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"Clear Knowledge in the Over Information Age"

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To: Mr. Casey LaLonde
Township Manager
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Re: Accufacts report on the repurposing of an existing 12-inch Sunoco pipeline segment to interconnect with the Mariner East 2 and Mariner East 2X crossing West Goshen Township

1. Introduction

Accufacts Inc. ("Accufacts") was asked to assist West Goshen Township ("WGT") in evaluating a recent Energy Transfer Partners/Sunoco Pipeline L.P. ("Sunoco") proposal to repurpose an existing Sunoco 12-inch liquid transmission pipeline to serve as an interconnection to begin moving propane and butane eastward on the completed western portion of the Mariner East 2 ("ME 2") and completed eastern segment of Mariner East 2 Expansion ("ME 2X") pipelines ("Repurpose Project").[1] Remaining portions of the yet to be completed ME 2 and ME 2X have run into unexpected challenges and delays in allowing their full project installations. It should be noted that the 12-inch pipeline segment involved in the Repurpose Project will be returned to its previous refined product (i.e., gasoline, jet fuel, and diesel) service once the ME 2 and ME 2X projects are fully installed.

This Accufacts evaluation focuses on the repurposed 12-inch segment that could directly impact WGT and follows a similar evaluation process utilized for the ME 1 and ME 2 pipelines crossing WGT. [2] My evaluation follows a process safety management "system" approach focused mainly on the 12-inch pipeline spanning WGT. This includes validating pipeline integrity, possible threat evaluation to the specific pipeline, the pipeline's design and

[1] A third expansion project after ME 1 and ME 2 was initiated by Sunoco as a new 16-inch pipeline to carry additional HVLs eastward, beyond that supplied via ME 1 (8-inch) and ME 2 (20-inch), and is now renamed ME 2X.

[2] Accufacts public reports to WGT Township Manager, Mr. Casey LaLonde, "Accufacts Report on Mariner East Project Affecting West Goshen Township," dated March 6, 2015, and "Accufacts Report on Mariner East 2 Expansion Project Affecting West Goshen Township," dated January 6, 2017.

operation, and other system equipment beyond WGT such as mainline valve placement/actuation, control room remote release detection and monitoring, as well as automatic and emergency shutdown and response planning. As discussed further below, the 12-inch pipeline meets or exceeds federal pipeline safety regulations for HVL liquid transmission pipeline service. Additional observations as they relate to the Repurpose Project's 12-inch pipeline, are discussed below.

Accufacts provides specialized technical and safety expertise in pipeline siting, design, operation/maintenance, emergency response, and regulatory requirements, especially as it relates to HVLs, a category of liquids given special definition and regulation in the federal pipeline safety regulations.[3] Accufacts assisted WGT's legal team in collecting relevant technical information from Sunoco regarding the design and operation of the proposed repurposed ME 1, and the new ME 2, providing advice as to the safety and adequacy of Sunoco's approach. The safety processes used to analyze the ME 1 and ME 2 pipelines is very similar, though the threats, pipe diameter, and specific materials moved on each pipeline can influence various safety approaches that have been implemented.

The discussion and conclusions in this report are based on a careful review and analysis of detailed information provided by Sunoco to Accufacts under the conditions of a Settlement Agreement between WGT, approved by the Pennsylvania Public Utilities Commission, as well as a Nondisclosure Agreement, or NDA, restricting release by Accufacts of certain "sensitive" information. While this limitation does not restrict Accufacts' ability to present its independent critical observations, the reader should be aware of the obligation to honor the NDA, as Accufacts will not disclose such sensitive details.

2. The Repurpose Project Interconnection System

Under the Repurpose Project, Sunoco is proposing to temporarily use slightly more than 24 miles of an existing 12-inch line segment to interconnect a western portion of the completed 20-inch ME 2 pipeline ending at Fairview Road in Wallace Township, with the completed downstream eastern segment of the 16-inch ME 2X that begins at Glen Riddle Junction in Middletown Township, and flows to the system's terminus, the Sunoco Marcus Hook Industrial Complex on the Delaware River. The Repurpose Project, depending on the material shipped, would allow Sunoco to move approximately 150 to 160 MB/D of butane or propane liquids from western Pennsylvania eastward to Sunoco's Marcus Hook facility until the ME 2 and ME 2X pipelines are fully completed, at which time the 12-inch line would be returned to its previous refined products service.

[3] 49CFR§195.2 Definitions.

