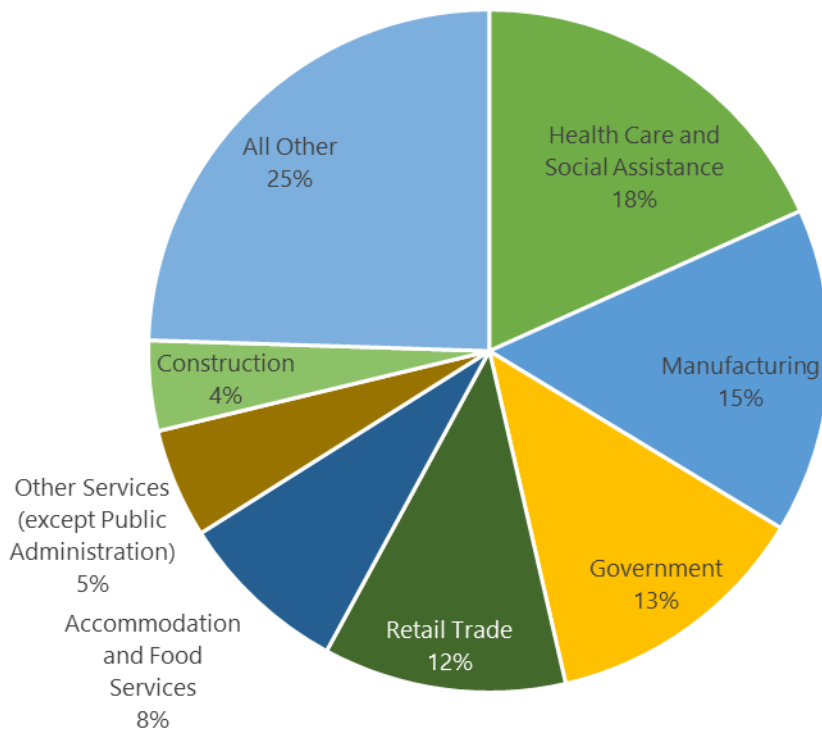
National and global economic trends have contributed the region's prolonged population and job decline. In the past five years, NW PA has lost about 2.9% of residents, compared to 0.3% growth in Pennsylvania as a whole and 3.7% growth nationally. The region saw a similar decline in jobs, decreasing by 3.0%, compared to 3.6% *gain* statewide and a 7.4% gain nationally. Regional population and job losses are projected to continue, albeit at a decelerating rate, over the next decade.

KEY INDUSTRY SECTORS

The region's approximately 304,000 jobs are distributed across a variety of industry sectors. NW PA's largest industry sectors by employment include Health Care and Social Assistance (18% of all jobs), Manufacturing (15%), Government (13%), Retail Trade (12%), and Accommodation and Food Service (8%), as shown in Figure 2. Of these, Health Care and Accommodation/Food Service are the only sectors that have seen growth over the past five years and are expected to continue to grow.

Figure 2

Share of Jobs by Sector, NW PA, 2018



MANUFACTURING

While the Manufacturing sector has experienced continued job losses, shrinking by 8% and shedding over 4,000 jobs between 2013 and 2018, it remains a critical component of Northwest Pennsylvania's economy. In addition to accounting for 15% of all jobs, the sector contributes 23% of the region's overall economic output (Gross Regional Product), the highest contributing sector by far. Manufacturing is highly concentrated in NW PA; with a location quotient of 1.96,¹ the sector makes up nearly double the share of employment in the region relative to the US.

Within the manufacturing sector, the largest sub-industries include metals, plastics, and food and beverage manufacturing. Fabricated Metal Product Manufacturing and Primary Metal Manufacturing together make up about 28% of manufacturing output and 31% of jobs. Plastics and Rubber Product Manufacturing make up another 12% of output and 15% of jobs. Food Manufacturing and Beverage Manufacturing represent a combined 13% of output and 10% of jobs.

KEY MANUFACTURING SECTORS IN NORTHWEST PENNSYLVANIA



PLASTICS & RUBBER
MANUFACTURING



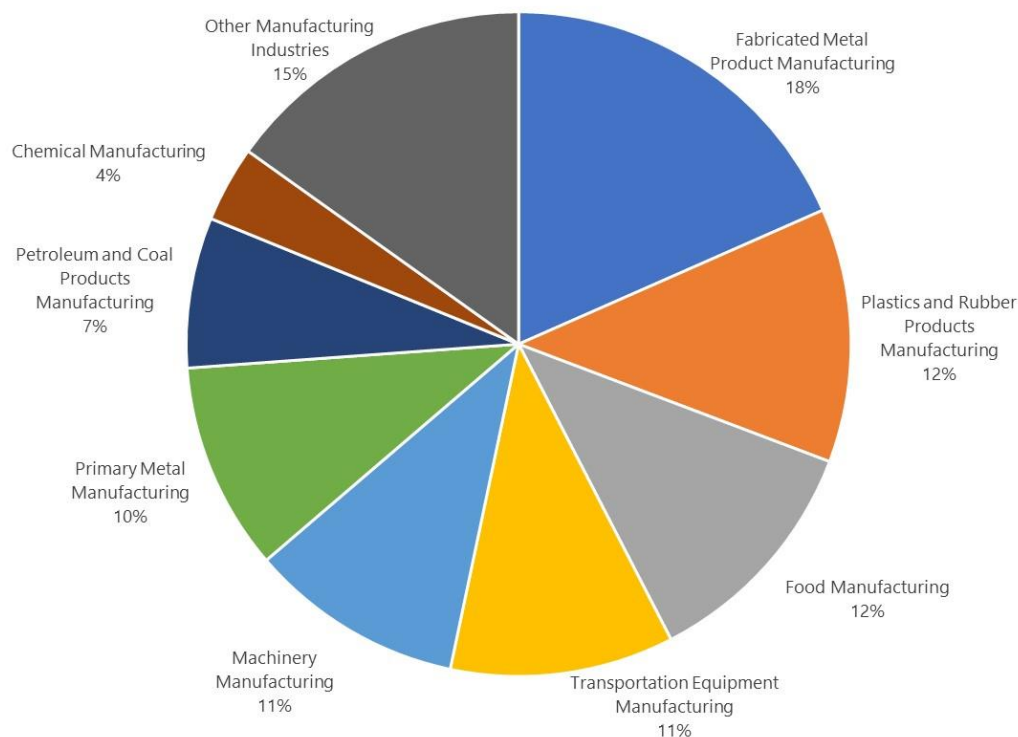
FOOD & BEVERAGE
MANUFACTURING



METAL
MANUFACTURING

Figure 3

Northwest Pennsylvania Manufacturing Sectors, 2017 GRP



¹ Location Quotient (LQ) measures the concentration of an industry in a region relative the national average. An LQ greater than 1 means the region has a higher concentration of a particular industry.

Of the 21 manufacturing sub-industries,² nine industries have shown employment growth over the last five years (2013-2018). Sub-industries adding at least 100 jobs over this period include:

- ◆ Plastics and Rubber Manufacturing: +800 jobs | 13% increase
- ◆ Food Manufacturing: +734 jobs | 22% increase
- ◆ Beverage and Tobacco³ Product Manufacturing: +218 jobs | 80% increase
- ◆ Wood Product Manufacturing: +142 jobs | 5% increase
- ◆ Petroleum and Coal Products Manufacturing: +131 jobs | 20% increase
- ◆ Furniture and Related Product Manufacturing: +106 jobs | 16% increase

Manufacturing sub-industries with the largest job losses over this period include:

- ◆ Transportation Equipment Manufacturing: -2,432 jobs | 35% decrease
- ◆ Machinery Manufacturing: -1,201 jobs | 18% decrease
- ◆ Fabricated Metal Product Manufacturing: -888 jobs | 8% decrease
- ◆ Chemical Manufacturing: -689 jobs | 48% decrease
- ◆ Computer and Electronic Product Manufacturing: -584 jobs | 34% decrease

For more detailed data on historic and projected employment growth in the manufacturing sector, refer to Appendix C: Detailed Data Tables.

² As categorized at the 3-digit NAICS level (North American Industry Classification System)

³ All employment in this sector is in the beverage industry; there is no tobacco industry presence in the region

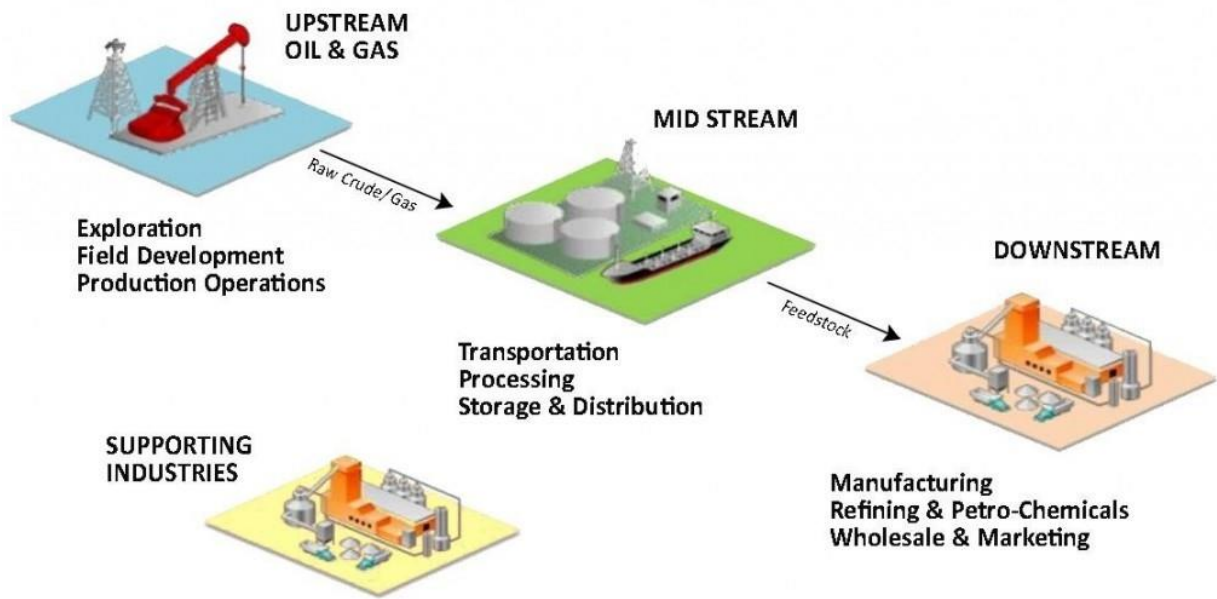


Image Source: AVATA

Figure 4: Petrochemicals Supply Chain

3 | PETROCHEMICALS SUPPLY CHAIN

The natural gas supply chain is commonly separated into three segments: upstream, midstream, and downstream.

- ◆ **Upstream** refers to anything having to do with the exploration and production of oil and natural gas. Geologic surveys and any information gathering used to locate specific areas where minerals are likely to be found is commonly called 'exploration.' The term 'upstream' also includes the steps involved in the actual drilling and bringing oil and natural gas resources to the surface, referred to as 'production'.
- ◆ The **midstream** segment of the oil and natural gas industry refers to anything required to transport and store crude oil and natural gas before they are refined and processed into fuels and key elements needed to make a very long list of products used every day. Midstream includes pipelines and all the infrastructure needed to move these resources long distances, such as pumping stations, tank trucks, rail tank cars and transcontinental tankers.
- ◆ **Downstream** includes everything involved in turning crude oil and natural gas into finished products. Some of the more obvious products are fuels like gasoline, diesel, kerosene, jet fuels, heating oils and asphalt for building roads. But long-chain hydrocarbons found in both oil and natural gas are used to make far less obvious products like synthetic rubbers, fertilizers, preservatives, containers, and plastics for parts in countless products. Oil and natural gas products are even used to make artificial limbs, hearing aids and

flame-retardant clothing to protect firefighters. In fact, paints, dyes, fibers and just about anything that is manufactured has some connection to oil and natural gas.⁴

As a result of falling production costs and the abundance of natural gas in the Marcellus Shale and Utica Shale, the states of Pennsylvania, Ohio, and West Virginia have seen a boom in economic activity related to petrochemical production. Further driving this boom is the fact that up to 40% of natural gas produced in the region is rich in natural gas liquid (NGL), a valuable commodity that can be refined into ethane, propane, and other raw materials, known as feedstocks, which are critical to downstream manufacturing of a wide variety of products.⁵

The relatively low cost of producing these feedstocks in the Appalachia region compared to the Gulf Coast, which has until recently been the sole hub of petrochemical production within the US, creates a key advantage for producers and has led to soaring investment in the region. By 2030, the region is expected to account for over 40% of US natural gas production,⁶ compared to 27% in 2017, and just 2% in 2008.⁷

The valuable NGL-rich “wet gas” is concentrated in Southwestern Pennsylvania and Northwestern West Virginia. Currently, once separated out of the natural gas, the NGLs, primarily ethane and propane, are transported by pipeline out of the region for processing into ethylene and propylene, known as “cracking,” and then further processed into polyethylene (PE) and polypropylene (PP) in the form of pelletized plastic. PE and PP are used in various forms as basic inputs to a broad range of plastics products.

NORTHWEST PENNSYLVANIA PETROCHEMICALS SUPPLY CHAIN

Polyethylene and its downstream uses is the focus of this study, given its designation as the chief product of the Pennsylvania Shell Complex. However, Northwest Pennsylvania has historically had a presence of economic activity in other sectors of the petrochemicals supply chain. In fact, aptly-named Oil City is known for being a hub for oil production during the Industrial Revolution after drilling of the world’s first oil well occurred in nearby Titusville in 1859.⁸ The economic legacy of the region is still evident through the range of petrochemical-related output that continues to be produced today.

Broad sectors comprising the petrochemical supply chain include the following:

- ◆ Oil and Gas Extraction
- ◆ Basic Chemical Manufacturing
- ◆ Chemical Product Manufacturing
- ◆ Plastics Product Manufacturing ◆ Rubber Product Manufacturing
- ◆ Other Plastics-Utilizing Product Manufacturing
- ◆ Wholesalers

Figure 5 shows the types of sub-industries in these broad sectors that are represented in Northwest Pennsylvania.

⁴ EnergyHQ.com

⁵ IHS Markit. *Prospects to Enhance Pennsylvania’s Opportunities in Petrochemical Manufacturing*. March 2017.

⁶ IHS Markit. *Prospects to Enhance Pennsylvania’s Opportunities in Petrochemical Manufacturing*. March 2017.

⁷ Petrochemical Update. *US Northeast Petrochemical Situation and Outlook 2019*.

⁸ <https://www.britannica.com/place/Oil-City>

Figure 5: Components of the Petrochemicals Supply Chain in Northwest Pennsylvania

Oil and Gas Extraction	Basic Chemical Manufacturing	Chemical Product Manufacturing	Plastics Product Manufacturing	Rubber Product Manufacturing	Plastics-Utilizing	Wholesalers
<ul style="list-style-type: none"> •Petroleum and Natural Gas Extraction •Drilling Wells •Support Activities 	<ul style="list-style-type: none"> •Inorganic Chemical Manufacturing 	<ul style="list-style-type: none"> •Plastics Material and Resins •Synthetic Rubber •Synthetic Fibers and Filaments •Pesticide •Paint and Coating •Adhesives 	<ul style="list-style-type: none"> •Pipes and pipe fittings •Bottles •Laminated plastic •Foam products •Consumer goods •Industrial liners •Packaging •Food containers 	<ul style="list-style-type: none"> •Tires •Hoses and belts •Mechanical applications 	<ul style="list-style-type: none"> •Electronic components •Motor vehicle components 	<ul style="list-style-type: none"> •Plastics materials •Chemicals •Petroleum and petroleum products

The petrochemicals supply chain accounts for an estimated 6% of the region's gross regional product and 3% of employment.⁹ This economic activity can be divided by NAICS code¹⁰ as shown in Table 1 and Figure 6. In terms of jobs, plastics product manufacturing makes up the dominant share of the supply chain, accounting for 60% of all petrochemicals employment in the region. Oil and gas extraction is significant in terms of gross regional product, making up over 30% of supply chain output, yet accounts for only 10% of jobs. This speaks to the relatively low labor-intensiveness of extraction compared to plastics manufacturing. *Table 1*

Northwest Pennsylvania Petrochemical Supply Chain by Industry Sector				
Sector	2017 GRP	Percent of Total	2018 Jobs	Percent of Total
Oil and Gas Extraction	\$462,454,069	30.5%	911	10.0%
Basic Chemical Manufacturing	\$95,692,762	6.3%	223	2.4%
Chemical Product Manufacturing	\$127,017,272	8.4%	509	5.6%
Plastics Product Manufacturing	\$529,252,345	34.9%	5,485	60.0%
Rubber Product Manufacturing	\$214,252,933	14.1%	1,339	14.7%
Other Plastics-Utilizing Product Manufacturing	\$31,892,388	2.1%	317	3.5%
Wholesalers	\$56,378,222	3.7%	354	3.9%
Petrochemical Supply Chain Total	\$1,516,939,990	100.0%	9,139	100.0%

Note: Transportation and Warehousing omitted due to data limitations in separating out petrochemicals-related transportation and warehousing.

Source: EMSI, Camoin Associates

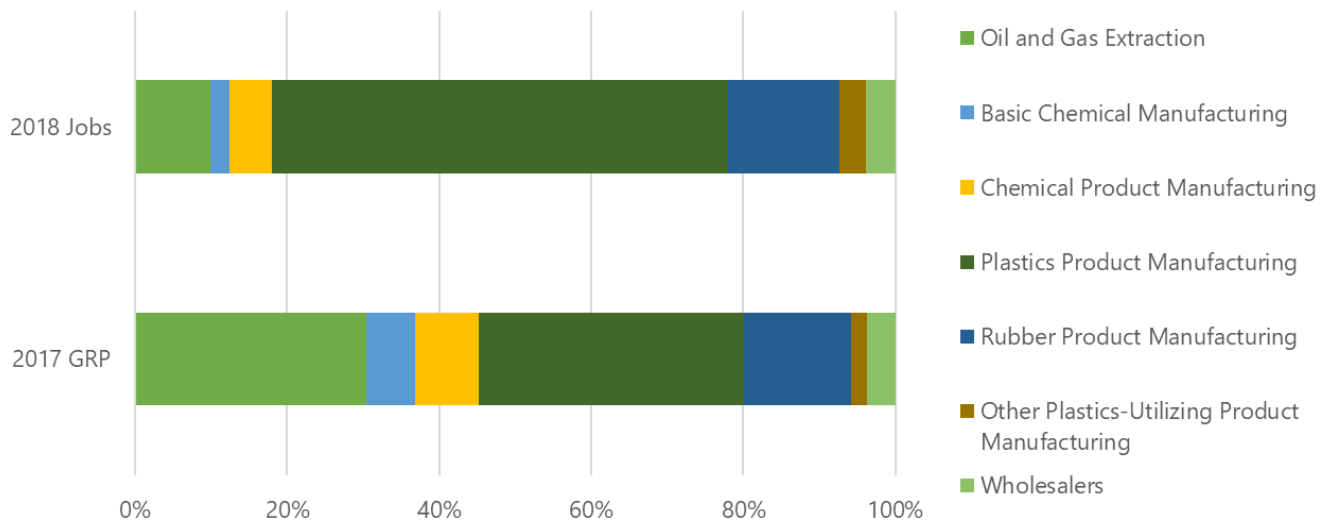
Rubber product manufacturing is also a significant component of the supply chain, with about 14% of output and 15% of jobs in this category,

Figure 6

⁹ Camoin Associates, EMSI

¹⁰ The North American Industry Classification System is used by the Federal statistical agencies to classify business establishments for the purpose of collecting, analyzing, and public statistical data related to the US economy.

Petrochemical Supply Chain in NW PA, Jobs and Gross Regional Product



Please refer to Appendix B: Detailed Data Tables for a comprehensive breakdown of employment and economic output by sub-industry.

PENNSYLVANIA SHELL CHEMICALS COMPLEX

The first large-scale, NGL-based petrochemical investment in Pennsylvania will be the Shell Pennsylvania Chemicals ethane cracker in Monaca, Beaver County. It is slated to be a world-scale, ethane-fed cracker that will produce 1.5 million metric tons (MT) per year of ethylene, which will be converted to over 1.0 million MT per year of high-density polyethylene (HDPE) and 550,000 MT per year of linear low-density polyethylene (LLDPE). HDPE and LLDPE are two of the fastest growing and largest volume plastic resins globally. The project is likely to be completed by 2021–22.¹¹

According to IHS Markit, between 2026 and 2030 the expected ethane production from the Marcellus and Utica Shale plays will be enough to support up to four additional world-scale ethane steam crackers in the Appalachia region, even after meeting the demand from the future Shell Pennsylvania Chemicals ethane steam cracker. This is also in addition to meeting the demand for ethane from pipelines currently shipping it out of the region and future pipeline projects that will do the same.¹²

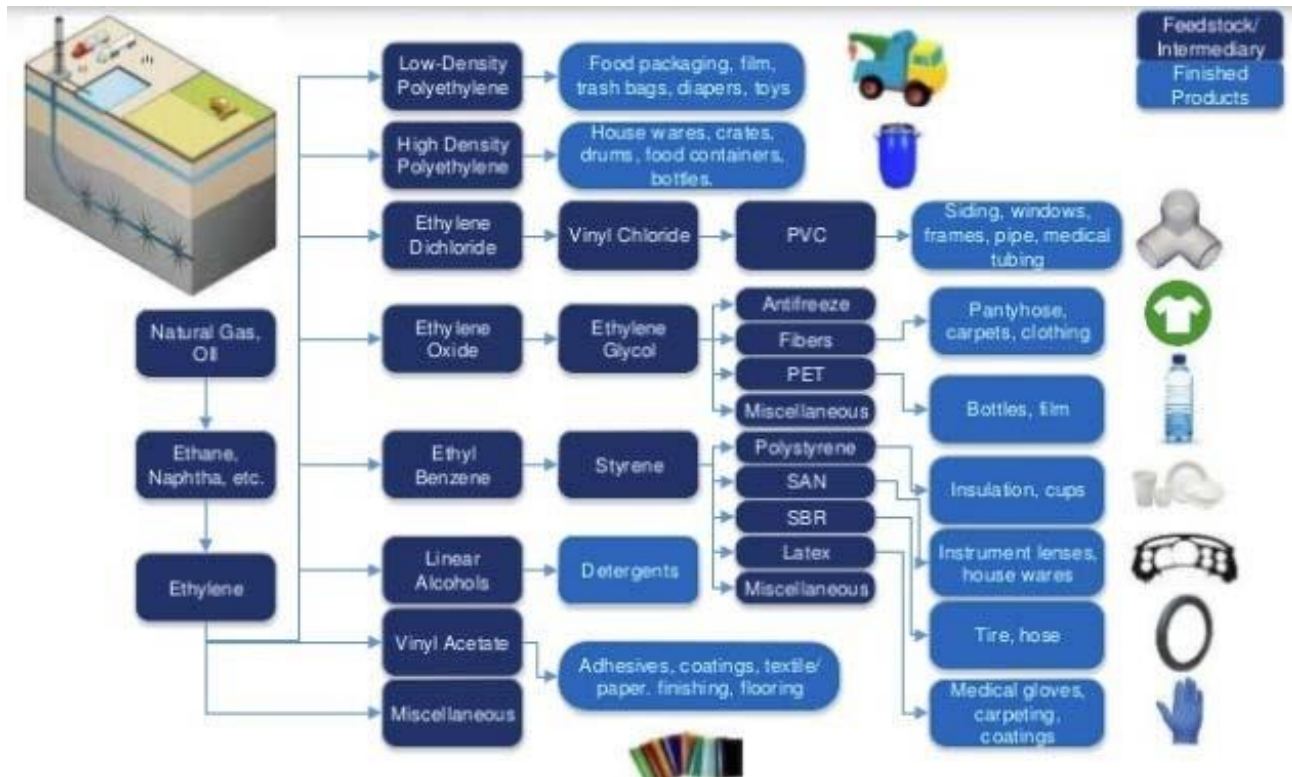
ETHANE CRACKING

An ethane cracker is a facility that processes ethane, a natural gas liquid, into ethylene. This process is accomplished through cracking where ethane is heated to a point where it “cracks” into ethylene. Ethylene is a major building block for numerous consumer and industrial products including everyday items such as plastics bags, plastic bottles, and diapers. End products also include antifreeze, detergent, clothing, and housing materials, as shown in Figure 7.

Figure 7: Products Derived from Ethylene

¹¹ IHS Markit™. “Prospects to Enhance Pennsylvania’s Opportunities in Petrochemical Manufacturing.” March 2017.

¹² IHS Markit™. “Prospects to Enhance Pennsylvania’s Opportunities in Petrochemical Manufacturing.” March 2017.



Source: Professional Logistics Group

In the case of the Shell Pennsylvania, 100% of ethylene produced will be further processed onsite into polyethylene. Polyethylene is produced in the form of plastic pellets, which are shipped to fabrication sites where plastics materials and products are manufactured. Plastics products are made using various methods, including: extrusion (film), injection molding (containers), blow molding (bottles) or rotation molding (hollow plastic products).

POLYETHYLENE PRODUCTS

The two types of pelletized polyethylene produced at Shell Pennsylvania are high-density polyethylene (HDPE) and linear low-density polyethylene (LLDPE), each of which have different chemical properties and end uses. HDPE is more rigid and semi-translucent in appearance and used to make products such as housewares, crates, drums, bottles, pipes, plumbing, and food containers. LLDPE is very flexible, yet puncture-resistant, and translucent in appearance. Its end uses include plastics films, sheets, trash can lines, molded products, and shipping sacks.

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4 | OPPORTUNITIES FOR NORTHWEST PENNSYLVANIA

Key opportunities for Northwest Pennsylvania arising as a result of the Shell complex relate specifically to the polyethylene (PE) supply chain, which can be thought of as a component of the overall petrochemicals supply chain. Opportunities relate primarily to geographic proximity advantages that the region can provide over competing locations. According to Shell, it plans to sell its PE pellets to buyers located within a 700-mile radius of the Shell Pennsylvania facility.

These buyers currently must source their pellets from the Gulf Coast, Canada (Sarnia, Ontario region), or from overseas. For those buyers, having a supplier based in the Appalachia region offers two important advantages:

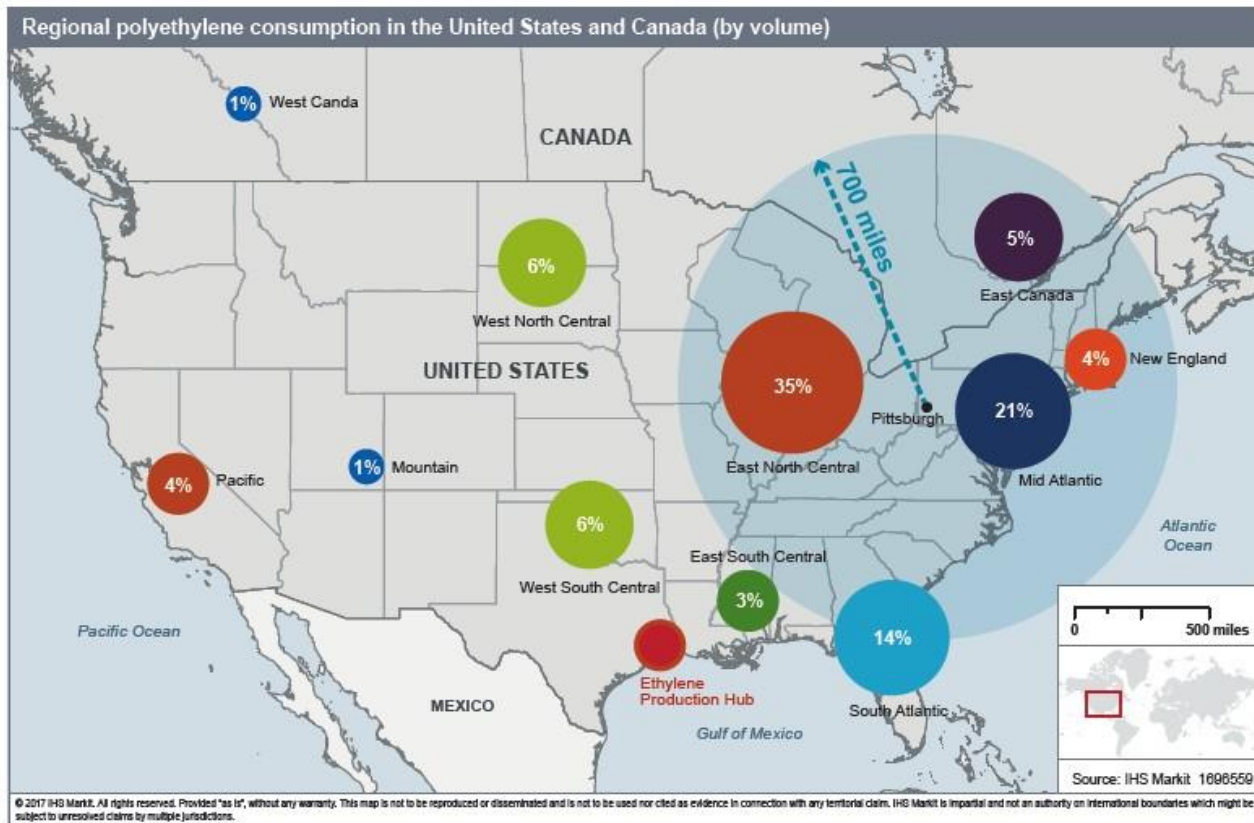
1. Shorter delivery lead times, contributing to increased reliability and flexibility in production
2. 5-10% total delivered cost advantage due to shorter shipping distances¹³

The most benefit will be enjoyed by buyers within approximately 300 to 400 miles of the facility, which is within trucking distance. Buyers beyond 400 miles but within 700 miles will be served primarily by rail, which is more inexpensive than trucking for long-haul distances.

¹³ Petrochemical Update. *US Northeast Petrochemical Situation and Outlook 2019*.

As shown in Figure 8, approximately 73% of polyethylene demand (by volume) is located within 700 miles of the Shell complex. The regions with highest concentrations of users include the East North Central region of the Midwest (i.e. the Great Lakes region), with 35% of demand; the Mid-Atlantic, with 21%; and the South Atlantic, with 14%. The Shell complex is situated roughly at the intersection of these three regions, putting it in ideal location for serving the three top-buying regions in North America.

Figure 8



While being positioned closer to a PE source will certainly be a positive for PE buyers, it is *not* the determining factor in where they choose to locate. This is evidenced clearly by the fact that the top-buying regions are not proximate to the Gulf Coast PE production region. In fact, the West South Central and East South Central regions, which contain the Gulf Coast, collectively account for just 9% of PE purchases.

This intuitively makes sense when transportation costs are considered. PE pellets are light; compared to shipping end use products that PE buyers manufacture, the cost of shipping PE is relatively insignificant. PE-derived products that are hollow, such as bottles and drums, take up a large amount of space relative to their weight, and are therefore inefficient to ship long distances. PE pellets, on the other hand, can be packed tightly and shipped efficiently. Therefore, PE buyers are much more likely to locate near their customers than to their PE supplier. Key customers include other manufacturers and consumers, both of which are concentrated in population centers of the Northeast, Midwest, and Southeast.

POLYETHYLENE-UTILIZING TARGETED INDUSTRIES

The region's main opportunity for economic growth related to Shell Pennsylvania is to attract polyethylene users, building on its strong existing plastics industrial base. This section narrows in on the individual industries that use polyethylene, summarizing key trends that will impact industry performance into the future.

The major links in the PE supply chain and the NAICS codes to which they belong are as follows:

1. Polyethylene pellet producers
 - ◆ *NAICS 32521 | Plastic and Resin Manufacturing*
2. Pellet compounders and converters
 - ◆ *NAICS 32599 | Chemical Product Manufacturing*
3. Plastics products manufacturers
 - ◆ *NAICS 32611 | Plastic Film, Sheet, and Bag Manufacturing*
 - ◆ *NAICS 32612 | Plastic Pipe and Parts Manufacturing*
 - ◆ *NAICS 32613 | Laminated Plastics Manufacturing*
 - ◆ *NAICS 32616 | Plastic Bottle Manufacturing*
 - ◆ *NAICS 32619 | Plastic Products Miscellaneous Manufacturing*
4. Wholesalers and distributors of intermediate and final plastics products
 - ◆ *NAICS 42461 | Plastics Wholesaling*



Pennsylvania Shell Complex, Monaca, PA

Source: Shell

1 | POLYETHYLENE PELLET PRODUCERS

PE pellet production is not considered a realistic target opportunity for Northwest Pennsylvania, but is included here to provide context for the rest of the PE supply chain. As in the case of Shell Pennsylvania, these facilities are often

located adjacent to ethane crackers, and Northwest Pennsylvania would not be a prime location for a siting a cracker as it is not located over prime wet gas territory. Current and past locations under consideration for ethane cracker/PE plant complexes in the Appalachia region have been in Ohio and West Virginia along the Ohio River.

Polyethylene pellet production falls within the Plastic and Resin Manufacturing industry.

NAICS 32521

Plastic and Resin Manufacturing

This industry manufactures resins, plastic materials (i.e. polymers) and synthetic rubber. This includes thermosetting resins, thermoplastic resins and synthetic rubber. Raw material inputs are sourced from chemical industries and industries involved in the production of petroleum-based feedstock.

National Statistics, 2018

Revenue	\$95.9B	Exports	\$37.7B	Profit	\$7.5B
Growth 13-18	-3.2%	Imports	\$18.2B	Establishments	1,303
Growth 18-23	0.8%	Trade Balance	\$19.5B	Enterprises	1,015

2018 Share of Job Growth 13-18 Projected Job Growth 18-23 Jobs US Jobs Change Pct. Change Change Pct. Change

NW PA	178	0%	(53)	-23%	3	2%
200-mile Radius	10,174	15%	(6)	0%	(657)	-6%
United States	67,664	100%	1,573	2%	(1,322)	-2%

Top Products	Major Industry	Top US Business			
	Markets	Locations	Export Markets	Import Markets	External Drivers
•Polyethylene •Polypropylene •PVC •Other thermoplastics •Thermosetting resins and plastics materials	•Manufacturing •Construction	•Great Lakes •South Atlantic •Mid Atlantic •Texas •California	•Mexico •Canada •China •Belgium	•Canada •Germany •Japan •Mexico	•Value of construction •World price of crude oil •World price of natural gas •Trade-weighted index

Source: Industry performance information from IBISWorld; employment data from EMSI

Plastic and Resin Manufacturing Industry Outlook¹⁴

The importance of plastic and resin products in construction and manufacturing industries is expected to help the Plastic and Resin Manufacturing industry rebound in terms of revenue over the five years to 2023. Stronger industrial production and construction activity will underpin sustained revenue growth for operators. Consequently, over the five years to 2023, IBISWorld expects industry revenue to rise slightly at an annualized rate of 0.8% to \$99.6 billion.

Sustained demand

The industry's two largest buyers, downstream manufacturers and the construction sector, are set to experience growth in demand and revenue over the next five years, following a period of continued recovery over the past five years. Over the five years to 2023, per capita disposable income is anticipated to grow an annualized 2.3%, while unemployment is expected to remain low during the period. These two factors will spur more consumer spending at

¹⁴ IBISWorld

the retail level, which will increase demand for manufactured goods that use plastic and resin as inputs, thus increasing industry demand. The industrial production index, a measurement that includes manufacturing activity, is set to grow at an annualized rate of 1.6% over the five years to 2023. As manufacturing activity improves, demand for plastic and resin inputs will rise.

Demand for plastic-based construction materials is also anticipated to expand. Housing starts are expected to increase at an annualized rate of 3.3% over the five years to 2023, and the value of private nonresidential construction is also set to increase during the five-year period. As construction projects advance, demand for pipes, flooring and other plastic-based construction materials will increase, thereby stimulating demand for plastic and resin inputs.

Demand from foreign buyers will also rise, with exports forecast to increase at an annualized rate of 1.3% to \$40.3 billion over the next five years, accounting for 40.5% of industry revenue in 2023. Much of this demand is expected to come from neighboring Mexico and Canada, which, in addition to their shared borders with the United States, also possess favorable US trade relations via the North American Free Trade Agreement. As the US dollar continues to remain volatile over the next five years, imports are expected to fall at an annualized rate of 0.4% to \$17.9 billion over the five years to 2023, accounting for 23.2% of domestic demand.

Profit remains strong

Raw material prices will increase over the next five years. Specifically, the price of crude oil is expected to increase at an annualized rate of 2.8% over the five years to 2023, while the world price of natural gas is expected to rise at the same rate as crude oil over the next five years. With demand from key downstream buying markets set to increase, plastic and resin manufacturers are expected to pass on most of these additional costs to customers.

Companies will likely invest more resources into integration and research and development, particularly in relation to innovation and efficiency in the production process. Popular resins such as polypropylene and polyethylene, which together account for more than half of all industry revenue, are produced in bulk within large, highly capital-intensive facilities. To lower production costs, larger, more successful companies integrate these facilities into oil refineries to more efficiently source inputs and expand their distribution capabilities.

Manufacturers will also likely invest resources into bioplastic technology, an alternative to fossil fuel-based plastics, which are derived from biomass sources such as vegetable oil and cornstarch. In addition to being biodegradable, the production process for bioplastics generates less greenhouse gas when compared with petroleum-based plastics. However, bioplastic is significantly more expensive to produce than petroleum-based plastic, averaging 20.0% more in production costs. Still, plastic and resin manufacturers will continue to explore ways to use bioplastics and reduce their production costs over the next five years.

Several new players are forecast to enter the industry with the expectation of reaping the benefits of industry-wide revenue growth. Over the five years to 2023, IBISWorld estimates the number of enterprises will increase at an annualized rate of 1.3% to 1,082 enterprises. Furthermore, employment is expected to grow at an annualized rate of 1.0% to 82,231 workers during the same period. The difference between enterprise growth and employment growth highlights the industry's gradual shift toward automation in the production process. The Plastic and Resin Manufacturing industry is already highly capital-intensive and, while additional labor will be needed to monitor production processes and handle customer service inquiries, the majority of new demand will arise through investments in new production equipment.

2 | PELLET COMPOUNDERS AND CONVERTERS

The custom-compounding of purchased plastic resins involves buying plastic from plastic manufacturers and then altering the resins to form new compounds. Industry manufacturers manipulate these resins to increase flexibility, stress resistance and flame resistance to meet customer needs. Operators across the manufacturing sector are the

primary buyers of these modified resins, with automotive, appliance and power tool manufacturers being the largest purchasers.

Depending on the capabilities of the individual business, end-product plastics manufacturers may purchase polyethylene pellets in raw form and convert them inhouse, or purchase compounded or converted plastics from establishments in this industry. Given the existing presence of plastics manufacturing in Northwest Pennsylvania, compounders and converters are a logical target industry for the region.

Compounders and converters fall within the Chemical Product Manufacturing industry. Over the past five years, demand for this product segment has fluctuated in line with the general economy. As consumer spending and corporate profit have grown, so too has demand for custom-compounded resins. As a result, this segment has grown as a share of industry revenue over the past five years.¹⁵

NAICS 32599

Chemical Product Manufacturing

Operators in this industry manufacture a diverse range of chemical products. Key activities include customcompounding of plastic resins and manufacturing toners, toner cartridges, photographic chemicals and sensitized photographic film, paper and plates. Custom-compounding of plastic resins includes custom mixing and blending of purchased plastic resins and reformulating plastic resins from recycled plastic products.

National Statistics, 2018

Revenue	\$41.8B	Exports	\$7.2B	Profit	\$2.8B
Growth 13-18	-0.4%	Imports	\$4.8B	Establishments	1,869
Growth 18-23	-0.1%	Trade Balance	\$2.5B	Enterprises	1,499

2018 Share of Job Growth 13-18 Projected Job Growth 18-23 Jobs US Jobs Change Pct.

NW PA	51	0%	(284)	-85%	(5)	-10%
200-mile Radius	5,179	8%	(643)	-11%	(342)	-7%
United States	68,286	100%	(990)	-1%	(1,795)	-3%

Major Industry		Top US Business			
Top Products	Markets	Locations	Export Markets	Import Markets	External Drivers
<ul style="list-style-type: none"> •Customcompounding of resins •Photographic films, papers, and plates 	<ul style="list-style-type: none"> •Manufacturing sector •Automobile industry •Households •Construction sector 	<ul style="list-style-type: none"> •California •Texas •Southeast •Mid-Atlantic •Great Lakes 	<ul style="list-style-type: none"> •China •Canada •Mexico •Singapore 	<ul style="list-style-type: none"> •Japan •China •Canada •Germany 	<ul style="list-style-type: none"> •World price of crude oil •Industrial production index •Per capita disposable income •Trade-weighted index

Source: Industry performance information from IBISWorld; employment data from EMSI

¹⁵ IBISWorld

Chemical Product Manufacturing Industry Outlook¹⁶

Revenue for the Chemical Product Manufacturing industry is expected to continue trending downward over the next five years slightly at an annualized rate of 0.1% to \$41.6 billion by 2023. While demand for photographic chemicals and materials will continue to fall over the next five years, demand from other downstream manufacturers is expected to remain stable. However, industry revenue is expected to continue its downward trend, with revenue declining an estimated 0.1% in 2019.

Tempered growth among industry segments

The manufacturing sector is expected to benefit from renewed demand over the five years to 2023. Much of this expected uptick in demand can be attributed to rising per capita disposable income, which is forecast to increase at an annualized rate of 1.4% over the next five years. Higher incomes will translate into consumption, increasing demand for manufactured products.

For example, developments in the consumer appliance sector are expected stimulate demand for parts such as pipes, wire and cables, the production of which depends on chemical product inputs. Consequently, as demand for appliances rises over the next five years, demand for industry products will follow suit.

With construction activity expected to pick up significantly through 2023, demand for chemicals used in construction materials is also anticipated to increase. For example, the value of private nonresidential construction is projected to grow at an annualized rate of 3.1% over the five years to 2023. As a result, construction material manufacturers will stimulate demand for a wide range of chemical products, benefiting the industry.

However, other key end markets for industry operators, such as the automotive sector, are expected to experience a decline in revenue over the next five years. For example, new car sales are forecast to decline at an annualized rate of 1.0% over the five years to 2023, decreasing demand for new car parts and reducing demand for chemical inputs.

Furthermore, falling demand from the photography sector will continue to constrain industry revenue. Demand for photographic materials will decline as digital photography continues to replace analog photography, especially as consumers view more photos exclusively in digital form. Consequently, this lagging segment will temper industry growth.

Squeezed profit

The prices of raw material inputs used in this industry, particularly the price of crude oil, are expected to be volatile over the next five years. While crude oil prices are expected to grow at an annualized rate of 2.8% over the next five years, IBISWorld expects significant year-to-year changes in crude oil prices through 2023, though growth in this driver will be steady. Since the price of crude oil is a key component of the industry's cost structure, price fluctuations will cause similar changes in industry cost structures and sales prices. As the industry encounters difficulty projecting costs, profit margins are expected to be pressured.

In addition to rising feedstock prices, industry operators will have to cope with changing environmental regulations. The US government is likely to increase the stringency of chemical regulation over the next five years as Congress becomes more focused on reducing greenhouse gas emissions and protecting the environment. New regulations are likely to raise costs by forcing manufacturers to restructure production processes to comply with new laws.

Since costs are expected to increase and revenue is projected to decline, the industry is expected to continue consolidating. The number of enterprises is expected to continue its slow decline, inching downward an annualized 0.9% to 1,430 companies over the next five years. Employment is expected to decline as well, albeit at a slightly faster rate than over the past five years, at an annualized rate of 0.5% to 59,858 workers.

¹⁶ IBISWorld

Rising exports and imports

Exports are expected to rise only slightly, further hampering industry revenue growth. Exports are expected to rise slightly at an annualized rate of 0.5% to \$7.4 billion; however, their share to total revenue in 2023 will remain steady. IBISWorld forecasts that exports will account for 17.8% of revenue in 2023.

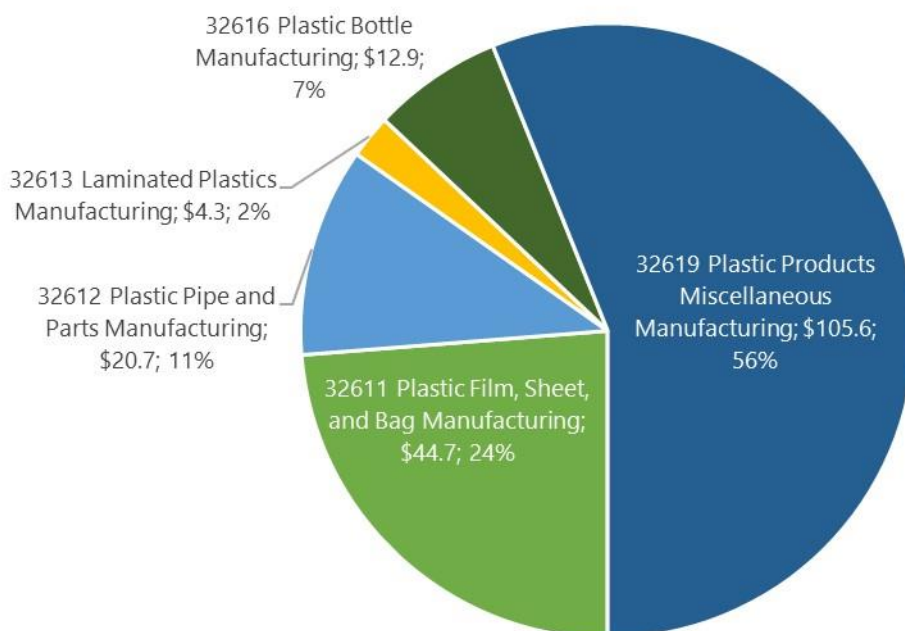
Meanwhile, the value of chemical products imported into the United States is expected to increase through 2023. Despite a decrease in the value of the dollar, imports are expected to rise. Consequently, the value of imported chemical products is forecast to decrease at an annualized rate of 0.8% to \$4.6 billion over the five years to 2023.

