



4.3.5 Environmental Hazards – Oil and Natural Gas Pipelines

This section provides a profile and vulnerability assessment of the oil and natural gas pipelines hazard profile for the Chester County Hazard Mitigation Plan (HMP).

Product release into the local environment can derive from a fixed facility or occur at any location along a pipeline route, and may be the result of carelessness, technical failure, external incidents, or an intentional act against the facility or container. Release of certain products considered hazardous materials (hazmat) can immediately and adversely impact the general population, causing effects ranging from inconvenient evacuations to personal injury and even death. Moreover, any release can compromise the local environment through contamination of soil, groundwater, or local flora and fauna.

4.3.5.1 Location and Extent

Based on past occurrences, pipeline incidents within Chester County have been accidental and have not been considered terrorist or criminal acts. While past occurrences have not been deemed intentional, an intentional release of any of these products in large quantity would pose a threat to the local population, economy, and environment resulting in lost revenue, injuries, and deaths.

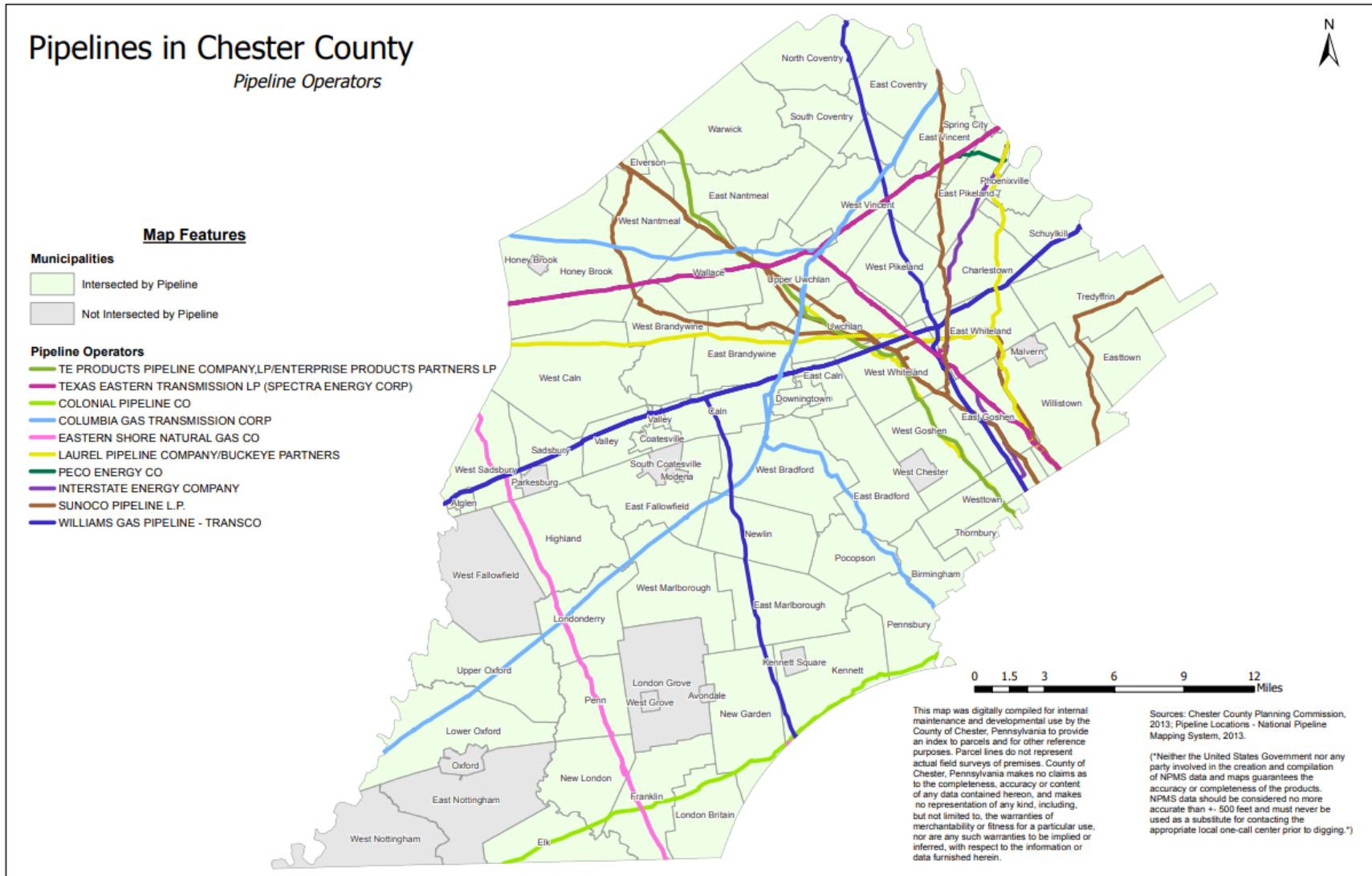
Chester County is home to nearly 600 linear miles of pipelines. Many of the pipelines have been in place for decades; more recently, the construction of new lines and upgrades to existing lines have increased. The county's large agricultural areas increase its vulnerability to pipeline accidents. In 2013, the Chester County Planning Commission created the Pipeline Information Center (PIC) to inform community members of all pipeline issues, pipeline safety, the new pipeline review process, and the latest information on pipeline project activity within the county (Chester County Planning Commission n.d.).