The 12-inch pipeline passes through the Boot Road pump station located within WGT, but does not utilize the pumps at this station, as pumping is not needed at this site for HVL movement to reach Marcus Hook. The nearest upstream pump station involving the interconnected Repurpose Project system is at Middletown pump station, located in Londonderry Township, Dauphin County, approximately 72 miles upstream of WGT. The Middletown pump station will supply energy to the 20-inch ME 2 Pipeline running approximately 60 miles eastward where it will interconnect at Fairview Road in Wallace Township to the slightly over 24 miles of the 12-inch that would then flow eastward until it connects to the completed eastern portion of the 16-inch ME 2X at Glen Riddle Junction in Middletown Township. The Marcus Hook delivery facility is roughly 20 miles downstream of WGT.[4]

3. Integrity of the repurposed 12-inch pipeline segment

The Repurpose Project will utilize slightly over 24 miles of existing 12-inch pipeline that was originally installed in 1937, consisting of seamless Grade B pipe that is not at risk of vintage seam cracking or selective seam crack corrosion threats, specialized forms of "crack like" threats that can result in pipeline rupture. The 12-inch Repurpose Project pipeline segment, like the ME 1 8-inch line, crosses slightly over a mile of WGT passing through the Boot Road pump station site. Approximately 55% of the slightly over one mile of 12-inch pipeline spanning WGT has been replaced with pipe of 1968 or newer vintage. It is not unusual to have certain sections of an older pipeline updated or replaced. This could be due to imperfections or major anomalies introduced with time, such as corrosion or third-party damage identified by field inspections or assessment methods such as inline inspection ("ILI") tools that may identify that a particular section of the pipeline be remediated or replaced. Pipe segments may also require replacement and relocation because of other needs such as roadwork or other activities that have nothing to do with the condition of the pipeline.

3a) Age of steel pipe is a poor risk predictor

As mentioned in previous reports, pipe steel, even pipe steel manufactured over 80 years ago, does not age or wear out like some older materials such as cast or wrought iron that can be "age" sensitive. Pipe steel has essentially an infinite life if properly maintained and operated within its design parameters, and periodically assessed as to its integrity. The type of 12-inch pipe installed in 1937 underscores why risk factors cannot be properly assigned to steel pipe based solely on age, such as old versus new claims. For

[4] Because the older 12-inch segment utilizes a different milepost numbering system, I have just referenced by approximate mileage from key facilities to avoid confusion.

example, because of greater uncertainties, safety factors during manufacturer for some older steel pipe tended to be more stringent than that utilized on new steel pipe. This is one reason why many types of older steel pipe can easily accept hydrotest pressures well above 100% specified minimum yield strength, or SMYS, without damage. Quite simply, much of the so-called old steel pipe across the U.S. can be in better condition for service than some new steel pipe. Thus, age by itself is a very poor predictor of steel pipe failure risks. For the Repurpose Project, the 12-inch pipe steel, both initially installed and the newer replacement segments within WGT, do not exhibit cracking threat risks associated with certain vintages of pipe that can be very challenging to assess as to its integrity.

3b) Sunoco has met or exceeded federal hydrotesting requirements in assessing the 12-inch pipeline's integrity for future service.

Given the type of pipe, a strength test hydrotest, like that performed by Sunoco in 2017 involving the 12-inch segment, is appropriate in assessing the existing 12-inch pipeline's integrity to operate at the determined maximum operating pressure, or MOP.[5] Sunoco has provided me with the hydrotest details regarding the important 2017 pipe integrity verification assessment. In addition, Sunoco also submitted further evidence that in 2017 they went beyond minimum federal hydrotest regulations by performing a spike hydrotest at pressures above the strength hydrotest defined in federal pipeline safety regulations.[6] Sunoco also reported the hydrotest results as pressures and as a percentage of specified minimum yield strength, or % SMYS. SMYS and % SMYS are important pipe variables in evaluating pipeline potential failure risks utilizing pipe fracture mechanics. Neither the spike hydrotest nor reporting results as % SMYS are required in federal pipeline safety regulations. For the Repurpose Project, Sunoco has met and exceeded federal requirements in the important integrity assessment validation method utilizing hydrotesting to verify the pipe's integrity and maximum operating pressure, or MOP.