3 | POLYETHYLENE-UTILIZING PLASTICS MANUFACTURING

Polyethylene is used in a variety of end products across five plastics manufacturing sub-industries. Figure 9 shows the breakdown of these industries in terms of total US revenue for 2018. Key products in these industries include plastic film, sheets, bags, and packaging; pipes and plumbing fixtures; plastic profile shapes; laminates; bottles for food, beverages, industrial products, and household products; housewares; motor vehicle parts; and building materials.

Figure 9

PE-Utilizing Plastics Manufacturing Industries, by Total US Industry Revenue (\$Billions), 2018



Top markets for these products include construction, food and beverage manufacturing, automotive and transportation manufacturing, utilities, household product manufacturing, and other general manufacturing. All five sub-industries are projected to show revenue growth annually over the next five years, driven by a number of factors, including increased consumer spending, increased demand from construction and industrial production, and increased exports, in part due to the projected slight decline in the value of the US dollar.

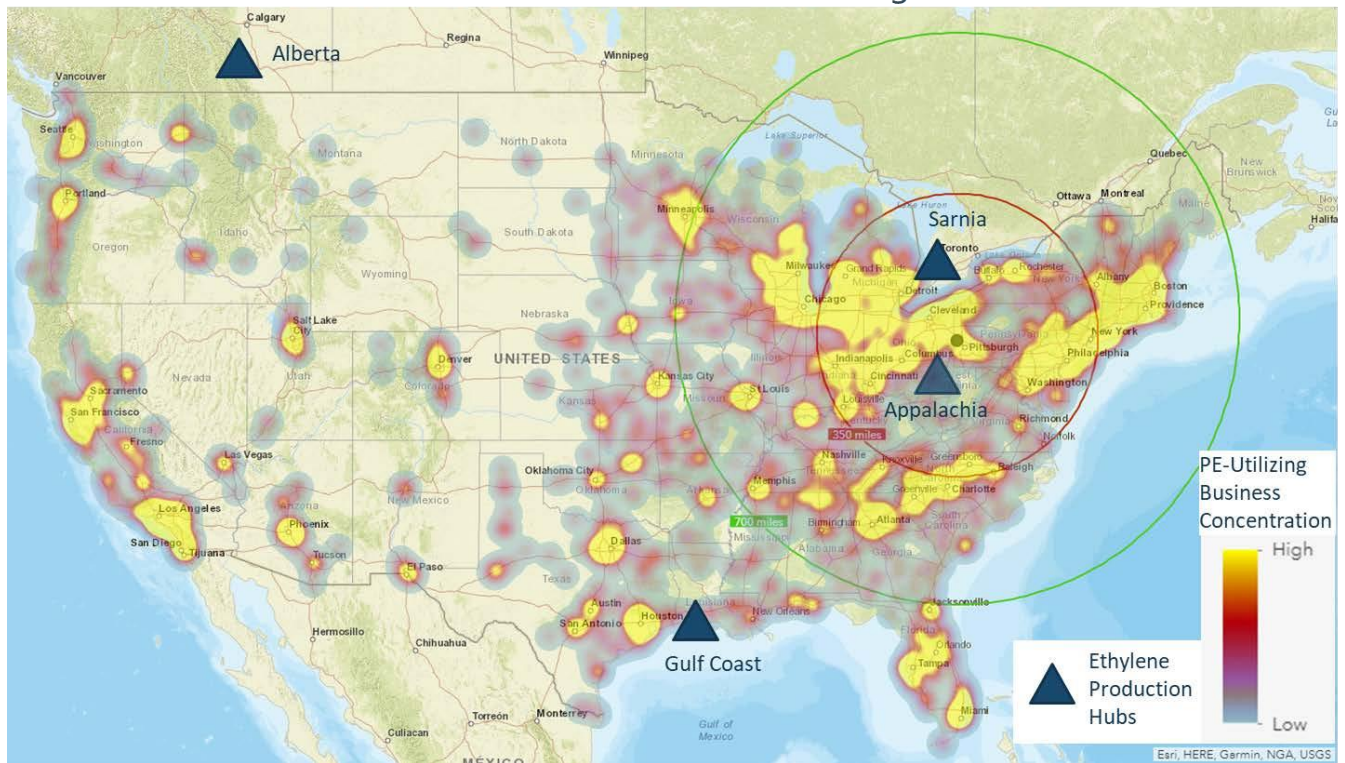
The largest export markets for PE-derived goods include Mexico, Canada, China, and the United Kingdom. Import markets include Canada, China, Mexico, Germany, South Korea, and Taiwan.

As illustrated in Figure 10, PE-utilizing industries tend to be concentrated in the Great Lakes Region (the area spanning roughly from Milwaukee to Pittsburgh), Northeast Corridor (Boston to Washington, DC), South Atlantic (Raleigh to Atlanta), as well as Florida, California, and Texas.

Northwest Pennsylvania already has a significant presence of many of these industries on which to build.

Figure 10

Concentrations of Businesses in PE-Utilizing Industries



Source: Esri

Profiles for each of the polyethylene-utilizing sub-industries follow, with detailed information on industry characteristics, performance, and outlook.

NAICS 32611**Plastic Film, Sheet, and Bag Manufacturing**

This industry converts plastic resins into various films, sheets and bags. Industry products are used by manufacturers for packing and storing products, by retailers for transporting merchandise and by consumers for household purposes. Industry operators also form, coat or laminate plastic film and sheets into single-wall or multiwall plastic bags.

National Statistics, 2018

Revenue	\$44.7B	Exports	\$9.0B	Profit	\$2.8B
Growth 13-18	-0.4%	Imports	\$9.8B	Establishments	1,307
Growth 18-23	1.6%	Trade Balance	-\$0.8B	Enterprises	1,003

2018 Share of Job Growth 13-18 Projected Job Growth 18-23 Jobs US Jobs Change Pct.
Change Change Pct. Change

NW PA	<10	0%	N/A	N/A	N/A	N/A
200-mile Radius	7,186	8%	84,674	488	7%	461
United States	100%			9,255	11%	3,716

Top Products	Major Industry	Top US Business		Export Markets	Import Markets	External Drivers
	Markets	Locations				
•Plastic film and sheets •Plastic packaging film and sheets •Plastic bags	•Food and beverage manufacturers and retailers •Pharmaceutical, medical, and hygiene manufacturers	•Great Lakes •Mid-Atlantic •South Atlantic •California •Texas	•Mexico •Canada •China •United Kingdom	•Canada •China •Mexico •Germany	•Consumer spending •Demand from construction, food manufacturing, and agriculture •Price of plastic materials and resin •Trade-weighted index	

Source: Industry performance information from IBISWorld; employment data from EMSI

Plastic Film, Sheet, and Bag Manufacturing Industry Outlook¹⁷

Over the five years to 2023, IBISWorld projects that industry revenue will grow at an annualized rate of 1.6% to \$48.4 billion. Increases in consumer spending, industrial production, construction and exports will drive demand for plastic film, sheets and bags over the period. In the latter part of the period, IBISWorld expects the industry to experience stronger growth due to advances in the use of polyethylene, which is the main ingredient in plastic bags and sheets, and the fifth-most frequently used plastic. Advances in biodegradable polyethylene are currently underway but are not used on a commercial scale yet.

Increased consumer spending

Revenue growth in the retail, wholesale and distributors markets is expected to remain strong throughout the period as the economy strengthens. Additionally, improving consumer sentiment and increasing household income are expected to aid growth in overall retail activity. Over the five years to 2023, per capita disposable income is forecast to grow an annualized 1.4% and consumer spending is forecast to grow an annualized 2.0%, which will lead to an increased demand for industry products.

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As the US population increases over the next five years, demand for food, beverages, tobacco and other consumer goods is anticipated to rise steadily as well. The expected boost in demand for packaged, processed and fresh foods will benefit the industry. However, environmental concerns may adversely affect growth within the plastic bag segment. For example, as consumers shift to reusable fabric bags, and if new regulations that restrict the use of plastic bags are implemented, industry demand could fall. Moving forward, it will be necessary for plastic bag manufacturers to adapt to environmental regulations.

Foreign competition remains steady

Domestic manufacturers of common industry products, such as plastic bags and laminates, will continue to experience competition from overseas manufacturers. With that said, the value of imports will decline at an annualized rate of 1.0% to \$9.3 billion. Imports have difficulty with custom-made, branded and value-added product segments. Many industry customers have plastic packaging made to their specifications in terms of design, plastic strength and logo placement. As a result, domestic producers with established ties to the end users of these products are somewhat protected from competition from generic imports. During the upcoming period, some US companies (e.g. Sealed Air Corporation) plan to increase production capabilities in emerging markets, likely resulting in some production moving away from the United States, while expansions of low-cost Asian plants will result in more imports from the region. However, the value of the US dollar is expected to decrease over the next five years, which will depress demand for imports, resulting in a decline over the five years to 2023.

IBISWorld anticipates that exports of industry products will grow at an annualized rate of 3.3% to \$10.6 billion over the five years to 2023. Exports are expected to perform well, aided by a depreciating US dollar during the period, due to the continuing growth of emerging economies in Asia and South America. Furthermore, plastic packaging manufacturers will increasingly offer advanced barrier-protection technologies, prompting rising US exports of packaged foods over the next five years.

Profitability and structure changes

Industry profit margins are expected to remain consistent throughout the period as input prices remain low. With expenses such as input and wage prices kept low, it is expected that operators will hold on to these profitability gains. Consequently, profit margins are forecast to remain relatively steady over the five years to 2023. The prices of plastic materials and resin inputs, which are made from oil feedstock, affect industry profit margins, as they are the main input costs for the industry. Prices for these inputs tend to fluctuate with the price of oil, which can be volatile. Oil prices have fallen and, while volatile, are expected to remain low in the short term, thereby limiting rises in the price of plastic materials. Plastic materials and resin price growth is expected to be limited, increasing an annualized 2.1% over the five years to 2023.

However, relative to other industries, profitability is low in this industry, particularly in segments with few value-added products. Wages are expected to keep pace with revenue, increasing at an annualized 1.4% to \$6.6 billion over the

five years to 2023, which will push down profit slightly over this period. Nevertheless, increased demand for industry products and rising per capita disposable income will encourage new entrants to the industry. Over the five years to 2023, the number of enterprises is expected to rise marginally, at an annualized rate of 0.4% to 1,021, due to revenue growth encouraging new entrants, despite profitability trends that would point toward increased consolidation. Over the next five years, regional manufacturers will need to communicate the advantages of local supply (e.g. better ability to provide tailored products and faster production runs) to compete with larger national manufacturers and foreign manufacturers. Additionally, companies that invest in R&D to boost production efficiency will stand out from the competition.

NAICS 32612

Plastic Pipe and Parts Manufacturing

This industry manufactures a range of plastic pipes, plastic fittings for plastic pipes and unlaminated plastic profile shapes, such as rods, tubes, plates and car parts. It does not include plastic hose fixtures, plastic plumbing fixtures or plastic packaging.

National Statistics, 2018

Revenue	\$20.7B	Exports	\$2.2B	Profit	\$1.5B
Growth 13-18	2.8%	Imports	\$1.2B	Establishments	842
Growth 18-23	1.6%	Trade Balance	\$1.0B	Enterprises	624

2018 Share of Job Growth 13-18 Projected Job Growth 18-23 Jobs US Jobs Change Pct. Change Change Pct. Change

NW PA	507	1%	129	34%	38	7%
200-mile Radius	6,670	13%	390	6%	(128)	-2%
United States	52,137	100%	2,208	4%	727	1%

Top Products	Major Industry	Top US Business		Export Markets	Import Markets	External Drivers
	Markets	Locations				
•Unlaminated plastic profile shapes •Drain, waste, and vent pipes •Pipe fittings and unions •Pipes for pressurized water applications	•General manufacturing •Construction •Utilities construction •Industrial and energy	•Great Lakes •Southeast •Mid-Atlantic •California •Texas	•Mexico •Canada •China •United Kingdom	•Canada •Mexico •China •Germany	•Value of construction •Demand from automobile manufacturing •Price of plastic materials and resin •Trade-weighted index •Demand from water supply and irrigation systems	

Source: Industry performance information from IBISWorld; employment data from EMSI

Plastic Pipe and Parts Manufacturing industry Outlook¹⁸

The Plastic Pipe and Parts Manufacturing industry will likely continue to grow over the five years to 2023 as a result of rising demand from key downstream markets. However, industry performance is likely to be more subdued as economic growth decelerates and demand from construction markets returns to sources of organic growth. However, interest rates are expected to remain relatively low over the five years to 2023, keeping financing opportunities attractive for both consumers and businesses. As the cost of borrowing remains low, consumers will feel more incentivized to invest in new items. Accordingly, demand for cars, residential housing and nonresidential projects are expected to increase as consumers and businesses attempt to secure favorable borrowing agreements. Continued growth in these markets is expected to lead to an increase in demand for industry products, as plastic pipes and parts are used in automobile production and construction projects. However, as interest rates reach normalized levels over the five years to 2023, construction activity is expected to slow, which in turn will lead to slower demand for plastic pipes and parts. Overall, revenue is expected to grow at an annualized rate of 1.6% to \$22.4 billion over the five years to 2023.

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Key markets

While construction activity is expected to increase over the five years to 2023, it is forecast to decelerate compared with the past five years. Domestic economic conditions are expected to continue improving, benefiting both businesses and households. The value of construction, which is an estimate of the total dollar value of both public and private construction, is expected to increase at an annualized rate of 1.5% over the five years to 2023. As construction activity increases, demand for industry products is expected to increase as well, due to construction industries using plastic pipes and parts in their production.

In particular, residential construction is directly affected by the interest rates at which consumers can borrow funds. Over the five years to 2023, the Federal Reserve is expected to continue its process of interest rate normalization through gradual increases in the Federal Funds Rate (FFR). As the FFR gradually increases, interest payments on mortgages increase as well. This makes purchasing a house more expensive for individuals and slows their demand for homes. As a result, the value of residential construction is only expected to increase at an annualized rate of 0.5% over the five years to 2023, which is significantly slower than its 4.7% annualized growth during the previous five-year period. As demand for homes slows over the five years to 2023, residential construction operators' demand for industry products will similarly slow. Similarly, new car sales are expected to decline at an annualized rate of 1.0% over the five years to 2023. As with purchasing a new home, buying a car requires financing that is dependent upon interest rates. As rates rise and auto loans become more expensive, consumers slow their demand for new cars. This will lead to slightly lower demand for industry products from auto manufacturers during the outlook period.

Industry structure

The industry will continue to be active in the research and development of products that can be used as substitutes for more-expensive metal or concrete materials, and will remain an important measure for operators over the five years to 2023. New and advanced plastics are expected to continue to give the industry the opportunity to further penetrate what have traditionally been metal-dominated markets, such as automobile component manufacturing and oil and gas transmission. However, the industry is expected to remain vulnerable to volatility in the price of crude oil and petroleum byproducts. The rate at which the economy and the industry adapt to highly volatile oil prices is expected to play an important role in determining the profitability and demand for industry products. High

oil prices increase the price of plastic resin, which is generally passed on to end users of plastic pipes. However, passing higher purchase costs down to customers negatively affects demand for industry products. Furthermore, high oil prices reduce demand for new automobiles, diminishing demand for plastic profile shapes. Industry operators need to adapt their pricing systems to respond more effectively to fluctuating resin prices. Over the five years to 2023, crude oil prices are expected to remain highly volatile, limiting the industry's ability to internalize costs effectively. Due to these uncertainties, industry profit is forecast to stagnate somewhat over the five years to 2023. Furthermore, profit margins are expected to be affected by competition among major players and from less expensive imports. As a result, profit margins are expected to decline from 7.2% of revenue in 2018 to 7.1% in 2023.

Imports are expected to grow at an annualized rate of 1.4% to \$1.3 billion over the five years to 2023, while exports are expected to increase at an annualized rate of 1.8% to \$2.4 billion during the period. In 2018, imports are expected to capture 6.3% of domestic demand, while exports are expected to generate 10.7% of industry revenue. As the value of the US dollar depreciates, domestic plastic pipes and products become more competitive in the global market. Over the five years to 2023, the trade-weighted index is expected to decline at an annualized rate of 0.2%, signaling a decline in the value of the US dollar.

NAICS 32613

Laminated Plastics Manufacturing

Companies within this industry manufacture a range of laminated plastic shapes, plates and sheets. The lamination process generally involves bonding or impregnating profiles with plastics resins and compressing them under heat. Laminated plastic products are used for interior and exterior motor vehicle parts, consumer appliances and construction projects.

National Statistics, 2018

Revenue	\$4.6B	Exports	N/A	Profit	\$451.M
Growth 13-18	1.8%	Imports	N/A	Establishments	239
Growth 18-23	0.7%	Trade Balance	N/A	Enterprises	221

2018 Share of Job Growth 13-18 Projected Job Growth 18-23 Jobs US Jobs Change Pct.

NW PA	93 0%	3,399	(35)	-27%	(2)	-2%
200-mile Radius	17%		1,141	51%	466	14%
United States	19,581	100%	2,663	16%	1,705	9%

Top Products	Major Industry	Top US Business	Export Markets	Import Markets	External Drivers
	Markets	Locations			

<ul style="list-style-type: none"> •Thermoplastic laminates •Thermosetting laminates 	<ul style="list-style-type: none"> •Automotive and transportation manufacturing •Downstream manufacturing •Construction industries •Healthcare and safety product manufacturing 	<ul style="list-style-type: none"> •Ohio •Other Great Lakes states •Mid-Atlantic •California •Florida 	•Not available	•Not available	<ul style="list-style-type: none"> •Industrial production index •Value of construction •Demand from transportation equipment manufacturing •Price of plastic materials and resin
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Source: Industry performance information from IBISWorld; employment data from EMSI

Laminated Plastics Manufacturing Industry Outlook¹⁹

Over the five years to 2024, revenue for the Laminated Plastics Manufacturing industry is expected to increase at an annualized rate of 0.7% to \$4.8 billion, as steady demand from consumer goods markets, construction and manufacturers will fuel revenue expansion. Additionally, stable purchasing costs are projected to keep profit margins relatively level.

Growing demand

Demand from downstream customers will continue to strengthen as the US economy grows. Housing starts and the value of private nonresidential construction are expected to increase at annualized rates of 2.8% and 2.3%, respectively, over the five years to 2024. This expansion will cause an increase in demand for laminated plastic sheets and shapes from the construction sector, as rising consumer spending and historically low mortgage rates will likely encourage residential and commercial construction through 2024. However, shifting consumer preferences for substitute materials, such as natural stone and wood, will mitigate gains for the industry's decorative laminate products, especially in the residential construction market.

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Nevertheless, a projected 1.7% annualized increase in consumer spending will also bolster sales of consumer goods, such as electronics and appliances. This rise in spending will bode well for the Laminated Plastics Manufacturing industry, as downstream producers of goods will purchase more laminated plastics to meet consumer demand. Although these downstream trends are still positive for the industry, growth in consumer spending is anticipated to slow in comparison with its elevated growth rate during the five-year period to 2019.

While demand for laminated plastics is expected to grow, it will be at a slower rate than the previous period. The price of crude oil is expected to over the five years to 2024, as strong demand is expected to return from developing nations, such as China. A modest increase in the price of crude oil is expected to keep plastic resin prices relatively stable.

Rising costs

As a result of stable input prices, purchase costs will likely remain relatively unchanged over the five years to 2024. This industry makes purchases from plastic chemical manufacturers, which price their goods according to raw material prices. Since oil prices are dependent on global demand, and global growth has been increasing at a more tepid pace, the cost of goods for laminated plastic producers is expected to rise only marginally. As a result, industry operators will be able to maintain their profit margins. Steep and sudden price increases, particularly during a period

of decreased product demand, can deter consumers from making purchases. However, this phenomenon is less of a threat during the outlook period than it was during the current period. As a result, profit, measured as earnings before interest and taxes, is forecast to remain relatively stable, projected to account for an estimated 9.9% of revenue in 2024.

Despite slower revenue growth over the next five years, the number of companies in the industry is expected to grow at an annualized rate of 0.4% to 226 enterprises in 2024. However, more successful businesses and diversified operators are expected to acquire distressed industry operators during the period. Consolidation will also help laminated plastics manufacturers defray expenditures on major costs such as research and development. With ongoing advances in laminated plastics production, the industry is expected to see slower new hiring, as new production technologies will permit operators to employ fewer workers and still maintain the same level of output. Nonetheless, new workers will be needed to meet the rise in laminated plastics demand. As a result, employment is expected to increase at an annualized rate of 1.0% over the five years to 2024 to 12,579 workers.

NAICS 32616

Plastic Bottle Manufacturing

Operators in this industry manufacture a range of bottles from various plastic compounds based on their end use. These bottles are then sold to beverage, food and chemical manufacturers to use as packaging for soft drinks, milk, condiments and household and automotive chemicals. This industry does not manufacture reusable plastic bottles or other plastic containers.

National Statistics, 2018

Revenue	\$12.9B	Exports	\$667M	Profit	\$1.5B
Growth 13-18	-0.3%	Imports	\$1.0B	Establishments	471
Growth 18-23	1.2%	Trade Balance	-\$375M	Enterprises	190

2018 Share of Job Growth 13-18 Projected Job Growth 18-23 Jobs US Jobs Change Pct.

	Change	Pct. Change				
NW PA	131	0%	12	10%	4	3%
200-mile Radius	4,560	14%	895	24%	183	4%
United States	32,186	100%	1,302	4%	3	0%

Top Products	Major Industry	Top US Business		Export Markets	Import Markets	External Drivers
	Markets	Locations				

•Beverage bottles	•Beverage manufacturers	•Great Lakes	•Canada	•China	•Demand from soda production
•Food bottles	•Food manufacturers	•Mid-Atlantic	•Mexico	•Canada	•Per capita disposable income
•Automotive and industrial product bottles	•Automotive and industrial product manufacturers	•South Atlantic	•Belgium	•Mexico	•Price of plastic materials and resin
•Household product bottles	•Household product manufacturers	•California	•Japan	•South Korea	•World price of crude oil

Source: Industry performance information from IBISWorld; employment data from EMSI

Plastic Bottle Manufacturing Industry Outlook²⁰

After years of revenue volatility, growth in the Plastic Bottle Manufacturing industry will stabilize over the five years to 2023. As the economy continues to grow and consumers increase their spending, downstream customers will increase their demand for plastic bottles. Consequently, over the five years to 2023, industry revenue is forecast to increase an annualized 1.2% to \$13.7 billion.

Similar to the past five years, industry profit margins are expected to remain relatively stable. The price of plastic materials and resin is forecast to rise at an annualized rate of 2.1%, slightly pushing up industry costs. Companies with long-term customer contracts will be able to pass on rising plastic prices to consumers, although profit margins are still expected to slightly shrink over the next five years.

Increasing demand

Despite changing consumer preferences, demand for plastic bottles from the industry's largest customer, beverage manufacturers, is expected to remain low over the next five years. Consumers are expected to demand more goods from the bottled water and sports drink segments as the public becomes increasingly health-conscious. New types

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of drink products are also appearing on the market and recording phenomenal growth, such as relaxation drinks (IBISWorld report OD4204). Consequently, future growth in the beverage production market will stem from continued innovation of noncarbonated drinks, coupled with heavy and effectively targeted promotion. As demand for these items increases, demand for plastic bottles will expand.

Moreover, demand for bottles containing food will likely remain stable. As disposable income expands, consumers will reduce their in-home cooking and return to dining out at restaurants. Furthermore, demand for sauces and seasonings in grocery stores is expected to decrease, causing some food manufacturers to require fewer bottles. However, restaurants' demand for food products will increase, offsetting the decline in demand from households.

Demand from the household products segment is expected to grow over the next five years. With more disposable income available, consumers will expand their purchases of household goods, many of which are sold in plastic bottles. Household goods manufacturing is expected to grow over the next five years.

Industry challenges

Although the industry is expected to grow over the next five years, plastic bottle manufacturers are expected to experience some challenges. Competition will arise from downstream customers increasingly producing their own plastic goods. For example, PepsiCo Inc., one of the largest plastic bottle buyers, has already purchased and

established its own bottle manufacturing and bottling operations. As a result, former major player Constar International lost significant business from PepsiCo; according to Thomson Reuters Corporation, this played a role in the company filing for Chapter 11 bankruptcy for the third time in 2013 and subsequently liquidating its assets in 2014. IBISWorld expects more industry customers to opt for in-house production of plastic goods, resulting in a loss of business for many industry players.

Similarly, environmental concerns about disposable materials are emerging as a potential threat to the industry. While plastic is recyclable, some consumers are shifting away from purchasing packs of single-serve bottles in favor of larger quantities (e.g. one two-liter soda bottle instead of a six-pack of 12-ounce bottles). This trend will potentially lead to lower demand for plastic bottles from beverage and food producers. Nevertheless, technological achievements can counter this drop in demand. In June 2015, Coca-Cola Co. unveiled the first polyethylene terephthalate bottle made partially from plant-based materials, though the bottle has not yet reached the market. If industry players can positively market these advancements, the industry could experience an increase in demand.

Other industry trends are expected to outweigh these challenges. Over the five years to 2023, the number of enterprises is expected to increase an annualized 0.9% to 199, indicating increased production capacity. Additionally, more highly skilled technicians will be required to operate certain machinery, causing wages to rise at an annualized rate of 1.1% to \$1.6 billion. Another boon for the industry is a slow down in the decline in exports; the US dollar is expected to depreciate, making US-made products more price-competitive in foreign markets. Consequently, exports are expected to decline at an annualized rate of only 0.4% \$654.5 million. However, imports are projected to grow at an annualized rate of 2.1% to \$1.2 billion over the five years to 2023, as foreign producers will remain competitive in terms of lower production costs.

NAICS 32619

Plastic Products Miscellaneous Manufacturing

This industry comprises companies that manufacture a range of plastic products, including housewares, building materials, motor vehicle parts, resilient floor coverings and appliance parts. This industry excludes plastic film, sheets, bags, profile shapes, pipes, pipe fittings, laminates, foam products and bottles.

National Statistics, 2018

Revenue	\$105.6B	Exports	\$10.5B	Profit	\$6.0B
Growth 13-18	0.7%	Imports	\$23.6B	Establishments	6,341
Growth 18-23	0.4%	Trade Balance	-\$13.1B	Enterprises	5,421

2018 Share of Job Growth 13-18 Projected Job Growth 18-23 Jobs US Jobs Change Pct. Change Change Pct. Change

NW PA	4,606	1%	468	11%	(128)	-3%
200-mile Radius	39,968	13%	2,504	7%	(2,141)	-5%
United States	315,492	100%	29,033	10%	(7,591)	-2%

Major Industry		Top US Business		Export Markets		Import Markets		External Drivers	
Top Products	Markets	Locations							

<ul style="list-style-type: none"> ▪Housewares ▪Motor vehicle parts ▪Building materials ▪Packaging ▪Plumbing fixtures 	<ul style="list-style-type: none"> ▪Hardware and home improvement wholesalers ▪Automotive manufacturers ▪Electrical and electronic manufacturers 	<ul style="list-style-type: none"> ▪Great Lakes ▪Mid-Atlantic ▪California 	<ul style="list-style-type: none"> ▪Mexico ▪Canada ▪China ▪United Kingdom 	<ul style="list-style-type: none"> ▪China ▪Canada ▪Mexico ▪Taiwan 	<ul style="list-style-type: none"> ▪Demand from automobile and electrical manufacturing ▪Demand from tool and hardware wholesaling ▪Value of construction ▪Price of plastic materials and resin ▪Trade-weighted index
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Source: Industry performance information from IBISWorld; employment data from EMSI

Plastic Products Miscellaneous Manufacturing Industry Outlook²¹

Revenue for the Plastic Products Miscellaneous Manufacturing industry is expected to experience slower growth over the next five years. Though a wide variety of downstream industries use plastic products, growth in demand from the construction sector is expected to slow. As a result of slowed downstream demand, revenue is expected to increase at an annualized rate of 0.4% to \$108.0 billion over the five years to 2024.

Normalizing markets

Since demand for plastic building materials and flooring depends on the construction and housing market, the growth of these sectors will be a critical factor in the industry's performance over the five years to 2024. As the economy continues to grow, developers and individuals will continue to invest in new units and undertake upgrades and repairs. However, the value of construction is anticipated to grow at a more moderate pace than it did over the past five years.

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Moreover, per capita disposable income drives consumer spending for items that use plastic products, including furniture, electronics and many others. Over the five years to 2024, per capita disposable income is expected to rise at an annualized rate of 1.3%. Consequently, increasing consumer spending is expected to boost demand for the Plastic Products Miscellaneous Manufacturing industry's goods. The wide variety of products that use plastic is beneficial to operators, as there are few substitutes for the industry's goods. For example, furniture manufacturers use plastic as component parts in production, and furniture sales are expected to increase slightly over the next five years. Alongside housing market improvements, increasing demand for furniture will flow through to the industry, as furniture manufacturers ramp up production to meet increasing demand, positively affecting industry performance.

Growing trade

The Plastic Products Miscellaneous Manufacturing industry will continue to experience challenges from foreign competitors over the five years to 2024. Domestic producers have dealt with rising import competition for years and many have moved production to emerging economies to be closer to downstream markets and to take advantage of lower labor costs. Over the five years to 2024, imports are forecast to grow at an annualized rate of

0.4% to \$24.2 billion. By 2024, imports are expected to account for 19.9% of domestic demand, unchanged from 2019. The comparatively lower cost of production in Asia is expected to continue attracting foreign investment to the region, encouraging US consumers to purchase more affordable Asian goods, despite an anticipated stagnation in the trade-weighted index during the period.

While import growth is expected to continue, exports will also increase, albeit modestly. Industry operators will likely invest in research and development to find innovative solutions for downstream users. Additionally, industry operators are expected to benefit from the stagnation of the dollar relative to other currencies, as US exports become more price competitive. Over the five years to 2024, exports are forecast to increase at an annualized rate of 0.4% to \$10.8 billion. The strongest export growth is expected to occur in Mexico and Canada, which benefit from established free-trade agreements, most notably the North American Free Trade Agreement (NAFTA).

Profit stagnation leads to consolidation

Profit margin growth over the coming five years will likely be limited, as the industry's main input, plastic resin, is expected to increase slightly in price, at an annualized rate of 2.2%. To combat rising input costs, industry operators are expected to adjust selling prices upward, while minimizing manufacturing costs by acquiring competitors and thereby achieving returns-on-scale of greater production volumes.

Along with industry consolidation, increased competition from more affordable imports will drive smaller companies to exit the industry. As a result, the number of industry participants is expected to decline at annualized rate of 0.2% over the next five years to 5,362 companies. Additionally, with more automation of the manufacturing process, industry employment will increase at a modest annualized rate of just 0.5% to 405,375 workers.

4 | PLASTICS WHOLESALERS

Plastics wholesalers represent an additional opportunity for Northwest Pennsylvania. This includes wholesaling of intermediate plastic products, such as raw or compounded pellets, as well as of finished plastics goods that are sold to other manufacturing industries. Currently, there is minimal plastic wholesaling activity in the immediate region, though there is a concentration of plastics wholesalers across the Ohio border in the Cleveland-Akron region.¹⁷

NAICS 42461

Plastics Wholesaling

This industry wholesales plastics materials and resins, as well as unsupported plastic film, sheet, sheeting, rod, tube and other basic forms and shapes. Products sold within the Plastics Wholesaling industry are sold to industrial manufacturers. Manufacturers use plastic products to manufacture durable goods.

National Statistics, 2018

Revenue	\$56.9B	Exports	N/A	Profit	\$2.3B
Growth 13-18	0.6%	Imports	N/A	Establishments	3,686
Growth 18-23	1.4%	Trade Balance	N/A	Enterprises	3,006

2018 Share of Job Growth 13-18 Projected Job Growth 18-23 Jobs US Jobs Change Pct.

Change	Change Pct.	Change	Change Pct.	Change	Change Pct.
NW PA	<10	0%	N/A	N/A	N/A
200-mile Radius	1,770	7%	24,770	260	17%
United States	100%		3,072	14%	2,172

Major Industry		Top US Business		Export Markets		Import Markets		External Drivers	
Top Products		Markets		Locations					
•Plastics raw materials, e.g. polyethylene, PET, vinyl and polyvinyl chloride, polypropylene	•Polystyrene and polyurethane foam	•Plastics manufacturers	•Other manufacturers using plastic packaging	•Great Lakes	•Mid-Atlantic	•N/A; Export activity accounted for at the manufacturing level	•N/A; Import activity accounted for at the manufacturing level	•Industrial production index	•Value of construction
•Other film, sheet, and foam	•Other wholesalers			•South Atlantic	•California			•Consumer spending	•Demand from plastics manufacturing
				•Texas				•Price of plastic materials and resin	

Source: Industry performance information from IBISWorld; employment data from EMSI

Plastics Wholesaling Industry Outlook²³

The Plastics Wholesaling industry distributes and sells a variety of primary form plastics, resins and foam to a wide array of customers, mostly in manufacturing industries. Industry clients use the raw plastic and resin inputs to manufacture an assortment of plastics products including soft drink bottles, furniture, electronics, pipes and fittings. Operators in this industry also distribute finished plastic products to other downstream markets, such as

¹⁷ IBISWorld

construction material manufacturers and car manufacturers. Over the five years to 2018, the industry benefitted overall from growing demand from downstream customers, including the construction sector and certain manufacturing industries. However, growth in downstream demand was not steady throughout the period; it

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fluctuated alongside commodity prices, which produced uneven industry performance. Volatility in the price of plastic and the value of construction especially affected revenue. For example, in 2013, the industry experienced a 13.1% increase in revenue as result of a surge in the value of construction in 2012 and 2013, which bolstered downstream demand for industry products. However, in 2014, industry revenue decreased 1.2% as the value of construction started to dip. Revenue grew the following year as industry operators adjusted to lower commodity prices and demand, but fell further in 2016 with a drop in the price of plastic. Revenue continued to decline in 2017 but increased in 2018 as commodity prices and downstream demand stabilized. Throughout the period, consumer spending helped to mitigate the volatility in downstream demand and commodity prices. Over the five years to 2018, industry revenue is estimated to have grown at an annualized rate of 0.6% to \$56.9 billion, including a 3.2% increase in 2018 alone.

Growth in downstream demand

During the five-year period, robust growth in several key downstream markets bolstered industry demand. The construction sector saw particularly strong growth, as housing starts, a primary indicator of the economy's overall health, increased at an estimated annualized rate of 7.2% over the five years to 2018. More broadly, the value of overall construction is expected to have increased at an annualized rate of 3.8% during the five-year period, boosting purchases of plastic products including pipes and other fixtures from industry operators. Furthermore, the automotive industry has experienced an increase in demand for its products. New car sales are expected to grow at an annualized rate of 2.4% over the five years to 2018, increasing demand for plastics products for car components.

Profit fluctuations

Industry profit, defined as earnings before interest and taxes, has fluctuated moderately over the past five years. The volatility of plastic prices hindered revenue growth while rising wages increased costs and restricted profit. However, increased consumer spending and high volumes of activity in construction and car manufacturing industries, coupled with an increase in industrial productivity, placed upward pressure on margins.

Additionally, as employers hired more-skilled employees to manage wholesaling facilities, total wage payments are expected to increase at an annualized rate of 1.0% over the five years to 2018. Consequently, profit margins are expected to decrease relative to their early-period high; IBISWorld expects industry profit to account for 4.0% of total revenue in 2018, compared to 4.4% in 2013.

Changes in corporate strategy

Shifts in cost structure and revenue have caused many plastic manufacturers and distributors to change their business strategies. Most notably, manufacturers have begun to streamline their relationships with distributors, with each relying on a single company to sell their goods to downstream consumers. By entering into such arrangements with manufacturers, distributors can have guaranteed suppliers with multi-year contracts and gain a competitive advantage by being the only distributor that carries a certain product line. Wholesalers can also provide more customer service and flexibility in order sizes when compared to manufacturers that sell directly to customers. This trend negatively affects distributors that cannot secure contract deals, resulting in consolidation within the industry.

In addition to securing demand from a small number of large buyers, some industry operators have expanded by focusing on international markets. During the five-year period, larger operators pursued acquisitions or joint

partnerships in developing parts of the world, including Eastern Europe and China. For example, Nexeo Solutions completed an acquisition of the distribution business of Ultra Chem in Mexico City in 2017, while PolyOne Corporation opened their Asia Innovation Center in Shanghai in 2015. Furthermore, global petroleum product powerhouse SABIC, a Saudi Arabian company entered the US industry with its purchase of GE Plastics in 2007 and has since expanded its reach to become one of the largest semi-finished plastics products distributors in North America, according to Modern Distribution Management's 2016 Top Plastics Distributors ranking.

As consumer preferences shift toward environmentally friendly products, operators have responded by rebranding to focus on recycling, sustainability and combatting climate change. The Society of the Plastics Industry has renamed itself as the Plastics Industry Association with the purpose of reshaping how people understand plastics.

Increasing consolidation propels employment growth

Despite industry revenue increasing for most of the period, the number of industry operators has continued its historic downward trend. IBISWorld estimates the number of industry enterprises to fall at an annualized 1.9% over the five years to 2018 to 3,006 enterprises. This trend is partially a consequence of increasing consolidation at the regional level, with mid-sized operators out-pricing smaller competitors and capturing a greater portion of lucrative direct-distribution contracts.

As operators continue to grow larger, total industry employment is expected to increase throughout the period as larger distributors require more employees to perform warehousing functions. Accordingly, IBISWorld estimates the number of employees in the Plastics Wholesaling industry to increase at an annualized rate of 0.4% over the five years to 2018 to 33,999 workers. Meanwhile, total wage payments are expected to increase an annualized 1.0% in the same five-year period to reach \$2.5 billion, outpacing growth in labor. While growth in employment is primarily a result of increased demand for industry products, the wage increase is the product of an effort by businesses shift its labor force to highly skilled workers. In the long run, this is expected to increase company productivity.

OTHER OPPORTUNITIES EXPLORED

COMPRESSED NATURAL GAS

An additional opportunity that emerged from the study is within the area of natural gas distribution and use. While pipelines are in place and more are being considered and developed, there are and will be areas that will be underserved by gas pipeline. For these areas portable compressed natural gas (CNG) offers economic opportunity. Based on information provided by the Pennsylvania Independent Oil and Natural Gas Association.¹⁸ There are companies potentially interested in “virtual pipeline” systems development. This involves companies engaged in taking gas, converting it to CNG, and storing and transporting it within tanks to users. This includes manufacturers which would utilize gas for their baseload needs. According to PIOGA, CNG would be a competitive source within a 75-to-100-mile radius of a particular user. This presents an opportunity for the NWPA region to attract companies involved in the distribution and business operations as well as the manufacturing of equipment such as trailers and tanks. Existing companies in this space include Insightful, Quantum, and Hexagon. Such operation would be a match for the site criteria utilized for this project.

ETHANE STORAGE AND DISTRIBUTION HUB

The boom in ethane production in the Appalachia region has brought about a need for an ethane storage and distribution hub in the Eastern US that would allow for a steady of supply of feedstock for petrochemical plants in the region. The establishment of such a hub would also benefit the industry through supply diversity, whereas supply is currently limited to the concentration of infrastructure along the Gulf Coast. Geographic diversity would provide manufacturers flexibility and redundancy with regard to where they purchase their feedstock and how it is transported to them, as well as mitigate price spikes in feedstocks caused by a severe weather or other disruptive event in any one region.¹⁹

A location near the Marcellus and Utica shales would be advantageous, and a site with suitable geology would be needed to allow for underground storage of large volumes of pressurized NGL. A geological study performed by West Virginia University and its partners found suitable locations in West Virginia, Ohio, and Southwestern Pennsylvania. Northwest Pennsylvania is not thought to offer the geology needed for such a facility.²⁶

PORT OF ERIE

The research team interviewed the Erie-Western Pennsylvania Port Authority to identify potential opportunities related to shipment of petrochemicals-related products through the port. It was determined that the seasonality of the port and lack of container shipping largely precludes its use for regular shipment of manufactured goods. The port is currently used primarily for import of aggregate, with occasional use for one-off project cargo. Its use for export is limited, with no exports in some years. Moreover, the Shell facility itself plans to export polyethylene pellets through East Coast ports and not through the Port of Erie.

¹⁸ Pennsylvania Independent Oil and Gas Association (PIOGA) www.pioga.org

¹⁹ US Department of Energy. *Ethane Storage and Distribution Hub in the United States*. Report to Congress. November 2018. ²⁶ Appalachia Oil and Natural Gas Consortium at West Virginia University. *A Geologic Study to Determine the Potential to Create an Appalachian Storage for Natural Gas Liquids*. July 2017.



Source: Google Maps

5 | REGIONAL ASSETS ANALYSIS

Proximity to Shell alone will not be enough to drive plastics businesses to Northwest Pennsylvania; being within 100 miles of a PE source may be no more advantageous for a particular company than being anywhere in the broader region within several hundred miles. Therefore, in order to expand and attract plastics manufacturing to the region, Northwest Pennsylvania must demonstrate its competitiveness in two critical areas:

- ◆ Physical Assets – Availability of suitable, shovel-ready sites
- ◆ Economic and Workforce Development Assets – Availability of a skilled workforce with knowledge of plastics manufacturing

This section of the report assesses Northwest Pennsylvania's assets in these areas.

PHYSICAL ASSETS ANALYSIS

The purpose of the Physical Assets Analysis is to identify those geographic areas within Northwest Pennsylvania possessing the highest degree of physical potential to accommodate a range of petrochemical supply chain facilities.

To achieve this goal, the asset analysis was conducted in two stages:

- ◆ Stage 1 – Development Hot Spot Identification
- ◆ Stage 2 – Development Hot Spot Profiles

Stage 1 focuses on transportation and utility assets, as these important systems are typically primary drivers of petrochemical supply chain facility site selection decisions. By graphically documenting transportation and utility systems at a high level, the analysis was able to identify areas of geographic “Convergence”, or areas where the largest number of transportation and utility systems are located in relatively close proximity to one other. Accordingly, geographic areas with the highest convergence of transportation and utility system components are identified as potential “Petrochemical Supply Chain Facility Development Hot Spots”.

Stage 2 focuses on environmental and land use characteristics within the Hot Spot areas identified in Stage 1, as environmental and land use factors are important secondary drivers of site selection decisions. By graphically documenting environmental and land use patterns within each of the Hot Spot areas, the analysis reveals areas with the highest degree of buildability for petrochemical supply chain facilities.

STAGE 1 – DEVELOPMENT HOT SPOT IDENTIFICATION

As transportation and utility systems are typically primary drivers for petrochemical supply chain facility site selection decisions, the Stage 1 analysis focuses on these two important criteria as a means to identify likely geographic Hot Spots for petrochemical supply chain development.

Initially, Stage 1 looked broadly at Shell and Nova ethane cracker shipping lanes and natural gas / natural gas liquids (NGLs) supply lines to understand how these important systems engage and link the 8-county NWC territory to national and international destinations. Stage 1 then looked more specifically at the 8-county territory to document and analyze primary transportation and utility assets within the territory.

The Stage 1 analysis revealed ten areas of convergence for primary transportation and utility assets within the 8-county NWC territory.

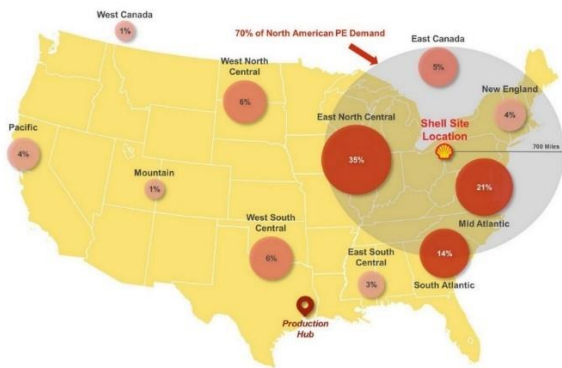
Stage 1 is presented in the following sections:

- ◆ Transportation Shipping Lanes
- ◆ Natural Gas & NGL Pipelines
- ◆ Primary Transportation & Utility Assets
- ◆ Petrochemical Supply Chain Facility Development Hot Spots

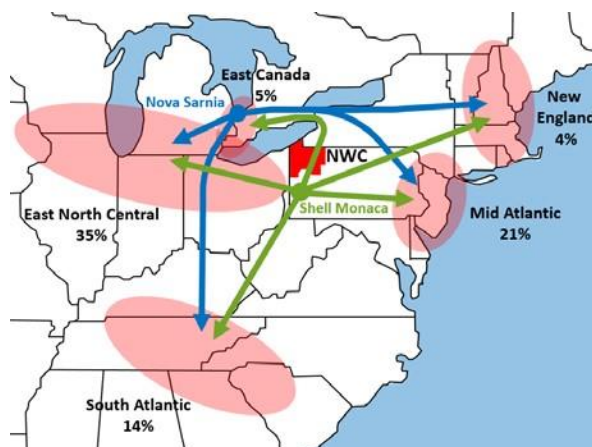
Transportation Shipping Lanes

Both the Shell ethane cracker in Monaca, Pennsylvania and the Nova ethane cracker in Sarnia, Ontario are slated to produce the same two grades of polyethylene (PE) pellet feedstock for the plastics manufacturing industry. “High Density” grade PE pellets serve as manufacturing feedstock for such products as plastic bottles and pipes, while “Linear Low Density” grade PE pellets serve as feedstock for such products as plastic bags.