Active pipeline projects in the county include the Mariner East 2 project that carries natural gas, ethane, and propane; 2017 Expansion Project; Northeast Supply Enhancement Project; Greater Philadelphia Expansion Project; and Adelphia Gateway, all of which transport natural gas.

Figure 4.3.5-1 shows pipeline operators in Chester County. Mostly all of the municipalities in Chester County are intersected by pipelines besides Honey Brook Borough, West Fallowfield Township, Oxford Borough, East Nottingham Township, West Nottingham Township, London Grove Township, West Grove Borough, Avondale Borough, Kennett Square Borough, South Coatesville Borough, Modena Borough, West Chester Borough, and Malvern Borough.



Figure 4.3.5-1. Chester County Pipelines



Source: Chester County Planning Commission 2013





4.3.5.2 Range of Magnitude

The Pipeline and Hazardous Materials Safety Administration (PHMSA) classifies pipeline incidents into the following categories: Gas Distribution, Gas Gathering, Gas Transmission, and Liquefied Natural Gas (LNG). Pipeline incidents within Chester County could range from minor leaks to a large explosion that could lead to loss of life and damage to property, environment, and economy. Severity of an incident varies depending on the type of material released, and distance and related response time for emergency response teams. Areas closest to the release sites are generally at the greatest risk; however, depending on the material, a release can travel great distances or persist over a long period of time resulting in far-reaching effects on people and the environment.

The worst-case scenario would be a large, uncontrolled release of a toxic gas or liquid from a pipeline or pump station within a major urban area. Physical property damage to private wells and public water systems is likely from this type of event, the potential for injury and death to people up to 0.25 mile from the scene is significant. This type of event would likely overwhelm the medical care capacity within the county, and possibly the region. Businesses nearby could close, and households could potentially be displaced.

4.3.5.3 Past Occurrence

The county has experienced pipeline accidents. For most incidents, municipal police departments and county emergency dispatchers are contacted for emergency response. The county's Hazardous Materials Response Team is contacted for technical advice about addressing the hazardous material. Between 2000 and 2019, a total of 311 pipeline incidents have occurred, resulting in 20 fatalities, 58 injuries, and \$210,050,876 in damages in the state of Pennsylvania (PHMSA 2020).

One significant incident occurred in West Goshen Township at a pump station on August 5, 2019. Pipeline experts state vapor buildup likely led to an explosion at a Sunoco Pipeline pump station. Independent pipeline experts say the explosion appeared to have been caused by relighting of a pilot in a flare for burning off excess gases at a time when vapor had accumulated. In a report developed for the township, responders concluded that Sunoco exceeded federal safety requirements in the plans for the pumping station. Local residents reported that the explosion shook their house (Hurdle 2019).

Another significant incident took place in West Whiteland and Uwchlan Townships in July 2017, where several households complained about access to their private well water being interrupted or being cloudy. Sunoco Pipeline LP suspended installation of its contentious Mariner East 2 underground pipeline near Exton. Some families had to stay in hotels for the rest of the week and several families were provided bottled water. Local officials suspected that non-toxic bentonite clay used as a lubricant during the horizontal-drilling process may have migrated into private wells (Maykuth 2017).

