

STATE OF VERMONT
PUBLIC UTILITIES COMMISSION

Petition of Vermont Gas Systems, Inc., for a)
certificate of public good, pursuant to 30)
V.S.A. § 248 , authorizing the construction of)
the “Addison Natural Gas Project” consisting)
of approximately 43 miles of new natural gas) Case No. 17-3550-INV
transmission pipeline in Chittenden and)
Addison Counties, approximately 5 miles of)
new distribution mainlines in Addison County,)
together with three new gate stations in)
Williston, New Haven and Middlebury,)
Vermont)

INTERVENORS’ MOTION TO BROADEN SCOPE OF INVESTIGATION
(CORRECTED)

I. THE MOTION

After being granted Intervenor status in Case No. 17-3550-Inv, Intervenor have conducted a limited investigation, including interviews, a deposition and documentary discovery. However, very much important discovery remains to be done. Discovery was put on hold while the Commission’s RFP was out to bid.

Intervenor have already asked the Commission to address depth of cover violation within the Red Maple/Green Ash wetland in New Haven, at other wetlands, at stream crossings, in residential areas, and in areas of Prime Agricultural soils, and violation of the approved Blasting Plan. As important as those issues are, issues of far greater significance have arisen.

Although discovery is far from complete, sufficient information has been provided to lead a reasonable observer to conclude that Vermont Gas Systems committed widespread, repeated and potentially catastrophic violations of critical public safety requirements of the Certificate of Public

Good. It also violated an environmental protection requirement that is essential to protecting wetlands. Intervenor's seek to broaden the scope of the investigation to include all of the violations that have become apparent, pursuant to Board Rule 5.408 (substantial change requires PUC approval), and 30 V.S.A. §§ 30 and 248, as well as Board Rule 2.105 (procedures not specifically governed), 2.204(G) (amendments to any filing), 2.206 (motions), and 2.107 (waiver of rules). Once the scope encompasses all of the violations, the Commission can properly exercise its authority.

The Commission may decide to seek its own experts to assist it in determining the public safety risks and natural resource risks arising from the evidence.

Ultimately, Intervenor's will ask the Commission to decide whether or not to order immediate cessation of ANGP operation until the pipeline has been excavated and inspected, necessary repairs have been completed and inspected, and the pipeline then is reburied to meet the safety and natural resource protection conditions and specifications upon which the existing CPG was granted. In the alternative, the Commission may require that an amended CPG be applied for under Rule 5.408, incorporating these substantial changes from the approved project.

The violations that are the subject of the motion are summarized as follows:

Safety Violation 1: Uninspected Repairs of Damaged Corrosion Protection Coatings, and Known Damaged Coatings, Were Buried in Many Locations.

Corrosion is a principal cause of pipeline failure and resulting catastrophic loss of life. The testimony and plans submitted in order to obtain the CPG required use of pipes and sleeves with coatings to protect against corrosion, and required inspection of all coatings prior to burial. The Commission's Findings explicitly relied upon the company's commitment to a quality assurance program specifically to protect pipe coatings.

The coatings on pipes and sleeves were found to be compromised due to many causes. Many hundreds of coatings were repaired by unspecified Over & Under and Michels employees with no required training or certification (unlike welders). Coating inspectors complained on over 45 different days that they were too short-staffed to inspect the repairs of each coating defect, because one coating inspector was responsible for 3 to 5 coating crews. Only “spot checks” were made. Many, perhaps most, repaired pipeline and/or repaired sleeve sections were buried before they could be inspected.

The coatings on some pipes buried by means of HDD also were found to be damaged. The company elected not to repair these coatings.

There is no record of how many uninspected pipeline or sleeve repairs were buried, but the notes reveal this was a very common occurrence. The record is unclear how many damaged HDD-installed pipes the company chose not to repair.

Safety Violations 2(a)-(f). Clean Sand Was Not Placed Under and Over the Pipe.

The CPG plans required that “**CLEAN SAND**” be placed **6 inches under the pipe (9 inches if on rock) and 12 inches over the pipe for the entire 41-mile length of the pipeline** (except where HDD was used). “**APPROVED BACKFILL**” was required to be placed **on top of the 18 to 21 inches of “CLEAN SAND.”** Clean sand or other high quality backfill, under and over the pipe, is necessary to avoid abrasion of coatings and reduce corrosion.

Violation 2(a). The pipeline was placed directly on trench bottom, without clean sand (or other backfill), in numerous locations.

The company’s written specifications for its contractors in 2014 explicitly authorized the contractors to lay the coated pipe directly on trench bottom, in patent violation of the CPG-approved plans. Contractors complied with the company’s specifications by laying the pipe directly on trench bottom in some locations in 2014.

The specifications to contractors then were changed to require that at least 6 inches of “select backfill” – not necessarily sand -- be placed under the pipe at all times. Nonetheless, in June of 2016, Vermont’s inspector found ongoing construction in which pipe was being laid directly on trench bottom without any clean sand or other backfill beneath it.