Shell has released a generalized diagram of projected markets for PE pellets that will be produced at the Shell Monaca facility, as shown in *Shell Anticipated Market Geographies* below. In addition, the Shell diagram illustrates that 70% of North American PE demand lies within a 700-mile radius of the Monaca facility.



Shell Anticipated Market Geographies US Plastics Clusters



Canadian Plastics Clusters Shell & Nova Transport Lane Desire Lines

Supply chain economics typically require plastics product manufacturers to locate closer to their customers than to their feedstock supplier. With this assumption, Shell's Monaca PE pellet customers, typically plastic products manufacturers, will likely be located in the five geographies shown in the Shell diagram.

Superimposing Shell's five customer geographies on the *US Plastics Clusters* map, and referencing the *Canadian Plastics Clusters* map, a refined indication of Shell and Nova customer locations can be interpolated.

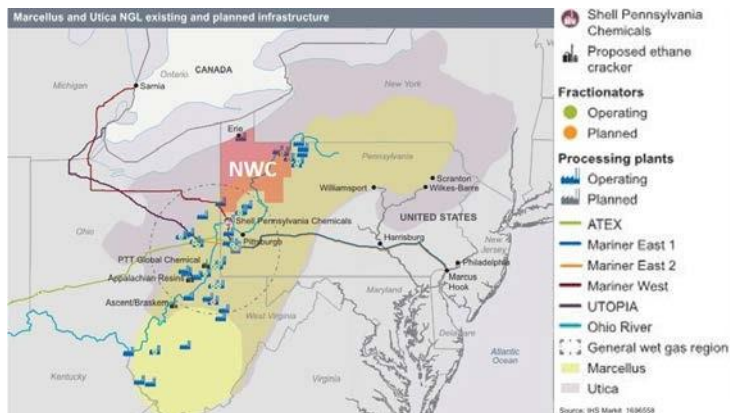
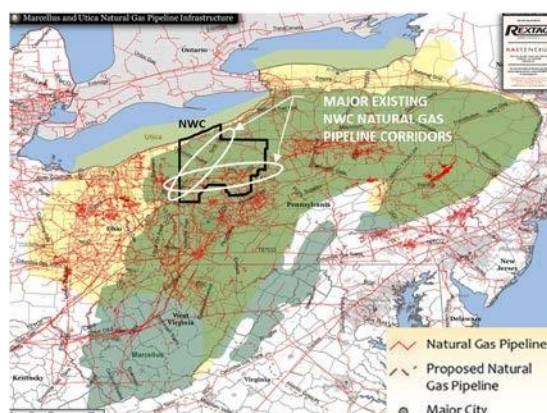
The *Shell & Nova Transport Lane Desire Lines* diagram indicates primary "Desire Lines" between Shell and Nova ethane cracker facilities and their likely market areas. As shown, the 8-county NWC territory is likely to contain Shell to-East Canada rail and/or truck shipping "Lanes". PE pellet compounders/converters, distributors, and others may find site locations in proximity to these shipping lanes attractive.

Natural Gas & NGL Pipelines

Natural gas and NGL (natural gas liquids) pipeline alignments require support facilities along, or in close proximity to, the alignment. These facility types include fractionators, processing plants, and other facilities.

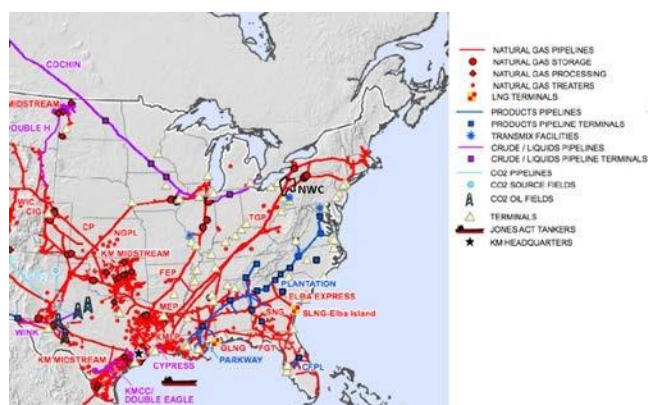
In addition, certain manufacturing operations require, or are greatly enhanced by, a direct supply of natural gas and/or NGLs. Shell's Monaca ethane cracker serves as a significant example of this, as a key consideration in Shell's Monaca location decision was availability of a direct connection to a natural gas pipeline providing a reliable supply of natural gas feedstock for ethane cracker operations.

Tapping into a major natural gas transmission line requires a process of feasibility determination, application, and approval, but if found to be feasible, a direct tap-in capability could provide a significant selling point for certain sites across the 8-county NWC territory.



Existing Natural Gas Pipelines - Rextag

Existing & Planned NGL Infrastructure – IHS Markit



Existing Natural Gas Pipelines – Glacier Media

Proposed Natural Gas Pipelines - CAPP



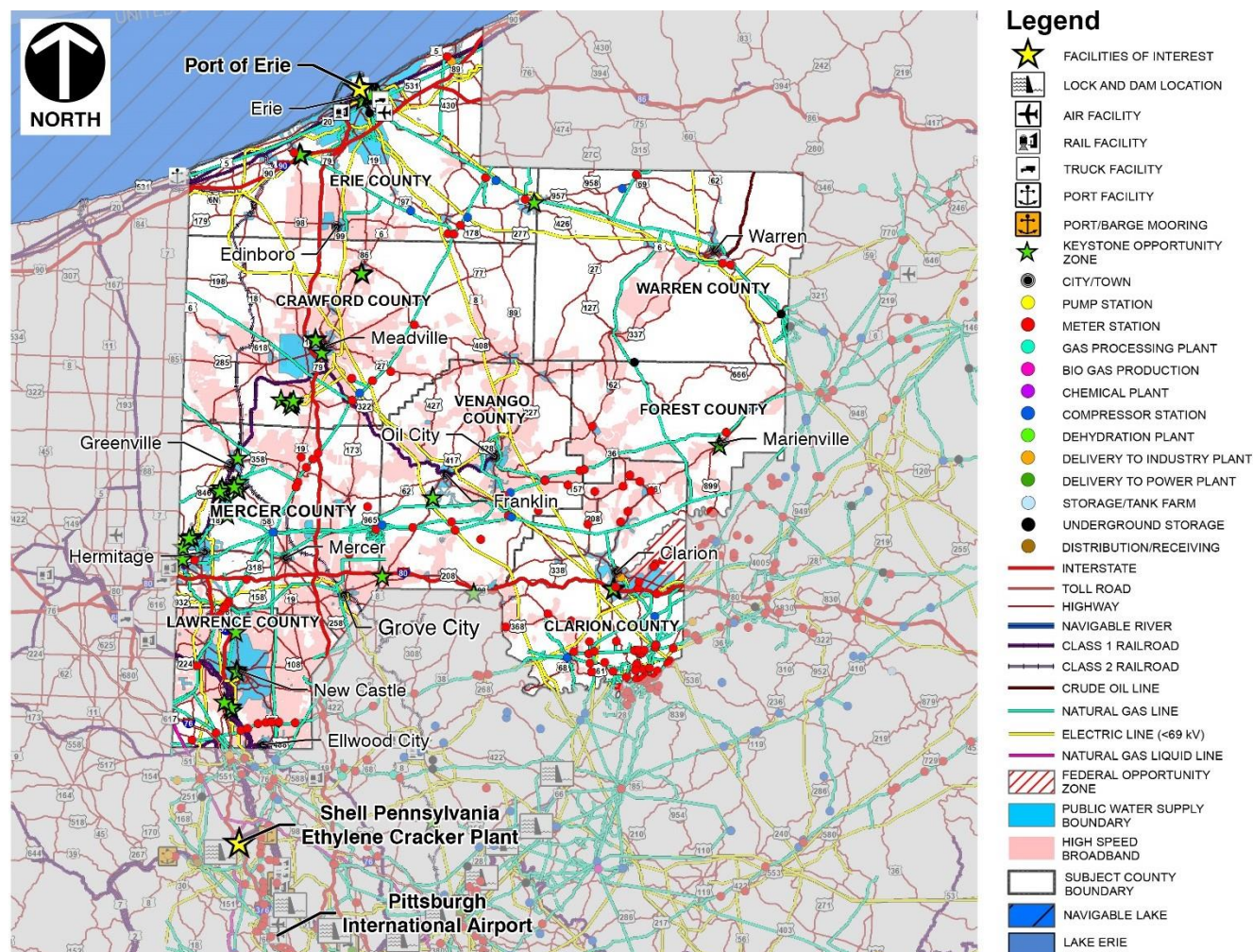
As shown in *Existing Natural Gas Pipelines – Rextag* and *Existing Natural Gas Pipelines – Glacier Media*, two primary natural gas pipeline corridors cross the NWC territory. In addition, *Existing & Planned NGL Infrastructure – IHS Markit* indicates the Mariner West alignment touches the southwest corner of the NWC territory. Finally, the *Proposed Natural Gas Pipelines – CAPP* map shows several proposed pipelines that may cross the NWC territory.

Specific identification of these pipeline alignments and investigation of associated support and direct tap-in opportunities may identify new business attraction opportunities.

Primary Transportation & Utility Assets

A comprehensive GIS (Geographic Information Systems) data set was prepared as part of this project. The GIS data set was utilized to develop mapping for four primary information groups: 1) Transportation Assets, 2) Utility Assets, 3) Land Use Characteristics, and 4) Environmental Characteristics.

The *Primary Transportation & Utility Assets* map below summarizes primary transportation and utility systems within the 8-county NWC territory, with specific assets shown in the drawing legend below. This map is the basis for determining transportation and utility convergence geographies as described in the *Petrochemical Supply Chain Facility Development Hot Spots* section below.

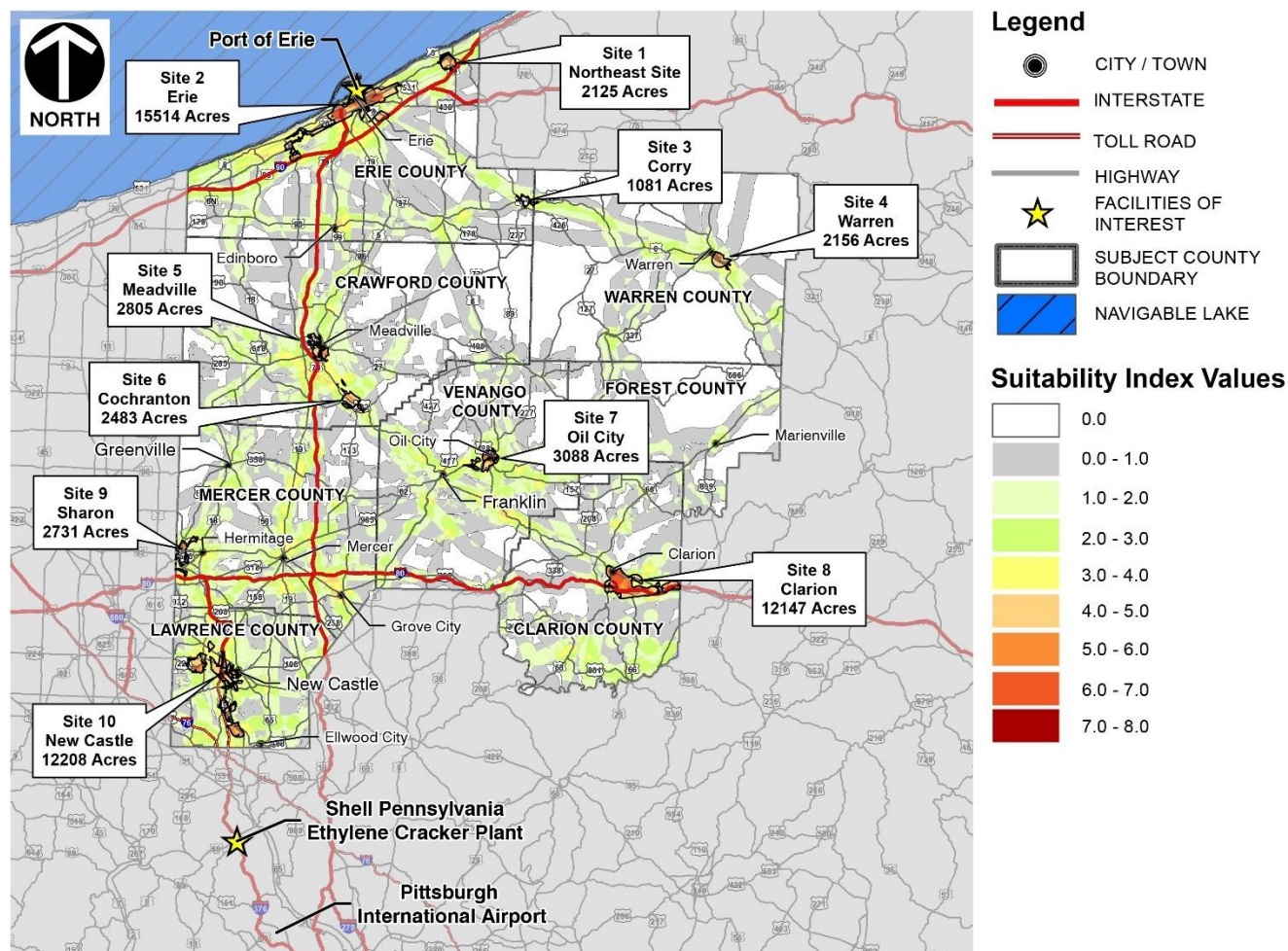


Primary Transportation & Utility Assets

The *Primary Transportation & Utility Assets* map represents a snapshot summary of primary transportation and utility systems. The comprehensive GIS data set prepared for this project, however, contains significant additional information beyond that shown in this report document. As a whole, the GIS data set is designed to serve as a valuable interactive tool in future analyses aimed at identifying specific candidate sites for business attraction, expansion, and retention.

Petrochemical Supply Chain Facility Development Hot Spots

Interpreting from the *Primary Transportation & Utility Assets* map in the preceding section, ten development Hot Spot areas are identified as shown in the *Petrochemical Supply Chain Facility Development Hot Spots* map below. The numbers and corresponding colors shown in the Suitability Index Values legend indicate the number of assets that overlay each other in specific geographies, with warmer colors representing a higher number of overlaying assets.



Petrochemical Supply Chain Facility Development Hot Spots

Accordingly, the ten Hot Spots shown represent those areas within the 8-county NWC territory that possess the greatest collective convergence of primary transportation and utility assets, as compared to other areas in the territory. These ten geographies represent localities with the greatest potential to appeal to the first-order transportation and utility-related site selection criteria typically employed by petrochemical supply chain companies looking for sites to accommodate new or expanded facilities.

STAGE 2 – DEVELOPMENT HOT SPOT PROFILES

The Stage 1 analysis in the previous section looked broadly at the entire 8-county NWC territory and identified ten potential *Petrochemical Supply Chain Facility Development Hot Spots* based on geographic areas where primary transportation and utility assets “Converge”.

Consequently, the ten Hot Spot geographies represent those areas across the 8-county NWC territory that are most likely to meet a petrochemical facility site selector’s requirements for site transportation and utility capabilities. Individual sites/parcels within each of the Hot Spot geographies are in close enough proximity to existing primary transportation and utility systems such that system modifications/extensions, if needed to meet the requirements of a prospective new petrochemical supply chain facility, are likely to be technically feasible and reasonably costeffective.

Stage 2 looks more closely at each of the ten Hot Spots by analyzing land use and environmental characteristics as a means to identify developable areas within each. The Hot Spot maps presented in this section provide a snapshot

overview of land use and environmental profiles for each Hot Spot geography. The maps shown were generated from the comprehensive GIS (Geographic Information Systems) data set prepared as part of this project. The GIS data set is designed for use as a valuable interactive tool for future analyses involving searches for sites to accommodate the needs of specific business attraction/expansion prospects.

Based on the supply chain opportunities identified, three general petrochemical supply chain facility typologies are identified as likely candidates for the NWC 8-county territory. These typologies are documented below, along with first-order land type descriptors for use in searching the GIS data set for candidate sites.

Large Manufacturing Facility Sites

- ◆ Candidate Site Size Range: 400-1,000 acres
- ◆ Existing Land Use: Vacant parcels, agriculture, industrial, within KOZ and/or Federal Opportunity Zone
- ◆ Parcel Characteristics: Large contiguous acreage, typically vacant, or able to repurpose, rezone, or assemble
- ◆ Topographic Percent Slope: 0-5%
- ◆ Environmental Features: Avoid wetlands, floodzones, streams, undermined areas, public open space

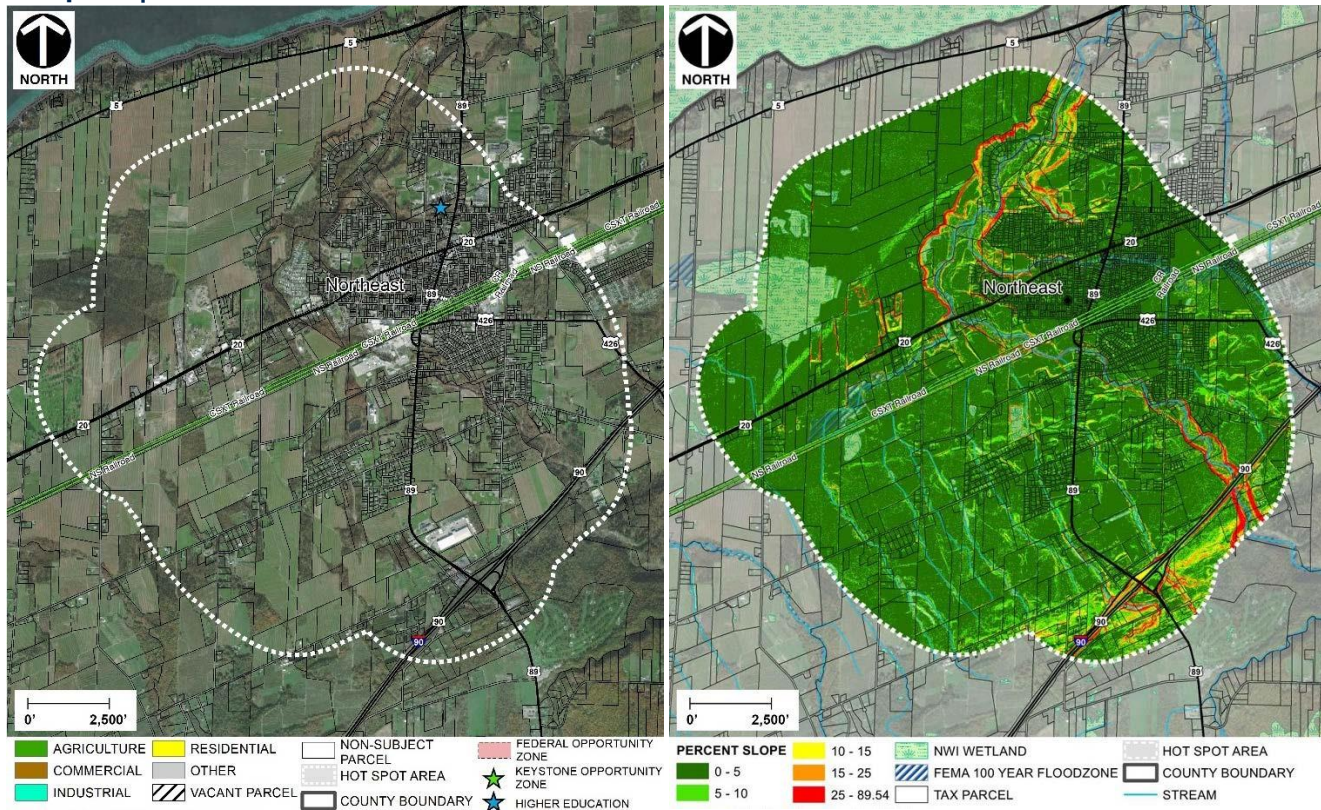
Small-Medium Manufacturing Facility Sites

- ◆ Candidate Site Size Range: 20-400 acres
- ◆ Existing Land Use: Infill or vacant parcels, agriculture, industrial, within KOZ and/or Federal Opportunity Zone
- ◆ Parcel Characteristics: Infill or medium contiguous vacant acreage, or able to repurpose, rezone, or assemble
- ◆ Topographic Percent Slope: 0-10%
- ◆ Environmental Features: Avoid wetlands, floodzones, streams, undermined areas, public open space

Warehouse/Logistics Facility Sites

- ◆ Candidate Site Size Range: 10-200 acres
- ◆ Existing Land Use: Infill or vacant parcels, agriculture, industrial, within KOZ and/or Federal Opportunity Zone
- ◆ Parcel Characteristics: Medium contiguous acreage, typically vacant, possible infill, or able to repurpose, rezone, or assemble
- ◆ Topographic Percent Slope: 0-5%
- ◆ Environmental Features: Avoid wetlands, floodzones, streams, undermined areas, public open space

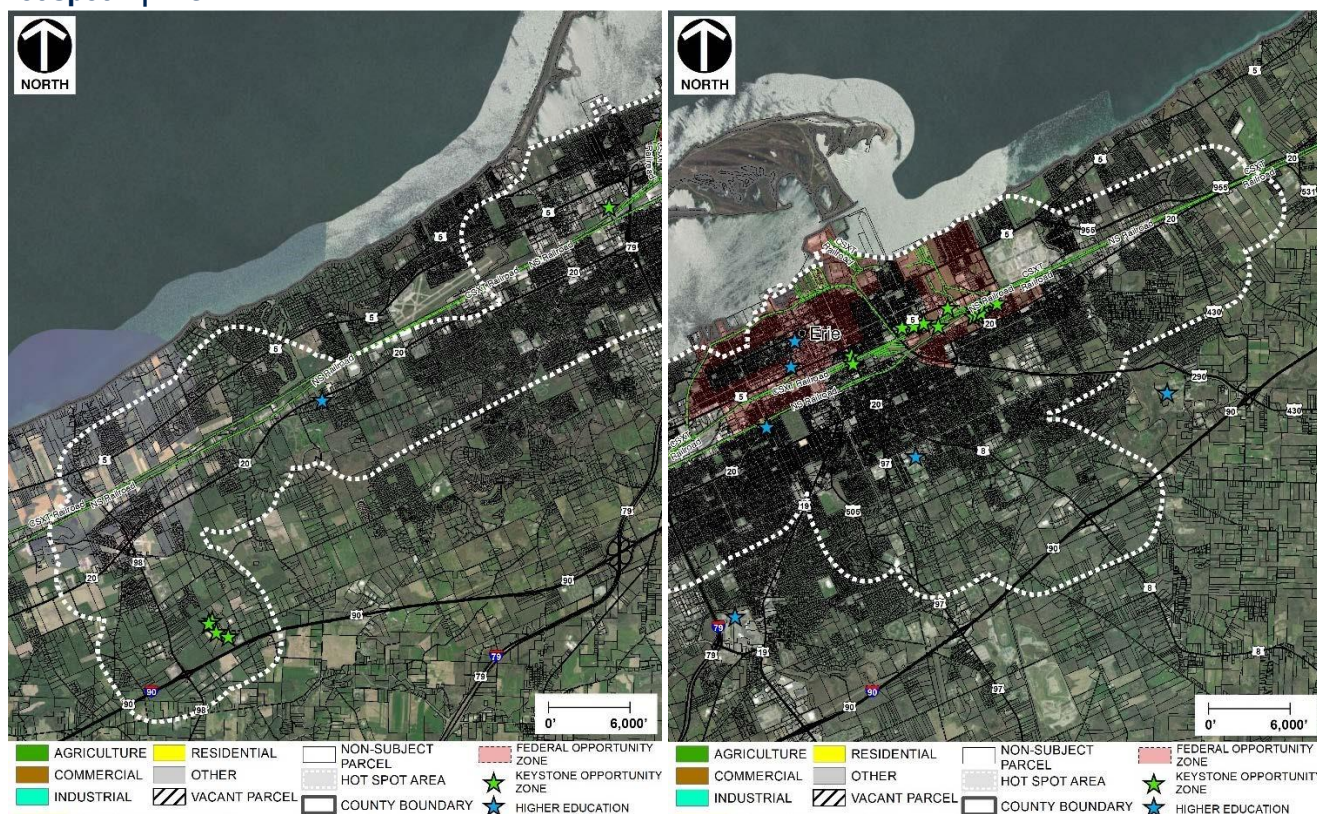
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Hot Spot 1 | Northeast**Hot Spot 1 – Northeast: Land Use Characteristics Environmental Characteristics**

NOTE: The Land Use Characteristics map shown above for this Hot Spot is incomplete due missing land use information. The map will be completed upon receipt of this information.

HOT SPOT 1 - GENERAL INFORMATION		
COUNTY	MUNICIPALITIES	TOTAL AREA (AC.)
Erie	Northeast Township, Northeast Borough	5,409
HOT SPOT 1 - SCREENING INFORMATION		
SCREENING CRITERIA	% OF HOT SPOT AREA	AREA (AC.)
NWI Wetlands	5%	286
FEMA Floodplains	4%	192
Undermined Areas	0%	0
0 -5% Slope Areas	77%	4,194
5 - 10% Slope Areas	15%	794
10 - 15% Slope Areas	3%	184
15- 25% Slope Areas	3%	140
25 -90% Slope Areas	2%	97
Land Use - Agricultural		

Land Use - Commercial		
Land Use - Industrial		
Land Use - Residential		
Land Use - Other		

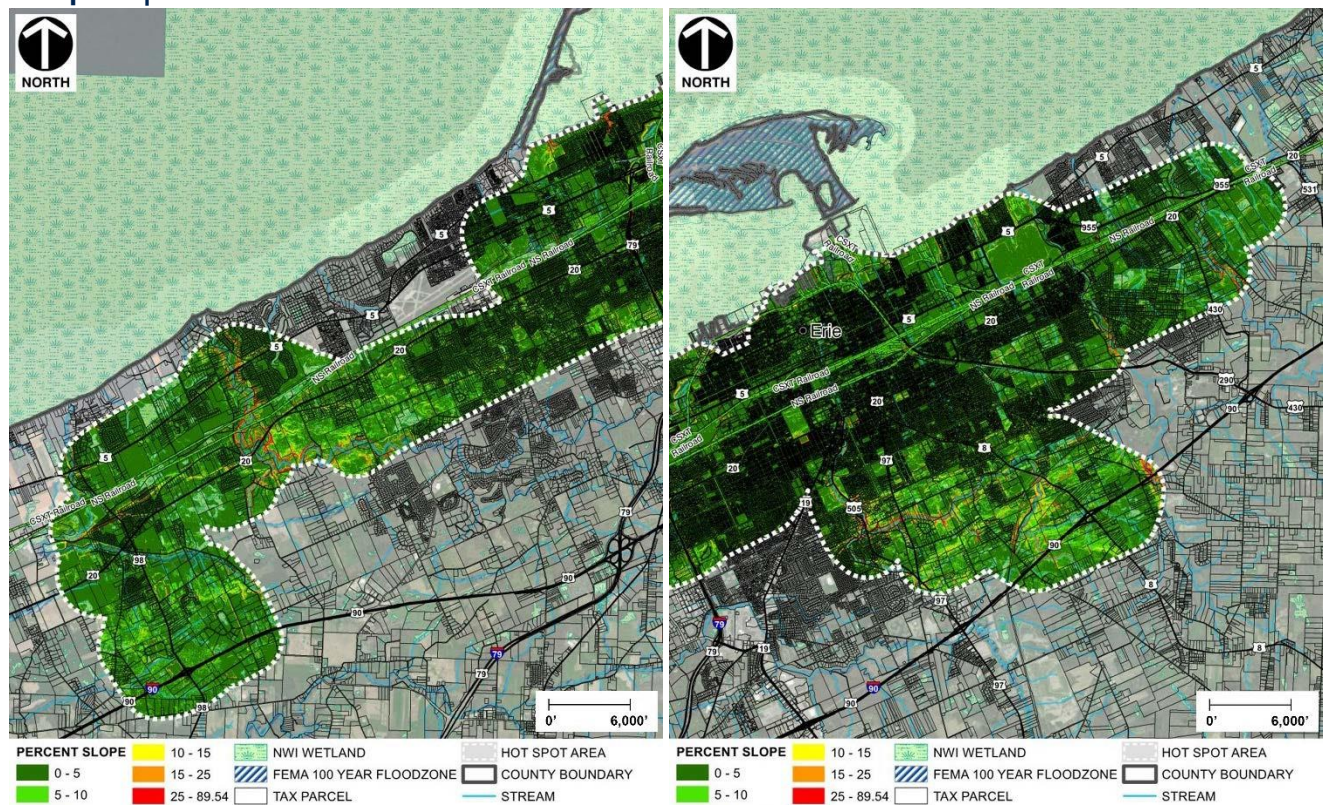
Hot Spot 2 | Erie**Hot Spot 2 – Erie: Land Use Characteristics**

NOTE: The Land Use Characteristics map shown above for this Hot Spot is incomplete due missing land use information. The map will be completed upon receipt of this information.

HOT SPOT 2 - GENERAL INFORMATION		
COUNTY	MUNICIPALITIES	TOTAL AREA (AC.)
Erie	City of Erie; Townships: Harborcreek, Millcreek, Summit, Lawrence Park, Fairview, Greene	36,058
HOT SPOT 2 - SCREENING INFORMATION		
SCREENING CRITERIA	% OF HOT SPOT AREA	AREA (AC.)
NWI Wetlands	4%	1,448
FEMA Floodplains	3%	915
Undermined Areas	0%	0

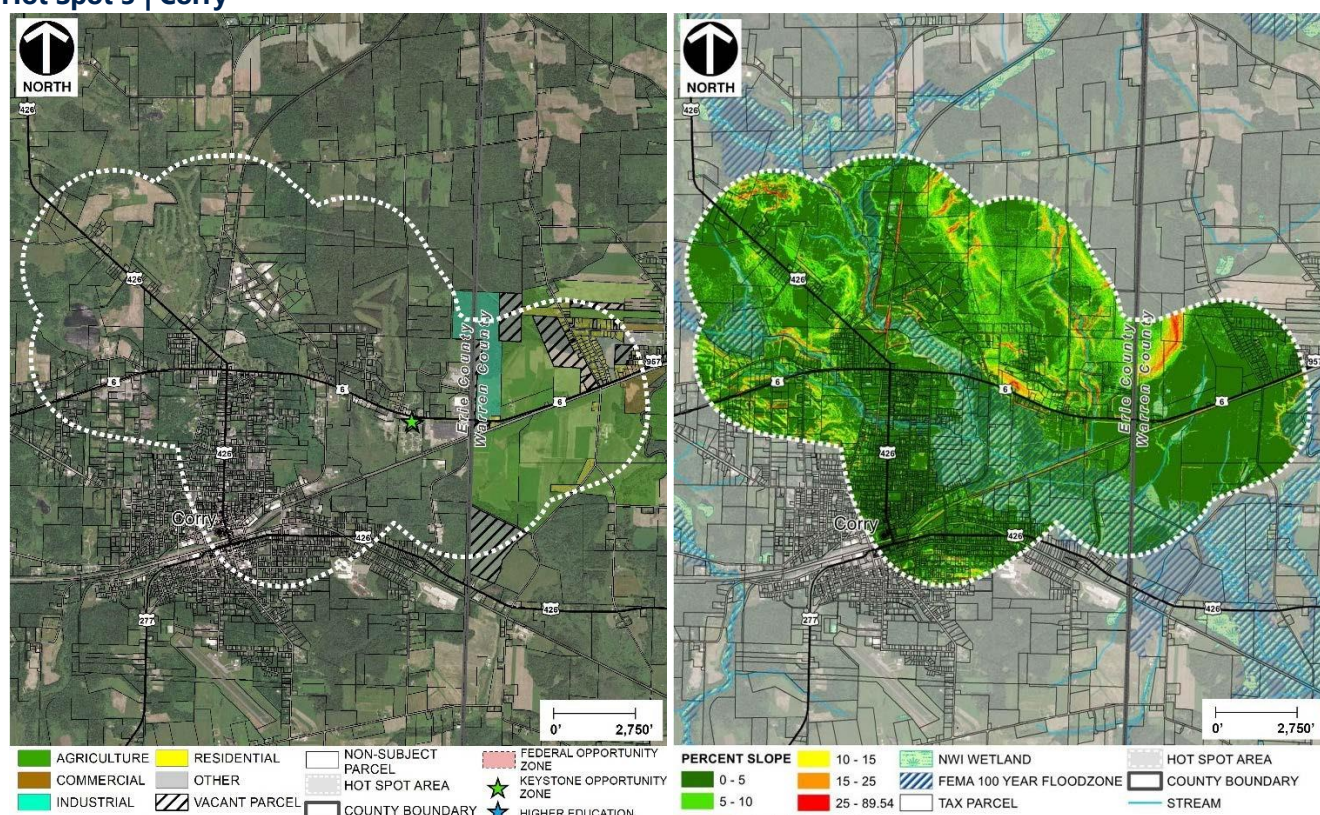
0 -5% Slope Areas	75%	27,097
5 - 10% Slope Areas	17%	6,134
10 - 15% Slope Areas	4%	1,437
15- 25% Slope Areas	2%	863
25 -90% Slope Areas	2%	526
Land Use - Agricultural		
Land Use - Commercial		
Land Use - Industrial		
Land Use - Residential		
Land Use - Other		

Hot Spot 2 | Erie



Hot Spot 2 – Erie: Environmental Characteristics

The *Hot Spot 2 – General Information* and *Hot Spot 2 – Screening Information* tables on the previous page present combined data that includes all of Hot Spot 2.

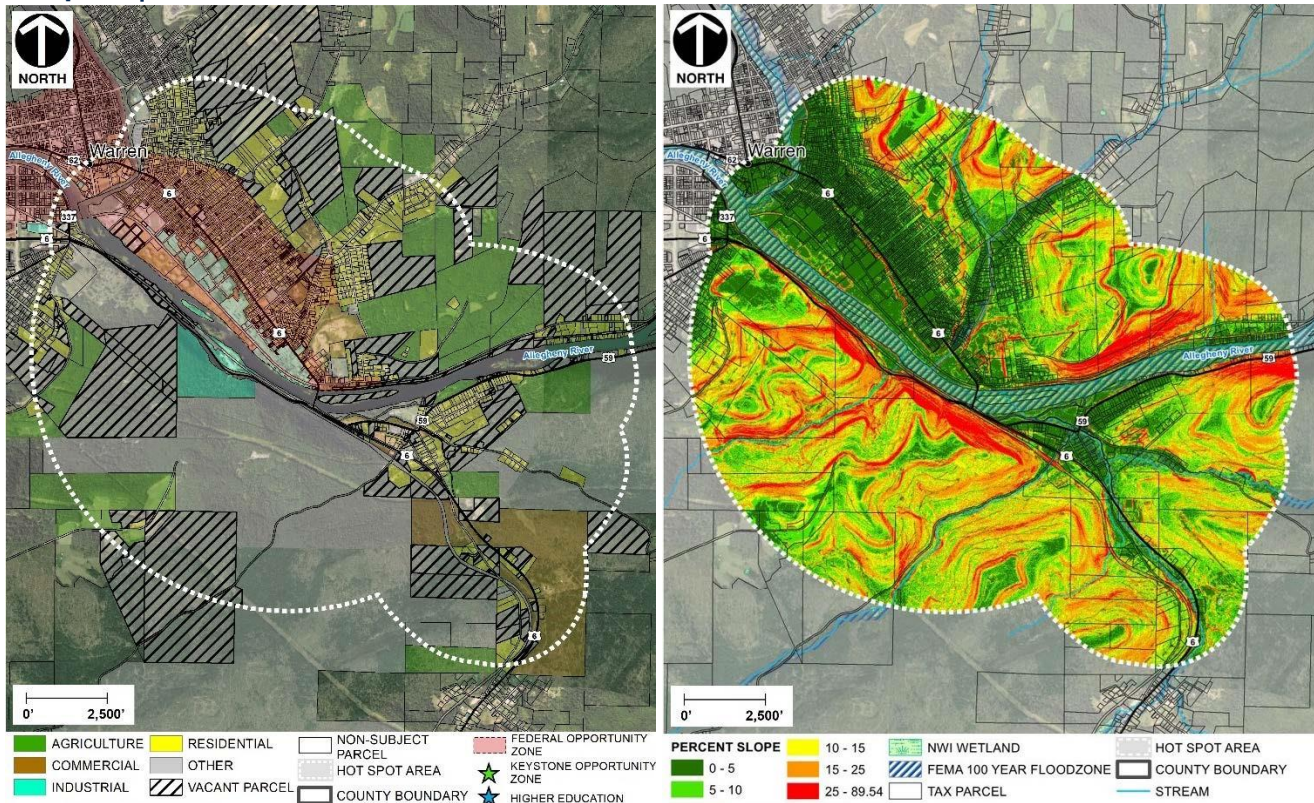
Hot Spot 3 | Corry**Hot Spot 3 – Corry: Land Use Characteristics****Environmental Characteristics**

NOTE: The Land Use Characteristics map shown above for this Hot Spot is incomplete due missing land use information. The map will be completed upon receipt of this information.

HOT SPOT 3 - GENERAL INFORMATION		
COUNTY	MUNICIPALITIES	TOTAL AREA (AC.)
Erie, Warren	City of Corry; Townships: Columbus, Wayne	4,510
HOT SPOT 3 - SCREENING INFORMATION		
SCREENING CRITERIA	% OF HOT SPOT AREA	AREA (AC.)
NWI Wetlands	11%	493
FEMA Floodplains	18%	915
Undermined Areas	0%	0
0 -5% Slope Areas	70%	3,166
5 - 10% Slope Areas	21%	937
10 - 15% Slope Areas	5%	245
15- 25% Slope Areas	3%	129
25 -90% Slope Areas	1%	33
Land Use - Agricultural		

Land Use - Commercial		
Land Use - Industrial		
Land Use - Residential		
Land Use - Other		

Hot Spot 4 | Warren



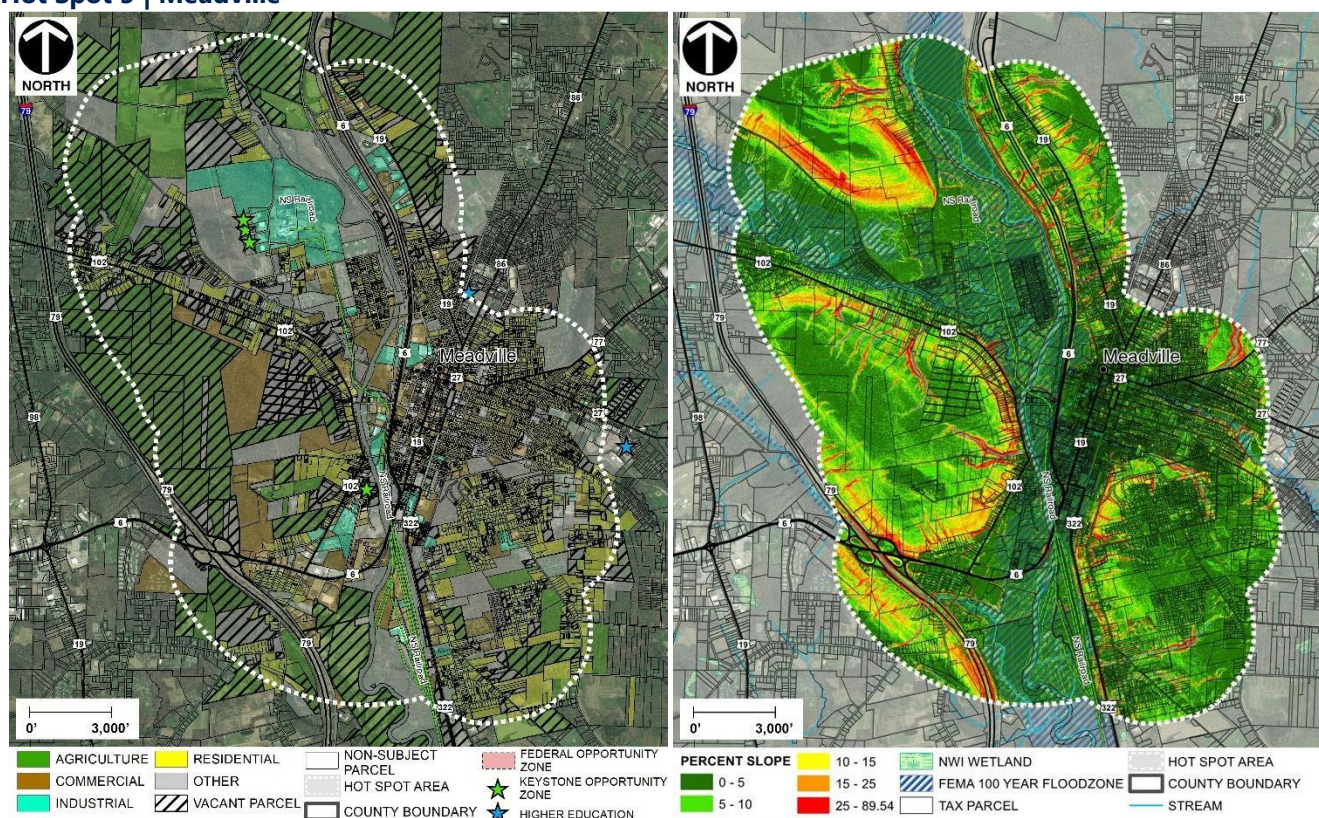
Hot Spot 4 – Warren: Land Use Characteristics

Environmental Characteristics

HOT SPOT 4 - GENERAL INFORMATION		
COUNTY	MUNICIPALITIES	TOTAL AREA (AC.)
Warren	City of Warren; Townships: Glade, Mead, Pleasant	5,500
HOT SPOT 4 - SCREENING INFORMATION		
SCREENING CRITERIA	% OF HOT SPOT AREA	AREA (AC.)
NWI Wetlands	5%	287
FEMA Floodplains	8%	425
Undermined Areas	0%	0
0 -5% Slope Areas	30%	1,626

5 - 10% Slope Areas	22%	1,233
10 - 15% Slope Areas	20%	1,091
15- 25% Slope Areas	20%	1,125
25 -90% Slope Areas	8%	425
Land Use - Agricultural	13%	702
Land Use - Commercial	8%	456
Land Use - Industrial	3%	173
Land Use - Residential	15%	800
Land Use - Other	61%	3,369

Hot Spot 5 | Meadville

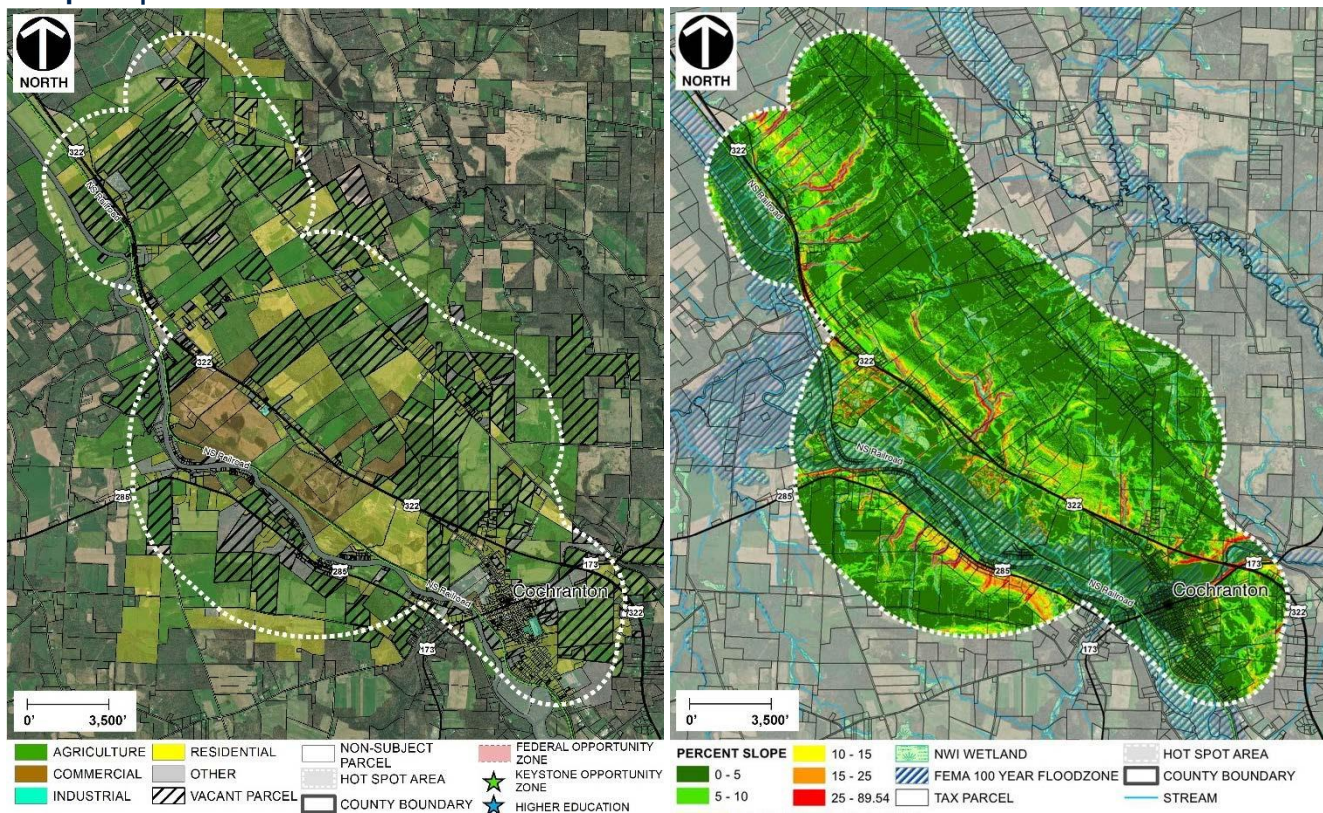


Hot Spot 5 – Meadville: Land Use Characteristics Environmental Characteristics

HOT SPOT 5 - GENERAL INFORMATION		
COUNTY	MUNICIPALITIES	TOTAL AREA (AC.)
Crawford	City of Meadville; Townships: Hayfield, Union, Vernon, West Mead	8,098
HOT SPOT 5 - SCREENING INFORMATION		
SCREENING CRITERIA	% OF HOT SPOT AREA	AREA (AC.)
NWI Wetlands	4%	333
FEMA Floodplains	24%	1,924