In June 2018, Sunoco pipeline spilled 33,500 gallons of gas into Darby Creek. Sunoco installed a new 12-inch line that would temporarily carry gas liquids, which was the same line that leaked gasoline in a creek near Philadelphia International Airport. The company said the stretch of pipeline that was converted runs between Wallace and Middletown Townships, a distance of about 25 miles (Hurdle 2018).

4.3.5.4 Future Occurrence

Because of the wide scope of definition of pipeline incidents, ranging from a small spill to a large release of a highly volatile or toxic hazmat, incidents can happen at any time, and will occur in the future. Transportation of hazmats via pipelines cross streams within the watersheds that are part of the county's domestic water supply.

While pipeline incidents in Chester County have occurred in the past, future incidents are generally considered difficult to predict. Although the county does not anticipate severe releases on any regular basis, the possibility of a significant release should not be discounted. Based on Risk Factor Methodology Probability Criteria, the likelihood of future occurrences within Chester County remains *highly likely*.



4.3.5.5 Vulnerability Assessment

To understand risk, a community must evaluate assets exposed or vulnerable within the identified hazard area. Effects of and risk from pipelines are examined. The following sections evaluate and estimate potential impacts in Chester County:

- Overview of vulnerability
- Impacts on (1) life, health, and safety; (2) general building stock; (3) critical facilities, (4) the economy, and (5) the environment
- Cascading effect on other hazards
- Future growth and development

Overview of Vulnerability

Pipelines within the Commonwealth of Pennsylvania are regulated by several different agencies. Although Chester County has no regulatory authority over pipeline operators, the county can be engaged in the environmental review of proposals and coordinating emergency services response. Some of the county-level departments involved include the Planning Commission, Water Resources Authority, Conservation District, Facility and Parks, and Department of Emergency Services. Federal and state agencies involved in pipeline safety and regulations include the following:

- Federal Emergency Regulatory Commission (FERC) is an independent agency of the United States government that regulates the interstate transmission of electricity, natural gas, and oil, and reviews proposals to build LNG terminals and interstate natural gas pipelines.
- U.S. Department of Transportation (USDOT) oversees the safety of pipelines and transportation infrastructure.
- Pipeline and Hazardous Materials Safety Administration (PHMSA) develops and enforces regulations for a safe, reliable, and environmentally sound pipeline transportation system.
- Public Utility Commission (PUC) enforces safety standards for pipeline facilities.
- Pennsylvania Department of Environmental Protection (PADEP) has regulatory authority over any crossing of a wetland or waterway by a pipeline. Pipeline projects located within Delaware River Basin may be subject to regulatory review by the Delaware River Basin Commission (DRBC).
- Many municipal governments are authorized to enact zoning and subdivision regulations to regulate the siting and environmental impact of pipelines (Chester County Planning Commission 2013).

Impact on Life, Health, and Safety

Pipeline hazards exert the greatest impact on the residential population in Chester County (Table 4.3.5-1 summarizes population vulnerable to pipeline hazards). Several incidents reported in the county are related to liquid and gas leaks from pump stations and pipelines. The Township of Uwchlan has the greatest number of residents in the pipeline hazard area, with a total of 17,797 people. First responders are also greatly impacted as well. Their safety may be at risk during on-scene operations and they may need to perform additional responsibilities such as traffic control. There is a potential for a higher than normal call volume/demand for first responders and they may have a difficult time responding to incidents due to limited access to roads and damaged infrastructure.

Table 4.3.5-1. Estimated Chester County Population Vulnerable to Pipeline Hazards

Jurisdiction	Total Population	Within 0.5 Mile of a Pipeline	
		Number	Percent Total
Atglen (B)	1,459	1,074	73.6%
Avondale (B)	1,295	0	0.0%
Birmingham (Twp)	4,207	551	13.1%
Caln (Twp)	14,198	9,069	63.9%