In addition, it is also worth noting that Sunoco had run in-line inspection ("ILI,") tools, commonly called smart pigs, before the 2017 hydrotest. The ILI runs were utilized to help identify possible pipe corrosion or abnormal force damage anomalies that may have needed remediation/replacement to assure a successful hydrotest. The modifications to

[5] MOP is defined in federal pipeline safety regulation 49CFR§195.406. Surge and other pressure variations up to 110% MOP are allowed in the pipeline provided the operator has incorporated "adequate controls and protective equipment to control the pressures within this limit."

[6] A spike test is a short duration hydrotest (on the order of 15 to 30 minutes) at pressures higher than a strength test that is required to be carried out for eight hours. While not required, spike hydrotests are usually performed in addition to a strength hydrotest to provide additional confidence in a pipe's integrity.

the 12-inch pipeline repurpose segment incorporate the installation of pig launchers/receivers to permit future ILI runs on this pipeline segment. ILI can be an important integrity monitoring approach, especially since the 12-inch pipeline spanning WGT is obviously located in a high consequence area, or HCA.[7]

Sunoco recently, within the last month, repeated hydrotesting, both strength and spike, and an additional ILI run of the 12-inch pipeline segment to assure pipeline integrity for its new service. No hydrotesting failures occurred even though this recent hydrotest was performed at slighter higher pressures then those of the 2017 hydrotest. The recent ILI run indicated no anomalies requiring timely remediation, though additional field verification digs are currently being performed to verify ILI tool performance tolerances and that identified anomalies are within acceptable levels, as is advised by industry standards for ILI tool runs.

4. Operation of the Repurposed Project 12-inch pipeline affecting the Township

Given my background and experience, several main operational issues are relevant to the Repurpose Project 12-inch segment that could affect WGT.

4a) Overpressure protection on the 12-inch pipeline segment

The MOP of the approximately 24 miles of 12-inch pipeline will be lower than that for either the ME 2 or ME 2X pipelines that it will be operationally linked with as one pipeline system. In further questioning, Sunoco provided me with evidence of the protective equipment that will be utilized to keep the 12-inch pipeline below 110% MOP. While not specifically defined in federal pipeline safety regulations, prudent safety management approaches usually require that overpressure protection be based on two independent systems that are not linked, and that do not rely on an individual, such as control room operator intervention, to prevent an overpressure event. Sunoco has demonstrated to me that their overpressure protection on the 12-inch is based on two independent levels of safety equipment, not relying on human intervention, to prevent overpressure. On a liquid pipeline, overpressure can occur very quickly, well before a control room operator, for example, could recognize and timely intervene to prevent overpressure. While the control room operator has the capability to initiate automatic shutdown of the pipeline at any time, Sunoco has undertaken an approach to establish two independent safety equipment installations that don't rely on humans to prevent possible overpressure on the 12-inch line.

[7] An HCA is defined in federal pipeline safety regulation 49CFR§195.450, and currently requires integrity evaluation, such as ILI, at least every five years.

The MOP limitation on the 12-inch pipeline will also restrict the maximum flow rate of the Repurpose Project pipeline that will vary with the product. A quick calculation will easily demonstrate that maximum flow rates will be below Sunoco's internal maximum design velocity to avoid large surge overpressure events from flow changes, such as inadvertent valve closure, or pump shutdown. Sunoco has repeatedly demonstrated to me that their engineers and design standards understand the risk of surge overpressure in their liquid pipelines and have taken measures to avoid such situations.

4b) 12-inch pipeline segment remote operation of mainline valves

The 12-inch pipe that could affect WGT contains a remotely operated valve at the Boot Road pump station that splits the 12-inch pipeline that could affect WGT into two segments. The nearest valve upstream on the 12-inch line will be at Exton Junction in Chester County, approximately 4 miles upstream from the Boot Road valve. This existing valve from the line's previous service is currently a manual valve, but at the request of Accufacts, Sunoco has agreed to add a remote actuator to this valve before startup. The nearest downstream mainline valve on the 12-inch is approximately 6 miles downstream of Boot Road in Middletown Township in Delaware County, and is also a remotely operated valve.

Given the many uncertainties in valve placement calculations and decisions, the science of valve placement on a liquid HVL pipeline is not determined within feet along a pipeline, but by miles or approximate milepost. The location and valve operation decisions are driven by such factors as the material being moved, pipe diameter, sensitive area locations along the pipeline, and the ease and quickness of when a valve can be accessed and closed in an emergency. Given the smaller diameter of the pipeline, the valve locations on the 12-inch Repurpose Project segment appear reasonable. In a release emergency, manual valves cannot be closed as quickly as remotely operated valves. The remotely operated valves along the 12-inch will be similar in purpose and pipeline system integration as remotely operated valves on the ME 1 and ME 2 projects.[8] Remotely operated valves can be commanded to close at their location or by the control center. From my perspective, Sunoco has incorporated prudent additional safety design and protocols related to mainline valve remote operation that are not required by federal pipeline safety regulations.