Undermined Areas	0%	0
0 -5% Slope Areas	55%	4,453
5 - 10% Slope Areas	24%	1,984
10 - 15% Slope Areas	10%	786
15- 25% Slope Areas	7%	595
25 -90% Slope Areas	3%	280
Land Use - Agricultural	24%	1,969
Land Use - Commercial	10%	820
Land Use - Industrial	6%	462
Land Use - Residential	18%	1,490
Land Use - Other	41%	3,358

Hot Spot 6 | Cochrannton



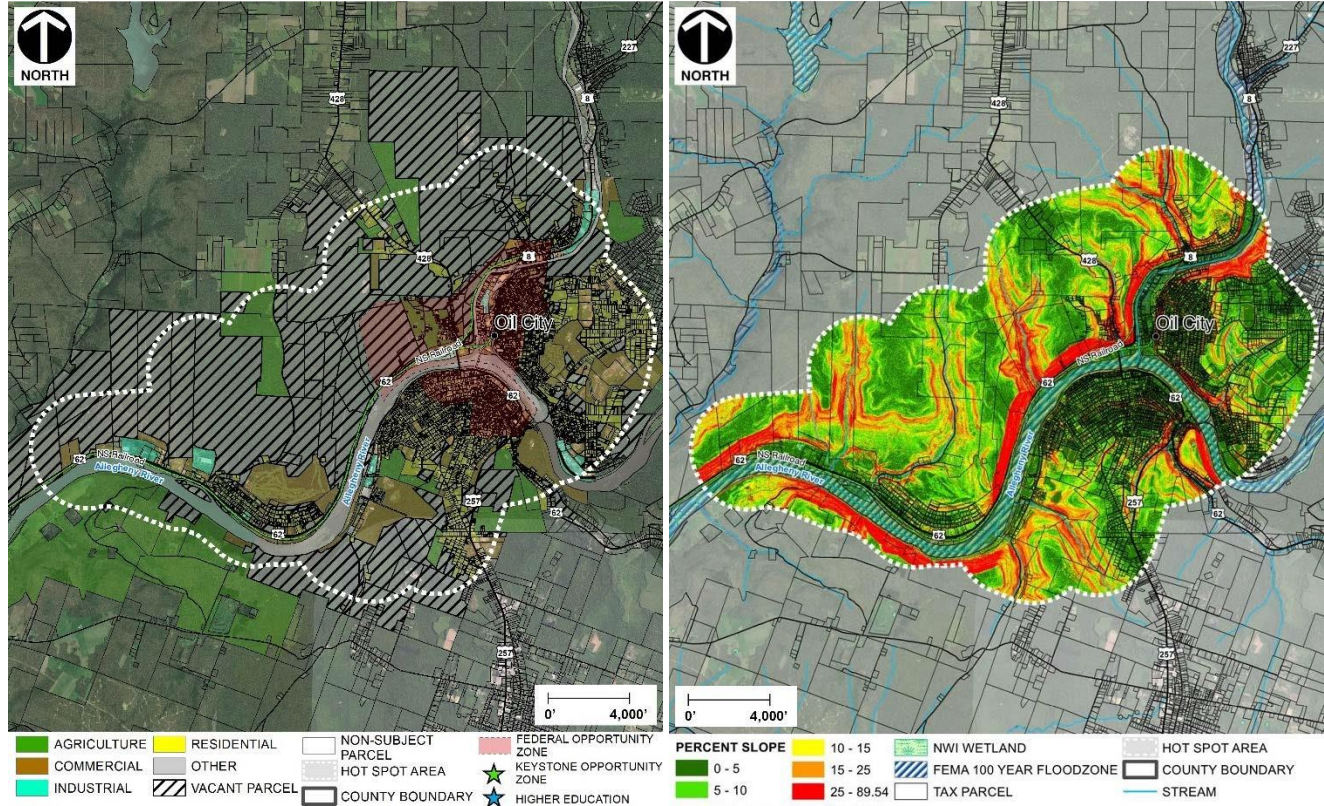
Hot Spot 6 – Cochrannton: Land Use Characteristics

Environmental Characteristics

HOT SPOT 6 - GENERAL INFORMATION		
COUNTY	MUNICIPALITIES	TOTAL AREA (AC.)
Crawford	Townships: East Fairfield, Fairfield, Union, Wayne, West Mead	8,398
HOT SPOT 6 - SCREENING INFORMATION		

SCREENING CRITERIA	% OF HOT SPOT AREA	AREA (AC.)
NWI Wetlands	8%	665
FEMA Floodplains	16%	1,375
Undermined Areas	0%	0
0 -5% Slope Areas	62%	5,217
5 - 10% Slope Areas	24%	2,034
10 - 15% Slope Areas	7%	572
15- 25% Slope Areas	4%	367
25 -90% Slope Areas	2%	208
Land Use - Agricultural	56%	4,713
Land Use - Commercial	8%	675
Land Use - Industrial	0%	13
Land Use - Residential	20%	1,694
Land Use - Other	16%	1,302

Hot Spot 7 | Oil City



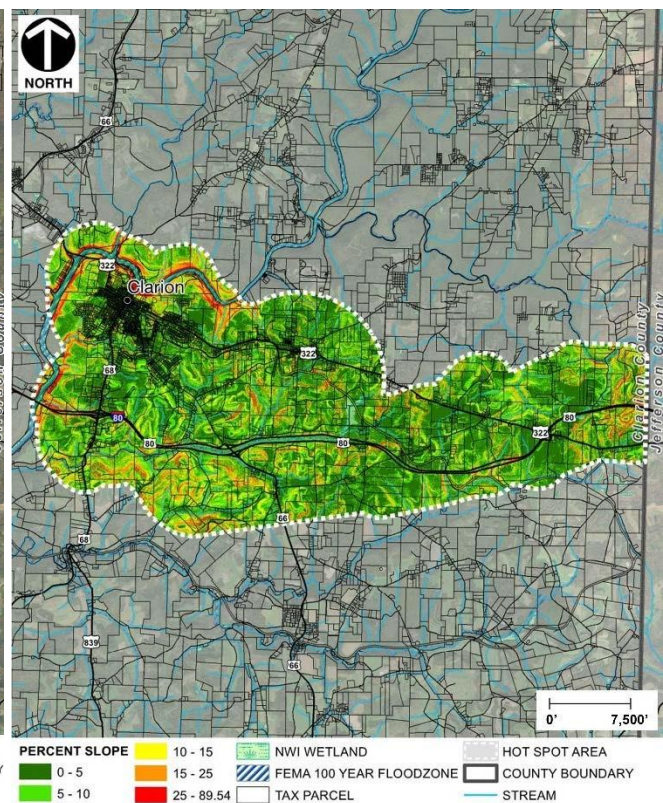
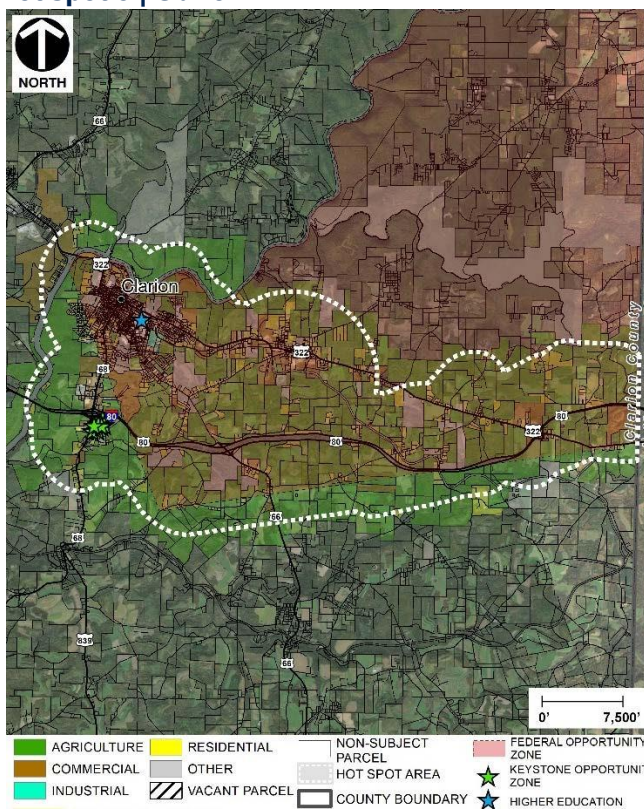
Hot Spot 7 – Oil City: Land Use Characteristics

Environmental Characteristics

HOT SPOT 7 - GENERAL INFORMATION		
COUNTY	MUNICIPALITIES	TOTAL AREA (AC.)
Venango	City of Oil City; Townships: Cornplanter, Cranberry, Sugar creek	9,135

HOT SPOT 7 - SCREENING INFORMATION		
SCREENING CRITERIA	% OF HOT SPOT AREA	AREA (AC.)
NWI Wetlands	7%	632
FEMA Floodplains	9%	806
Undermined Areas	0%	0
0 -5% Slope Areas	33%	3,044
5 - 10% Slope Areas	25%	2,328
10 - 15% Slope Areas	15%	1,349
15- 25% Slope Areas	15%	1,404
25 -90% Slope Areas	11%	1,010
Land Use - Agricultural	9%	780
Land Use - Commercial	13%	1,164
Land Use - Industrial	2%	174
Land Use - Residential	14%	1,319
Land Use - Other	62%	5,698

Hot Spot 8 | Clarion



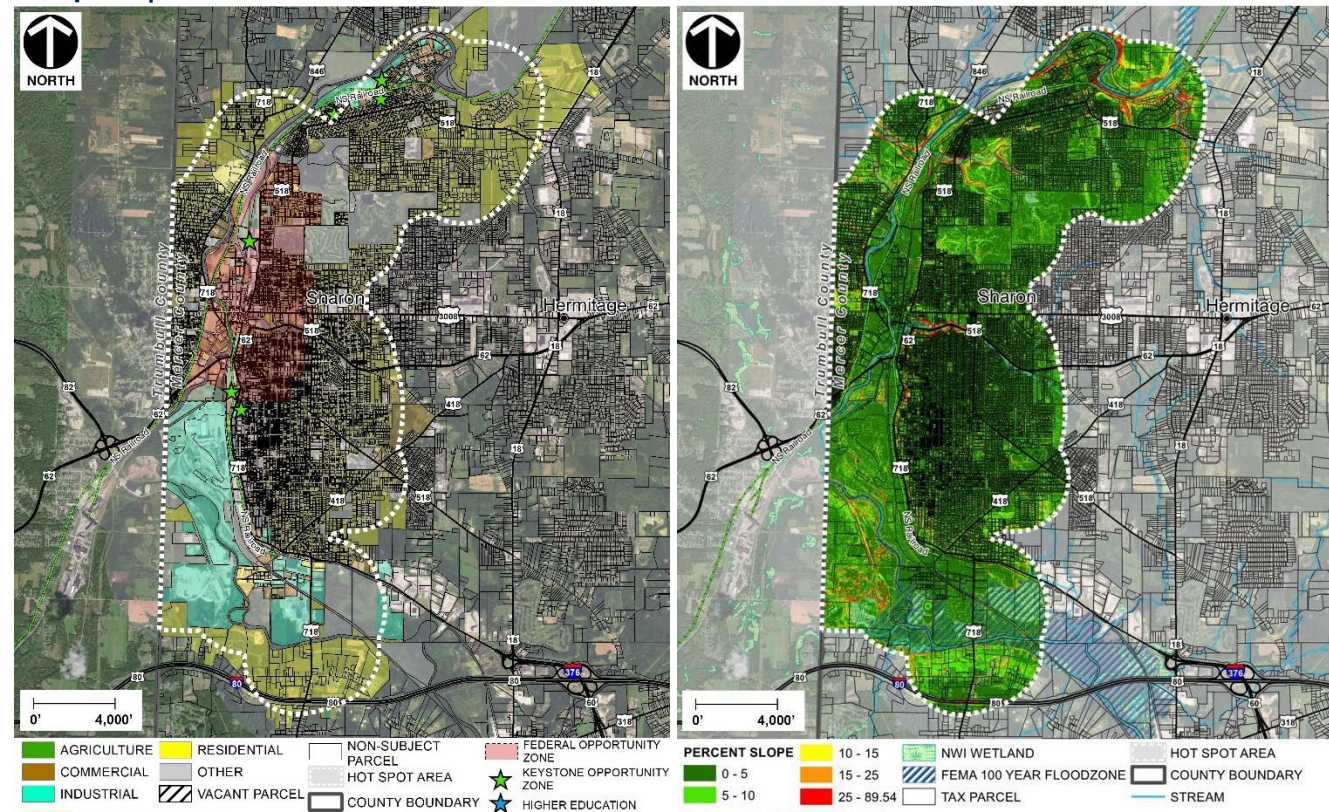
Hot Spot 8 – Clarion: Land Use Characteristics

Environmental Characteristics

HOT SPOT 8 - GENERAL INFORMATION

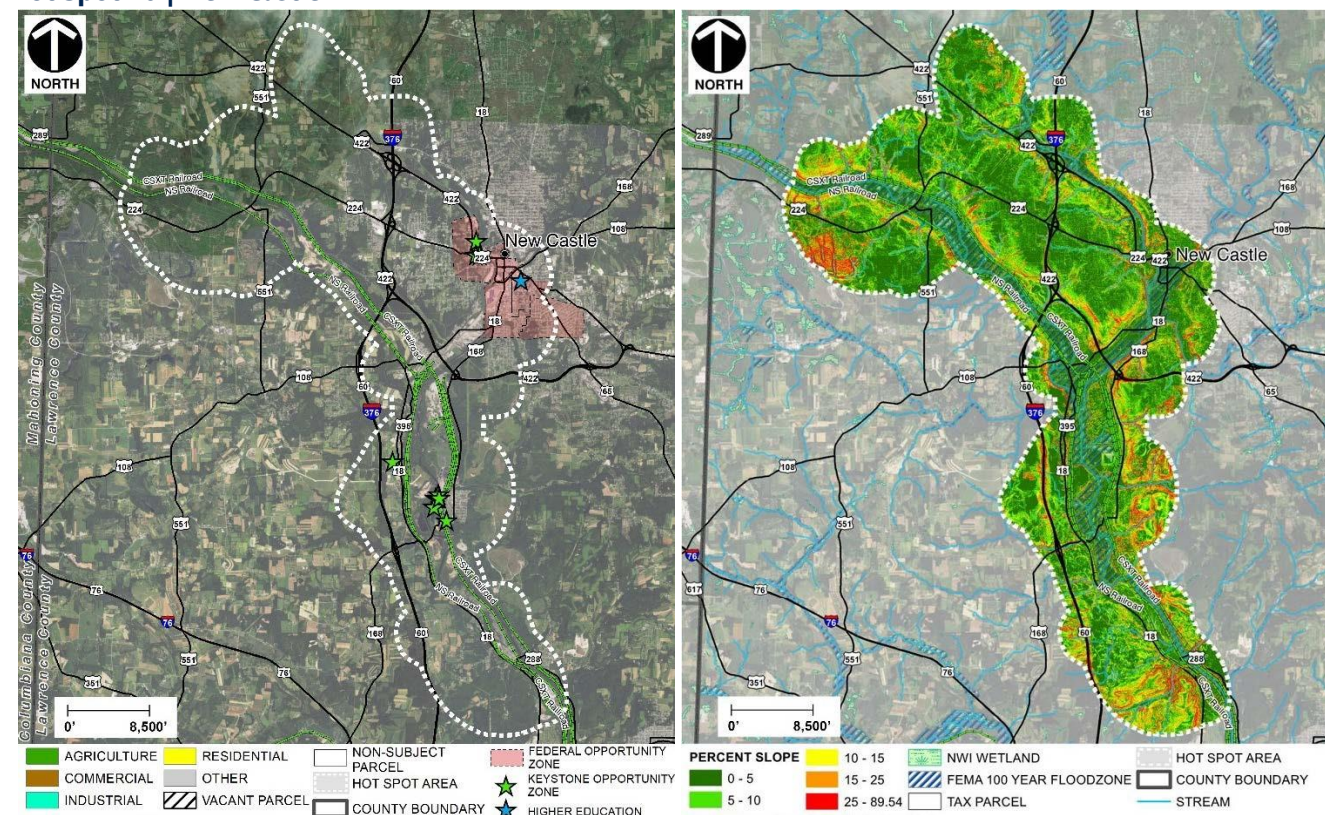
COUNTY	MUNICIPALITIES	TOTAL AREA (AC.)
Clarion	Boroughs: Clarion, Strattanville; Townships: Clarion, Highland, Limestone, Millcreek, Monroe, Paint	22,661
HOT SPOT 8 - SCREENING INFORMATION		
SCREENING CRITERIA	% OF HOT SPOT AREA	AREA (AC.)
NWI Wetlands	3%	593
FEMA Floodplains	3%	725
Undermined Areas	0%	0
0 -5% Slope Areas	43%	9,761
5 - 10% Slope Areas	31%	6,931
10 - 15% Slope Areas	13%	3,016
15- 25% Slope Areas	9%	2,091
25 -90% Slope Areas	4%	862
Land Use - Agricultural	64%	14,574
Land Use - Commercial	9%	1,945
Land Use - Industrial	0%	46
Land Use - Residential	13%	2,965
Land Use - Other	14%	3,131

Hot Spot 9 | Sharon



HOT SPOT 9 - GENERAL INFORMATION		
COUNTY	MUNICIPALITIES	TOTAL AREA (AC.)
Mercer	Cities: Farrell, Hermitage, Sharon; Townships: Shenango, South Pymatuning; Boroughs: Sharpsville, Wheatland	8,330
HOT SPOT 9 - SCREENING INFORMATION		
SCREENING CRITERIA	% OF HOT SPOT AREA	AREA (AC.)
NWI Wetlands	5%	380
FEMA Floodplains	9%	766
Undermined Areas	0%	0
0 -5% Slope Areas	63%	5,211
5 - 10% Slope Areas	24%	2,006
10 - 15% Slope Areas	7%	559
15- 25% Slope Areas	4%	346
25 -90% Slope Areas	2%	208
Land Use - Agricultural	0%	4
Land Use - Commercial	6%	527
Land Use - Industrial	13%	1,057
Land Use - Residential	46%	3,830
Land Use - Other	35%	2,912

Hot Spot 10 | New Castle



Hot Spot 10 – New Castle: Land Use Characteristics Environmental Characteristics

NOTE: The Land Use Characteristics map shown above for this Hot Spot is incomplete due missing parcel boundary and land use information. The map will be completed upon receipt of this information.

HOT SPOT 10 - GENERAL INFORMATION		
COUNTY	MUNICIPALITIES	TOTAL AREA (AC.)
Lawrence	City of New Castle; Townships: Mahoning, Neshannock, North Beaver, Pulaski, Shenango, Taylor, Union, Wayne; Boroughs: New Beaver, South New Castle, Wampum	32,340
HOT SPOT 10 - SCREENING INFORMATION		
SCREENING CRITERIA	% OF HOT SPOT AREA	AREA (AC.)
NWI Wetlands	5%	1,480
FEMA Floodplains	14%	4,622
Undermined Areas	0%	0
0 -5% Slope Areas	50%	16,259
5 - 10% Slope Areas	25%	8,100
10 - 15% Slope Areas	11%	3,410
15- 25% Slope Areas	9%	2,807
25 -90% Slope Areas	5%	1,764
Land Use - Agricultural		
Land Use - Commercial		
Land Use - Industrial		
Land Use - Residential		
Land Use - Other		

ECONOMIC AND WORKFORCE DEVELOPMENT ASSETS

Workforce availability is a critical consideration for plastics businesses seeking to expand in or relocate to Northwest Pennsylvania. In 2018, the top 10 occupations for polyethyleneutilizing plastics industries accounted for 20,000 jobs in NW PA, with some of these positions in the plastics industry itself and others in different industries with overlapping skills needs. Nationally, these 10 occupations account for about half of all labor required by the plastics industry. Median earnings for these occupations range from \$23,000 to \$55,000, compared to overall median earnings for the region of \$32,000.²⁰

While a 5% decline in overall need for these positions is expected over the next five years—principally driven by increased automation in the industry—a steady pipeline of skilled workers will be needed to satisfy replacement demand as existing workers retire or otherwise leave these occupations.

Each year through 2023, there will be a need to fill 2,250 positions in these occupations that are left vacant, an annual replacement rate of about 12%. In other words, 12% of the existing workforce in the top plastics occupations in NW PA will be retiring each year over the next five years. This projection does not take into account any additional industry that may be attracted to NW PA as a result of the expanding petrochemical presence. See Table 2 for detail on projected replacement demand for individual occupations.

Fortunately, the region already has a strong foundational concentration of these occupations on which to build. It also has a system of organizations with missions related to building plastics-related workforce capacity in the region. These include, but are not limited to:

- ◆ PennState Behrend – Plastics Training Academy
- ◆ Clarion University – training to support petrochemicals industry
- ◆ Keystone Community Education Council – educational training program development organization
- ◆ Northwest Industrial Resource Center (NWIRC) – services for small and medium-sized manufacturers
- ◆ American Injection Molding (AIM) Institute – education and training for plastic injection molding
- ◆ NWPA JobConnect – workforce development planning and implementation for the region

Top Occupations for US PE-Utilizing Plastics Manufacturing Industries, by percent of all jobs

1. Molding, Coremaking, and Casting Machine Operators – 12%
2. Assemblers and Fabricators – 8%
3. Extruding and Drawing Machine Operators – 6%
4. First-Line Supervisors – 5%
5. Inspectors, Testers, Sorters, Samples, and Weighers – 4%
6. Hand Packers and Packagers – 4%
7. Hand Laborers and Material Movers – 3%
8. Cutting, Punching, and Press Machine Operators – 3%
9. Maintenance and Repair Workers – 2%
10. Shipping and Receiving Clerks – 2%

²⁰ EMSI

- ◆ NWPA Oil and Gas Hub – partnership promoting petrochemical-related economic development ◆ Team Pennsylvania – non-profit supporting programs for economic prosperity statewide

Table 2

Plastics Occupations in Northwest Pennsylvania, Replacement Jobs									
SOC	Description	2018 Jobs	2023 Jobs	2018 - 2023 Change	2018 - 2023 % Change	Annual Replacement Jobs	2018 - 2023 Replacement Jobs	Annual Replacement Rate	Median Annual Earnings
51-1011	First-Line Supervisors of Production and Operating Workers	2,076	1,993	(83)	(4%)	196	980	9.6%	\$54,503
49-9071	Maintenance and Repair Workers, General	3,761	3,742	(19)	(1%)	361	1,803	9.6%	\$34,376
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	1,425	1,277	(148)	(10%)	161	803	11.8%	\$33,435
51-4021	Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic	470	437	(33)	(7%)	46	229	10.0%	\$33,356
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	821	751	(70)	(9%)	88	442	11.2%	\$33,257
43-5071	Shipping, Receiving, and Traffic Clerks	1,203	1,152	(51)	(4%)	117	585	9.9%	\$31,998
51-2098	Assemblers and Fabricators, All Other, Including Team Assemblers	3,430	3,011	(419)	(12%)	373	1,864	11.5%	\$28,959
51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	639	605	(34)	(5%)	70	351	11.2%	\$28,596
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	5,224	5,170	(54)	(1%)	703	3,516	13.5%	\$26,285
53-7064	Packers and Packagers, Hand	928	899	(29)	(3%)	136	682	14.9%	\$23,108
	Total	19,977	19,036	(941)	(5%)	2,251	11,256	11.5%	

Source: EMSI

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Source: Bechtel

6 | RECOMMENDATIONS

Achieving the full potential of petrochemical-related opportunities will require Northwest Pennsylvania stakeholders to work together and with partners outside the region to accomplish three main goals:

1. Identify and prepare physical sites
2. Attract and retain investment
3. Build organizational capacity

These goals will be critical in ensuring that Northwest Pennsylvania is “at the table” with other neighboring regions in Pennsylvania, Ohio, and West Virginia as investment comes along. In working toward these three goals, NW PA will be well poised to capture its share of economic opportunity by building on its foundational assets and manufacturing history.

1 | IDENTIFY AND PREPARE PHYSICAL SITES

1.1 IDENTIFY SPECIFIC CANDIDATE SITES/PARCELS

Collectively, this report and its underlying GIS data set are designed as tools for use in identifying specific candidate sites for petrochemical supply chain facilities within the 8-county NWC territory. A key next step is to combine these tools with local knowledge of land ownership, regulatory dynamics, and local political interests in order to realistically identify a broad range of potential candidate sites for the NWC initiative. This task should seek to identify the broadest range of potential sites for each of the three petrochemical supply chain facility typologies described in Stage 2 – Development Hot Spot Profiles:

- ◆ Large Manufacturing Facility Sites
- ◆ Small-Medium Manufacturing Facility Sites
- ◆ Warehouse/Logistics Facility Sites

1.2 DETERMINE CANDIDATE SITE SHORTFALLS & MITIGATION COSTS

Once a broad range of potential candidate sites are identified for each of the three petrochemical supply chain facility typologies, further investigation should be conducted to determine generalized pros and cons for each site. For identified shortfalls, a “Shovel-Ready-Lite” analysis can be conducted to determine, at a high level, cost and complexity to bring each candidate site to shovel-ready development status. “Shovel-Ready-Lite” refers to a situation-specific process of conceptually designing, permitting, and identifying funding for needed improvements, everything short of actually constructing the improvement. Information generated in the Shovel-Ready-Lite analysis can, in turn, be presented to site selectors and prospects as evidence, produced at a relatively low cost, of NWC’s ability to bring a site to shovel-ready status in a credible and predictable time period.

1.3 PRIORITIZE CANDIDATE SITES FOR MARKET OFFERING

Utilizing the findings of the Shovel-Ready-Lite analysis, prioritize the candidate sites for offering to the local, national, and global marketplace. Priority sites in each of the three petrochemical supply chain facility typologies identified in Stage 2 – Development Hot Spot Profiles should be identified.

2 | ATTRACT AND RETAIN INVESTMENT

2.1 IMPLEMENT A PETROCHEMICALS-RELATED BUSINESS RETENTION AND EXPANSION INITIATIVE

There are existing petrochemical supply chain companies in the region, most significantly, plastics manufacturers. It is critical to keep them sustainable and support their growth. A formal business visitation and engagement program must be developed and implemented that captures and addresses their needs. This includes visiting businesses, listening to their needs and plans, working with partners to address their needs, tracking information and results, and integrating findings back into strategic planning for this entire effort.

2.2 DEVELOP A WORKPLAN TO ACTIVELY PROMOTE CANDIDATE SITES AND ATTRACT INVESTMENT

Once the NWC data-driven story is constructed and ready to be told, an investment and businesses attraction workplan and schedule is an important need to guide actions. The work plan should include targeted and focused outreach, communications, and attraction into the local, national, and global marketplace. Efforts should focus on the targeted industry opportunities as identified this report identified, including:

- ◆ Pelletized plastic compounders and converters
- ◆ Polyethylene-utilizing plastics manufacturers

- ◆ Plastics wholesalers and distributors

Critical activities to include in the workplan are:

- ◆ Targeted lead generation – developing and maintaining a quality list of companies, contacts, and business intelligence. This should include companies vetted to be “likely to consider” an expansion or relocation in the near future (1-5 years) that would consider the region as a possible location. Key geographic regions to target based on existing presence of companies in the targeted industries include:
 - ◆ *Domestic: Great Lakes Region, Northeast Corridor (Boston to Washington, DC), South Atlantic Region (Raleigh to Atlanta), Florida, Texas, California*
 - ◆ *International: Canada, China, Mexico, Germany, South Korea, Taiwan*
- ◆ Conversations and engagement with site locators to make them aware of the investment case and assets in the region
- ◆ Protocols and execution plans for meetings and follow through with active leads
- ◆ Priority plans for industry conferences and trade shows and execution plans for participation
- ◆ Relationship building and integration with regional and state partners for business attraction efforts

2.3 PREPARE BRANDING/MARKETING COLLATERALS, PROMOTIONAL TOOLS, & METHODOLOGIES

Effectively presenting the NWC initiative to the marketplace requires effective tools to communicate and sell the advantages of NWC to the local, national, and global marketplace. This should start with determining a “brand” for the initiative, a unified banner or strategy which can inform and guide promotional actions for the NWC initiative. Once established, the new Brand can infuse a variety of promotional tactics, such as an NWC initiative-specific website, webinars, canned and custom presentations, and hardcopy flyers and brochures. This initiative has to be grounded on solid information and data. This requires gathering and tabulating data, keeping it regularly updated (at least annually), and making it available and integrated with marketing materials, presentations, and a “go-to” website for the initiative. Critical data includes:

- ◆ Sites (utilizing and building on the GIS tool created for this project) and linking to regional and state site marketing and listing services
- ◆ Employment and workforce data
- ◆ Education and job training assets, programs and services
- ◆ Listing of related businesses in the region
- ◆ Infrastructure – transportation, water, sewer, utility, telecommunications in the region and price points
- ◆ Programs, services, and incentives to assist investors, developers, and businesses

3 | BUILD ORGANIZATIONAL CAPACITY

3.1 SECURE A “CHAMPION” TO UNIFY & LEAD THE NWC INITIATIVE

Perhaps the single most important key to success for the NWC initiative is coordinating and promoting differing NWC interests in a way that presents a unified face to the local, national, and global marketplace. Identifying and retaining a committed, experienced, dynamic individual to lead the NWC initiative will focus the effort, provide single-point accountability, and energize the entire process.

This person and the effort should be supported by an engaged advisory committee that provides strategic advice and oversight. This should consist of persons with experience and expertise within the region for economic, businesses, site, and workforce development specifically related to petrochemical and related manufacturing and logistics industries. The current advisory committee for this project could serve as a starting point for forming the advisory team.

3.2 ESTABLISH A “ONE-STOP SHOP” TO FACILITATE PROSPECT ENQUIRIES

A great way to present the NWC region as being “open for business” is to have an entity or agency empowered to serve as a single point of contact to lead, shepherd, and facilitate prospect enquiries related to business attraction, expansion, and retention for the NWC initiative. This should include marketing, incentives, site availability, and regulatory/permitting facilitation, among others.

3.3 CONTINUE AND AUGMENT WORKFORCE DEVELOPMENT EFFORTS WITHIN THE REGION

A key asset to growing these industries is the existing workforce assets and related programs. This must be continued and expanded as warranted by demand over time.

3.4 COLLABORATE WITH REGIONAL AND STATE PARTNERS

There is a lot of good work being done by the state as well as regional economic development entities to support and grow the petrochemical and related logistics and manufacturing sectors in Pennsylvania. Successful economic growth, particularly business attraction, is best achieved through effective coalitions at the local, regional, state, and multi-state levels. Partnerships and collaboration with the State, Pittsburgh Regional Alliance, and Tri-State Coalition will be critical for leveraging this unique opportunity in the region.

APPENDIX A: GIS ANALYSIS

A comprehensive GIS (Geographic Information Systems) data set was prepared as part of this project. The 8-county NWC territory maps included in this report represent snapshot views generated from the GIS data set. The GIS data set, however, contains significant additional information beyond that shown in this report document. The GIS data set is designed for use as a valuable interactive tool for future analyses involving searches for sites to accommodate the needs of specific business attraction/expansion prospects.

GIS SCREENING PROCESS

To investigate and identify regional assets across the 8-county NWC territory, a GIS analysis model was developed to evaluate siting criteria.

The initial step in the analysis process was procurement of primary screening data sets in a GIS format. These included layers for both transportation and utility features, such as railroads, ports, pipelines, public water supply, etc. Once the primary screening data was obtained and conditioned, a 1-mile buffer (2 miles total) was applied to each data set, and the results were then geometrically unioned within ArcGIS. From this unioned data set, the number of overlaps for each layer was calculated, and the ten highest scoring areas were selected as development "Hot Spots".

For this analysis, each layer was weighted equally, and the results were derived solely from the sum of the overlaps. To better represent each selected area, all adjacent polygons within 1 mile and scoring at least a 5 or above were added to create final development Hot Spot boundaries. Upon establishing Hot Spot boundaries, secondary land use and environmental screening layers, including slope, wetlands, mined-areas, and land use/parcel boundaries, were overlaid on the Hot Spot mapping to provide a holistic visual assessment of each selected area. Summary metrics for key criteria were then computed for each Hot Spot, reported as the total acre of each feature type and the percentage of total Hot Spot area.

A complete list of the GIS data sources used in the Hot Spot and site screening analysis is provided below:

TRANSPORTATION ASSETS

- ◆ Interstate, Toll Roads, Highways: Esri Data & Maps and StreetMap North America for ArcGIS, from TeleAtlas, 2019
- ◆ Navigable River: Derived from Pennsylvania Department of Environmental Protection (PADEP) 305B stream dataset, provided via Pennsylvania Spatial Data Access (PASDA), 2019
- ◆ Lock and Dam Locations, Air Facilities, Rail Facilities, Truck Facilities, Port Facilities, Port/Barge Mooring Facilities: Port of Pittsburgh Commission, 2019; Intermodal Freight Facilities via US Department of Transportation, 2015
- ◆ Class 1 and 2 Railroads: Esri Data & Maps and StreetMap North America for ArcGIS, from U.S. National Transportation Atlas, 2019

UTILITY ASSETS

- ◆ Crude Oil, Natural Gas, Natural Gas Liquid Transmission lines: PennWell MapSearch natural gas dataset (license), 2019; National Pipeline Mapping System (NPMS) Public Viewer, 2019

- ◆ Electric Transmission lines: PennWell MapSearch power dataset (license), 2019
- ◆ Electric and natural gas facilities: PennWell MapSearch power & natural gas datasets (license), 2019
- ◆ Public Water Supply: Public Water Supplier's (PWS) Service Areas provided by PASDA, 2019
- ◆ High Speed Broadband Availability: Terrestrial Broadband availability provided by GeoTel (purchase), 2019

LAND USE CHARACTERISTICS

- ◆ Jurisdictional Boundaries: PASDA via Pennsylvania Department of Transportation (PADOT), 2019
- ◆ Parcel Boundaries and Land Use: Provided by individual counties to NW Commission, current as of 2019
- ◆ Keystone Opportunity Zones: Provided via online access (KMZ) through the Pennsylvania Department of Community and Economic Development, 2019
- ◆ Federal Opportunity Zones: US Department of Treasury, Community Development Financial Institutions (CDFI) resource page, 2019

ENVIRONMENTAL CHARACTERISTICS

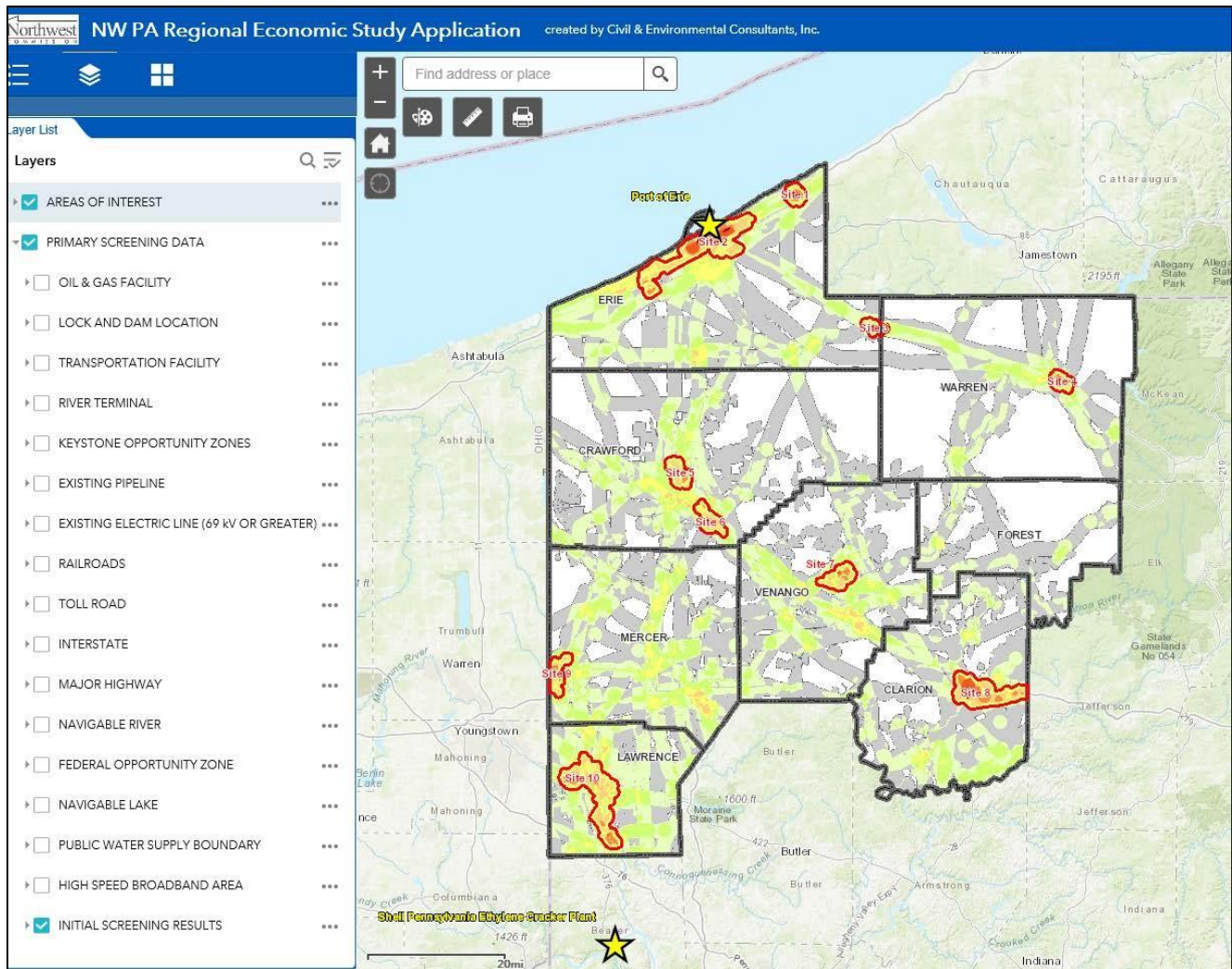
- ◆ Wetlands: National Wetlands Inventory (NWI) datasets, provided by US Fish & Wildlife Service, 2019
- ◆ 100-Year Floodplains: PASDA, provided via FEMA Map Service Center, various dates
- ◆ Mining Areas: PASDA Digitized Mined areas, 2019
- ◆ Percent Slope Areas: Derived from PASDA Lidar and Elevation datasets, 2006-2008

GIS DATA VIEWER

In addition to the hardcopy figures and data summary tables presented in this report, a GIS web application displaying relevant project data has been created.

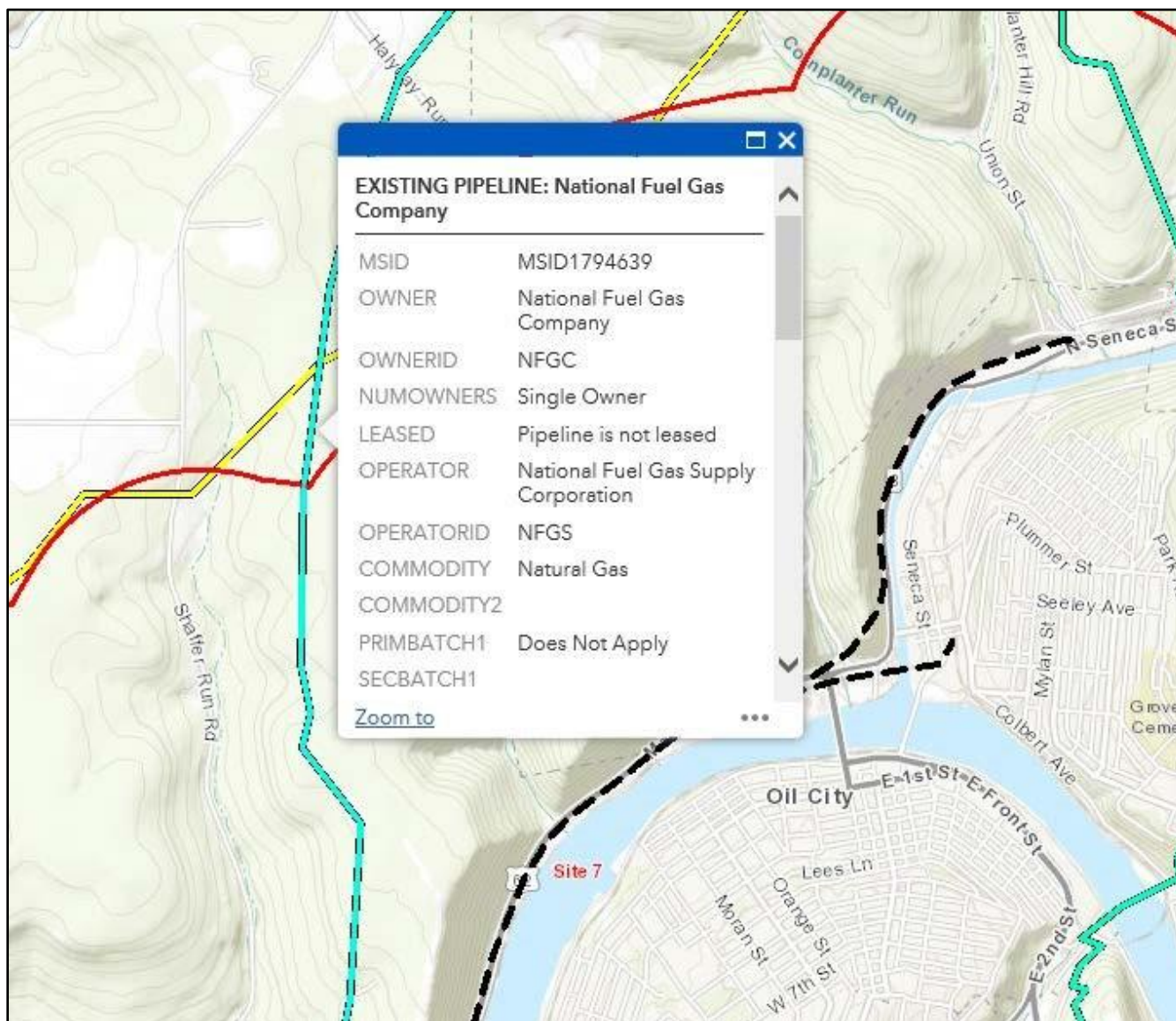
The application allows users to view the report data and findings in an interactive, web-based format.

Access to this online resource is restricted to the Northwest Commission (NWC) / Camoin / CECP project team at this time. User names and passwords will be provided to team members as appropriate and determined by NWC. However, the project team intends to share this resource with county commissioners and community stakeholders as part of the future phases of the project. The project team will work closely with NWC to configure the web mapping application and determine the relevant data sets for presentation to the larger audience.



Initial Web Map View

Functionality within the application includes the ability to turn on and off data sets, zoom to desired map extents, change base maps, and the option to print custom maps from the display. In addition, the application allows users to view the attribute data linked to each dataset through pop-up boxes that appear on screen when the object is clicked on. Feature attribute data can also be viewed in a table format within the application and selected results can be exported to a .csv file if desired.



Sample Web Map View of Utility Data in an Identified Hot Spot Area

APPENDIX B: DETAILED DATA TABLES

POPULATION AND JOBS

693,378

Population (2018)

Population decreased by 20,742 over the last 5 years and is projected to decrease by 14,369 over the next 5 years.

304,084

Jobs (2018)

Jobs decreased by 9,587 over the last 5 years and are projected to decrease by 3,068 over the next 5 years.

\$49.3K

Avg. Earnings Per Job (2018)

Regional average earnings per job are \$15.5K below the national average earnings of \$64.7K per job.