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Jurisdiction	Total Population	Within 0.5 Mile of a Pipeline	
		Number	Percent Total
Charlestown (Twp)	5,813	4,209	72.4%
Coatesville (C)	13,147	8	0.1%
Downingtown (B)	7,929	2,012	25.4%
East Bradford (Twp)	9,959	593	6.0%
East Brandywine (Twp)	8,416	4,990	59.3%
East Caln (Twp)	4,876	3,502	71.8%
East Coventry (Twp)	6,770	1,511	22.3%
East Fallowfield (Twp)	7,567	485	6.4%
East Goshen (Twp)	18,199	16,361	89.9%
East Marlborough (Twp)	7,326	455	6.2%
East Nantmeal (Twp)	1,723	444	25.8%
East Nottingham (Twp)	8,929	0	0.0%
East Pikeland (Twp)	7,331	4,933	67.3%
East Vincent (Twp)	10,603	6,570	62.0%
East Whiteland (Twp)	7,062	5,204	73.7%
Easttown (Twp)	11,415	1,675	14.7%
Elk (Twp)	1,786	725	40.6%
Elverson (B)	1,405	1,104	78.6%
Franklin (Twp)	4,506	2,154	47.8%
Highland (Twp)	1,370	264	19.3%
Honey Brook (B)	1,865	0	0.0%
Honey Brook (Twp)	8,205	3,956	48.2%
Kennett (Twp)	8,177	1,929	23.6%
Kennett Square (B)	6,159	0	0.0%
London Britain (Twp)	3,241	1,012	31.2%
London Grove (Twp)	2,450	0	0.0%
Londonderry (Twp)	8,615	5,217	60.6%
Lower Oxford (Twp)	5,058	712	14.1%
Malvern (B)	3,440	218	6.3%
Modena (B)	873	0	0.0%
New Garden (Twp)	12,111	4,661	38.5%
New London (Twp)	1,312	221	16.8%
Newlin (Twp)	5,921	1,224	20.7%
North Coventry (Twp)	7,996	2,844	35.6%
Oxford (B)	5,420	0	0.0%
Parkesburg (B)	3,781	932	24.6%
Penn (Twp)	5,511	1,357	24.6%
Pennsbury (Twp)	3,649	644	17.6%
Phoenixville (B)	16,815	4,018	23.9%
Pocopson (Twp)	4,838	1,351	27.9%
Sadsbury (Twp)	3,919	1,934	49.3%
Schuylkill (Twp)	8,639	3,767	43.6%
South Coatesville (B)	1,276	0	0.0%
South Coventry (Twp)	2,631	255	9.7%
Spring City (B)	3,320	985	29.7%
Thornbury (Twp)	3,181	301	9.5%
Tredyffrin (Twp)	29,481	8,268	28.0%
Upper Oxford (Twp)	2,518	646	25.7%
Upper Uwchlan (Twp)	11,509	10,330	89.8%
Uwchlan (Twp)	18,869	17,797	94.3%
Valley (Twp)	7,661	4,271	55.7%
Wallace (Twp)	3,678	2,664	72.4%
Warwick (Twp)	2,543	203	8.0%
West Bradford (Twp)	12,869	7,847	61.0%
West Brandywine (Twp)	7,482	3,436	45.9%
West Caln (Twp)	9,080	2,722	30.0%



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Jurisdiction	Total Population	Within 0.5 Mile of a Pipeline	
		Number	Percent Total
West Chester (B)	19,888	0	0.0%
West Fallowfield (Twp)	2,596	28	1.1%
West Goshen (Twp)	23,021	12,085	52.5%
West Grove (B)	2,846	0	0.0%
West Marlborough (Twp)	771	138	17.9%
West Nantmeal (Twp)	1,999	1,167	58.4%
West Nottingham (Twp)	2,718	0	0.0%
West Pikeland (Twp)	4,069	2,064	50.7%
West Sadsbury (Twp)	2,393	1,548	64.7%
West Vincent (Twp)	5,257	2,577	49.0%
West Whiteland (Twp)	18,403	11,598	63.0%
Westtown (Twp)	10,916	5,170	47.4%
Willistown (Twp)	10,895	4,536	41.6%
Chester County (Total)	517,156	204,525	39.5%

Sources: U.S. Census 2018; Chester County Geographic Information System (GIS) 2020; National Pipeline Mapping System 2017
 Notes: % = Percent; B = Borough; C = City; Twp = Township

Impacts on General Building Stock

While buildings may be present within the hazard area, estimating direct damage to these structures and facilities would be difficult. Potential losses may include contamination and/or potential structural and content losses if an explosion occurs. To estimate the buildings exposed to a pipeline event, the half-mile buffer areas were overlaid upon the building level. The replacement cost value of the structures with their center in the buffer areas were totaled (Table 4.3.5-2). The Township of Uwchlan has the greatest number of buildings and the greatest replacement cost values that would be impacted by a pipeline event. However, if a pipeline release were to occur, the incident would not be located along all pipelines in the county, but instead only a section of the total pipeline exposure area. Therefore, the total exposure does not represent a complete vulnerability, should a hazard event occur.