In July of 2016, the company agreed not to lay pipe without use of select backfill such as sand beneath it. Nonetheless, in September of 2016, the

company again laid pipe without clean sand or any other backfill beneath it, in wetlands in New Haven and Monkton (see # 5 below).

Violation 2(b). In 2014, in those locations where the pipe was not placed directly on trench bottom, there is no record that clean sand or other select fill was placed under and over the pipeline.

The company's daily inspection records in 2014 contained columns for stating the number of loads of "select fill/sand" used in each location. Each column on every day reported "0." It appears that neither sand nor the substitute select fill which the company had unilaterally authorized was used in those sections where the pipe was not placed directly on trench bottom. Regular backfill must have been used.

Violation 2(c). In 2015, there is no record of sand or substitute select fill under and over the pipeline.

Records for 2015 continued to show "0" loads of "select fill/sand" used in each location.

Violation 2(d). In late 2015 and 2016, the company ceased recording whether sand or any other select backfill of any kind was being used.

In 2016 the company ceased asking inspectors to document whether select backfill of any kind (clean sand or a substitute) was being used. There are no more "0" entries because the inspection reports ceased addressing this topic.

Violation 2(e). In 2016, other records show a very small amount of sand was used, and in many areas neither clean sand nor a substitute was used.

Sand-purchase invoices show that only a small amount of sand, 350 c.y., was purchased in all of 2016. Other daily reports demonstrate that the pipeline was constructed on sandbags spaced 15 feet apart with no sand or select fill between the sandbags. Regular backfill was used.

Violation 2(f). In 2014, 2015, and 2016, the company kept no records showing that the required depth of sand or substitute select fill was measured or inspected.

In those locations where records show that sand or other select backfill of any kind was used, there is no documentation in 2014 or 2015 that clean sand or other select backfill below the pipe was measured to a depth of 6 inches on top of soils and 9 inches on top of rock, or that sand or other select backfill was measured to a depth of 12 inches above the pipe.

There is no record that the contractors' measurements or depths were ever inspected.

In 2016, there is no record of the use of clean sand or other select backfill of any kind at any section of the pipeline, so there also are no records of depth.

Safety Violations 3(a)-(d). Screening, Inspection, Compaction and Compaction Testing of Regular Backfill Did Not Occur. The CPG plans required that **regular backfill be placed over the select backfill, and that it must be: i) screened and inspected to ensure no rocks or soil clods over 3 inches in length were present, ii) compacted in 6-inch layers; iii) compacted to 90% within the VELCO ROW, iv) tested to insure proper compaction had occurred and then v) covered with topsoil. Properly inspected and compacted backfill is absolutely necessary for pipeline safety in the VELCO ROW and at all road crossings because load-bearing calculations were explicitly based properly compacted soils.**

Violation 3(a). There exist no records showing that backfill was being: i) screened and inspected to ensure no rocks or soil clods over 3 inches in length were present, ii) compacted in 6-inch layers; iii) compacted to 90% within the VELCO ROW, or iv) tested to insure proper compaction had occurred.

The company hired and formally designated "inspectors." Neither the inspectors nor the workers they were inspecting kept any records of backfill screening, backfill inspection, backfill layering, backfill compaction or backfill testing.

Violation 3(b). The company changed the screening standards so they would be less protective than the CPG standards.

The company's specifications to contractors changed the screening standard from 3 inches to 6 inches in 2015. The company did not consult with the Department, or inform the Commission, before changing the specifications that had been submitted to the Commission. From that date forward, backfill with rocks and clods of soil larger than 6 inches was used.

Violation 3(c). Backfill compaction testing did not occur except in 11 locations, where more than half of the compaction was found to be substandard.

There is no record that any construction contractor or the company tested backfill compaction, with two exceptions. Eight tests were done by Knight Engineering, in 2015, which showed widespread failure. At 8 locations within the VELCO ROW, 5 showed inadequate compaction. Additional

testing was performed at 3 VELCO ROW sites in 2016. One of the 3 additional sites failed. Intervenors do not know if testing has been done under roads.

Violation 3(d). Backfill compaction throughout the VELCO ROW probably does not meet the safety standard of 90%.

It is probable that much of the backfill throughout the VELCO ROW does not satisfy the 90% compaction pipeline safety requirement. The only evidence that exists is the data from the 11 sites tested by Knight Engineering. Six of the 11 sites tested failed.

Safety Violation 4. Zinc Ribbon Corrosion Protection for 2 High Risk Areas Was Not Installed, or There Is No Record of Where It Was Installed. An ARK engineering report issued in 2013 required that heightened corrosion protection be utilized in 27 specified high-risk areas (such as wetland areas that are parallel to or cross the VELCO ROW) by installation of zinc ribbon.