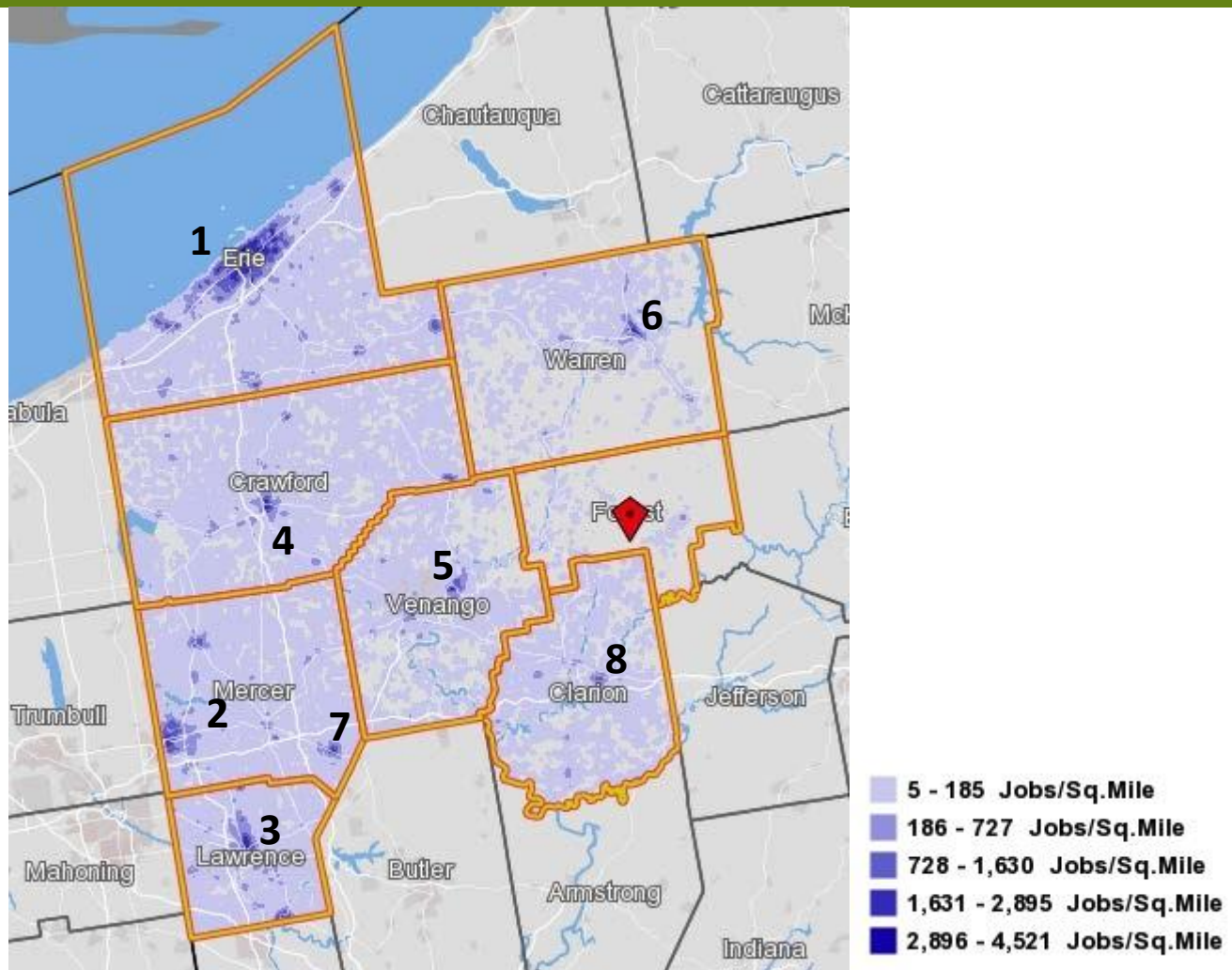
Population vs Jobs							
Region	Population			Jobs			2018 Jobs per 1,000 Population
	2018 Population	Historic Pct. Change 2013-2018	Projected Pct. Change 2018-2023	2018 Jobs	Historic Pct. Change 2013-2018	Projected Pct. Change 2018-2023	
NW PA	693,378	-2.90%	-2.07%	304,084	-3.06%	-1.01%	439
Pennsylvania	12,815,497	0.29%	0.36%	6,425,555	3.61%	3.13%	501
United States	328,038,851	3.73%	2.74%	161,636,598	7.40%	5.66%	493

Source: EMSI

Northwest Pennsylvania by County, 2018								
	Population	Pct. of Total	Labor Force	Pct. of Total	Jobs	Pct. of Total	GRP	Pct. of Total
Erie County	273,611	39%	130,823	41%	132,631	44%	\$12.4B	43%
Mercer County	111,105	16%	50,744	16%	51,789	17%	\$4.7B	16%
Lawrence County	86,540	12%	40,294	13%	31,571	10%	\$3.0B	11%
Crawford County	85,866	12%	38,979	12%	34,856	11%	\$3.2B	11%
Venango County	51,382	7%	22,947	7%	19,981	7%	\$1.8B	6%
Warren County	39,368	6%	19,353	6%	15,933	5%	\$1.9B	7%
Clarion County	38,250	6%	17,278	5%	15,153	5%	\$1.3B	5%
Forest County	7,256	1%	1,837	1%	2,170	1%	\$241.4M	1%
Region Total	693,378	100%	322,255	100%	304,084	100%	\$25.7B	100%

Source: EMSI

JOB CLUSTERS



Source: Census OnTheMap

ECONOMY OVERVIEW

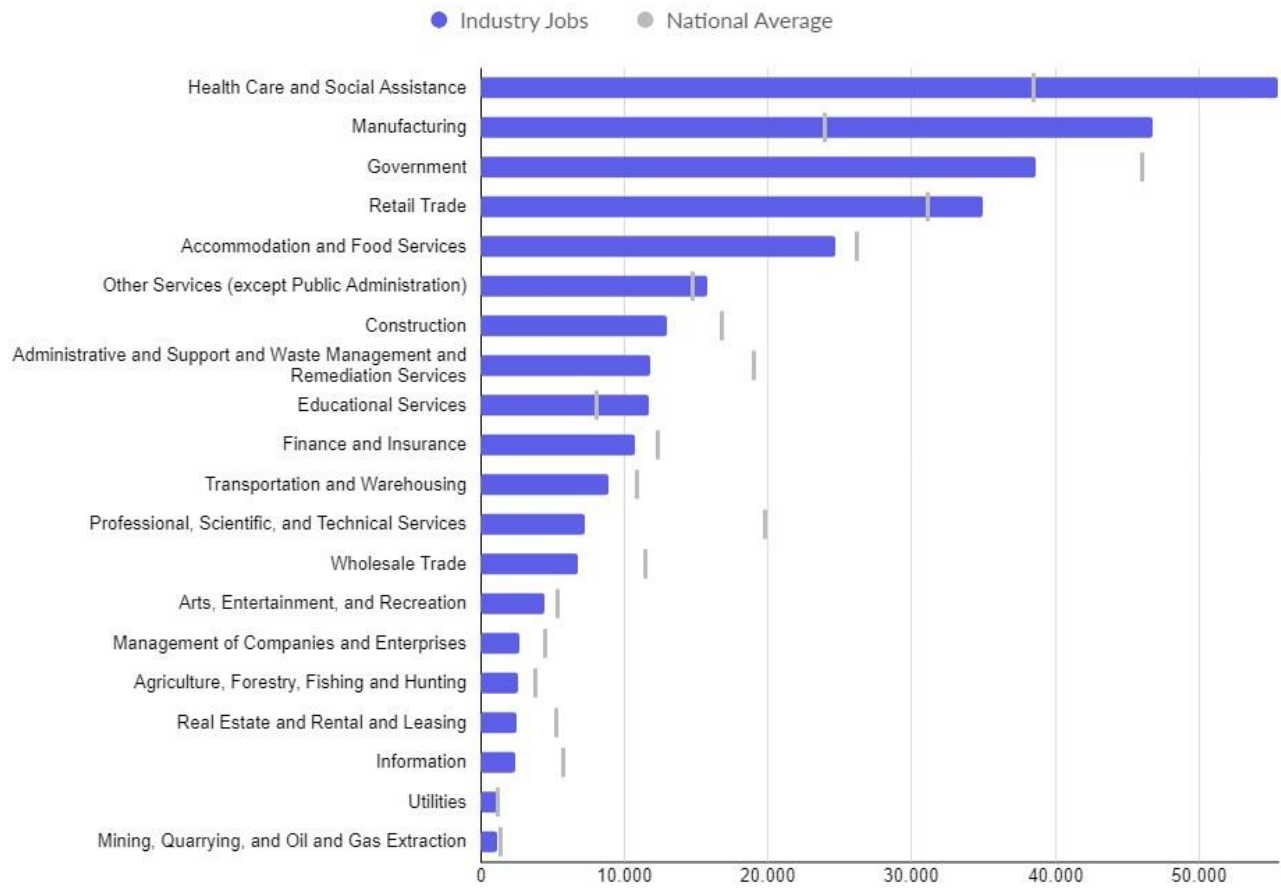
Northwest Pennsylvania Economy Overview

NAICS	Description	2013 Jobs	2018 Jobs	2023 Jobs	2013 - 2018 Change	2013 - 2018 % Change	2018 - 2023 Change	2018 - 2023 % Change	Business Locations	Avg. Earnings Per Job	2018 Location Quotient
11	Agriculture, Forestry, Fishing and Hunting	2,539	2,602	2,621	63	2%	19	1%	180	\$31,539	0.72
21	Mining, Quarrying, and Oil and Gas Extraction	1,897	1,159	1,150	(738)	(39%)	(9)	(1%)	125	\$81,830	0.94
22	Utilities	1,231	1,228	1,218	(3)	(0%)	(10)	(1%)	58	\$121,715	1.17
23	Construction	13,317	12,993	12,966	(324)	(2%)	(27)	(0%)	1,256	\$51,275	0.78
31	Manufacturing	50,983	46,866	44,058	(4,117)	(8%)	(2,808)	(6%)	1,301	\$68,927	1.96
42	Wholesale Trade	7,594	6,766	6,597	(828)	(11%)	(169)	(2%)	633	\$56,836	0.60

44	Retail Trade	37,102	35,025	33,490	(2,077)	(6%)	(1,535)	(4%)	2,373	\$31,271	1.13
48	Transportation and Warehousing	9,467	8,927	8,832	(540)	(6%)	(95)	(1%)	487	\$51,693	0.83
51	Information	2,797	2,419	2,131	(378)	(14%)	(288)	(12%)	145	\$54,177	0.43
52	Finance and Insurance	10,624	10,790	10,793	166	2%	3	0%	799	\$75,891	0.89
53	Real Estate and Rental and Leasing	2,543	2,502	2,456	(41)	(2%)	(46)	(2%)	400	\$38,028	0.49
54	Professional, Scientific, and Technical Services	7,517	7,304	7,456	(213)	(3%)	152	2%	960	\$53,046	0.37
55	Management of Companies and Enterprises	2,352	2,694	2,925	342	15%	231	9%	130	\$91,356	0.62
56	Administrative and Support and Waste Management and Remediation Services	11,423	11,847	11,920	424	4%	73	1%	646	\$29,045	0.63
61	Educational Services	12,057	11,776	11,758	(281)	(2%)	(18)	(0%)	149	\$32,780	1.49
62	Health Care and Social Assistance	54,703	55,558	58,320	855	2%	2,762	5%	3,599	\$49,402	1.45
71	Arts, Entertainment, and Recreation	4,578	4,474	4,482	(104)	(2%)	8	0%	250	\$22,415	0.85
72	Accommodation and Food Services	24,048	24,702	24,694	654	3%	(8)	(0%)	1,544	\$16,577	0.95
81	Other Services (except Public Administration)	16,199	15,780	15,655	(419)	(3%)	(125)	(1%)	1,555	\$24,917	1.08
90	Government	40,700	38,671	37,492	(2,029)	(5%)	(1,179)	(3%)	1,096	\$71,429	0.84
	Total	313,671	304,084	301,016	(9,587)	(3%)	(3,068)	(1%)	17,687	\$49,272	

Source: EMSI

Largest Industries



Top Industry Earnings



Economic Base Regional Comparison, Historic Change, 2013-2018

NAICS	Description	NW PA 2013 Jobs	NW PA 2018 Jobs	NW PA Change	NW PA % Change	PA % Change	US % Change
11	Agriculture, Forestry, Fishing and Hunting	2,539	2,602	63	2%	3%	2%
21	Mining, Quarrying, and Oil and Gas Extraction	1,897	1,159	(738)	(39%)	(25%)	(21%)
22	Utilities	1,231	1,228	(3)	(0%)	9%	2%
23	Construction	13,317	12,993	(324)	(2%)	7%	15%
31	Manufacturing	50,983	46,866	(4,117)	(8%)	0%	4%
42	Wholesale Trade	7,594	6,766	(828)	(11%)	(3%)	2%
44	Retail Trade	37,102	35,025	(2,077)	(6%)	(1%)	5%
48	Transportation and Warehousing	9,467	8,927	(540)	(6%)	16%	17%

51	Information	2,797	2,419	(378)	(14%)	(4%)	4%
52	Finance and Insurance	10,624	10,790	166	2%	2%	6%
53	Real Estate and Rental and Leasing	2,543	2,502	(41)	(2%)	7%	10%
54	Professional, Scientific, and Technical Services	7,517	7,304	(213)	(3%)	8%	11%
55	Management of Companies and Enterprises	2,352	2,694	342	15%	2%	10%
56	Administrative and Support and Waste Management and Remediation Services	11,423	11,847	424	4%	6%	10%
61	Educational Services	12,057	11,776	(281)	(2%)	10%	10%
62	Health Care and Social Assistance	54,703	55,558	855	2%	8%	10%
71	Arts, Entertainment, and Recreation	4,578	4,474	(104)	(2%)	7%	14%
72	Accommodation and Food Services	24,048	24,702	654	3%	7%	12%
81	Other Services (except Public Administration)	16,199	15,780	(419)	(3%)	2%	7%
90	Government	40,700	38,671	(2,029)	(5%)	(3%)	2%
	Total	313,671	304,084	(9,587)	(3%)	4%	7%

Source: EMSI

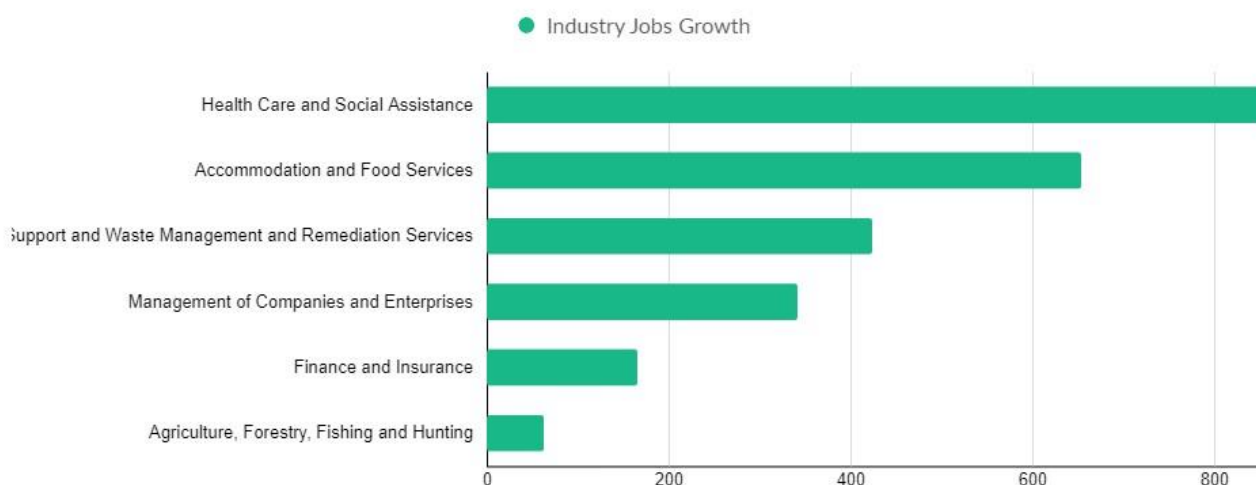
Economic Base Regional Comparison, Projected Change, 2018-2023

NAICS	Description	NW PA 2018 Jobs	NW PA 2023 Jobs	NW PA Change	NW PA % Change	PA % Change	US % Change
11	Agriculture, Forestry, Fishing and Hunting	2,602	2,621	19	1%	1%	2%
21	Mining, Quarrying, and Oil and Gas Extraction	1,159	1,150	(9)	(1%)	11%	7%
22	Utilities	1,228	1,218	(10)	(1%)	3%	4%
23	Construction	12,993	12,966	(27)	(0%)	4%	6%
31	Manufacturing	46,866	44,058	(2,808)	(6%)	(3%)	0%
42	Wholesale Trade	6,766	6,597	(169)	(2%)	1%	3%

44	Retail Trade	35,025	33,490	(1,535)	(4%)	(2%)	3%
48	Transportation and Warehousing	8,927	8,832	(95)	(1%)	6%	8%
51	Information	2,419	2,131	(288)	(12%)	(3%)	3%
52	Finance and Insurance	10,790	10,793	3	0%	3%	5%
53	Real Estate and Rental and Leasing	2,502	2,456	(46)	(2%)	1%	5%
54	Professional, Scientific, and Technical Services	7,304	7,456	152	2%	6%	9%
55	Management of Companies and Enterprises	2,694	2,925	231	9%	6%	6%
56	Administrative and Support and Waste Management and Remediation Services	11,847	11,920	73	1%	5%	7%
61	Educational Services	11,776	11,758	(18)	(0%)	7%	9%
62	Health Care and Social Assistance	55,558	58,320	2,762	5%	10%	12%
71	Arts, Entertainment, and Recreation	4,474	4,482	8	0%	5%	7%
72	Accommodation and Food Services	24,702	24,694	(8)	(0%)	4%	7%
81	Other Services (except Public Administration)	15,780	15,655	(125)	(1%)	2%	5%
90	Government	38,671	37,492	(1,179)	(3%)	(2%)	3%
	Total	304,084	301,016	(3,068)	(1%)	3%	6%

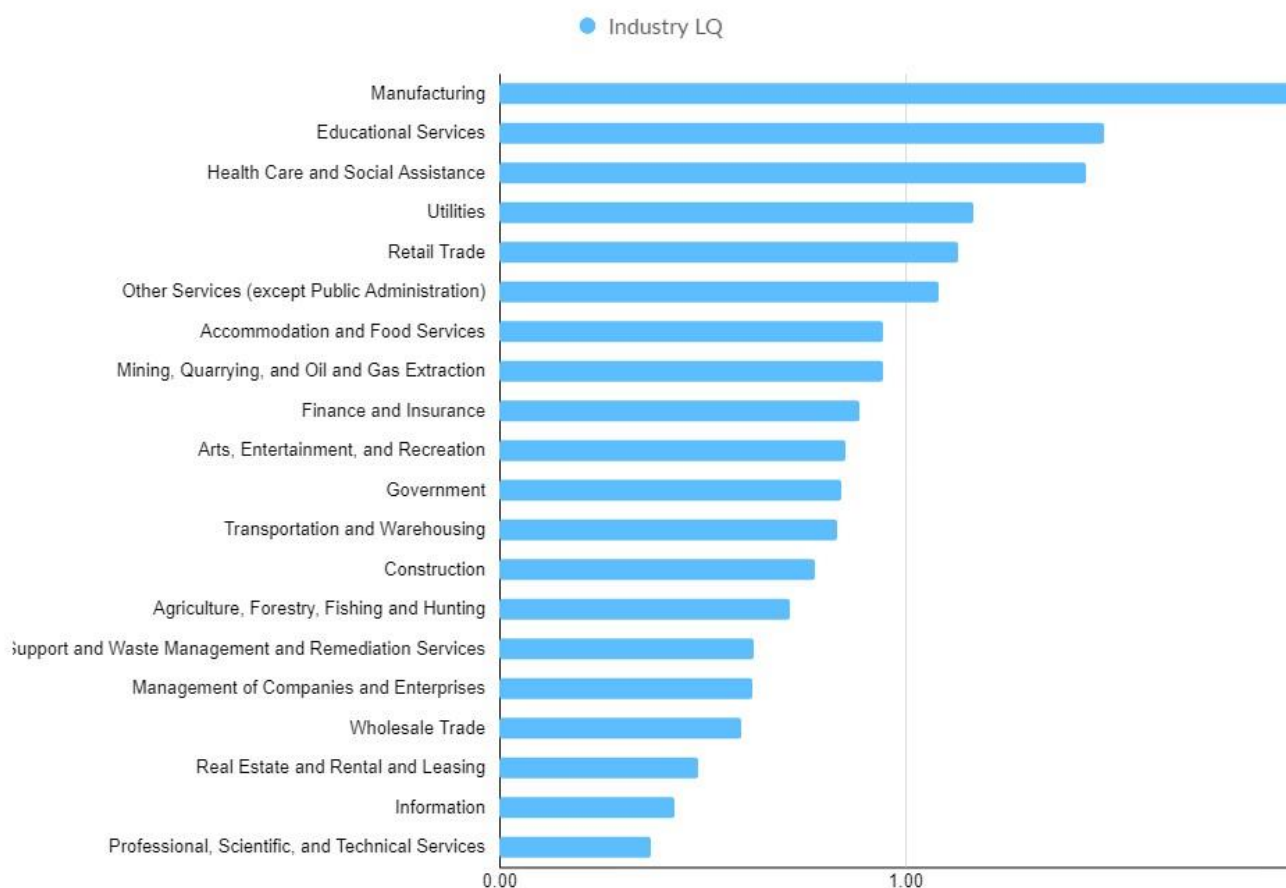
Source: EMSI

Top Growing Industries



Industry	2013 Jobs	2018 Jobs	Change in Jobs	% Change in Jobs	2018 LQ	2018 Earnings Per Worker	2017 GRP
Health Care and Social Assistance	54,703	55,558	855	+2%	1.45	\$49,402	\$3.13B
Accommodation and Food Services	24,048	24,702	654	+3%	0.95	\$16,577	\$645.12M
Administrative and Support and Waste Management and Remediation Services	11,423	11,847	424	+4%	0.63	\$29,045	\$544.35M
Management of Companies and Enterprises	2,352	2,694	342	+15%	0.62	\$91,356	\$284.90M
Finance and Insurance	10,624	10,790	166	+2%	0.89	\$75,891	\$2.52B
Agriculture, Forestry, Fishing and Hunting	2,539	2,602	63	+2%	0.72	\$31,539	\$358.57M

Top Industry LQ



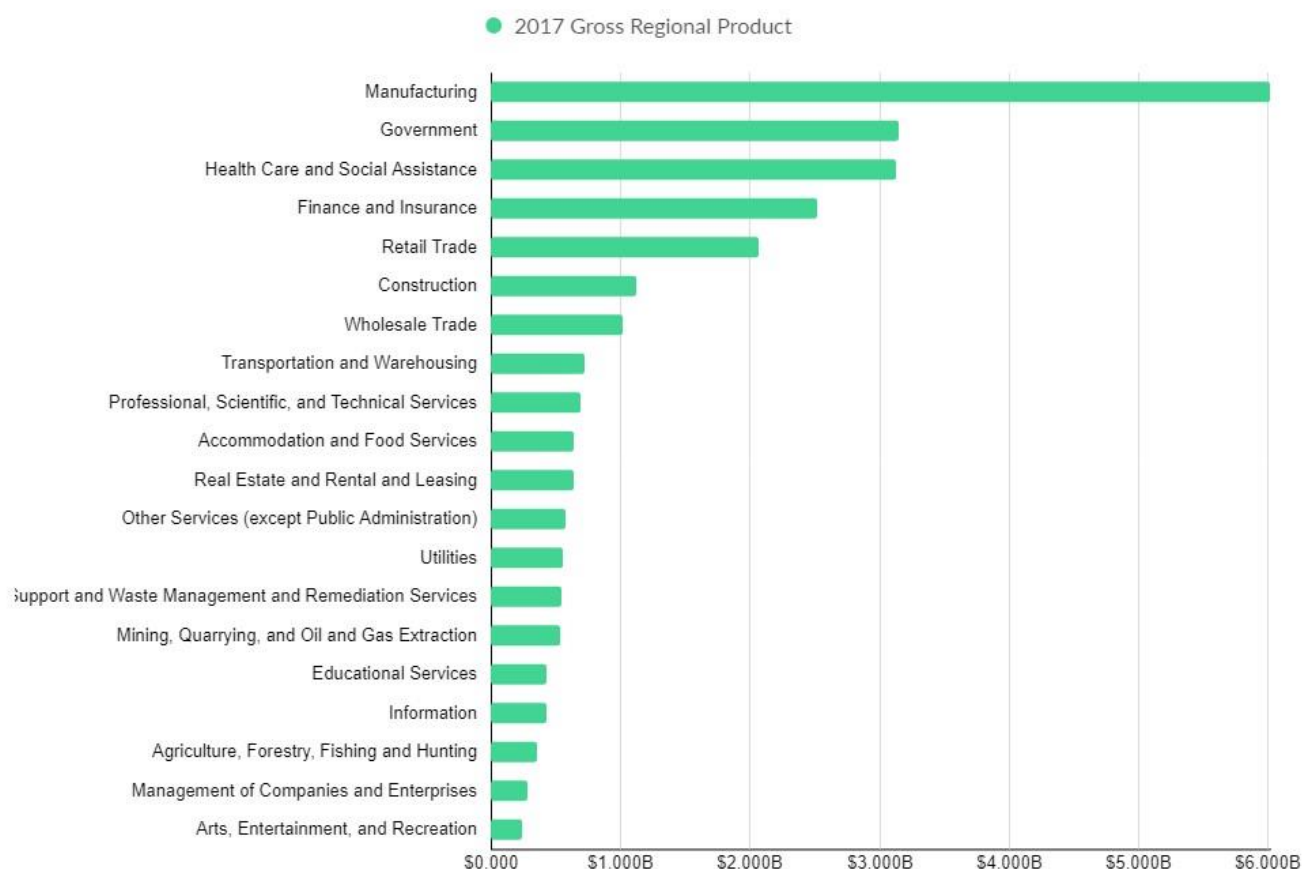
Economic Base Regional Comparison, Sector Job Share, 2018

NAICS	Description	NW PA 2018 Jobs	NW PA % of Total	PA % of Total	US % of Total
11	Agriculture, Forestry, Fishing and Hunting	2,602	1%	1%	1%
21	Mining, Quarrying, and Oil and Gas Extraction	1,159	0%	0%	0%
22	Utilities	1,228	0%	0%	0%
23	Construction	12,993	4%	5%	5%
31	Manufacturing	46,866	15%	9%	8%
42	Wholesale Trade	6,766	2%	3%	4%
44	Retail Trade	35,025	12%	10%	10%
48	Transportation and Warehousing	8,927	3%	4%	4%

51	Information	2,419	1%	1%	2%
52	Finance and Insurance	10,790	4%	4%	4%
53	Real Estate and Rental and Leasing	2,502	1%	1%	2%
54	Professional, Scientific, and Technical Services	7,304	2%	6%	6%
55	Management of Companies and Enterprises	2,694	1%	2%	1%
56	Administrative and Support and Waste Management and Remediation Services	11,847	4%	5%	6%
61	Educational Services	11,776	4%	5%	3%
62	Health Care and Social Assistance	55,558	18%	16%	13%
71	Arts, Entertainment, and Recreation	4,474	1%	2%	2%
72	Accommodation and Food Services	24,702	8%	7%	9%
81	Other Services (except Public Administration)	15,780	5%	5%	5%
90	Government	38,671	13%	11%	15%
	Total	304,084	100%	100%	100%

Source: EMSI

Top Industry GRP



Economic Base Regional Comparison, Sector GRP Share, 2017

NAICS	Description	NW PA GRP (\$MM)	NW PA % of Total	PA % of Total	US % of Total
11	Agriculture, Forestry, Fishing and Hunting	\$ 359	1%	1%	1%
21	Mining, Quarrying, and Oil and Gas Extraction	\$ 536	2%	1%	2%
22	Utilities	\$ 561	2%	2%	2%
23	Construction	\$ 1,120	4%	5%	5%
31	Manufacturing	\$ 6,017	23%	15%	13%
42	Wholesale Trade	\$ 1,023	4%	7%	7%
44	Retail Trade	\$ 2,069	8%	6%	6%
48	Transportation and Warehousing	\$ 725	3%	4%	3%
51	Information	\$ 428	2%	4%	6%

52	Finance and Insurance	\$ 2,519	10%	11%	9%
53	Real Estate and Rental and Leasing	\$ 637	2%	3%	4%
54	Professional, Scientific, and Technical Services	\$ 691	3%	8%	8%
55	Management of Companies and Enterprises	\$ 285	1%	3%	2%
56	Administrative and Support and Waste Management and Remediation Services	\$ 544	2%	3%	3%
61	Educational Services	\$ 434	2%	3%	1%
62	Health Care and Social Assistance	\$ 3,131	12%	10%	8%
71	Arts, Entertainment, and Recreation	\$ 237	1%	1%	1%
72	Accommodation and Food Services	\$ 645	3%	2%	3%
81	Other Services (except Public Administration)	\$ 575	2%	2%	2%
90	Government	\$ 3,153	12%	10%	13%
	Total	\$ 25,689	100%	100%	100%

Source: EMSI

MANUFACTURING SECTOR

Northwest Pennsylvania Manufacturing Sector												
NAICS	Description	2017 GRP	2013 Jobs	2018 Jobs	2023 Jobs	2013 - 2018 Change	2013 - 2018 % Change	2018 - 2023 Change	2018 - 2023 % Change	Business Locations	Avg. Earnings Per Job	2018 Location Quotient
332	Fabricated Metal Product Manufacturing	\$ 1,106,897,441	11,487	10,599	10,071	(888)	(8%)	(528)	(5%)	366	\$65,441	3.89
326	Plastics and Rubber Products Manufacturing	\$ 743,505,278	6,032	6,832	6,680	800	13%	(152)	(2%)	95	\$59,271	5.05
311	Food Manufacturing	\$ 702,305,790	3,324	4,058	4,245	734	22%	187	5%	79	\$60,622	1.33
336	Transportation Equipment Manufacturing	\$ 654,674,423	6,983	4,551	3,500	(2,432)	(35%)	(1,051)	(23%)	30	\$99,710	1.45

333	Machinery Manufacturing	\$ 627,148,164	6,733	5,532	4,958	(1,201)	(18%)	(574)	(10%)	198	\$77,879	2.70
331	Primary Metal Manufacturing	\$ 609,293,349	4,420	4,157	3,875	(263)	(6%)	(282)	(7%)	54	\$79,358	5.93
324	Petroleum and Coal Products Manufacturing	\$ 440,358,868	651	782	848	131	20%	66	8%	19	\$84,846	3.68
325	Chemical Manufacturing	\$ 222,710,034	1,441	752	684	(689)	(48%)	(68)	(9%)	25	\$80,199	0.48
321	Wood Product Manufacturing	\$ 214,907,057	2,857	2,999	2,837	142	5%	(162)	(5%)	129	\$51,396	3.79
334	Computer and Electronic Product Manufacturing	\$ 182,790,931	1,711	1,127	948	(584)	(34%)	(179)	(16%)	28	\$65,802	0.57
327	Nonmetallic Mineral Product Manufacturing	\$ 115,865,142	1,180	1,117	1,043	(63)	(5%)	(74)	(7%)	51	\$63,149	1.40
339	Miscellaneous Manufacturing	\$ 105,000,482	898	961	980	63	7%	19	2%	50	\$63,602	0.79
335	Electrical Equipment, Appliance, and Component Manufacturing	\$ 99,718,611	1,096	887	761	(209)	(19%)	(126)	(14%)	26	\$71,363	1.21
323	Printing and Related Support Activities	\$ 62,221,670	910	900	877	(10)	(1%)	(23)	(3%)	65	\$45,059	1.04
337	Furniture and Related Product Manufacturing	\$ 55,992,254	657	763	789	106	16%	26	3%	41	\$59,793	0.97
312	Beverage and Tobacco Product Manufacturing	\$ 48,044,998	274	492	572	218	80%	80	16%	26	\$36,021	0.97
322	Paper Manufacturing	\$ 16,485,793	222	193	190	(29)	(13%)	(3)	(2%)	7	\$61,488	0.28
314	Textile Product Mills	\$ 5,661,239	71	103	118	32	45%	15	15%	9	\$36,285	0.44
313	Textile Mills	\$ 2,173,369	21	34	44	13	62%	10	29%	3	\$37,312	0.16
315	Apparel Manufacturing	\$ 1,009,333	<10	23	30	Insf. Data	Insf. Data	7	30%	1	\$23,012	0.09
316	Leather and Allied Product Manufacturing	\$ 654,370	<10	<10	<10	Insf. Data	Insf. Data	Insf. Data	Insf. Data	2	Insf. Data	0.11
	Total		50,983	46,866	44,058	(4,117)	(8%)	(2,808)	(6%)	1,301	\$68,927	

Source: EMSI

Pennsylvania Manufacturing Sector												
NAICS	Description	2017 GRP	2013 Jobs	2018 Jobs	2023 Jobs	2013 - 2018 Change	2013 - 2018 % Change	2018 - 2023 Change	2018 - 2023 % Change	Business Locations	Avg. Earnings Per Job	2018 Location Quotient
325	Chemical Manufacturing	\$ 20,251,419,624	40,781	40,935	38,981	154	0%	(1,954)	(5%)	667	\$120,867	1.24
311	Food Manufacturing	\$ 11,649,902,830	68,383	72,934	72,743	4,551	7%	(191)	(0%)	1,322	\$60,701	1.13

332	Fabricated Metal Product Manufacturing	\$ 8,528,273,628	81,848	81,662	80,680	(186)	(0%)	(982)	(1%)	2,963	\$68,529	1.42
336	Transportation Equipment Manufacturing	\$ 7,137,535,973	38,903	37,106	36,223	(1,797)	(5%)	(883)	(2%)	401	\$91,734	0.56
334	Computer and Electronic Product Manufacturing	\$ 6,244,571,786	31,540	29,753	28,698	(1,787)	(6%)	(1,055)	(4%)	615	\$94,334	0.71
333	Machinery Manufacturing	\$ 6,119,677,878	48,723	44,387	42,084	(4,336)	(9%)	(2,303)	(5%)	1,255	\$85,633	1.02
331	Primary Metal Manufacturing	\$ 6,043,891,446	39,560	35,205	32,193	(4,355)	(11%)	(3,012)	(9%)	404	\$87,928	2.38
326	Plastics and Rubber Products Manufacturing	\$ 5,373,078,414	35,357	40,044	40,209	4,687	13%	165	0%	636	\$65,331	1.40
324	Petroleum and Coal Products Manufacturing	\$ 4,743,145,833	5,849	5,922	5,850	73	1%	(72)	(1%)	110	\$131,515	1.32
335	Electrical Equipment, Appliance, and Component Manufacturing	\$ 4,151,877,093	26,075	26,356	26,681	281	1%	325	1%	326	\$96,354	1.70
322	Paper Manufacturing	\$ 3,521,780,281	23,726	22,160	20,703	(1,566)	(7%)	(1,457)	(7%)	254	\$80,879	1.52
339	Miscellaneous Manufacturing	\$ 3,355,319,514	27,300	26,954	26,131	(346)	(1%)	(823)	(3%)	1,075	\$81,720	1.05
327	Nonmetallic Mineral Product Manufacturing	\$ 2,959,206,632	20,150	21,096	20,040	946	5%	(1,056)	(5%)	728	\$69,134	1.26
312	Beverage and Tobacco Product Manufacturing	\$ 2,870,269,564	7,030	10,582	11,925	3,552	51%	1,343	13%	384	\$60,491	0.99
323	Printing and Related Support Activities	\$ 2,130,406,135	25,208	23,905	21,368	(1,303)	(5%)	(2,537)	(11%)	1,128	\$59,083	1.31
321	Wood Product Manufacturing	\$ 1,836,421,357	21,799	23,885	23,682	2,086	10%	(203)	(1%)	959	\$51,069	1.43
337	Furniture and Related Product Manufacturing	\$ 1,439,445,170	16,045	17,508	17,739	1,463	9%	231	1%	645	\$57,465	1.06
313	Textile Mills	\$ 343,012,569	3,325	3,495	3,530	170	5%	35	1%	107	\$58,918	0.77
314	Textile Product Mills	\$ 264,282,458	4,486	4,123	3,696	(363)	(8%)	(427)	(10%)	234	\$45,295	0.83
315	Apparel Manufacturing	\$ 240,163,237	5,257	4,678	3,955	(579)	(11%)	(723)	(15%)	168	\$42,781	0.88
316	Leather and Allied Product Manufacturing	\$ 44,434,878	1,028	796	719	(232)	(23%)	(77)	(10%)	45	\$45,589	0.68
			572,374	573,487	557,831	1,113	0%	(15,656)	(3%)	14,424	\$77,375	

Source: EMSI

United States Manufacturing Sector												
NAICS	Description	2017 GRP	2013 Jobs	2018 Jobs	2023 Jobs	2013 - 2018 Change	2013 - 2018 % Change	2018 - 2023 Change	2018 - 2023 % Change	Business Locations	Avg. Earnings Per Job	2018 Location Quotient
325	Chemical Manufacturing	\$ 418,044,592,666	798,918	827,779	835,847	28,861	4%	8,068	1%	18,325	\$123,145	1.00
336	Transportation Equipment Manufacturing	\$ 317,202,404,693	1,522,790	1,667,968	1,718,767	145,178	10%	50,799	3%	14,908	\$93,074	1.00
334	Computer and Electronic Product Manufacturing	\$ 309,783,989,448	1,068,888	1,049,593	1,012,990	(19,295)	(2%)	(36,603)	(3%)	20,092	\$142,836	1.00
311	Food Manufacturing	\$ 223,713,862,449	1,489,507	1,619,301	1,681,951	129,794	9%	62,650	4%	33,454	\$58,549	1.00
332	Fabricated Metal Product Manufacturing	\$ 153,659,788,399	1,441,753	1,449,497	1,466,172	7,744	1%	16,675	1%	58,095	\$68,348	1.00
333	Machinery Manufacturing	\$ 150,544,965,901	1,111,832	1,089,480	1,094,506	(22,352)	(2%)	5,026	0%	30,331	\$88,078	1.00
324	Petroleum and Coal Products Manufacturing	\$ 146,306,061,693	111,984	112,842	114,773	858	1%	1,931	2%	2,287	\$178,372	1.00
312	Beverage and Tobacco Product Manufacturing	\$ 90,011,466,360	201,274	268,902	292,813	67,628	34%	23,911	9%	11,184	\$68,279	1.00
326	Plastics and Rubber Products Manufacturing	\$ 89,921,494,393	658,736	719,486	718,019	60,750	9%	(1,467)	(0%)	13,238	\$64,568	1.00
339	Miscellaneous Manufacturing	\$ 84,398,303,357	619,807	643,733	655,474	23,926	4%	11,741	2%	32,543	\$85,678	1.00
322	Paper Manufacturing	\$ 61,054,120,905	376,519	367,000	354,524	(9,519)	(3%)	(12,476)	(3%)	5,421	\$81,311	1.00
335	Electrical Equipment, Appliance, and Component Manufacturing	\$ 60,230,605,833	376,045	390,165	393,529	14,120	4%	3,364	1%	8,111	\$92,947	1.00
331	Primary Metal Manufacturing	\$ 57,567,269,143	397,121	372,533	357,779	(24,588)	(6%)	(14,754)	(4%)	5,497	\$84,586	1.00
327	Nonmetallic Mineral Product Manufacturing	\$ 57,524,465,600	383,343	422,684	425,292	39,341	10%	2,608	1%	16,412	\$69,376	1.00
323	Printing and Related Support Activities	\$ 38,591,560,948	473,690	457,759	419,680	(15,931)	(3%)	(38,079)	(8%)	28,480	\$57,006	1.00
321	Wood Product Manufacturing	\$ 32,222,190,736	371,475	420,575	430,285	49,100	13%	9,710	2%	14,689	\$53,548	1.00
337	Furniture and Related Product Manufacturing	\$ 31,566,544,137	382,444	416,638	421,375	34,194	9%	4,737	1%	17,781	\$53,148	1.00
313	Textile Mills	\$ 9,706,346,187	118,706	114,546	106,389	(4,160)	(4%)	(8,157)	(7%)	2,710	\$54,675	1.00
314	Textile Product Mills	\$ 9,071,517,258	119,810	125,375	118,471	5,565	5%	(6,904)	(6%)	6,577	\$48,465	1.00

315	Apparel Manufacturing	\$ 8,030,396,035	157,855	133,037	112,103	(24,818)	(16%)	(20,934)	(16%)	6,675	\$48,764	1.00
316	Leather and Allied Product Manufacturing	\$ 1,909,588,004	30,977	29,482	28,875	(1,495)	(5%)	(607)	(2%)	1,356	\$54,126	1.00
			12,213,476	12,698,373	12,759,612	484,897	4%	61,239	0%	348,162	\$83,094	

Source: EMSI

Top Industries Purchasing from the US Plastics Material and Resin Manufacturing Industry (NAICS 325211)

NAICS	Purchasing Industry	Sales to Industry	Pct. of Total Sales
326199	All Other Plastics Product Manufacturing	\$12,159,254,898	22.1%
325211	Plastics Material and Resin Manufacturing	\$3,577,335,096	6.5%
326113	Unlaminated Plastics Film and Sheet (except Packaging) Manufacturing	\$3,404,568,096	6.2%
326160	Plastics Bottle Manufacturing	\$2,408,226,036	4.4%
326111	Plastics Bag and Pouch Manufacturing	\$2,366,621,215	4.3%
326112	Plastics Packaging Film and Sheet (including Laminated) Manufacturing	\$1,702,957,260	3.1%
326122	Plastics Pipe and Pipe Fitting Manufacturing	\$1,566,112,363	2.8%
325510	Paint and Coating Manufacturing	\$1,435,739,023	2.6%
326121	Unlaminated Plastics Profile Shape Manufacturing	\$1,395,883,697	2.5%
326140	Polystyrene Foam Product Manufacturing	\$1,269,490,796	2.3%
336390	Other Motor Vehicle Parts Manufacturing	\$969,385,752	1.8%
322220	Paper Bag and Coated and Treated Paper Manufacturing	\$929,739,229	1.7%
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing	\$809,719,720	1.5%
325220	Artificial and Synthetic Fibers and Filaments Manufacturing	\$716,505,581	1.3%
336360	Motor Vehicle Seating and Interior Trim Manufacturing	\$636,996,499	1.2%
325199	All Other Basic Organic Chemical Manufacturing	\$575,562,489	1.0%
326191	Plastics Plumbing Fixture Manufacturing	\$544,706,266	1.0%
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing	\$503,569,415	0.9%
325520	Adhesive Manufacturing	\$495,618,867	0.9%
325110	Petrochemical Manufacturing	\$458,674,405	0.8%
339112	Surgical and Medical Instrument Manufacturing	\$405,032,423	0.7%
322291	Sanitary Paper Product Manufacturing	\$339,866,748	0.6%
336320	Motor Vehicle Electrical and Electronic Equipment Manufacturing	\$330,578,764	0.6%
325212	Synthetic Rubber Manufacturing	\$315,474,348	0.6%
339999	All Other Miscellaneous Manufacturing	\$313,772,476	0.6%
325991	Custom Compounding of Purchased Resins	\$296,744,239	0.5%

326130	Laminated Plastics Plate, Sheet (except Packaging), and Shape Manufacturing	\$292,284,342	0.5%
336612	Boat Building	\$280,032,420	0.5%
335220	Major Household Appliance Manufacturing	\$263,708,376	0.5%
541330	Engineering Services	\$238,036,724	0.4%
335931	Current-Carrying Wiring Device Manufacturing	\$235,526,614	0.4%
313210	Broadwoven Fabric Mills	\$234,030,903	0.4%
311511	Fluid Milk Manufacturing	\$225,191,102	0.4%
722513	Limited-Service Restaurants	\$216,125,243	0.4%
325992	Photographic Film, Paper, Plate, and Chemical Manufacturing	\$213,377,940	0.4%
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing	\$211,685,036	0.4%
339920	Sporting and Athletic Goods Manufacturing	\$193,137,582	0.4%
	All Other Industries	\$12,580,636,364	22.8%
	Total	\$55,111,908,347	100.0%

Source: EMSI

Industries with Highest Share of Total Purchases from the US Plastics Material and Resin Manufacturing Industry (NAICS 325211)				
NAICS	Purchasing Industry	Purchases from Plastics Material and Resin Manufacturing	Total Purchases	Pct. of Total Purchases
326121	Unlaminated Plastics Profile Shape Manufacturing	\$1,381,259,527	\$3,441,868,537	40.13%
326122	Plastics Pipe and Pipe Fitting Manufacturing	\$1,532,179,652	\$3,819,417,570	40.12%
326160	Plastics Bottle Manufacturing	\$2,416,858,682	\$6,730,781,406	35.91%
326112	Plastics Packaging Film and Sheet (including Laminated) Manufacturing	\$1,825,433,056	\$5,573,568,651	32.75%
326111	Plastics Bag and Pouch Manufacturing	\$2,336,455,572	\$7,152,061,134	32.67%
326113	Unlaminated Plastics Film and Sheet (except Packaging) Manufacturing	\$3,323,259,999	\$10,196,191,963	32.59%
326140	Polystyrene Foam Product Manufacturing	\$1,341,071,286	\$5,291,599,026	25.34%
326191	Plastics Plumbing Fixture Manufacturing	\$525,260,967	\$2,347,775,750	22.37%
326199	All Other Plastics Product Manufacturing	\$12,177,397,890	\$54,615,448,510	22.30%
326130	Laminated Plastics Plate, Sheet (except Packaging), and Shape Manufacturing	\$299,048,581	\$1,916,569,442	15.60%
325510	Paint and Coating Manufacturing	\$1,375,268,369	\$12,173,861,460	11.30%
325212	Synthetic Rubber Manufacturing	\$329,611,173	\$2,983,979,238	11.05%
325220	Artificial and Synthetic Fibers and Filaments Manufacturing	\$687,239,421	\$6,236,110,841	11.02%