Table 4.3.5-2. Total Building Exposed to a Pipeline Incident

Jurisdiction	Total Number of Buildings	Total Replacement Cost Value	With 0.5 Mile of a Pipeline			
			Number of Buildings	Percent of Total	RCV (Replacement Cost Value)	Percent Total
Atglen (B)	583	\$300,171,233	436	74.8%	\$232,623,618	77.5%
Avondale (B)	436	\$275,491,131	0	0.0%	\$0	0.0%
Birmingham (Twp)	1,774	\$1,521,752,088	235	13.2%	\$176,629,831	11.6%
Caln (Twp)	5,696	\$4,389,258,174	3,580	62.9%	\$2,587,525,346	59.0%
Charlestown (Twp)	2,655	\$2,334,124,537	1,949	73.4%	\$1,824,544,622	78.2%
Coatesville (C)	3,545	\$2,658,702,748	7	0.2%	\$28,492,994	1.1%
Downingtown (B)	2,619	\$2,678,308,815	624	23.8%	\$560,966,034	20.9%
East Bradford (Twp)	4,033	\$3,166,888,223	255	6.3%	\$186,210,606	5.9%
East Brandywine (Twp)	4,201	\$2,499,920,165	2,477	59.0%	\$1,304,802,700	52.2%
East Caln (Twp)	1,509	\$1,864,909,402	970	64.3%	\$659,800,023	35.4%
East Coventry (Twp)	3,832	\$2,200,926,728	935	24.4%	\$601,431,762	27.3%
East Fallowfield (Twp)	4,025	\$1,984,687,476	319	7.9%	\$182,408,390	9.2%
East Goshen (Twp)	6,498	\$5,680,635,001	5,836	89.8%	\$5,005,377,300	88.1%