[8] Accufacts public reports to WGT Township Manager, Mr. Casey LaLonde, "Accufacts Report on Mariner East Project Affecting West Goshen Township," dated March 6, 2015, and "Accufacts Report on Mariner East 2 Expansion Project Affecting West Goshen Township," dated January 6, 2017.

Based on recent observations and my extensive experience, I believe there is a need to comment further on two specific issues on mainline valves as they pertain to the Mariner East projects:

i) The dangers and risks of mainline valves in an HVL pipeline are being overstated.

I have found parties trying to prevent the installation of mainline valves on the Mariner East pipelines, declaring that valve installations are unsafe (i.e., adding potential leak sites) in an apparent attempt to stop the Mariner East projects. While I can appreciate the efforts to stop the projects, claims that valves are unsafe are based on false information and lack of experience that fails to understand and recognize the design, operating, and maintenance requirements, as well as the safety purpose of mainline valves, especially in sensitive locations. Mainline valves are not the primary level of safety protection on a HVL liquid transmission pipeline to prevent a release, but their installation serves an important role as a last level of protection to reduce the volume of release in the event of a pipeline rupture. Properly designed, installed, and maintained, mainline valves serve an important safety role, if ever needed.

ii) An ASME code citing maximum valve distance of 7.5 miles for pipelines moving LPGs is not always adequate.[9]

An American Society of Mechanical Engineers ("ASME") national code for pressure piping, ASME B31.4 attempts to address valve spacing. The section specifically referenced in this code was 434.15.2 Mainline Valves (e) which states: "In order to facilitate operational control, limit the duration of an outage, and to expedite repairs, mainline block valves shall be installed at 7.5 mile maximum spacing on piping systems transporting LPG or liquid anhydrous ammonia in industrial, commercial, and residential areas."[10] The cited section of the ASME code does not rise to the level of pipeline safety regulation for various important reasons. This national code does not consider unique additional risks associated with HVL pipelines in sensitive areas such as HCAs, the significant impact of pipe diameter on potential release volume, nor the unique property that, upon pipeline rupture, HVLs will essentially release the entire volume between closed valves, regardless of pipeline elevation profile. The location of sensitive receptors downhill of an HVL pipeline, for example, may justify

[9] LPGs are usually considered liquefied petroleum gases consisting of ethane, propane, or butanes, or their mixtures. LPGs are basically another name for HVLs.

[10] ASME B31.4-2006, "Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids," documents incorporated by reference, either partly or wholly in 49CFR§195.3 for liquid pipelines.

placement of additional remotely operated valves as a rupture "safety" if such placement doesn't increase the potential to overpressure the pipeline system, a determination easily evaluated by prudent engineering analysis.

Additional pipeline safety regulation regarding mainline valve spacing and placement in liquid pipelines, especially in HVL pipelines, is definitely warranted, but specific regulatory solutions are beyond this report, and will take quite some time and effort to promulgate, if ever, in today's politically charged environment, and emphasis on deregulation.

4c) Automatic Pipeline System Shutdown

Similar to the ME 1 and ME 2 approaches, the 12-inch segment of the Repurpose Project will incorporate safety system methods entailing automatic pipeline shutdown, involving upstream pump station shutdown and remote valve closure along the pipeline system of the 20-inch, 12-inch and 16-inch diameter segments when certain trigger events, indicative of a possible pipeline major release, occur. Since it had been some time since I had reviewed this system, this was discussed in detail with Sunoco as it relates to the 12-inch project. It is my opinion that Sunoco has provided prudent design and installation of safety equipment to assure timely and automatic system shutdown. The control room operator can also manually initiate an automatic shutdown of the pipeline system at any time.

4d) Leak detection and Automatic Pipeline System Shutdown

Because of the complexity of various hydrocarbons, it is very difficult to design and install a leak detection system that can remotely identify all forms of pipeline releases. The 12-inch segment of the Repurpose Project will incorporate similar advanced computer/automatic system monitoring logic utilized in the ME 1 and ME 2 projects to remotely identify possible pipeline releases, especially ruptures. The computer system when triggered can automatically and quickly shut down pumps and close mainline isolation valves. As in the previous Mariner East projects, an independent non-automatic additional leak detection system will be employed across the 12-inch pipeline intended to assist control room personnel in identifying possible lower rate pipeline releases, who then can intervene to initiate pipeline shutdown and isolation. Lower rate releases, often classified as leaks, can be difficult to reliably determine, given the wide range in possible leak release rates.