335210	Small Electrical Appliance Manufacturing	\$123,992,412	\$1,178,778,037	10.52%
334613	Blank Magnetic and Optical Recording Media Manufacturing	\$21,747,509	\$224,842,793	9.67%
334614	Software and Other Prerecorded Compact Disc, Tape, and Record Reproducing	\$39,006,119	\$411,434,133	9.48%
335932	Noncurrent-Carrying Wiring Device Manufacturing	\$69,795,571	\$819,310,805	8.52%
335931	Current-Carrying Wiring Device Manufacturing	\$228,619,121	\$2,760,319,205	8.28%
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing	\$511,164,513	\$6,514,767,313	7.85%
325991	Custom Compounding of Purchased Resins	\$290,379,986	\$3,842,865,118	7.56%
325920	Explosives Manufacturing	\$136,776,558	\$1,810,295,561	7.56%
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing	\$798,464,396	\$10,588,823,729	7.54%
325992	Photographic Film, Paper, Plate, and Chemical Manufacturing	\$185,755,453	\$2,549,404,108	7.29%
325520	Adhesive Manufacturing	\$477,893,125	\$6,664,306,439	7.17%
339930	Doll, Toy, and Game Manufacturing	\$76,467,269	\$1,073,396,417	7.12%
322291	Sanitary Paper Product Manufacturing	\$326,314,102	\$4,681,106,467	6.97%
322220	Paper Bag and Coated and Treated Paper Manufacturing	\$913,431,456	\$13,223,323,047	6.91%
325211	Plastics Material and Resin Manufacturing	\$3,502,143,579	\$50,800,812,710	6.89%
313240	Knit Fabric Mills	\$47,513,092	\$836,523,718	5.68%
313230	Nonwoven Fabric Mills	\$161,003,195	\$2,835,123,258	5.68%
313220	Narrow Fabric Mills and Schiffli Machine Embroidery	\$55,650,975	\$980,150,048	5.68%
313210	Broadwoven Fabric Mills	\$226,271,832	\$4,021,274,027	5.63%
336612	Boat Building	\$313,123,643	\$5,673,976,672	5.52%
337124	Metal Household Furniture Manufacturing	\$47,567,041	\$866,947,876	5.49%
337125	Household Furniture (except Wood and Metal) Manufacturing	\$41,189,380	\$752,517,334	5.47%
325910	Printing Ink Manufacturing	\$87,462,655	\$1,718,913,405	5.09%

Source: EMSI

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PETROCHEMICALS SUPPLY CHAIN

Natural Gas Supply Chain Industries, Northwest Pennsylvania

NAICS	Description	2013 Jobs	2018 Jobs	2023 Jobs	2013 - 2018 Change	2013 - 2018 % Change	2018 - 2023 Change	2018 - 2023 % Change	2018 Business Locations	Avg. Earnings Per Job	2018 Location Quotient	2017 GRP
OIL AND GAS EXTRACTION												
211120	Crude Petroleum Extraction	124	92	90	(32)	(26%)	(2)	(2%)	19	\$56,276	0.46	\$233,096,488
211130	Natural Gas Extraction	611	255	167	(356)	(58%)	(88)	(35%)	28	\$114,107	3.53	\$144,747,736
213111	Drilling Oil and Gas Wells	169	144	187	(25)	(15%)	43	30%	16	\$115,170	1.25	\$23,831,310
213112	Support Activities for Oil and Gas Operations	571	420	483	(151)	(26%)	63	15%	31	\$71,304	0.90	\$60,778,535
BASIC CHEMICAL MANUFACTURING												
325110	Petrochemical Manufacturing	<10	0	0	Insf. Data	Insf. Data	0	0%	0	\$0	0.00	\$0
325120	Industrial Gas Manufacturing	<10	<10	11	Insf. Data	Insf. Data	Insf. Data	Insf. Data	1	Insf. Data	0.21	\$2,773,390
325130	Synthetic Dye and Pigment Manufacturing	0	0	0	0	0%	0	0%	0	\$0	0.00	\$0
325180	Other Basic Inorganic Chemical Manufacturing	257	213	191	(44)	(17%)	(22)	(10%)	3	\$102,390	2.87	\$86,616,268
325193	Ethyl Alcohol Manufacturing	0	0	0	0	0%	0	0%	0	\$0	0.00	\$0
325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing	0	0	0	0	0%	0	0%	0	\$0	0.00	\$0
325199	All Other Basic Organic Chemical Manufacturing	49	11	<10	(38)	(78%)	Insf. Data	Insf. Data	1	\$70,984	0.15	\$6,303,105

Natural Gas Supply Chain Industries, Northwest Pennsylvania

NAICS	Description	2013 Jobs	2018 Jobs	2023 Jobs	2013 - 2018 Change	2013 - 2018 % Change	2018 - 2023 Change	2018 - 2023 % Change	2018 Business Locations	Avg. Earnings Per Job	2018 Location Quotient	2017 GRP
CHEMICAL PRODUCT MANUFACTURING												
325211	Plastics Material and Resin Manufacturing	34	62	68	28	82%	6	10%	3	\$76,720	0.57	\$23,496,671
325212	Synthetic Rubber Manufacturing	197	117	112	(80)	(41%)	(5)	(4%)	1	\$74,651	6.31	\$21,712,770

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325220	Artificial and Synthetic Fibers and Filaments Manufacturing	65	78	87	13	20%	9	12%	2	\$79,013	1.67	\$8,831,620
325311	Nitrogenous Fertilizer Manufacturing	0	0	0	0	0%	0	0%	0	\$0	0.00	\$0
325312	Phosphatic Fertilizer Manufacturing	0	0	0	0	0%	0	0%	0	\$0	0.00	\$0
325314	Fertilizer (Mixing Only) Manufacturing	0	0	0	0	0%	0	0%	0	\$0	0.00	\$0
325320	Pesticide and Other Agricultural Chemical Manufacturing	16	39	42	23	144%	3	8%	1	\$83,547	1.58	\$24,959,393
325411	Medicinal and Botanical Manufacturing	0	0	0	0	0%	0	0%	0	\$0	0.00	\$197,960
325412	Pharmaceutical Preparation Manufacturing	<10	<10	<10	Insf. Data	Insf. Data	Insf. Data	Insf. Data	0	Insf. Data	0.00	\$811,971
325413	In-Vitro Diagnostic Substance Manufacturing	0	0	0	0	0%	0	0%	0	\$0	0.00	\$0
325414	Biological Product (except Diagnostic) Manufacturing	<10	0	0	Insf. Data	Insf. Data	0	0%	0	\$0	0.00	\$355,099
325510	Paint and Coating Manufacturing	52	50	40	(2)	(4%)	(10)	(20%)	5	\$59,461	0.65	\$10,062,337
325520	Adhesive Manufacturing	424	100	50	(324)	(76%)	(50)	(50%)	1	\$55,701	2.42	\$8,230,502
325611	Soap and Other Detergent Manufacturing	<10	<10	<10	Insf. Data	Insf. Data	Insf. Data	Insf. Data	1	Insf. Data	0.12	\$6,851,019
325612	Polish and Other Sanitation Good Manufacturing	<10	<10	<10	Insf. Data	Insf. Data	Insf. Data	Insf. Data	1	Insf. Data	0.07	\$4,465,484
325613	Surface Active Agent Manufacturing	0	0	0	0	0%	0	0%	0	\$0	0.00	\$115,955
325620	Toilet Preparation Manufacturing	<10	16	22	Insf. Data	Insf. Data	6	38%	1	\$69,660	0.15	\$8,505,780
325910	Printing Ink Manufacturing	0	0	0	0	0%	0	0%	0	\$0	0.00	\$122,118
325920	Explosives Manufacturing	<10	0	0	Insf. Data	Insf. Data	0	0%	0	\$0	0.00	\$0
325991	Custom Compounding of Purchased Resins	114	0	0	(114)	(100%)	0	0%	0	\$0	0.00	\$141,841
325992	Photographic Film, Paper, Plate, and Chemical Manufacturing	130	<10	<10	Insf. Data	Insf. Data	Insf. Data	Insf. Data	1	Insf. Data	0.09	\$563,348
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing	91	49	45	(42)	(46%)	(4)	(8%)	3	\$79,399	0.66	\$7,593,405

Natural Gas Supply Chain Industries, Northwest Pennsylvania

NAICS	Description	2013 Jobs	2018 Jobs	2023 Jobs	2013 - 2018 Change	2013 - 2018 % Change	2018 - 2023 Change	2018 - 2023 % Change	2018 Business Locations	Avg. Earnings Per Job	2018 Location Quotient	2017 GRP
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PLASTICS PRODUCT MANUFACTURING												
326111	Plastics Bag and Pouch Manufacturing	<10	<10	<10	Insf. Data	Insf. Data	Insf. Data	Insf. Data	1	Insf. Data	0.09	\$1,808,848
326112	Plastics Packaging Film and Sheet (including Laminated) Manufacturing	0	<10	<10	Insf. Data	Insf. Data	Insf. Data	Insf. Data	1	Insf. Data	0.04	\$299,825
326113	Unlaminated Plastics Film and Sheet (except Packaging) Manufacturing	0	0	0	0	0%	0	0%	0	\$0	0.00	\$0
326121	Unlaminated Plastics Profile Shape Manufacturing	19	78	91	59	311%	13	17%	3	\$62,096	1.73	\$10,104,183
326122	Plastics Pipe and Pipe Fitting Manufacturing	359	429	454	70	19%	25	6%	4	\$61,336	8.11	\$45,347,469
326130	Laminated Plastics Plate, Sheet (except Packaging), and Shape Manufacturing	128	93	91	(35)	(27%)	(2)	(2%)	2	\$108,094	2.52	\$22,825,570
326140	Polystyrene Foam Product Manufacturing	70	93	106	23	33%	13	14%	4	\$69,922	1.47	\$12,188,926
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing	17	54	33	37	218%	(21)	(39%)	2	\$50,352	0.79	\$6,234,559
326160	Plastics Bottle Manufacturing	119	131	135	12	10%	4	3%	4	\$37,488	2.17	\$17,290,582
326191	Plastics Plumbing Fixture Manufacturing	30	21	11	(9)	(30%)	(10)	(48%)	2	\$33,708	0.78	\$1,434,668
326199	All Other Plastics Product Manufacturing	4,108	4,585	4,467	477	12%	(118)	(3%)	61	\$51,076	8.09	\$411,717,715
RUBBER PRODUCT MANUFACTURING												
326211	Tire Manufacturing (except Retreading)	179	252	248	73	41%	(4)	(2%)	1	\$69,588	2.70	\$27,084,478
326212	Tire Retreading	40	48	49	8	20%	1	2%	1	\$39,819	3.95	\$2,514,420
326220	Rubber and Plastics Hoses and Belting Manufacturing	270	281	279	11	4%	(2)	(1%)	2	\$75,610	6.25	\$21,638,606
326291	Rubber Product Manufacturing for Mechanical Use	684	758	708	74	11%	(50)	(7%)	6	\$96,854	13.27	\$161,617,845
326299	All Other Rubber Product Manufacturing	0	<10	<10	Insf. Data	Insf. Data	Insf. Data	Insf. Data	1	Insf. Data	0.02	\$1,397,584

Natural Gas Supply Chain Industries, Northwest Pennsylvania

NAICS	Description	2013 Jobs	2018 Jobs	2023 Jobs	2013 - 2018 Change	2013 - 2018 % Change	2018 - 2023 Change	2018 - 2023 % Change	2018 Business Locations	Avg. Earnings Per Job	2018 Location Quotient	2017 GRP
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OTHER PLASTICS-UTILIZING PRODUCT MANUFACTURING												
313210	Broadwoven Fabric Mills	0	12	19	12	Insf. Data	7	58%	1	\$39,078	0.24	\$649,500
313220	Narrow Fabric Mills and Schiffli Machine Embroidery	19	21	24	2	11%	3	14%	1	\$36,205	1.58	\$1,361,028
313230	Nonwoven Fabric Mills	0	0	0	0	0%	0	0%	0	\$0	0.00	\$0
313240	Knit Fabric Mills	0	0	0	0	0%	0	0%	0	\$0	0.00	\$0
322220	Paper Bag and Coated and Treated Paper Manufacturing	60	0	0	(60)	(100%)	0	0%	0	\$0	0.00	\$0
322291	Sanitary Paper Product Manufacturing	0	0	0	0	0%	0	0%	0	\$0	0.00	\$0
334613	Blank Magnetic and Optical Recording Media Manufacturing	0	0	0	0	0%	0	0%	0	\$0	0.00	\$0
334614	Software and Other Prerecorded Compact Disc, Tape, and Record Reproducing	0	0	0	0	0%	0	0%	0	\$0	0.00	\$8,114
335210	Small Electrical Appliance Manufacturing	0	0	0	0	0%	0	0%	0	\$0	0.00	\$0
335220	Major Household Appliance Manufacturing	0	0	0	0	0%	0	0%	0	\$0	0.00	\$0
335931	Current-Carrying Wiring Device Manufacturing	203	233	226	30	15%	(7)	(3%)	4	\$64,250	3.74	\$27,504,001
335932	Noncurrent-Carrying Wiring Device Manufacturing	<10	<10	<10	Insf. Data	Insf. Data	Insf. Data	Insf. Data	1	Insf. Data	0.02	\$19,491
336320	Motor Vehicle Electrical and Electronic Equipment Manufacturing	36	51	49	15	42%	(2)	(4%)	2	\$38,361	0.43	\$1,878,559
336360	Motor Vehicle Seating and Interior Trim Manufacturing	0	0	0	0	0%	0	0%	0	\$0	0.00	\$0
336612	Boat Building	0	0	0	0	0%	0	0%	0	\$0	0.00	\$0
339930	Doll, Toy, and Game Manufacturing	<10	<10	<10	Insf. Data	Insf. Data	Insf. Data	Insf. Data	0	Insf. Data	0.20	\$471,695
WHOLESALEERS												
424610	Plastics Materials and Basic Forms and Shapes Merchant Wholesalers	34	<10	<10	Insf. Data	Insf. Data	Insf. Data	Insf. Data	2	Insf. Data	0.16	\$2,854,389
424690	Other Chemical and Allied Products Merchant Wholesalers	305	226	218	(79)	(26%)	(8)	(4%)	16	\$68,138	1.06	\$36,369,280
424710	Petroleum Bulk Stations and Terminals	72	43	29	(29)	(40%)	(14)	(33%)	5	\$49,427	0.67	\$4,855,038
424720	Petroleum and Petroleum Products Merchant Wholesalers (except Bulk Stations and Terminals)	129	84	56	(45)	(35%)	(28)	(33%)	16	\$55,994	0.68	\$11,617,426

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424950	Paint, Varnish, and Supplies Merchant Wholesalers	22	<10	<10	Insf. Data	Insf. Data	Insf. Data	Insf. Data	1	Insf. Data	0.07	\$682,087
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Natural Gas Supply Chain Industries, Northwest Pennsylvania												
NAICS	Description	2013 Jobs	2018 Jobs	2023 Jobs	2013 - 2018 Change	2013 - 2018 % Change	2018 - 2023 Change	2018 - 2023 % Change	2018 Business Locations	Avg. Earnings Per Job	2018 Location Quotient	2017 GRP
TRANSPORTATION AND WAREHOUSING												
482110	Rail transportation	437	344	294	(93)	(21%)	(50)	(15%)	0	\$87,982	0.81	\$64,415,058
483111	Deep Sea Freight Transportation	<10	0	0	Insf. Data	Insf. Data	0	0%	0	\$0	0.00	\$400,236
483113	Coastal and Great Lakes Freight Transportation	<10	0	0	Insf. Data	Insf. Data	0	0%	0	\$0	0.00	\$0
483211	Inland Water Freight Transportation	<10	0	0	Insf. Data	Insf. Data	0	0%	0	\$0	0.00	\$310,342
484110	General Freight Trucking, Local	783	802	826	19	2%	24	3%	98	\$49,866	1.34	\$61,457,336
484121	General Freight Trucking, Long-Distance, Truckload	1,402	1,132	976	(270)	(19%)	(156)	(14%)	80	\$60,616	0.98	\$115,194,245
484122	General Freight Trucking, Long-Distance, Less Than Truckload	842	949	1,017	107	13%	68	7%	13	\$75,421	1.89	\$95,411,219
484220	Specialized Freight (except Used Goods) Trucking, Local	877	780	730	(97)	(11%)	(50)	(6%)	66	\$67,303	1.78	\$72,773,390
484230	Specialized Freight (except Used Goods) Trucking, Long-Distance	247	192	197	(55)	(22%)	5	3%	12	\$72,384	0.73	\$20,287,410
486110	Pipeline Transportation of Crude Oil	0	0	0	0	0%	0	0%	0	\$0	0.00	\$0
486210	Pipeline Transportation of Natural Gas	180	149	150	(31)	(17%)	1	1%	15	\$102,058	2.72	\$66,014,712
486910	Pipeline Transportation of Refined Petroleum Products	0	0	0	0	0%	0	0%	0	\$0	0.00	\$0
486990	All Other Pipeline Transportation	0	0	0	0	0%	0	0%	0	\$0	0.00	\$0
488210	Support Activities for Rail Transportation	98	53	54	(45)	(46%)	1	2%	4	\$54,032	0.83	\$4,085,452
488310	Port and Harbor Operations	0	0	0	0	0%	0	0%	0	\$0	0.00	\$0
488320	Marine Cargo Handling	0	0	0	0	0%	0	0%	0	\$0	0.00	\$0
488330	Navigational Services to Shipping	0	0	0	0	0%	0	0%	0	\$0	0.00	\$129,671
488390	Other Support Activities for Water Transportation	0	0	0	0	0%	0	0%	0	\$0	0.00	\$0

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488490	Other Support Activities for Road Transportation	<10	55	66	Insf. Data	Insf. Data	11	20%	3	\$39,046	0.70	\$3,271,044
488510	Freight Transportation Arrangement	113	121	144	8	7%	23	19%	13	\$76,908	0.27	\$13,835,069
488991	Packing and Crating	23	<10	<10	Insf. Data	Insf. Data	Insf. Data	Insf. Data	1	Insf. Data	0.19	\$840,065
488999	All Other Support Activities for Transportation	18	11	15	(7)	(39%)	4	36%	2	\$31,063	0.40	\$651,326
493110	General Warehousing and Storage	1,569	1,311	1,252	(258)	(16%)	(59)	(5%)	30	\$45,385	0.74	\$72,177,273
493190	Other Warehousing and Storage	19	14	<10	(5)	(26%)	Insf. Data	Insf. Data	3	\$63,527	0.16	\$2,181,769
TOTAL												
Natural Gas Supply Chain		16,460	15,103	14,655	(1,357)	(8%)	(448)	(3%)	600	\$63,230		
Economy Overall		313,671	304,084	301,016	(9,587)	(3%)	(3,068)	(1%)	17,687	\$49,272		

Source: EMSI

Natural Gas Supply Chain Industries, Historic and Projected Growth, Regional Comparison							
NAICS	Description	Historic % Change, 2013-2018			Projected % Change, 2018-2023		
		NW PA	PA	US	NW PA	PA	US
OIL AND GAS EXTRACTION							
211120	Crude Petroleum Extraction	(26%)	(34%)	(28%)	(2%)	(12%)	2%
211130	Natural Gas Extraction	(58%)	(24%)	(24%)	(35%)	21%	12%
213111	Drilling Oil and Gas Wells	(15%)	(47%)	(36%)	30%	14%	8%
213112	Support Activities for Oil and Gas Operations	(26%)	(18%)	(20%)	15%	27%	14%
BASIC CHEMICAL MANUFACTURING							
325110	Petrochemical Manufacturing	Insf. Data	Insf. Data	7%	0%	Insf. Data	1%
325120	Industrial Gas Manufacturing	Insf. Data	14%	(0%)	Insf. Data	(6%)	2%
325130	Synthetic Dye and Pigment Manufacturing	0%	(20%)	(3%)	0%	(6%)	(3%)
325180	Other Basic Inorganic Chemical Manufacturing	(17%)	2%	1%	(10%)	3%	2%
325193	Ethyl Alcohol Manufacturing	0%	100%	6%	0%	19%	11%
325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing	0%	7%	38%	0%	(10%)	21%
325199	All Other Basic Organic Chemical Manufacturing	(78%)	99%	9%	Insf. Data	17%	5%
CHEMICAL PRODUCT MANUFACTURING							
325211	Plastics Material and Resin Manufacturing	82%	(2%)	4%	10%	(16%)	(2%)
325212	Synthetic Rubber Manufacturing	(41%)	34%	(8%)	(4%)	23%	(2%)
325220	Artificial and Synthetic Fibers and Filaments Manufacturing	20%	(9%)	(2%)	12%	6%	(7%)
325311	Nitrogenous Fertilizer Manufacturing	0%	(38%)	7%	0%	3%	4%
325312	Phosphatic Fertilizer Manufacturing	0%	0%	(12%)	0%	0%	(12%)
325314	Fertilizer (Mixing Only) Manufacturing	0%	(2%)	1%	0%	(6%)	4%
325320	Pesticide and Other Agricultural Chemical Manufacturing	144%	(56%)	(8%)	8%	8%	(3%)
325411	Medicinal and Botanical Manufacturing	0%	137%	43%	0%	39%	15%
325412	Pharmaceutical Preparation Manufacturing	Insf. Data	(4%)	(2%)	Insf. Data	(12%)	(2%)
325413	In-Vitro Diagnostic Substance Manufacturing	0%	21%	16%	0%	14%	11%
325414	Biological Product (except Diagnostic) Manufacturing	Insf. Data	9%	24%	0%	(3%)	11%

325510	Paint and Coating Manufacturing	(4%)	19%	6%	(20%)	(3%)	(0%)
325520	Adhesive Manufacturing	(76%)	(37%)	12%	(50%)	(9%)	3%
325611	Soap and Other Detergent Manufacturing	Insf. Data	29%	5%	Insf. Data	13%	1%
325612	Polish and Other Sanitation Good Manufacturing	Insf. Data	4%	(1%)	Insf. Data	(3%)	(1%)
325613	Surface Active Agent Manufacturing	0%	(18%)	2%	0%	7%	9%
325620	Toilet Preparation Manufacturing	Insf. Data	9%	6%	38%	3%	1%
325910	Printing Ink Manufacturing	0%	22%	(5%)	0%	0%	(7%)
325920	Explosives Manufacturing	Insf. Data	7%	9%	0%	4%	1%
325991	Custom Compounding of Purchased Resins	(100%)	(14%)	7%	0%	(9%)	(0%)
325992	Photographic Film, Paper, Plate, and Chemical Manufacturing	Insf. Data	(42%)	(31%)	Insf. Data	(21%)	(17%)
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing	(46%)	12%	8%	(8%)	(8%)	0%

Natural Gas Supply Chain Industries, Historic and Projected Growth, Regional Comparison							
NAICS	Description	Historic % Change, 2013-2018			Projected % Change, 2018-2023		
		NW PA	PA	US	NW PA	PA	US
PLASTICS PRODUCT MANUFACTURING							
326111	Plastics Bag and Pouch Manufacturing	Insf. Data	14%	13%	Insf. Data	12%	5%
326112	Plastics Packaging Film and Sheet (including Laminated) Manufacturing	Insf. Data	9%	30%	Insf. Data	3%	14%
326113	Unlaminated Plastics Film and Sheet (except Packaging) Manufacturing	0%	8%	1%	0%	(3%)	(2%)
326121	Unlaminated Plastics Profile Shape Manufacturing	311%	12%	4%	17%	8%	1%
326122	Plastics Pipe and Pipe Fitting Manufacturing	19%	12%	5%	6%	6%	2%
326130	Laminated Plastics Plate, Sheet (except Packaging), and Shape Manufacturing	(27%)	1%	16%	(2%)	5%	9%
326140	Polystyrene Foam Product Manufacturing	33%	23%	20%	14%	17%	8%
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing	218%	5%	15%	(39%)	(10%)	5%
326160	Plastics Bottle Manufacturing	10%	(2%)	4%	3%	(3%)	0%
326191	Plastics Plumbing Fixture Manufacturing	(30%)	61%	13%	(48%)	21%	(0%)
326199	All Other Plastics Product Manufacturing	12%	17%	10%	(3%)	(3%)	(3%)
RUBBER PRODUCT MANUFACTURING							
326211	Tire Manufacturing (except Retreading)	41%	9%	7%	(2%)	(3%)	(4%)
326212	Tire Retreading	20%	29%	(2%)	2%	7%	7%

326220	Rubber and Plastics Hoses and Belting Manufacturing	4%	(19%)	1%	(1%)	(8%)	(3%)
326291	Rubber Product Manufacturing for Mechanical Use	11%	16%	8%	(7%)	(2%)	(4%)
326299	All Other Rubber Product Manufacturing	Insf. Data	24%	1%	Insf. Data	2%	(3%)
OTHER PLASTICS-UTILIZING PRODUCT MANUFACTURING							
313210	Broadwoven Fabric Mills	Insf. Data	(14%)	(5%)	58%	(13%)	(9%)
313220	Narrow Fabric Mills and Schiffli Machine Embroidery	11%	(24%)	(14%)	14%	(19%)	(7%)
313230	Nonwoven Fabric Mills	0%	168%	16%	0%	17%	7%
313240	Knit Fabric Mills	0%	49%	(14%)	0%	11%	(11%)
322220	Paper Bag and Coated and Treated Paper Manufacturing	(100%)	(23%)	(6%)	0%	(20%)	(4%)
322291	Sanitary Paper Product Manufacturing	0%	(7%)	(5%)	0%	(3%)	(3%)
334613	Blank Magnetic and Optical Recording Media Manufacturing	0%	Insf. Data	1%	0%	Insf. Data	2%
334614	Software and Other Prerecorded Compact Disc, Tape, and Record Reproducing	0%	(23%)	(30%)	0%	(9%)	(18%)
335210	Small Electrical Appliance Manufacturing	0%	9%	(6%)	0%	2%	(3%)
335220	Major Household Appliance Manufacturing	0%	116%	13%	0%	12%	(2%)
335931	Current-Carrying Wiring Device Manufacturing	15%	(2%)	3%	(3%)	(8%)	(3%)
335932	Noncurrent-Carrying Wiring Device Manufacturing	Insf. Data	16%	1%	Insf. Data	3%	(1%)
336320	Motor Vehicle Electrical and Electronic Equipment Manufacturing	42%	(22%)	16%	(4%)	(15%)	4%
336360	Motor Vehicle Seating and Interior Trim Manufacturing	0%	297%	24%	0%	24%	9%
336612	Boat Building	0%	Insf. Data	32%	0%	51%	8%
339930	Doll, Toy, and Game Manufacturing	Insf. Data	(39%)	(2%)	Insf. Data	(2%)	(1%)

Natural Gas Supply Chain Industries, Historic and Projected Growth, Regional Comparison

NAICS	Description	Historic % Change, 2013-2018			Projected % Change, 2018-2023		
		NW PA	PA	US	NW PA	PA	US
WHOLESALE							
424610	Plastics Materials and Basic Forms and Shapes Merchant Wholesalers	Insf. Data	(38%)	14%	Insf. Data	(20%)	9%
424690	Other Chemical and Allied Products Merchant Wholesalers	(26%)	8%	4%	(4%)	4%	3%
424710	Petroleum Bulk Stations and Terminals	(40%)	(9%)	6%	(33%)	(15%)	(1%)
424720	Petroleum and Petroleum Products Merchant Wholesalers (except Bulk Stations and Terminals)	(35%)	(16%)	(0%)	(33%)	(14%)	(5%)

424950	Paint, Varnish, and Supplies Merchant Wholesalers	Insf. Data	(23%)	8%	Insf. Data	(13%)	0%
TRANSPORTATION AND WAREHOUSING							
482110	Rail transportation	(21%)	(10%)	(4%)	(15%)	(3%)	1%
483111	Deep Sea Freight Transportation	Insf. Data	(19%)	(9%)	0%	11%	2%
483113	Coastal and Great Lakes Freight Transportation	Insf. Data	11%	(6%)	0%	(40%)	6%
483211	Inland Water Freight Transportation	Insf. Data	9%	(3%)	0%	19%	8%
484110	General Freight Trucking, Local	2%	1%	8%	3%	6%	4%
484121	General Freight Trucking, Long-Distance, Truckload	(19%)	(2%)	2%	(14%)	(7%)	0%
484122	General Freight Trucking, Long-Distance, Less Than Truckload	13%	19%	13%	7%	7%	7%
484220	Specialized Freight (except Used Goods) Trucking, Local	(11%)	(8%)	3%	(6%)	3%	3%
484230	Specialized Freight (except Used Goods) Trucking, Long-Distance	(22%)	(2%)	8%	3%	3%	6%
486110	Pipeline Transportation of Crude Oil	0%	(100%)	18%	0%	0%	9%
486210	Pipeline Transportation of Natural Gas	(17%)	22%	8%	1%	7%	4%
486910	Pipeline Transportation of Refined Petroleum Products	0%	19%	20%	0%	1%	8%
486990	All Other Pipeline Transportation	0%	0%	137%	0%	0%	25%
488210	Support Activities for Rail Transportation	(46%)	8%	17%	2%	7%	10%
488310	Port and Harbor Operations	0%	86%	(67%)	0%	5%	(4%)
488320	Marine Cargo Handling	0%	21%	36%	0%	3%	9%
488330	Navigational Services to Shipping	0%	13%	(12%)	0%	0%	(10%)
488390	Other Support Activities for Water Transportation	0%	4%	(13%)	0%	36%	(3%)
488490	Other Support Activities for Road Transportation	Insf. Data	107%	12%	20%	28%	13%
488510	Freight Transportation Arrangement	7%	25%	18%	19%	10%	8%
488991	Packing and Crating	Insf. Data	(2%)	7%	Insf. Data	(8%)	(4%)
488999	All Other Support Activities for Transportation	(39%)	33%	36%	36%	22%	8%
493110	General Warehousing and Storage	(16%)	40%	55%	(5%)	13%	18%
493190	Other Warehousing and Storage	(26%)	3%	4%	Insf. Data	6%	8%
TOTAL							
Natural Gas Supply Chain		(8%)	9%	8%	(3%)	4%	5%
Economy Overall		(3%)	4%	7%	(1%)	3%	6%

Source: EMSI

DATA SOURCES

ECONOMIC MODELING SPECIALISTS INTERNATIONAL (EMSI)

To analyze the industrial makeup of a study area, industry data organized by the North American Industrial Classification System (NAICS) is assessed. Camoin Associates subscribes to Economic Modeling Specialists Intl. (EMSI), a proprietary data provider that aggregates economic data from approximately 90 sources. EMSI industry data, in our experience, is more complete than most or perhaps all local data sources (for more information on EMSI, please see www.economicmodeling.com). This is because local data sources typically miss significant employment counts by industry because data on sole proprietorships and contractual employment (i.e. 1099 contractor positions) is not included and because certain employment counts are suppressed from BLS/BEA figures for confidentiality reasons when too few establishments exist within a single NAICS code.

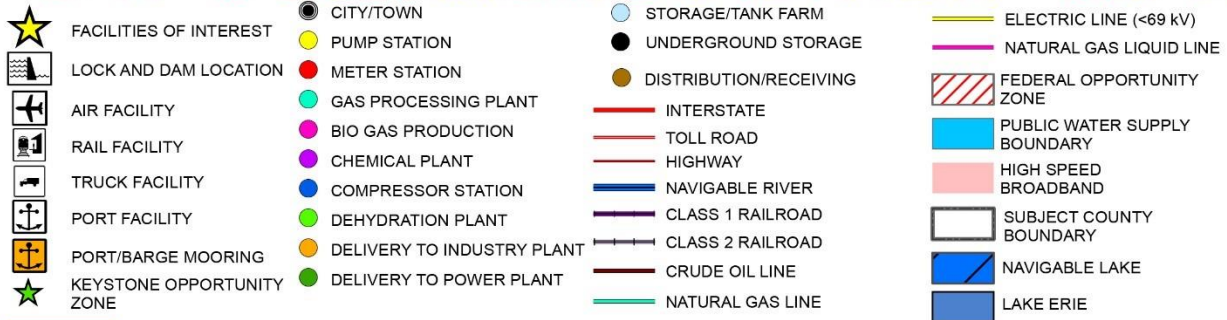
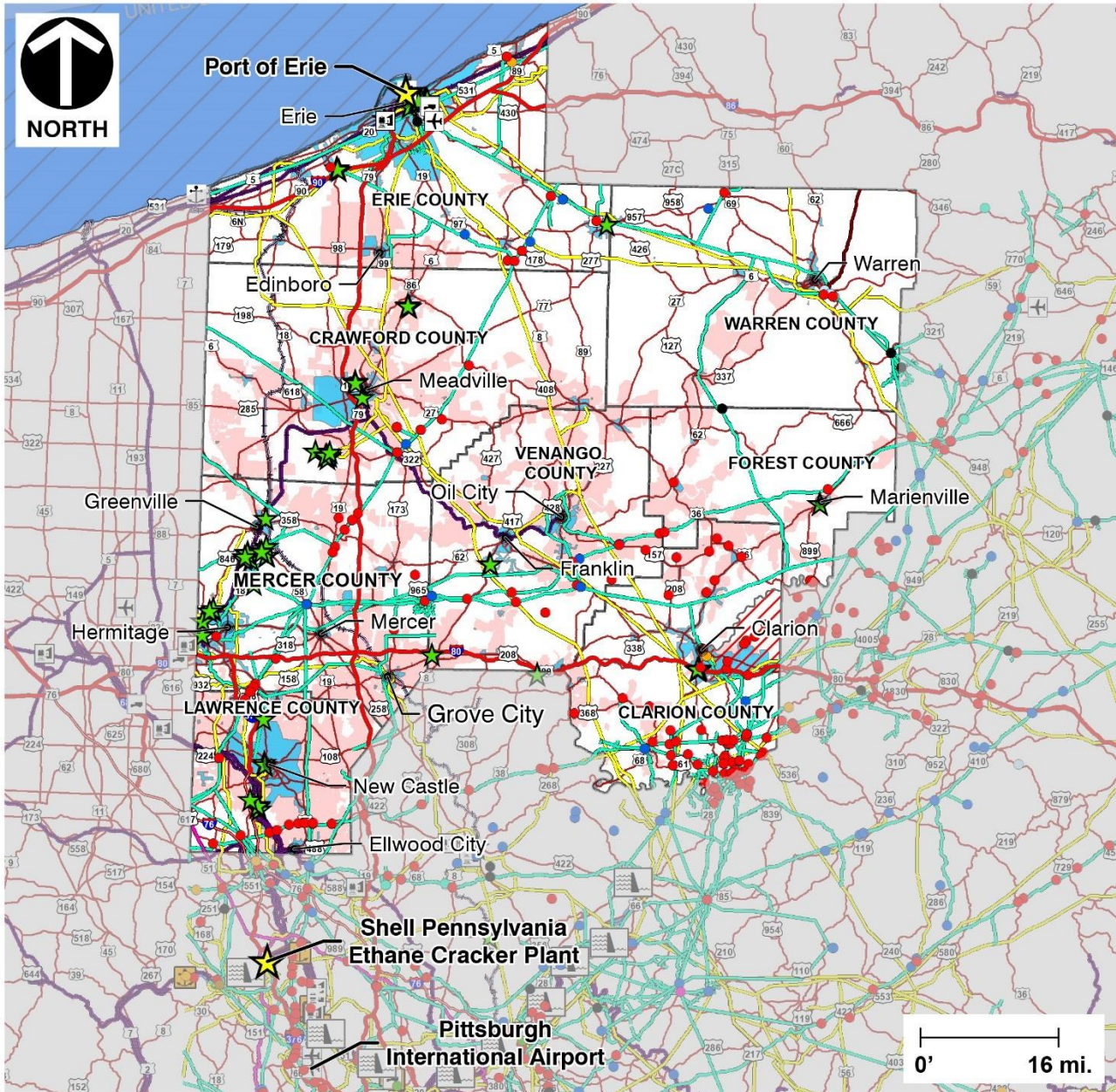
ESRI BUSINESS ANALYST ONLINE (BAO)

ESRI is the leading provider of location-driven market insights. It combines demographic, lifestyle, and spending data with map-based analytics to provide market intelligence for strategic decision-making. ESRI uses proprietary statistical models and data from the U.S. Census Bureau, the U.S. Postal Service, and various other sources to present current conditions and project future trends. Esri data are used by developers to maximize their portfolio, retailers to understand growth opportunities, and by economic developers to attract business that fit their community. For more information, visit www.esri.com.

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APPENDIX C: GIS DRAWINGS

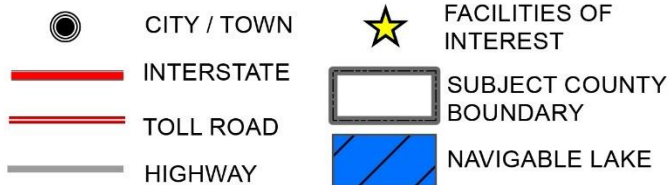
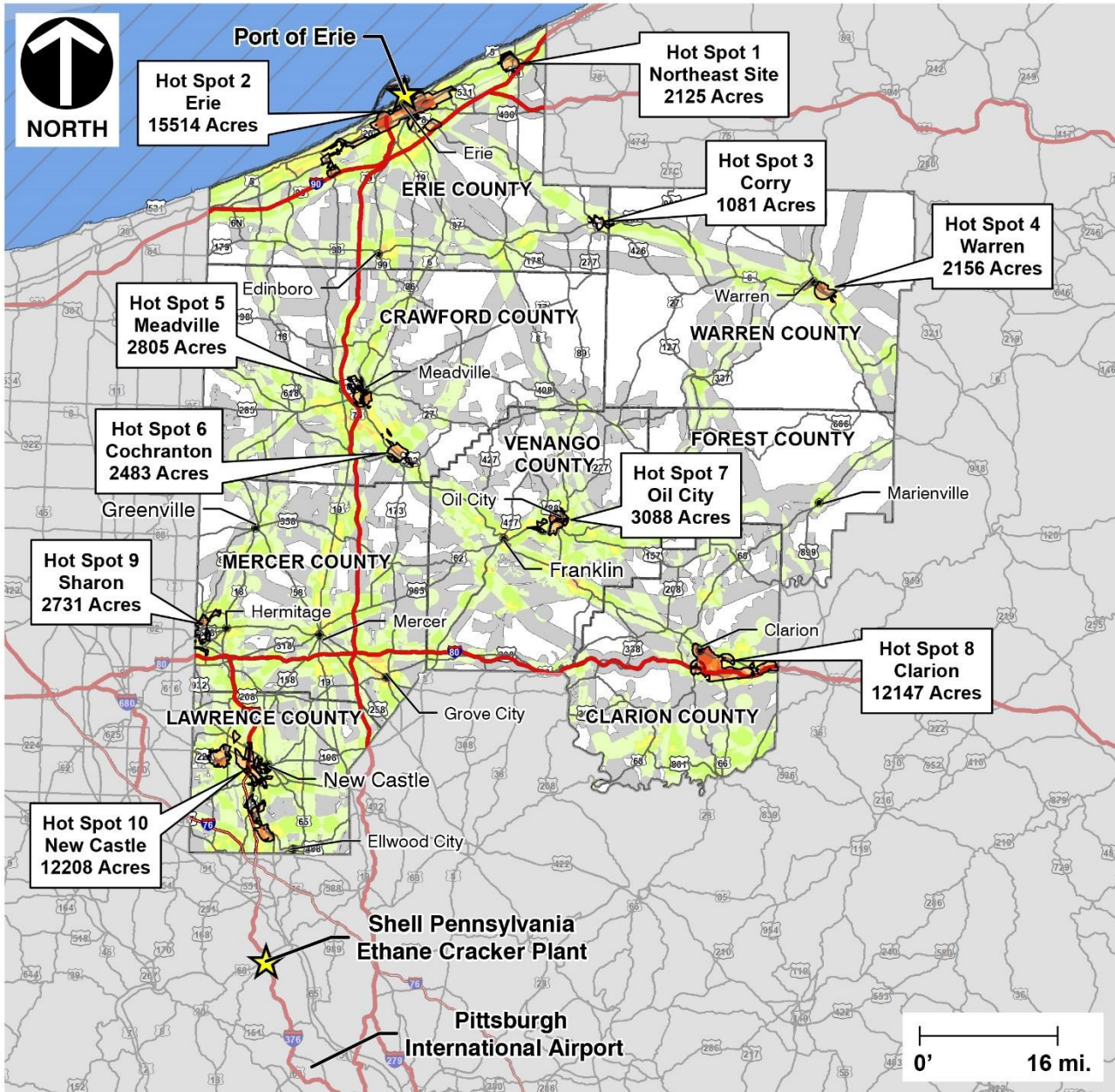


TRANSPORTATION AND UTILITIES OVERVIEW

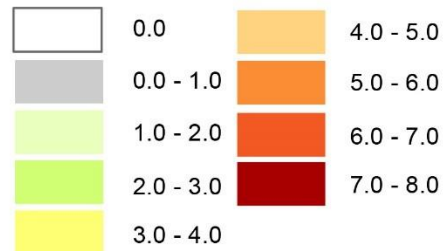
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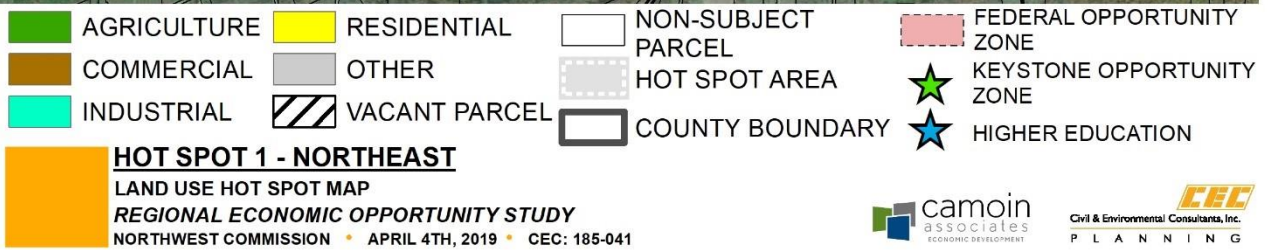
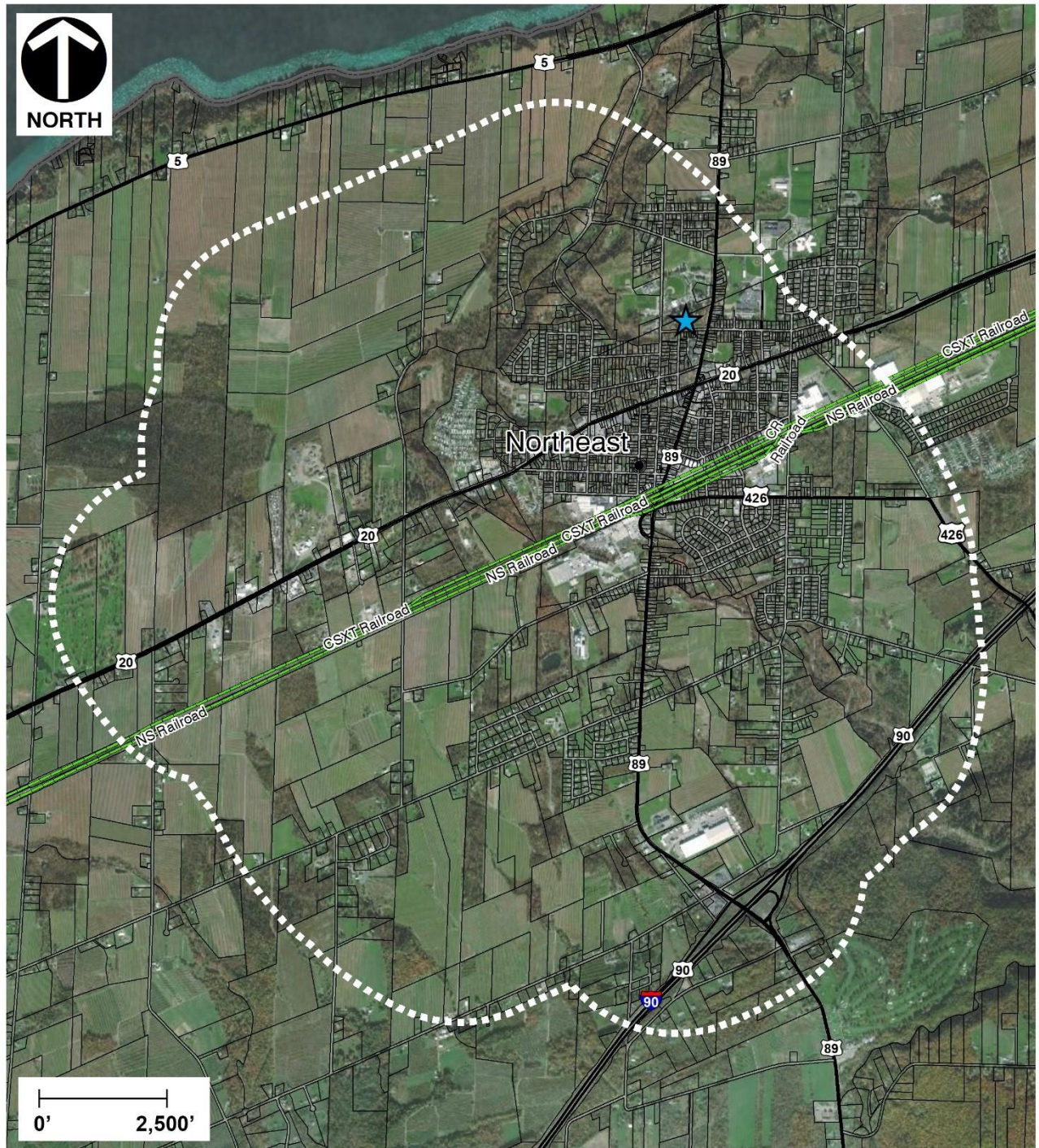
SUITABILITY INDEX VALUES