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Jurisdiction	Total Number of Buildings	Total Replacement Cost Value	With 0.5 Mile of a Pipeline			
			Number of Buildings	Percent of Total	RCV (Replacement Cost Value)	Percent Total
East Marlborough (Twp)	3,888	\$3,646,563,821	341	8.8%	\$242,133,936	6.6%
East Nantmeal (Twp)	1,509	\$1,131,945,456	341	22.6%	\$227,041,273	20.1%
East Nottingham (Twp)	4,960	\$3,185,167,607	0	0.0%	\$0	0.0%
East Pikeland (Twp)	3,959	\$2,751,413,608	2,671	67.5%	\$1,880,779,690	68.4%
East Vincent (Twp)	3,872	\$2,764,012,516	2,350	60.7%	\$1,482,457,302	53.6%
East Whiteland (Twp)	5,002	\$8,143,686,632	3,704	74.1%	\$5,194,240,730	63.8%
Easttown (Twp)	4,583	\$3,998,338,009	673	14.7%	\$606,903,373	15.2%
Elk (Twp)	1,361	\$754,193,647	559	41.1%	\$295,652,666	39.2%
Elverson (B)	716	\$516,332,051	556	77.7%	\$352,758,850	68.3%
Franklin (Twp)	2,468	\$1,537,535,450	1,156	46.8%	\$709,337,331	46.1%
Highland (Twp)	1,304	\$1,067,555,265	324	24.8%	\$281,585,711	26.4%
Honey Brook (B)	771	\$446,825,932	0	0.0%	\$0	0.0%
Honey Brook (Twp)	4,871	\$3,389,705,910	2,249	46.2%	\$1,379,154,898	40.7%
Kennett (Twp)	4,166	\$4,134,894,338	969	23.3%	\$839,029,482	20.3%
Kennett Square (B)	1,956	\$1,600,982,472	0	0.0%	\$0	0.0%
London Britain (Twp)	1,782	\$1,064,040,035	549	30.8%	\$284,588,930	26.7%
London Grove (Twp)	4,233	\$3,148,102,405	0	0.0%	\$0	0.0%
Londonderry (Twp)	1,755	\$1,034,199,367	1,016	57.9%	\$569,118,143	55.0%
Lower Oxford (Twp)	2,585	\$2,325,017,464	499	19.3%	\$414,593,211	17.8%
Malvern (B)	1,149	\$1,256,307,741	63	5.5%	\$73,382,681	5.8%
Modena (B)	226	\$143,886,459	0	0.0%	\$0	0.0%
New Garden (Twp)	5,418	\$5,996,313,471	1,839	33.9%	\$1,684,593,535	28.1%
New London (Twp)	2,955	\$1,850,994,293	542	18.3%	\$326,251,697	17.6%
Newlin (Twp)	1,188	\$767,919,221	272	22.9%	\$152,780,527	19.9%
North Coventry (Twp)	4,367	\$2,814,129,243	1,614	37.0%	\$1,419,825,344	50.5%
Oxford (B)	1,795	\$1,620,222,123	0	0.0%	\$0	0.0%
Parkesburg (B)	1,478	\$791,790,495	347	23.5%	\$185,561,765	23.4%
Penn (Twp)	2,962	\$3,335,917,017	952	32.1%	\$1,897,144,119	56.9%
Pennsbury (Twp)	1,793	\$1,741,030,601	359	20.0%	\$339,583,349	19.5%
Phoenixville (B)	6,031	\$4,404,373,172	1,383	22.9%	\$1,152,017,493	26.2%
Pocopson (Twp)	1,781	\$1,616,048,060	476	26.7%	\$480,587,472	29.7%
Sadsbury (Twp)	2,244	\$1,514,078,865	1,093	48.7%	\$939,693,219	62.1%
Schuylkill (Twp)	4,116	\$3,296,773,180	1,788	43.4%	\$1,358,411,568	41.2%
South Coatesville (B)	669	\$656,482,254	0	0.0%	\$0	0.0%
South Coventry (Twp)	1,655	\$1,175,837,157	144	8.7%	\$54,672,091	4.6%
Spring City (B)	1,282	\$913,935,869	384	30.0%	\$255,665,291	28.0%
Thornbury (Twp)	1,222	\$1,249,939,720	145	11.9%	\$335,876,666	26.9%



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Jurisdiction	Total Number of Buildings	Total Replacement Cost Value	With 0.5 Mile of a Pipeline			
			Number of Buildings	Percent of Total	RCV (Replacement Cost Value)	Percent Total
Tredyffrin (Twp)	10,751	\$13,427,976,905	3,118	29.0%	\$5,257,635,098	39.2%
Upper Oxford (Twp)	2,098	\$1,327,197,078	512	24.4%	\$309,718,578	23.3%
Upper Uwchlan (Twp)	4,459	\$3,757,709,779	3,963	88.9%	\$3,282,538,070	87.4%
Uwchlan (Twp)	6,633	\$7,025,589,763	6,230	93.9%	\$6,281,759,021	89.4%
Valley (Twp)	3,430	\$2,597,377,442	1,901	55.4%	\$1,354,281,549	52.1%
Wallace (Twp)	2,069	\$1,322,743,721	1,506	72.8%	\$952,211,809	72.0%
Warwick (Twp)	2,175	\$1,133,542,100	176	8.1%	\$93,238,330	8.2%
West Bradford (Twp)	6,163	\$3,995,074,181	3,705	60.1%	\$2,098,488,191	52.5%
West Brandywine (Twp)	4,149	\$2,231,906,820	1,942	46.8%	\$1,182,598,337	53.0%
West Caln (Twp)	6,021	\$2,765,167,902	1,746	29.0%	\$722,804,248	26.1%
West Chester (B)	4,156	\$5,374,643,016	0	0.0%	\$0	0.0%
West Fallowfield (Twp)	2,171	\$1,743,066,295	32	1.5%	\$26,046,613	1.5%
West Goshen (Twp)	8,399	\$9,444,801,871	4,271	50.9%	\$3,873,467,194	41.0%
West Grove (B)	1,053	\$499,625,186	0	0.0%	\$0	0.0%
West Marlborough (Twp)	967	\$997,081,475	131	13.5%	\$87,099,079	8.7%
West Nantmeal (Twp)	1,830	\$1,139,858,316	1,095	59.8%	\$651,320,164	57.1%
West Nottingham (Twp)	1,989	\$1,196,217,005	0	0.0%	\$0	0.0%
West Pikeland (Twp)	2,120	\$1,506,034,830	1,082	51.0%	\$717,348,285	47.6%
West Sadsbury (Twp)	1,876	\$1,651,357,888	1,134	60.4%	\$854,961,633	51.8%
West Vincent (Twp)	3,532	\$2,587,356,437	1,738	49.2%	\$1,307,741,811	50.5%
West Whiteland (Twp)	7,022	\$7,660,221,171	4,460	63.5%	\$4,956,653,247	64.7%
Westtown (Twp)	4,175	\$3,282,102,771	1,989	47.6%	\$1,553,918,977	47.3%
Willistown (Twp)	6,043	\$4,727,817,226	2,446	40.5%	\$1,829,508,526	38.7%
Chester County (Total)	232,759	\$194,736,735,824	90,158	38.7%	\$76,159,574,329	39.1%