4e) Emergency Response Plans, or ERPs

Pipeline operators are required under federal pipeline regulation to have emergency response plans to deal with the emergencies associated with pipeline releases. Such procedures focus on protecting people first and then property, establish who is in control and how control is handed off during various stages of a release, what type of command structure is utilized for such emergencies, such as the Incident Command Structure (or ICS) that has proven to be highly effective in pipeline releases, and how communication is maintained with first responders who are usually the first to arrive at a release site. It is important that all parties who may be involved be trained in their various roles and responsibilities in the event of a pipeline release emergency, especially pipelines moving HVL that can have serious consequences.

It is especially important to understand that an ERP will have no "one size fits all" solution to an HVL release at a specific site, as such a simple solution will not likely be appropriate or effective. An effective ERP will outline a process establishing various roles and responsibilities, especially communication with First Responders and the control room. This is a tough concept to convey to the public who tend to want to hear simple answers to complex issues. A pipeline operator's ERP will likely outline different levels of response, and identify key decision makers, given the diverse natures of a pipeline release, such as leak or rupture, and their possible impact along the pipeline's various locations.

During an emergency involving a release, the control room plays a critical role as the emergency contact actually controlling and monitoring the pipeline to assure that appropriate equipment has been properly shut down and pipeline segments isolated. In essence the control operator needs to verify that all automatic shutdown equipment has operated as designed during an emergency. The control room also serves as a liaison with local emergency responders until handoff to company onsite field incident command personnel can occur. The control room thus is a critically important initial contact with local emergency responders to assure everyone is properly communicating/coordinating during the initial stages of a possible pipeline release where there can be much confusion.

Under federal pipeline safety regulations, the pipeline operator is required to notify and coordinate with emergency first responders during pipeline emergencies.[11] The control room should have a list of local emergency contacts, including "other public officials." Local first responders and these officials should also have company emergency contacts and, for obvious reasons as identified above, the important pipeline control room

[11] 49CFR§195.402 Procedural manual for operations, maintenance, and emergencies.

emergency contact number(s). Because of various changes that may occur in organizations, local official contact numbers can be frustratingly difficult to keep current, but the control room contact number usually should never change. Federal pipeline safety regulations place the responsibility to keep emergency contacts with Township officials squarely on the pipeline operator for very good reasons.[12] It is Accufacts' understanding that these important contacts for WGT exists, and that Sunoco has a process for periodically updating the list. I would advise that WGT periodically test the process unannounced to assure it is current.

Quick judgment or reaction to order an evacuation near a release may not be an appropriate response, depending on many factors. While no one approach will cover all situations, shelter in place many times may be the prudent action, but this specific response must be a determined during the release event and will be highly dependent on the terrain and nature of the pipeline release.

5. Accufacts' Conclusions

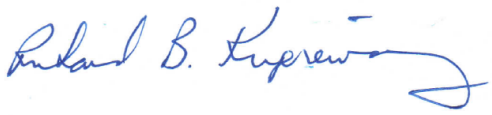
As discussed above, the important 2017 and recent hydrotests of the 12-inch segment and latest ILI assessments, verify its integrity for HVL service at its rated MOP. It is Accufacts' opinion for the section of 12-inch pipeline that crosses WGT, that Sunoco meets and exceeds a number of requirements of the federal pipeline safety regulations. It is Accufacts' opinion that on the Repurpose Project 12-inch pipeline segment spanning WGT, that in the specific areas of:

1. integrity management regulations that are meant to prevent pipe mainline rupture failure,
2. design and mainline valve placement,
3. valve actuation,
4. pipeline overpressure protection,
5. pipeline monitoring,
6. control room procedures,
7. leak detection, and
8. automatic pipeline system shutdown,

Sunoco meets and exceeds the requirements of federal pipeline safety regulations. These additional precautions reflect the level of respect that transporting such materials in a HCA should require in a prudent pipeline operation. Accufacts thus concludes that the 12-inch

[12] 49CFR§195.402(e)(7).

Repurpose Project spanning WGT meets or exceeds the prudent technical approaches commensurate with the safe transportation of HVL.



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