SUITABILITY HOT SPOT AREAS
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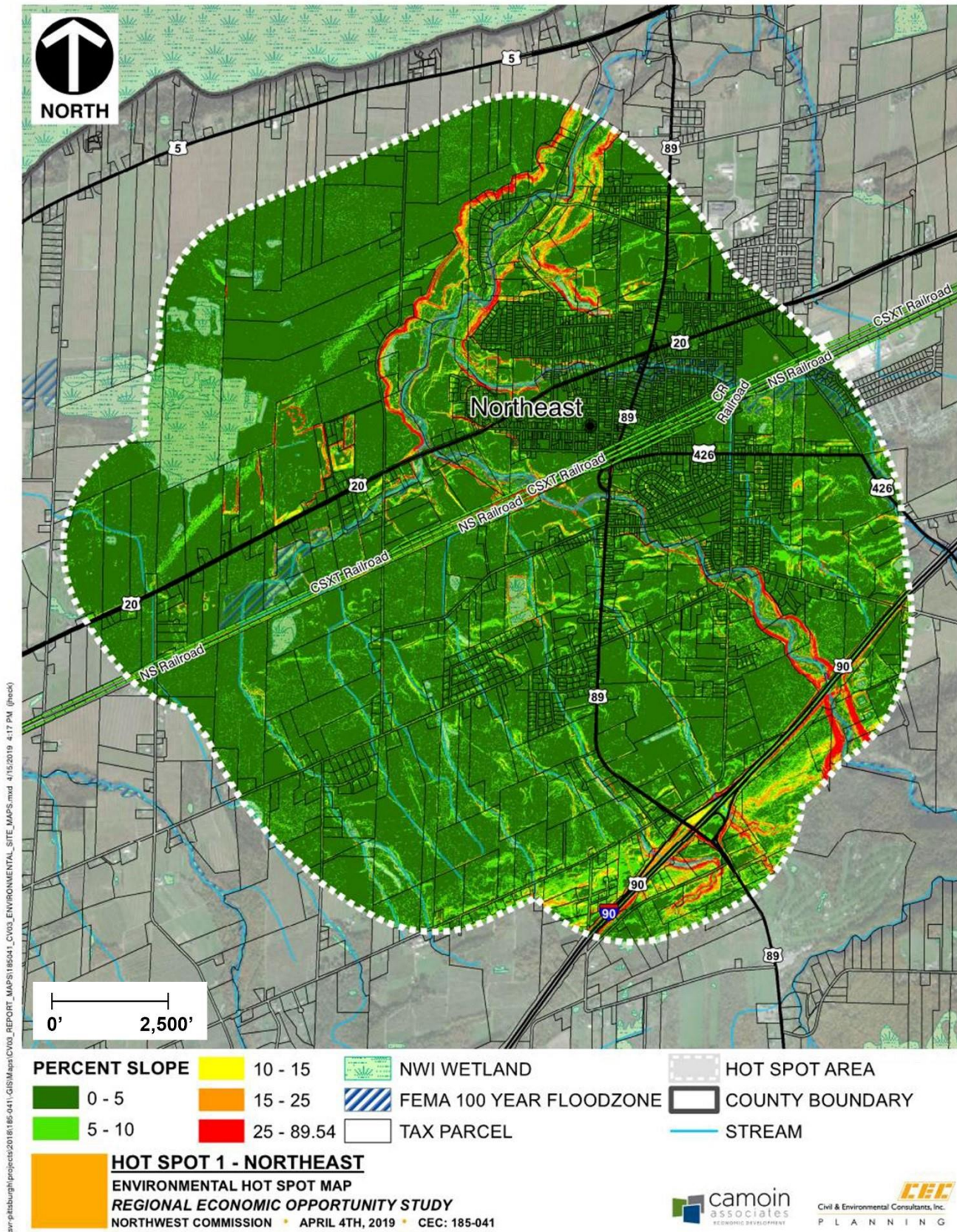
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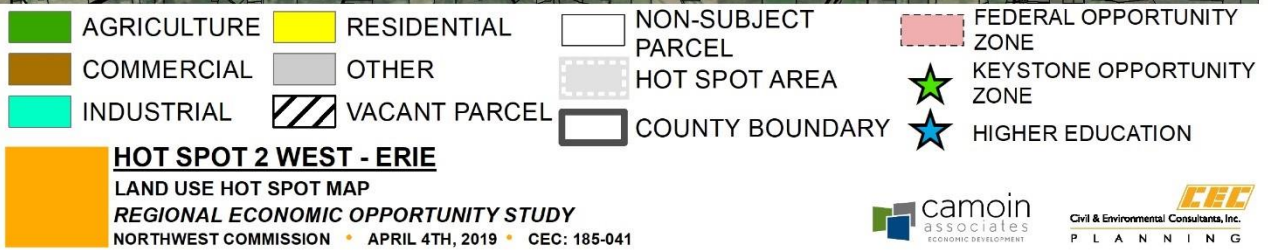
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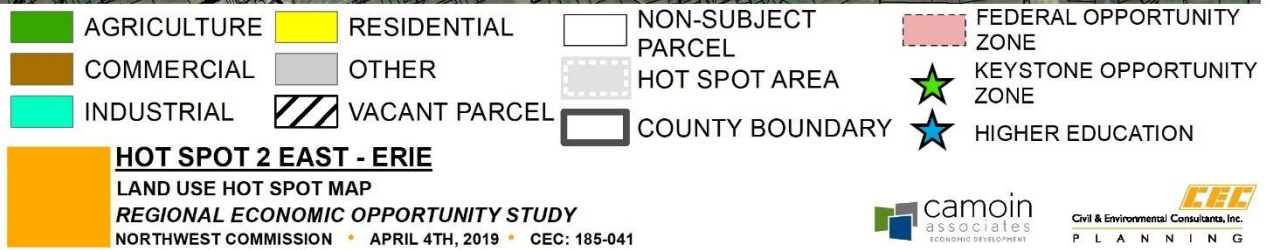
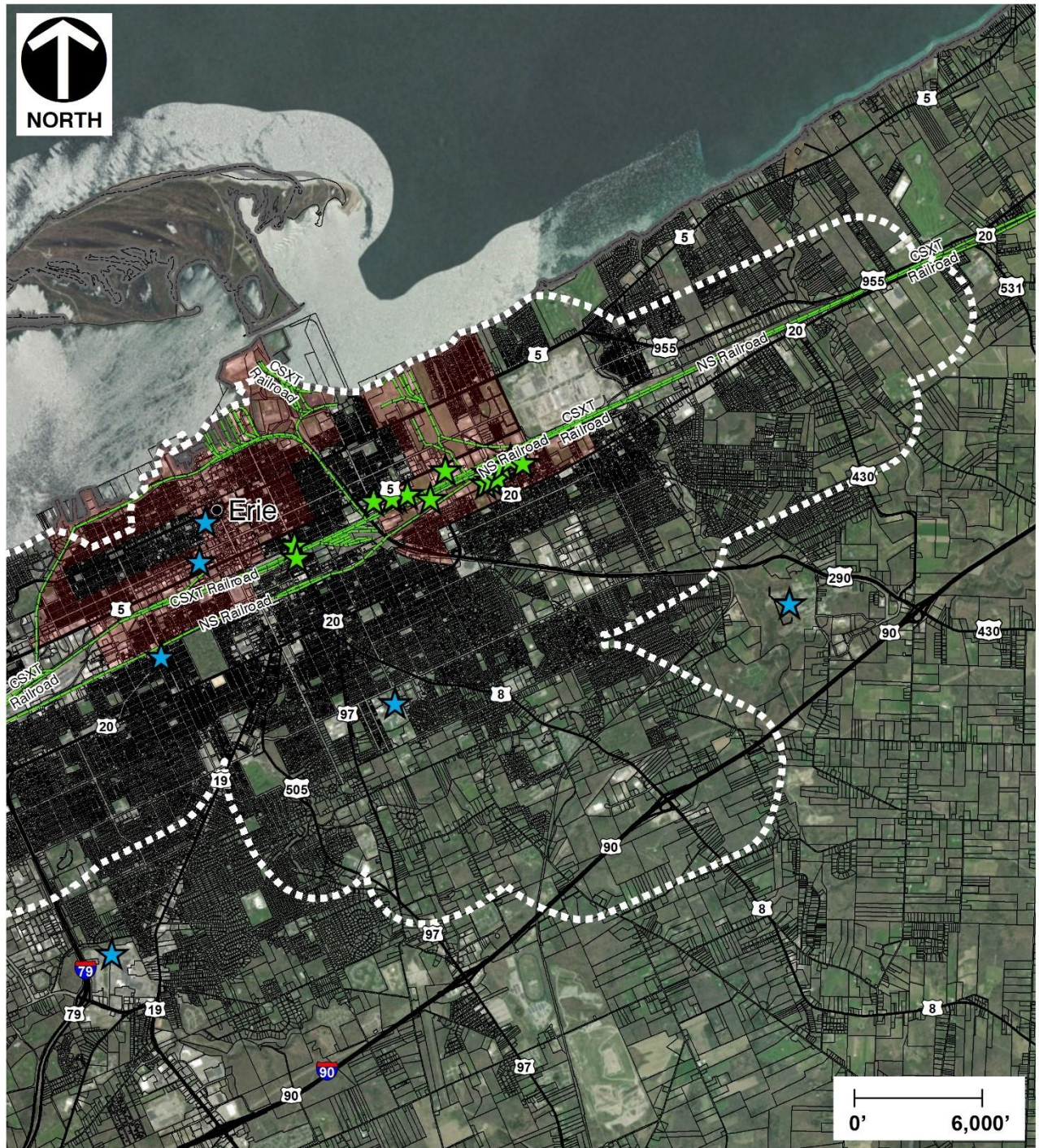
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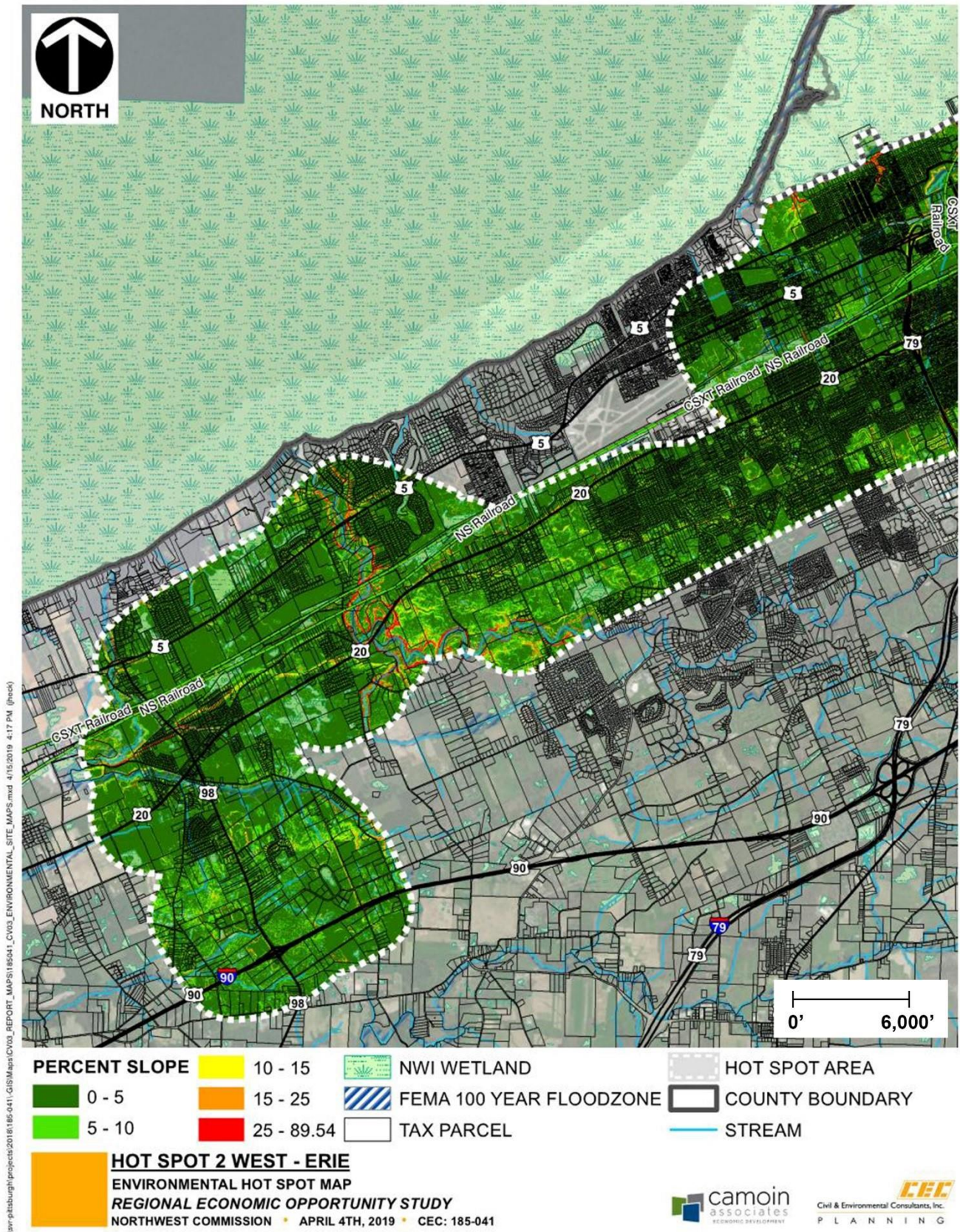


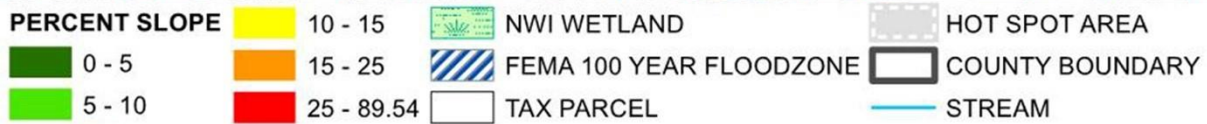
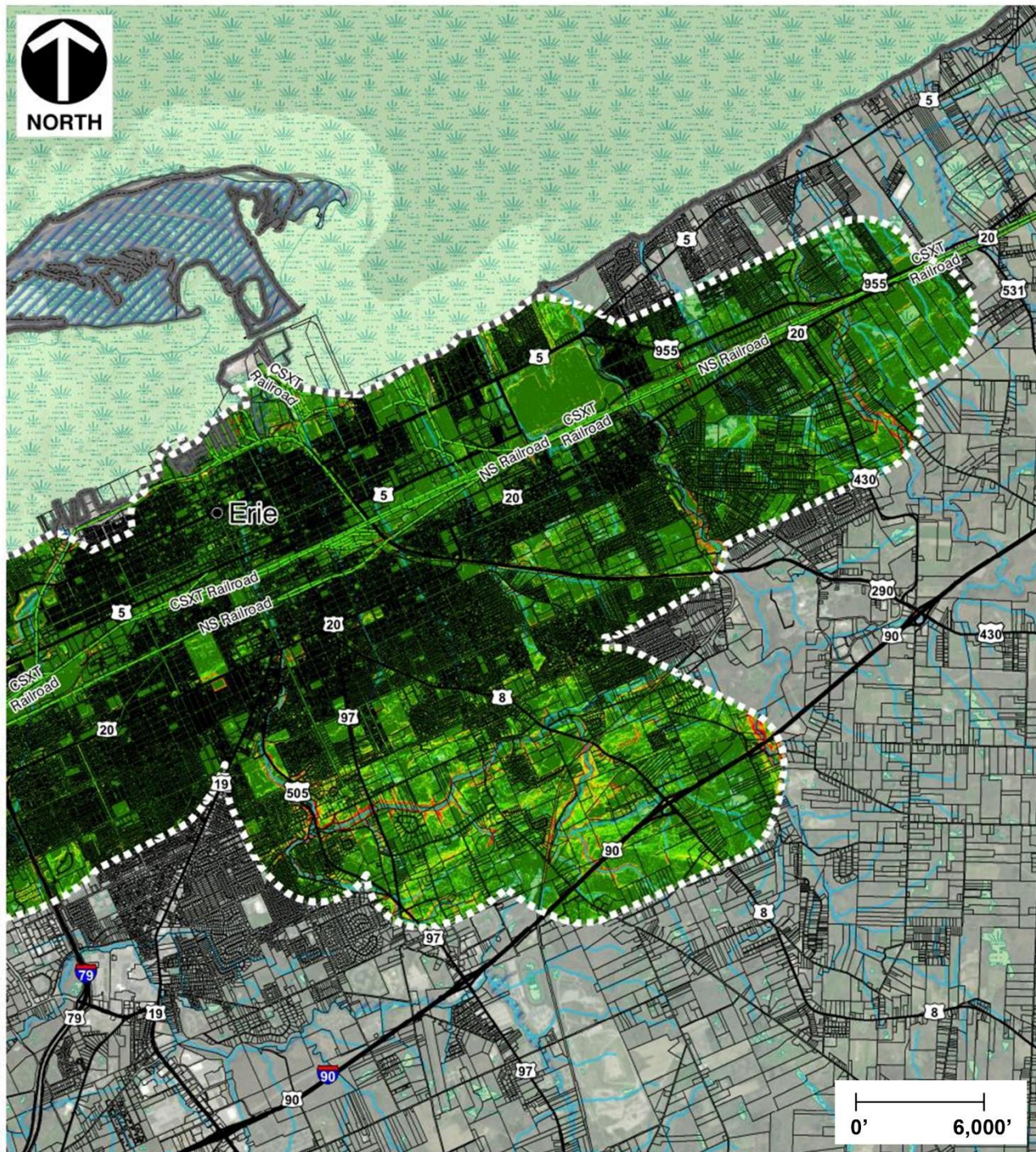


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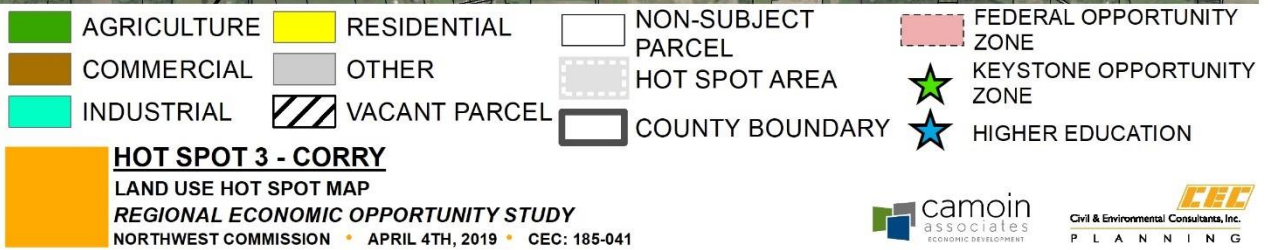
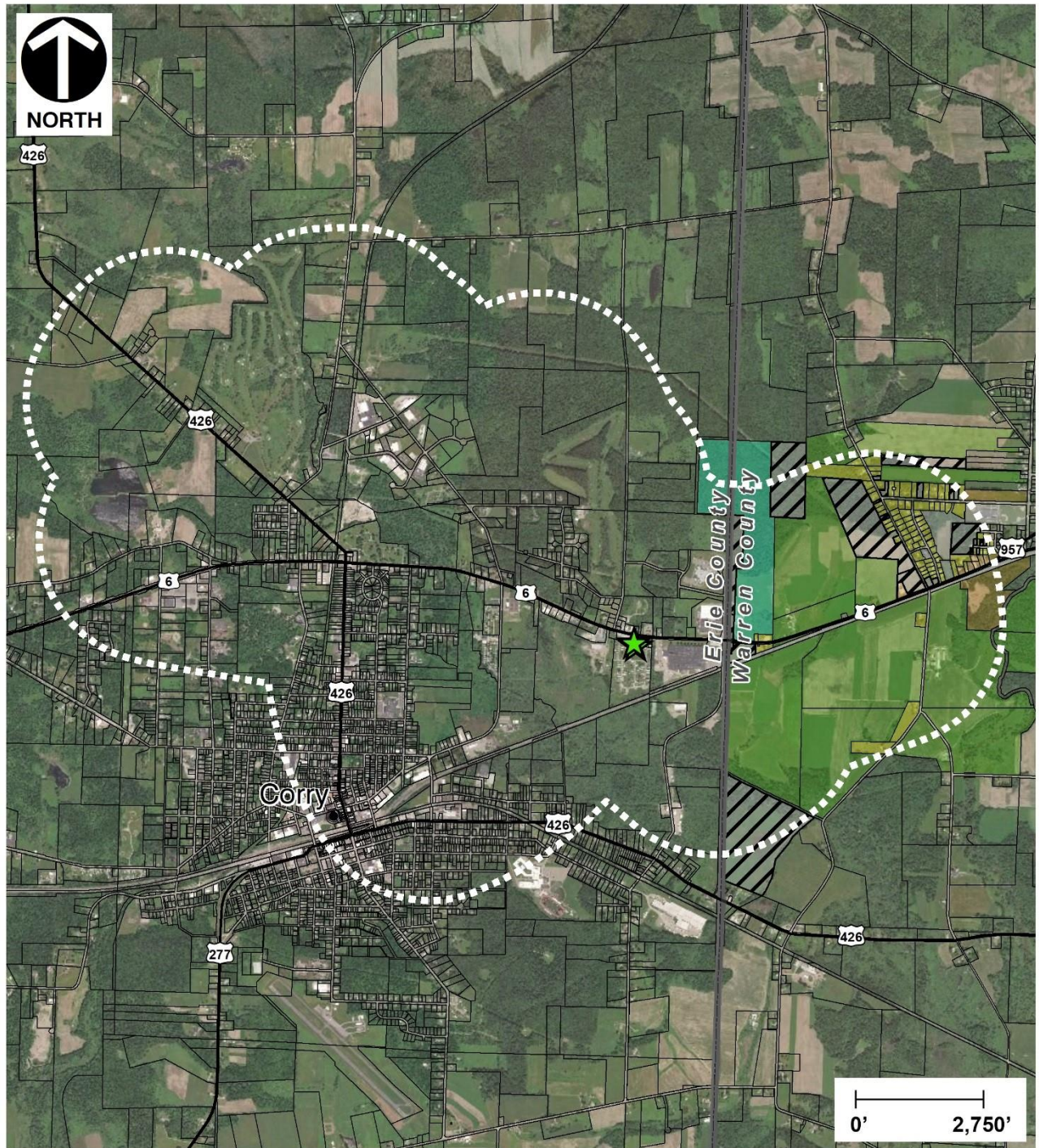




HOT SPOT 2 EAST - ERIE
 ENVIRONMENTAL HOT SPOT MAP
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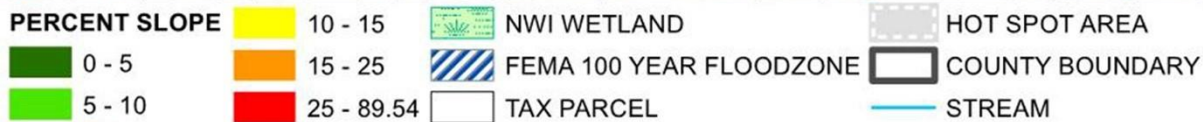
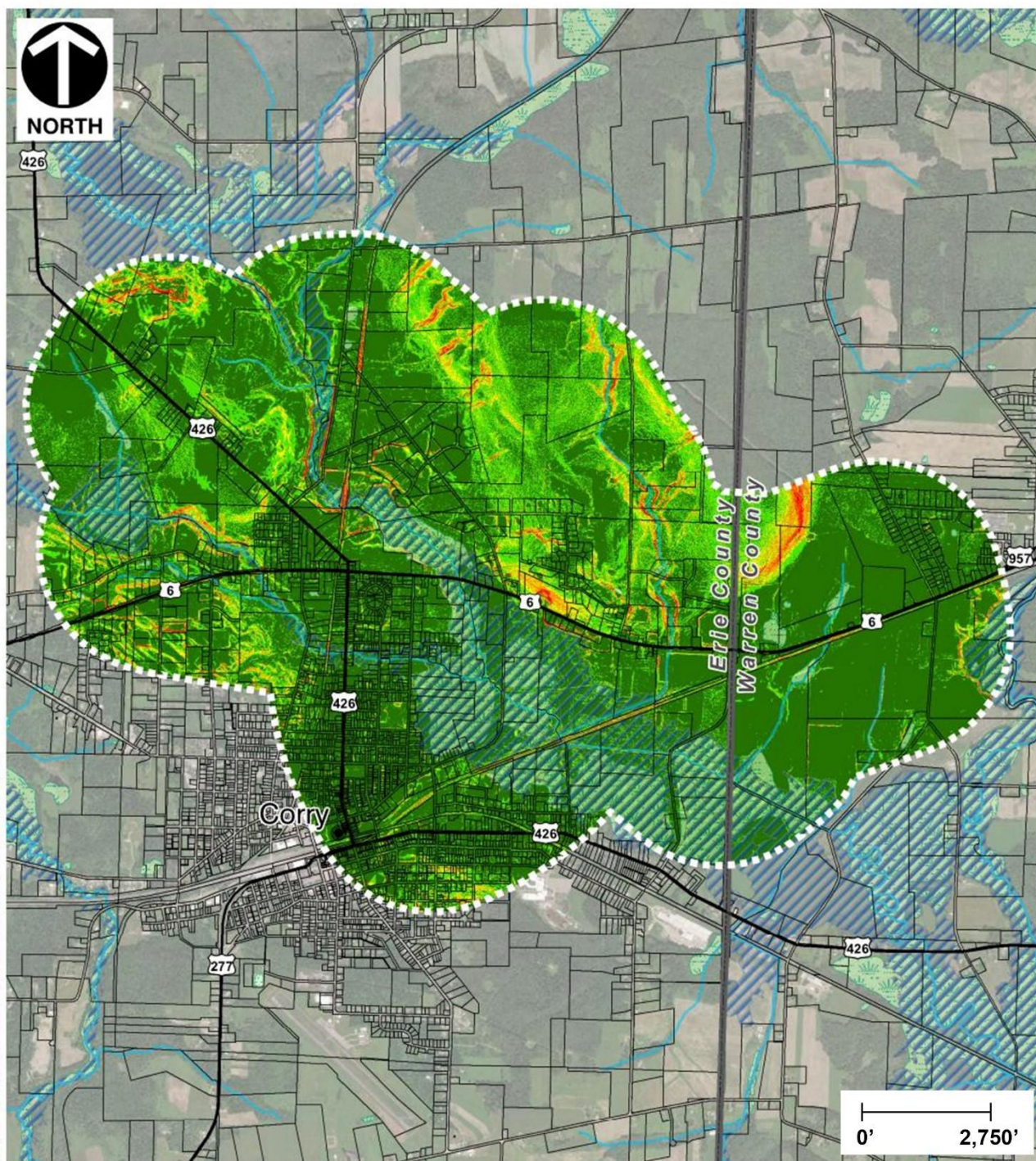
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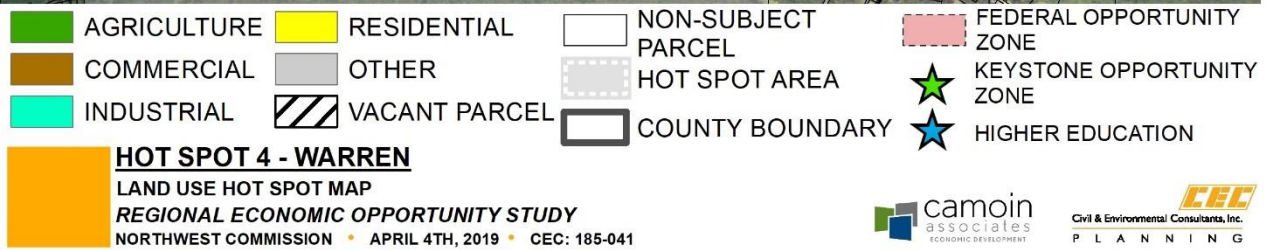
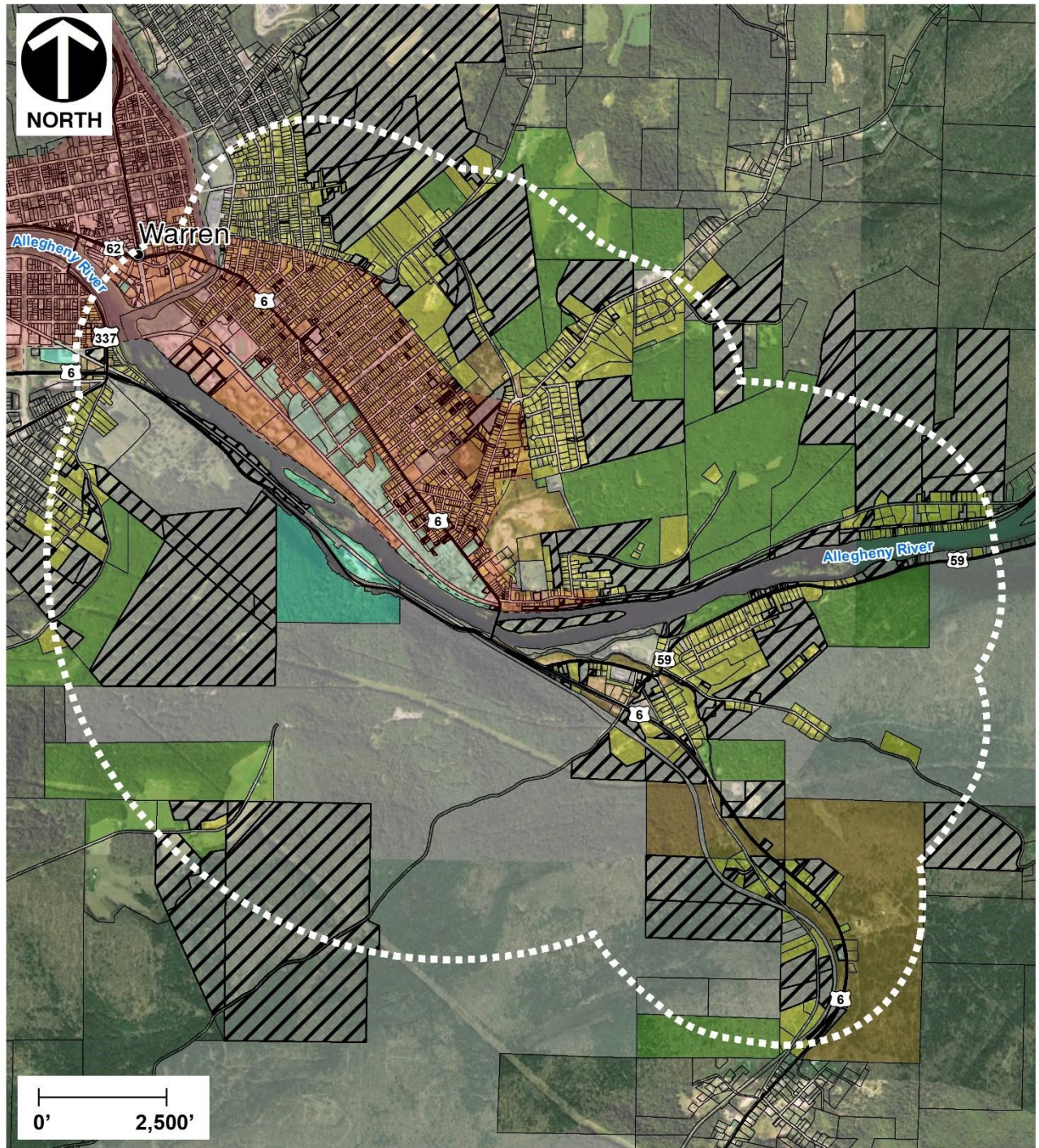
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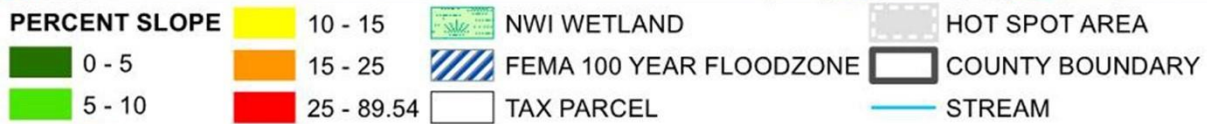
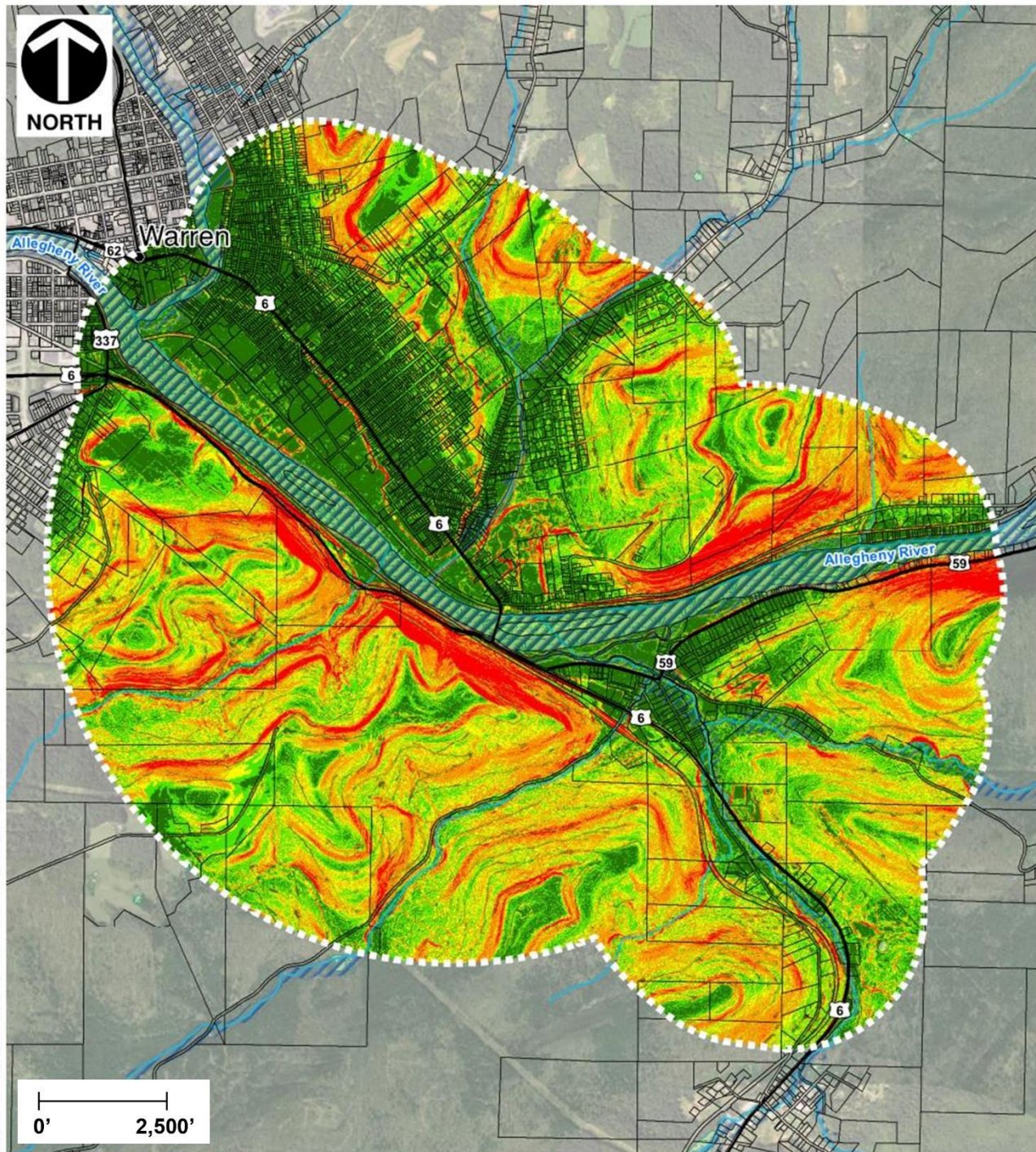


HOT SPOT 3 - CORRY
 ENVIRONMENTAL HOT SPOT MAP
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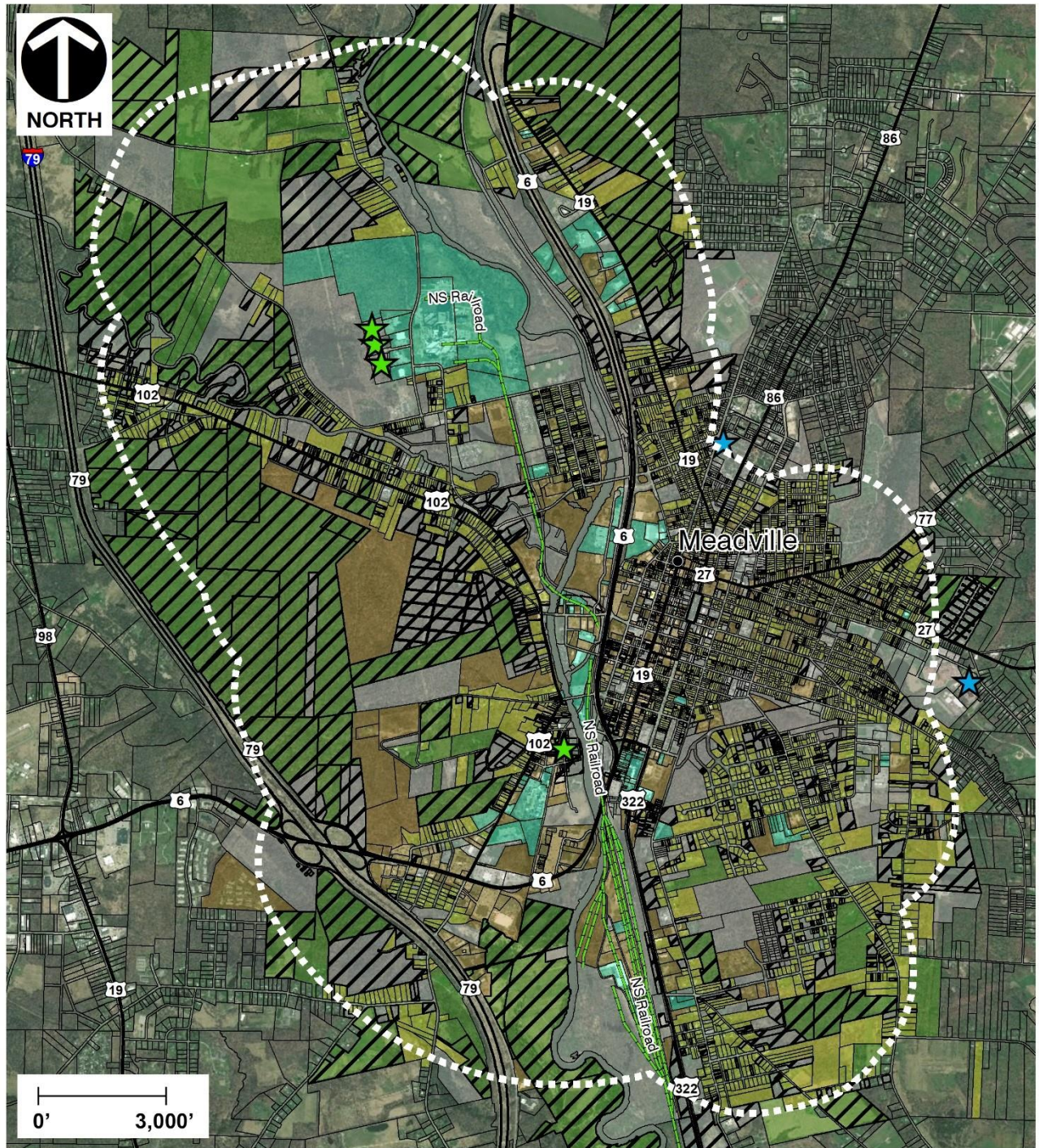




HOT SPOT 4 - WARREN
 ENVIRONMENTAL HOT SPOT MAP
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 ECONOMIC DEVELOPMENT

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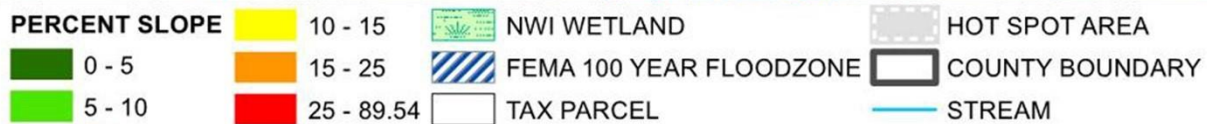
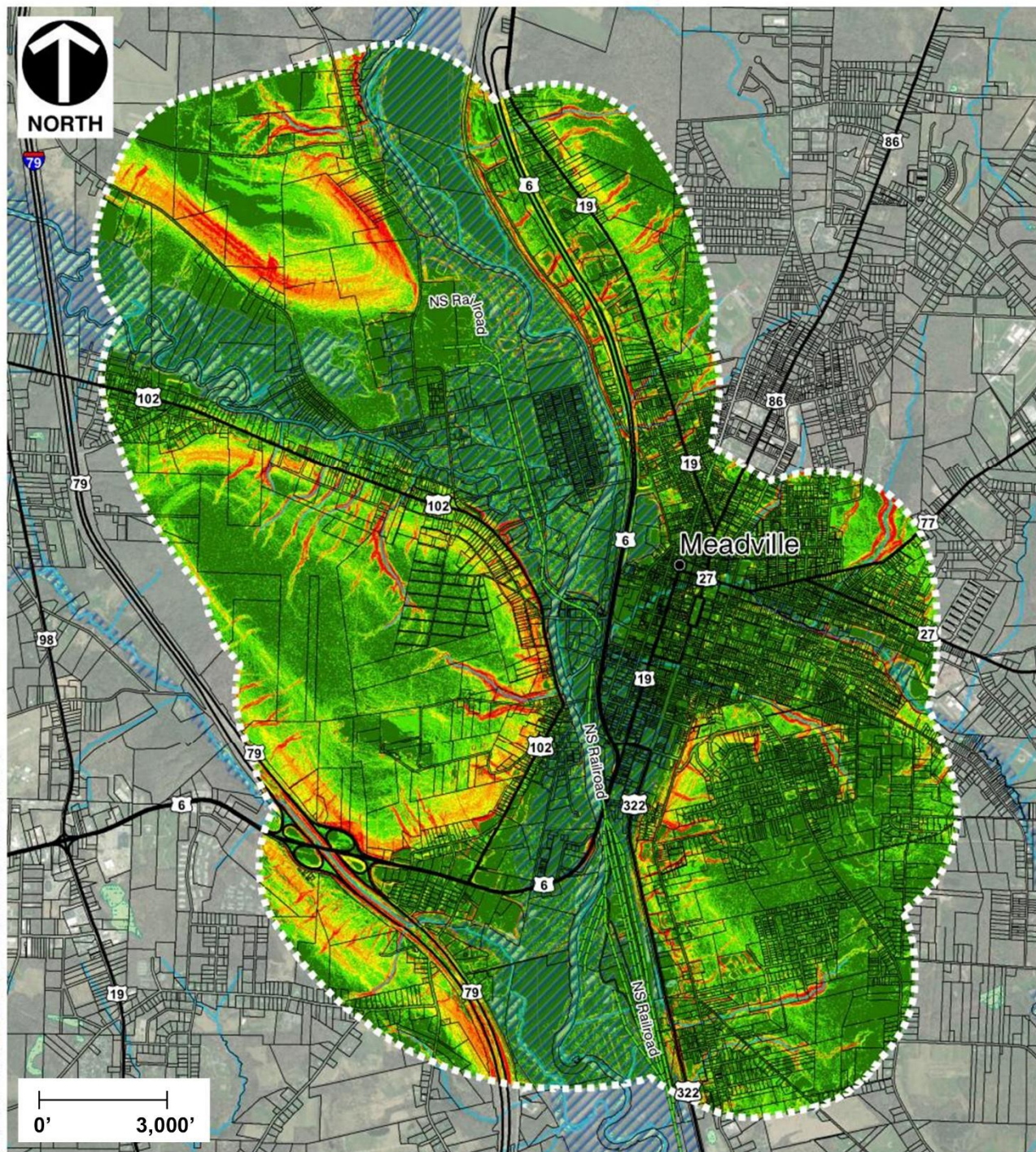
LEGEND