Sources: Chester County GIS 2020; RSMears 2019; National Pipeline Mapping System 2017
 Notes: % = Percent; B = Borough; C = City; Twp = Township

Impacts on Critical Facilities

Potential losses of critical facilities caused by a pipeline incident are difficult to quantify. Potential losses may include inaccessibility, loss of service, contamination, and/or potential structural and content losses if an explosion occurs. Table 4.3.5-3 summarizes critical facilities and lifelines located within the pipeline buffer area. A total of 4,202 critical facilities are located in Chester County. Overall, 1,564 critical facilities are exposed to a pipeline event, and 1,037 of those facilities are considered lifelines.

Table 4.3.5-3. Number of Critical Facilities in Pipeline Incident Exposure

Jurisdictions	Number of Critical Facilities in Pipeline Incident Exposure (Lifelines)	Jurisdictions	Number of Critical Facilities in Pipeline Incident Exposure (Lifelines)
Atglen (B)	14 (11)	North Coventry (Twp)	33 (19)





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Jurisdictions	Number of Critical Facilities in Pipeline Incident Exposure (Lifelines)	Jurisdictions	Number of Critical Facilities in Pipeline Incident Exposure (Lifelines)
Avondale (B)	0 (0)	Oxford (B)	0 (0)
Birmingham (Twp)	8 (8)	Parkesburg (B)	7 (3)
Caln (Twp)	56 (45)	Penn (Twp)	14 (9)
Charlestown (Twp)	53 (38)	Pennsbury (Twp)	12 (7)
Coatesville (C)	6 (6)	Phoenixville (B)	13 (11)
Downingtown (B)	13 (10)	Pocopson (Twp)	12 (9)
East Bradford (Twp)	10 (8)	Sadsbury (Twp)	24 (10)
East Brandywine (Twp)	26 (20)	Schuylkill (Twp)	24 (13)
East Caln (Twp)	8 (5)	South Coatesville (B)	0 (0)
East Coventry (Twp)	16 (13)	South Coventry (Twp)	3 (3)
East Fallowfield (Twp)	13 (11)	Spring City (B)	1 (1)
East Goshen (Twp)	59 (34)	Thornbury (Twp)	8 (7)
East Marlborough (Twp)	6 (5)	Tredyffrin (Twp)	119 (72)
East Nantmeal (Twp)	6 (6)	Upper Oxford (Twp)	4 (2)
East Nottingham (Twp)	0 (0)	Upper Uwchlan (Twp)	56 (42)
East Pikeland (Twp)	29 (20)	Uwchlan (Twp)	98 (43)
East Vincent (Twp)	39 (28)	Valley (Twp)	35 (24)
East Whiteland (Twp)	136 (78)	Wallace (Twp)	24 (21)
Easttown (Twp)	9 (4)	Warwick (Twp)	1 (1)
Elk (Twp)	2 (2)	West Bradford (Twp)	26 (17)
Elverson (B)	8 (4)	West Brandywine (Twp)	28 (24)
Franklin (Twp)	12 (8)	West Caln (Twp)	6 (3)
Highland (Twp)	6 (4)	West Chester (B)	0 (0)
Honey Brook (B)	0 (0)	West Fallowfield (Twp)	1 (1)
Honey Brook (Twp)	21 (11)	West Goshen (Twp)	69 (39)
Kennett (Twp)	21 (17)	West Grove (B)	0 (0)
Kennett Square (B)	0 (0)	West Marlborough (Twp)	7 (6)
London Britain (Twp)	8 (8)	West Nantmeal (Twp)	17 (12)
London Grove (Twp)	0 (0)	West Nottingham (Twp)	0 (0)
Londonderry (Twp)	16 (11)	West Pikeland (Twp)	28 (25)
Lower Oxford (Twp)	10 (9)	West Sadsbury (Twp)	24 (11)
Malvern (B)	0 (0)	West Vincent (Twp)	30 (26)
Modena (B)	0 (0)	West Whiteland (Twp)	145 (99)
New Garden (Twp)	19 (10)	Westtown (Twp)	14 (8)
New London (Twp)	9 (9)	Willistown (Twp)	33 (17)
Newlin (Twp)	9 (9)	Chester County (Total)	1,564 (1,037)