AGRICULTURE	RESIDENTIAL	NON-SUBJECT PARCEL	FEDERAL OPPORTUNITY ZONE
COMMERCIAL	OTHER	HOT SPOT AREA	KEYSTONE OPPORTUNITY ZONE
INDUSTRIAL	VACANT PARCEL	COUNTY BOUNDARY	HIGHER EDUCATION

HOT SPOT 5 - MEADVILLE
 LAND USE HOT SPOT MAP
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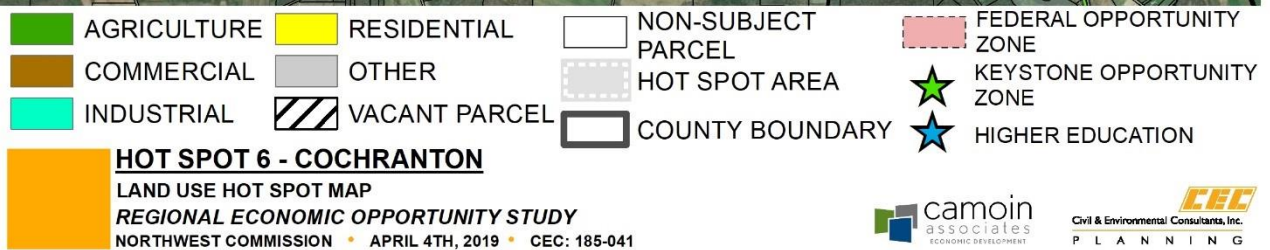
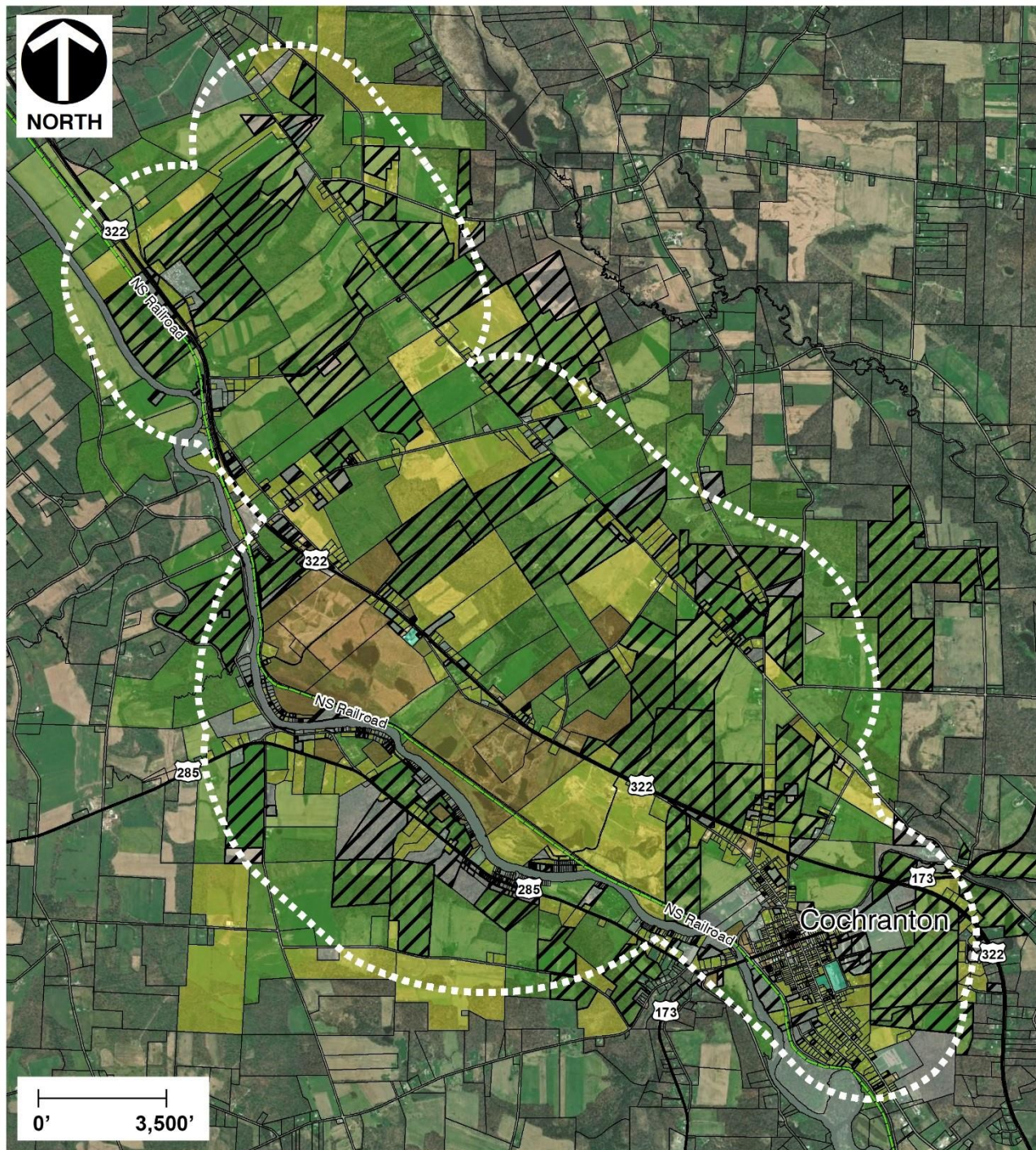
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HOT SPOT 5 - MEADVILLE
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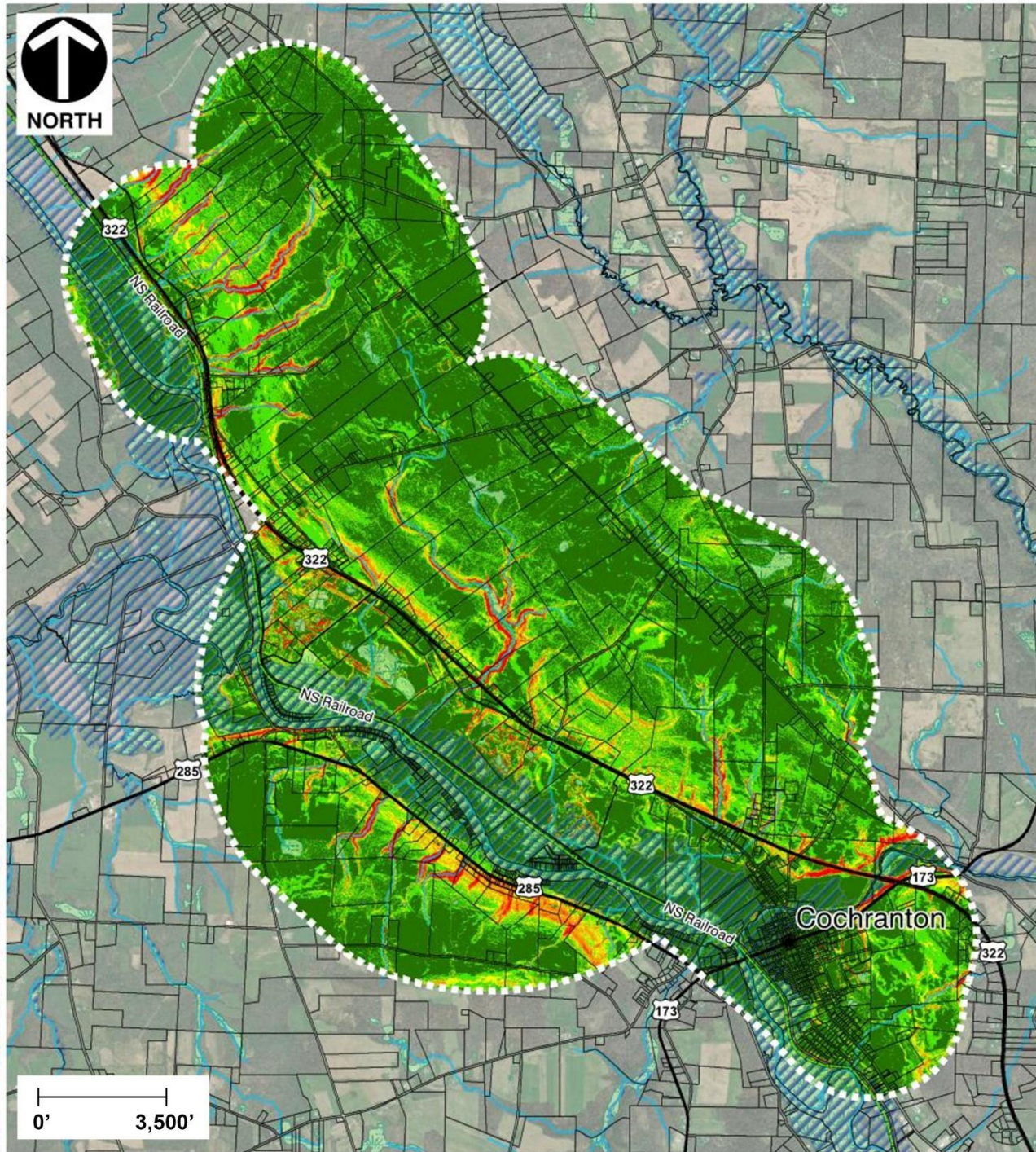
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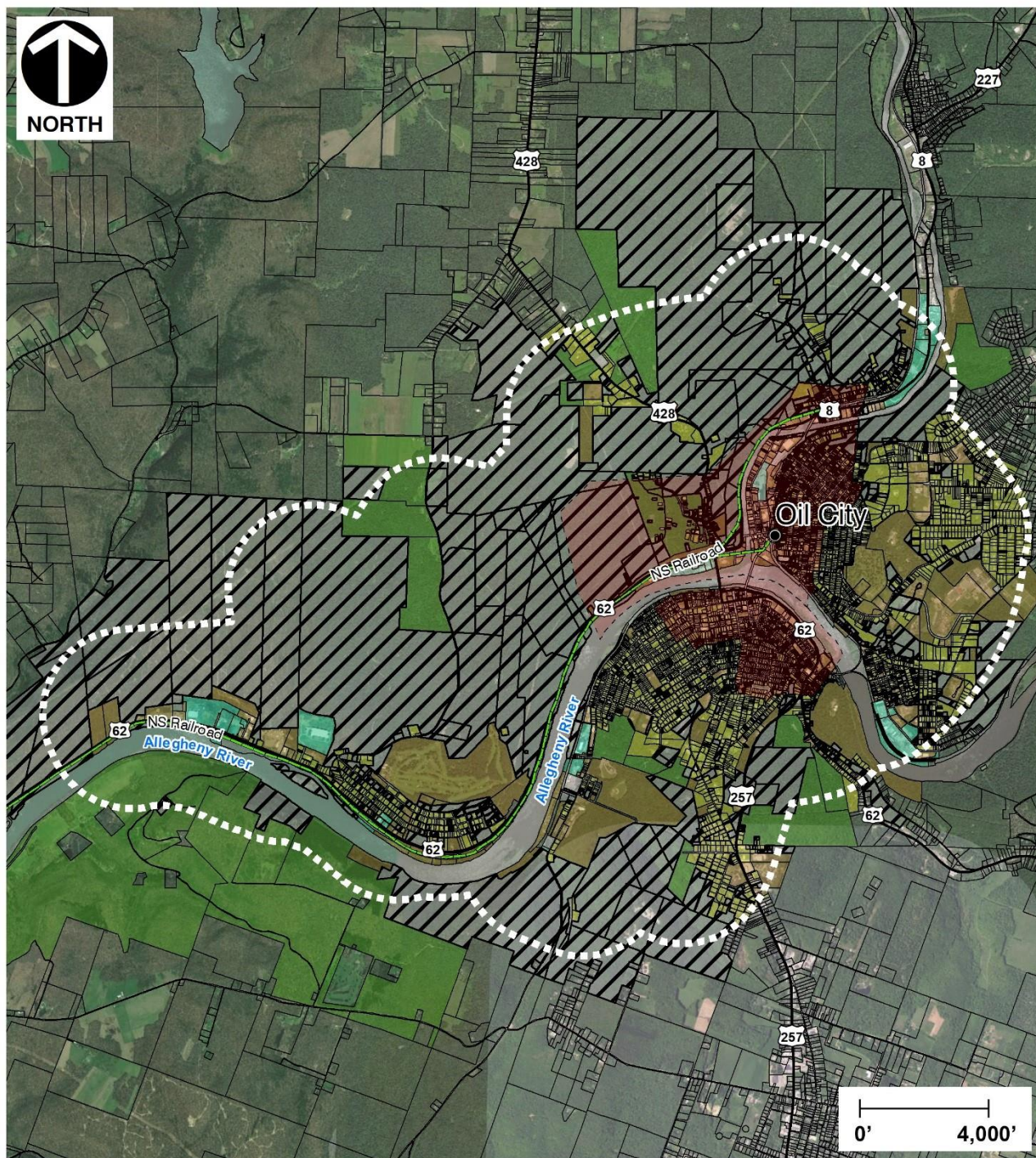


PERCENT SLOPE	10 - 15	NWI WETLAND	HOT SPOT AREA
0 - 5	15 - 25	FEMA 100 YEAR FLOODZONE	COUNTY BOUNDARY
5 - 10	25 - 89.54	TAX PARCEL	STREAM

HOT SPOT 6 - COCHRANTON
 ENVIRONMENTAL HOT SPOT MAP
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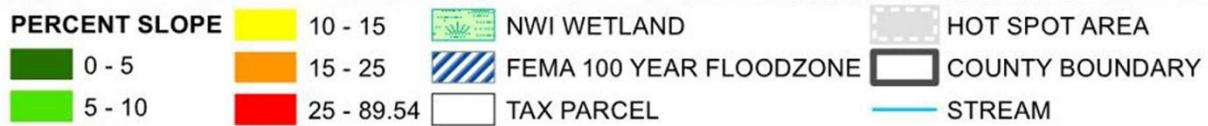
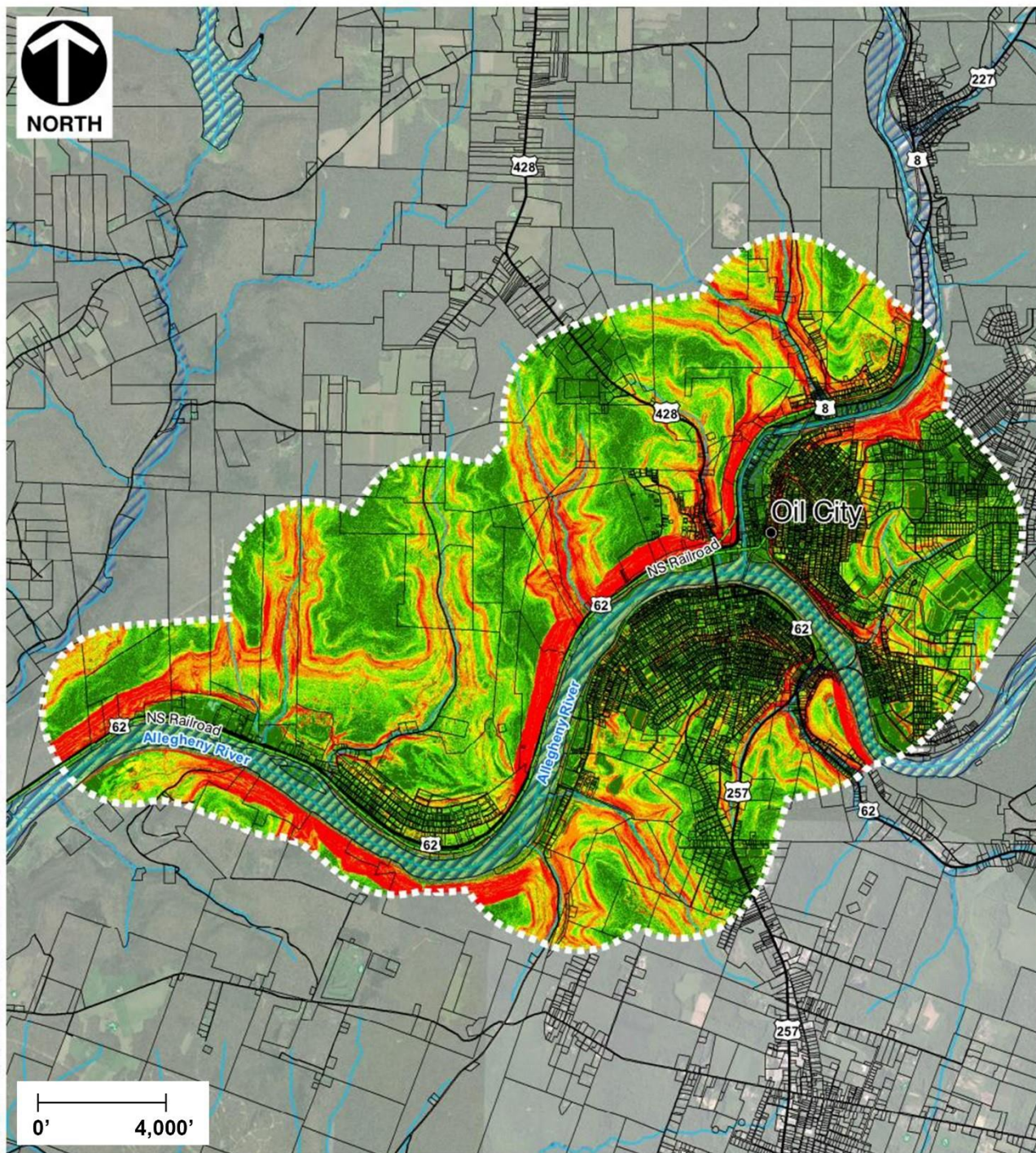
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- | | | | |
|-------------|---------------|--------------------|---------------------------|
| AGRICULTURE | RESIDENTIAL | NON-SUBJECT PARCEL | FEDERAL OPPORTUNITY ZONE |
| COMMERCIAL | OTHER | HOT SPOT AREA | KEYSTONE OPPORTUNITY ZONE |
| INDUSTRIAL | VACANT PARCEL | COUNTY BOUNDARY | HIGHER EDUCATION |
- HOT SPOT 7 - OIL CITY**
 LAND USE HOT SPOT MAP
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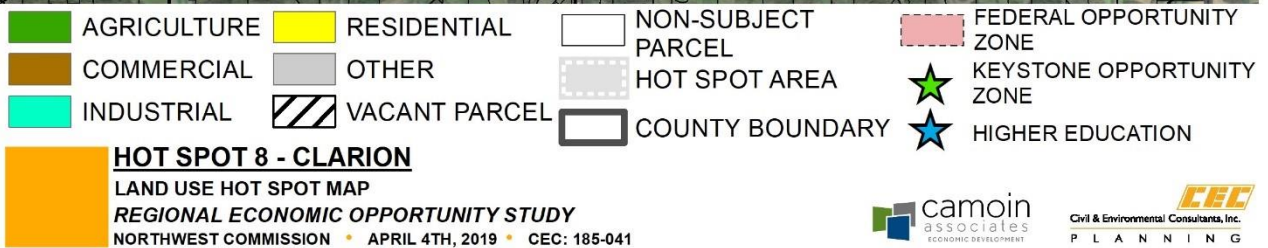
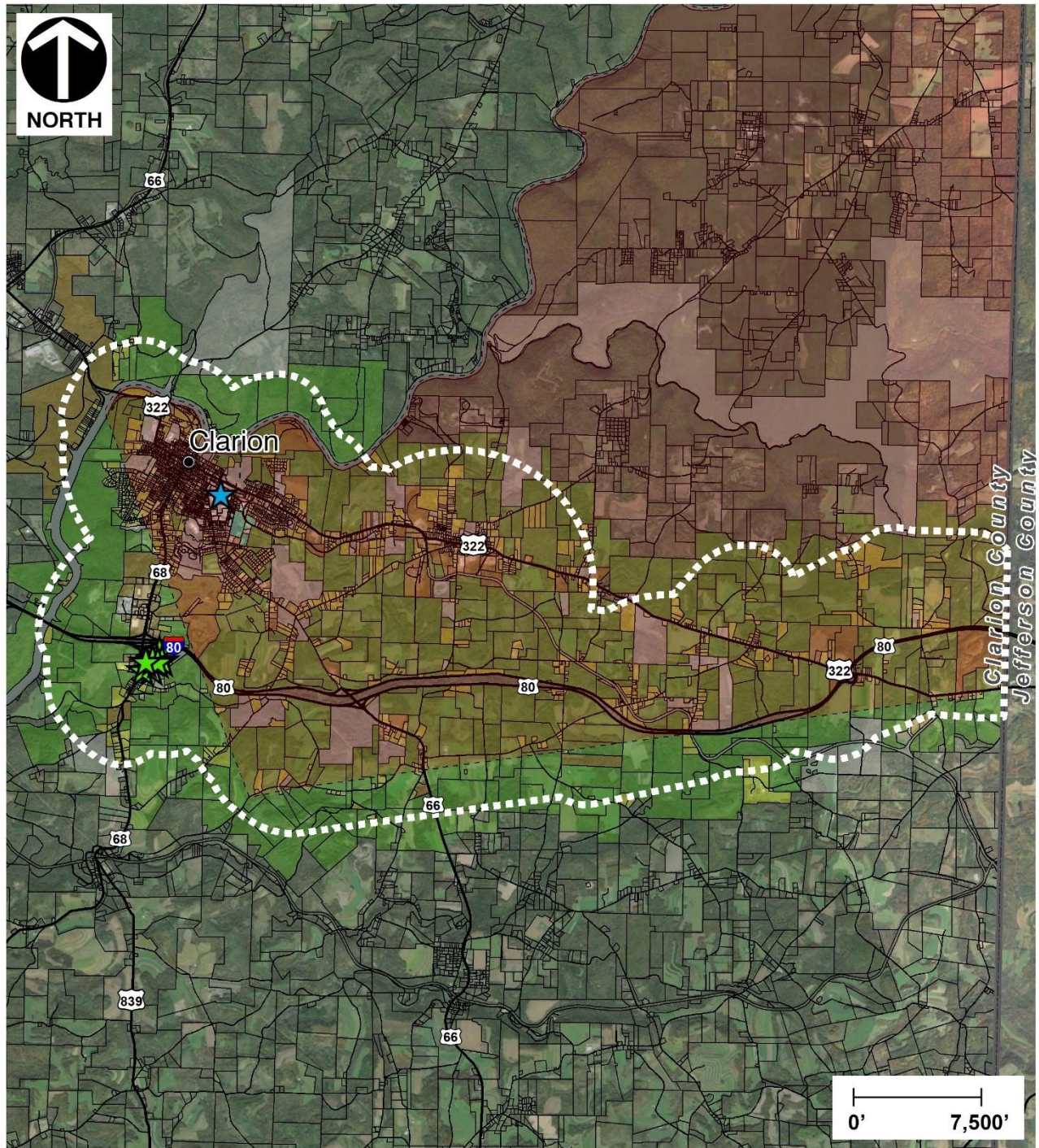
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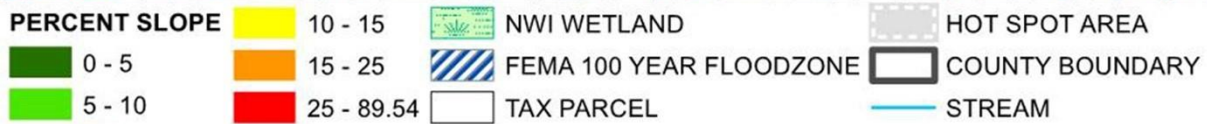
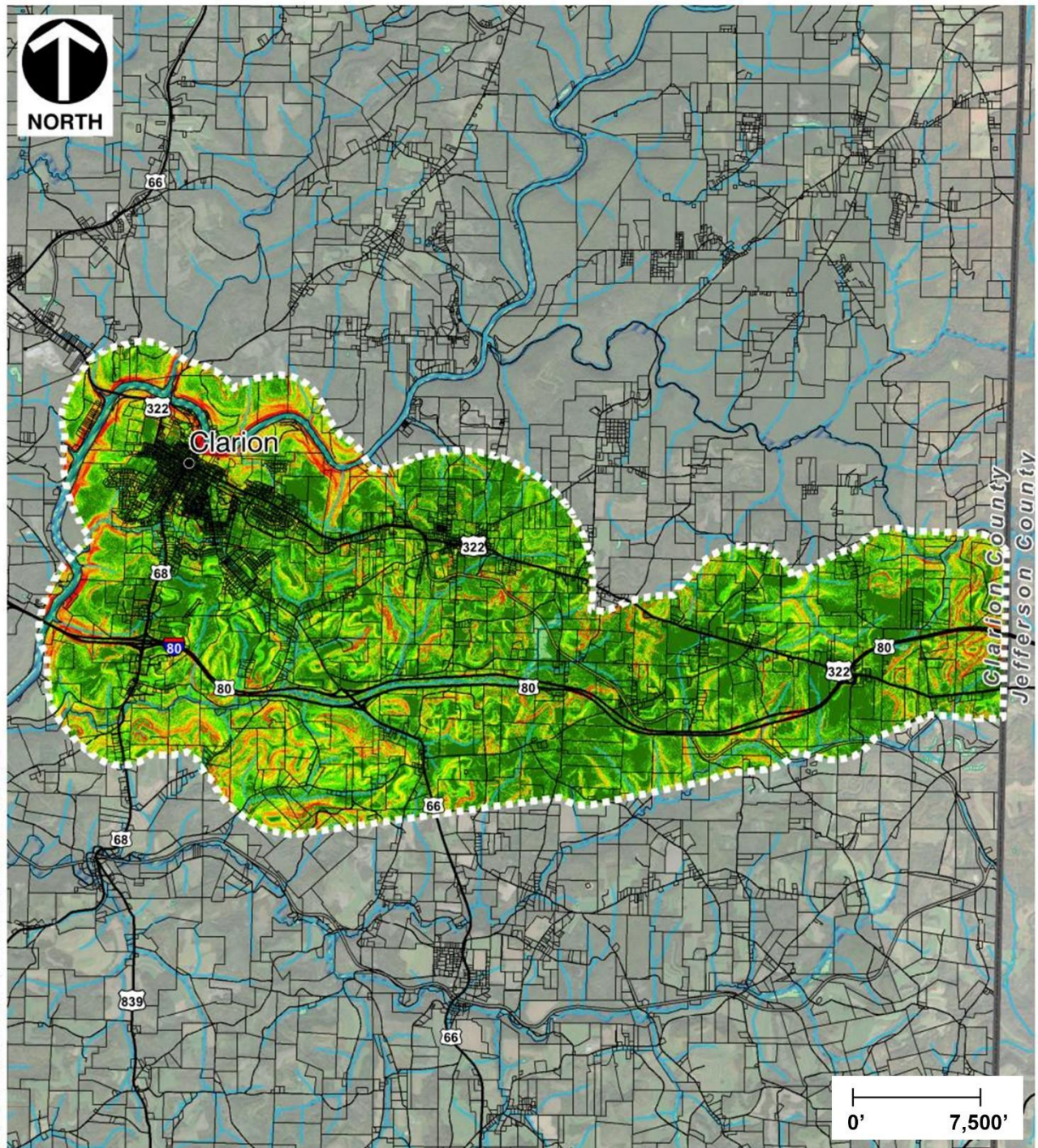


HOT SPOT 7 - OIL CITY
 ENVIRONMENTAL HOT SPOT MAP
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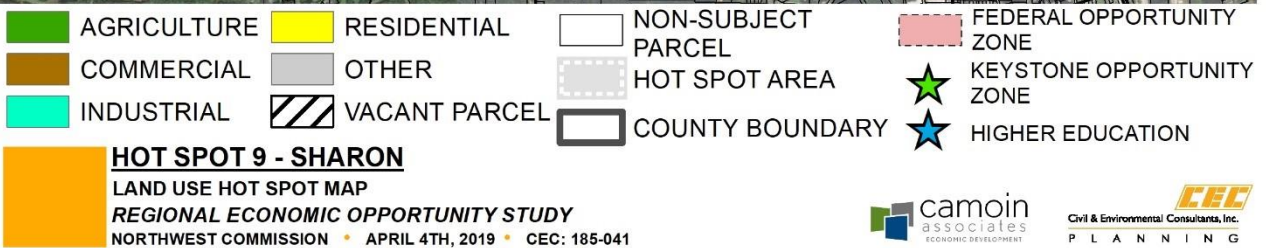
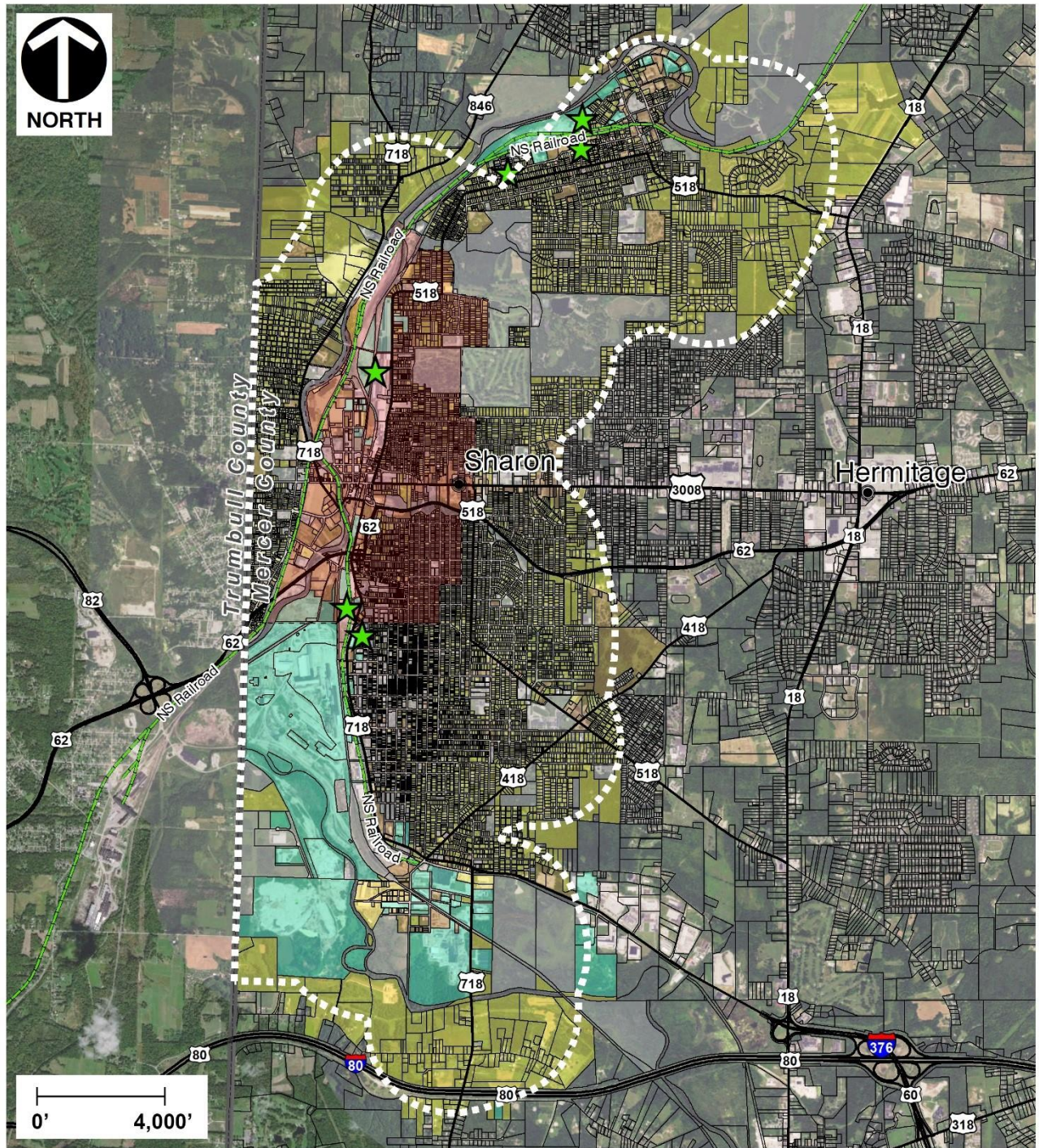




HOT SPOT 8 - CLARION
 ENVIRONMENTAL HOT SPOT MAP
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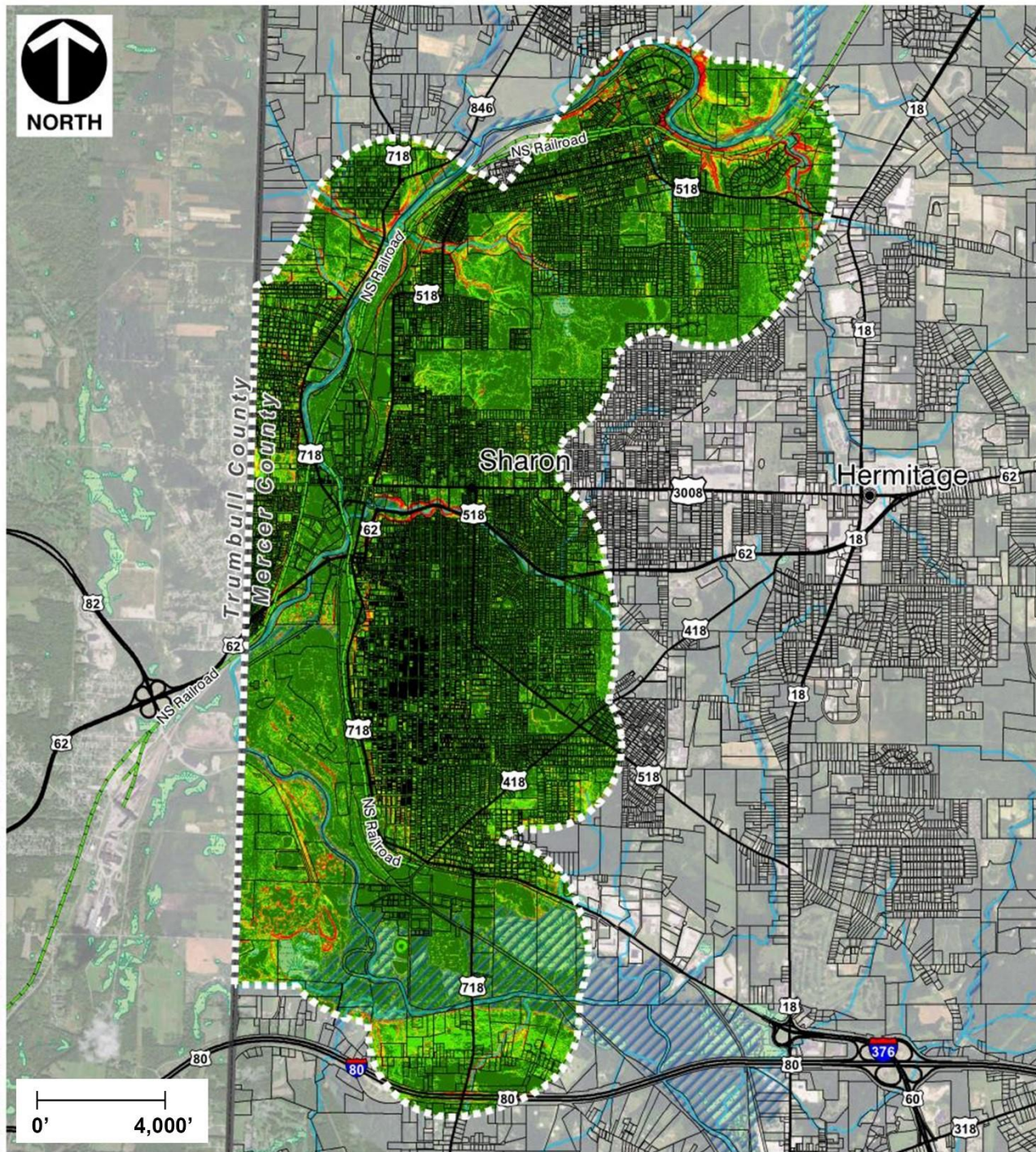
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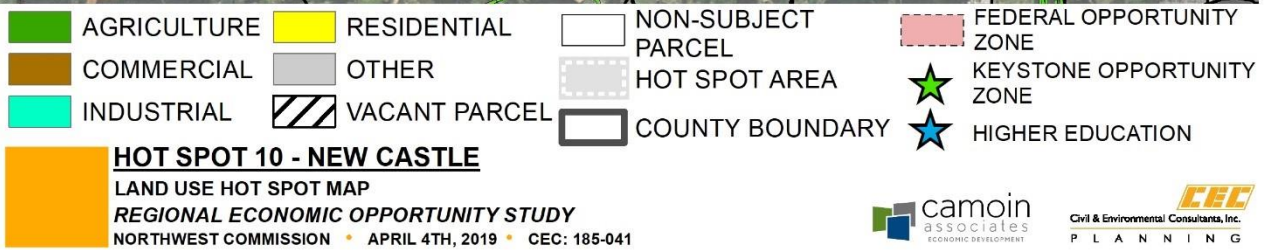
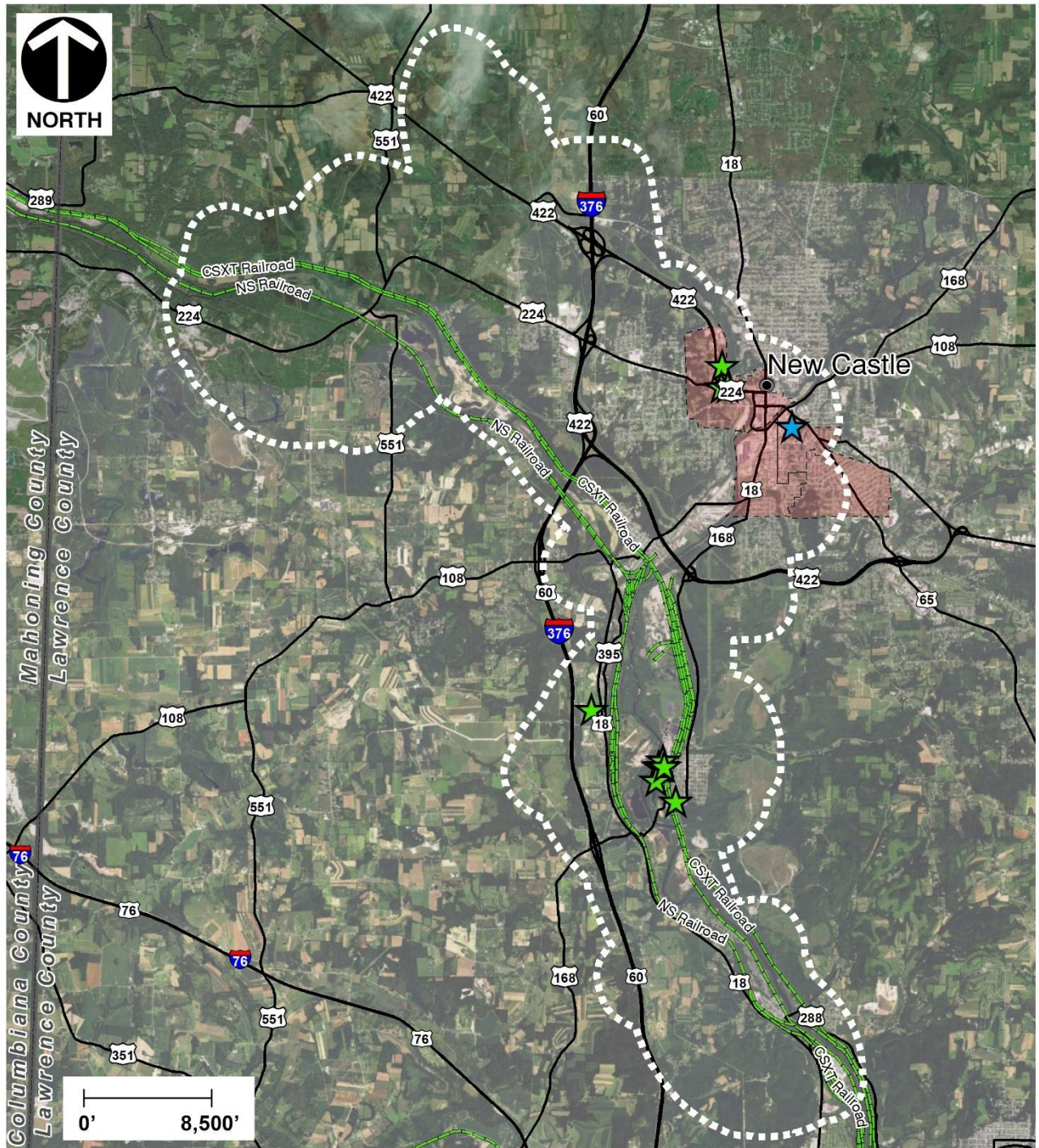
PERCENT SLOPE

0 - 5	10 - 15	NWI WETLAND	HOT SPOT AREA
5 - 10	15 - 25	FEMA 100 YEAR FLOODZONE	COUNTY BOUNDARY
25 - 89.54		TAX PARCEL	STREAM

HOT SPOT 9 - SHARON
 ENVIRONMENTAL HOT SPOT MAP
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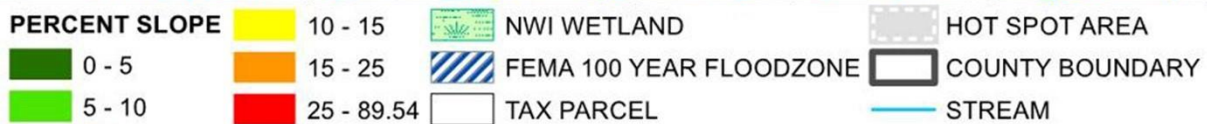
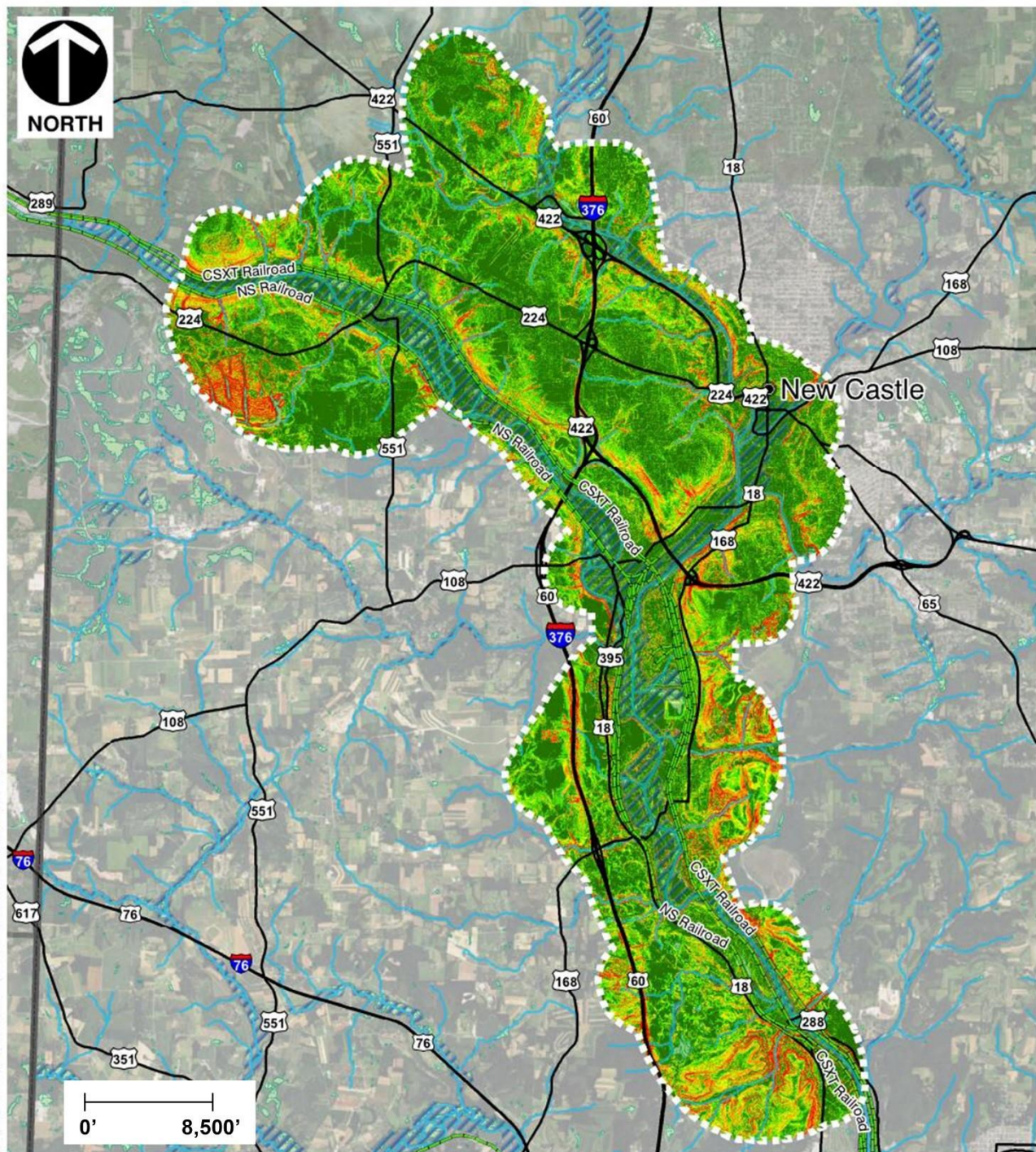
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HOT SPOT 10 - NEW CASTLE
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