Sources: *Chester County GIS 2020; National Pipeline Mapping 2017*
Notes: % = Percent; B = Borough; C = City; Twp = Township

Impact on the Economy

Economic loss from pipeline incidents and explosion incidents ranges from non-recordable to losses exceeding millions of dollars. Impact on the local economy from a single incident is almost impossible to measure because of complexities of predicting losses of work, revenue, and future business. However, it is certain that a significant incident within an urban area would cause various economic losses. Pipeline incidents can lead to closures of major transportation routes. Waterway, railroad, airport, and highway closures caused by these incidents can hinder delivery of goods and services. Potential impacts may be local, regional, or statewide depending on the magnitude of the event and the extent of disruptions to services. In 2019, Pennsylvania experienced 19 pipeline incidents, causing \$13.4 million in damages (PHMSA 2019).

Impact on the Environment

As discussed above, pipeline incidents and explosion incidents can profoundly affect the surrounding environment. Contamination of soil, surface water, and groundwater can result in many direct impacts on surrounding populations and ecosystems. When a large volume of product is released, much of it remains unrecovered as product disperses into the environment (Belvederesi, et al 2018). This can have an immense and lasting impact on the local flora and fauna.

Cascading Impacts to Other Hazards

Pipeline events can cause utility failure. If a spill or other release occurred, water quality and supply could stop or drastically decrease while the facility restored service. Pipeline incidents also have the potential to start fires. For instance, in 2019, there were 66 fires in the United States that resulted from a gas distribution pipeline incident (PHMSA 2019). These fires could potentially spread, causing other structural fires. Section 4.3.14, Structural Fires, and Section 4.3.18, Utility Interruption, provide additional information.

Future Changes that May Impact Vulnerability

Understanding future changes that effect vulnerability in the county can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The county considered the following factors when examining potential conditions that may affect hazard vulnerability:

- Potential or projected development
- Projected changes in population
- Other identified conditions as relevant and appropriate, including the impacts of climate change

Projected Development

Any areas of growth could be impacted by pipeline hazards if located within identified hazard areas. Additionally, an increase in development and population can increase the likelihood of a pipeline incident. The tables and hazard maps included in the jurisdictional annexes in this HMP contain additional information regarding the specific areas of development that would increase county vulnerability to the hazmat incident hazard.

Projected Changes in Population

Estimated population projections provided by the Center of Rural Pennsylvania indicates that Chester's population will continue to increase into 2040, increasing total population to approximately 603,068 persons (Center of Rural Pennsylvania 2013). Persons that move into pipeline exposure areas are at greater risk to be impacted in the event of a gas or oil release.



Climate Change

No immediate climate change impacts are associated with the hazard.

Change of Vulnerability Since the 2015 HMP

Since the 2015 analysis, population statistics have been updated using the 5-Year 2014-2018 American Community Survey Population Estimates. The general building stock was also established using RSMeans 2020 building valuations that estimated replacement cost value for each building in the inventory. Additionally, a critical facility dataset was provided from the county. Overall, exposure and vulnerability of the entire county to pipeline incidents will continue.