There is no record of installation of the zinc ribbon in the New Haven Red Maple/Green Ash swamp and a second location in St. George.

Safety Violation 5. The Unwritten “Sink in Swamp” Method Replaced the Two Approved Methods of Construction in Wetlands. The CPG required that the ANGP be constructed using the methods described in the construction plan exhibits. PHMSA requires adherence to written specifications. The exhibits contained two methods of construction, the trench method and Horizontal Directional Drilling, each of which were circumscribed by detailed written environmental and pipeline integrity protection standards.

In several wetland areas, a third, unwritten method was adopted, the “sink in swamp” method. This involved digging trenches on either side of the pipeline and relying on the weight of the pipeline to squeeze soils out from beneath it. The pipeline ended up on the bottom of the trench, without sand or select fill, without inspection of the soils the pipeline came to rest upon, and without inspection of the soils backfilled on top of the pipeline.

Safety Violations 6(a)-(c). No Quality Assurance Plan Was Adopted and Implemented Until Most of the ANGP Had Been Completed; the QA Plan Fails to Address Known Safety Risk and the CPG. The CPG required that the company adopt and enforce a written **Quality Assurance** plan as well as a **QA plan specific to coatings**. PUC findings rejected other safety conditions that had been requested in reliance on the company’s commitment to rigorous QA.

Violation 6(a). In 2014, construction occurred without a QA Plan or QA review.

The company had no QA plan in 2014, when the first 11 miles were constructed -- during which time pipe was laid directly on trench bottoms, contrary to the plans submitted to the PUC. The first QA review was conducted in December of 2015.

Violation 6(b). In 2015, construction continued despite DPS warnings the QA Plan lacked critical elements.

The Department's inspector warned the company in 2015 that it was constructing the ANGP without "critical elements" of a QA plan. Construction continued.

Violation 6(c). The company's QA documents do not address known compaction testing failures and their consequences for public safety, or the commitments made to the Board.

The company's QA documents omit the results of the 11 sites tested by Knight Engineering in 2015 and 2016, the failure to conduct compaction testing anywhere else, and the link between inadequate backfill compaction and pipeline failure. The QA documents also do not mention any of the commitments made by the company to the PUC.

Natural Resource Violation. Failure to Use Bentonite Trench Breakers. No bentonite was used at 13 wetland and stream locations. This places at risk the viability of each wetland.

II. THE 7 VIOLATIONS

VIOLATION 1: UNINSPECTED REPAIRS OF DAMAGED CORROSION PROTECTION COATINGS, AND KNOWN DAMAGED COATINGS, WERE BURIED IN MANY LOCATIONS.

Damaged or defective coatings are the single most common pipeline construction problem, according to the federal agency in charge of pipeline safety, the Pipeline and Hazardous Material Safety Administration, "PHMSA." PHMSA Pipeline Construction; FAQs, Question 2¹.

¹ <https://primis.phmsa.dot.gov/construction/faqs.html>.

Good coatings are “necessary” as one of two “layers of protection” against corrosion, according to PHMSA. The “cathodic protection” or “CP” system by itself does not suffice, because “the CP system is not always enough. There may be issues that reduce the effectiveness of CP, such as shielding. There may be problems with the CP system that go undetected for some period.” And, critically, just a few months of corrosion can doom a pipeline: “Experience has shown that corrosion can do significant damage to a pipeline if CP is not adequate, even for a period of a few months.” Therefore, it is “necessary to assure that pipeline coating is good to provide continued assurance of protection against corrosion even if CP problems occur.” PHMSA Pipeline Construction; FAQs, Question 4.

Later inspections, after the pipeline is buried, cannot substitute for quality assurance during construction. PHMSA Pipeline Construction; FAQs, Questions 2 and 7

A problem commonly found by PHMSA is “field-applied coatings have been identified as inadequate.” PHMSA Pipeline Construction; FAQs, Question 12. “Unrepaired coating defects at lowering” is one of the typical problems found by PHMSA inspectors. PHMSA Pipeline Construction: Miscellaneous². Poorly qualified construction personnel, poorly qualified inspectors, improper procedures, failure to follow procedures and lack of procedures are the most common problems that State pipeline inspectors have found. PHMSA Pipeline Construction; FAQs, Question 20.

Finding 120 of the Commission’s order in Docket 7970 addressed the potentially horrendous impacts of pipeline failure: “The impact radius, or the area subject to catastrophic harm

² <https://primis.phmsa.dot.gov/construction/issuemiscellaneous.html>

to both property and person, caused by a catastrophic breach of the transmission pipeline as designed by VGS is approximately 320 feet.” After finding that property and persons could suffer catastrophic harm within 320 feet of the pipeline, the Commission decided to approve of the project without a setback requirement of 320 feet. It did so for two reasons.

One reason was that a setback of that distance is not feasible. (Finding 277).

The second reason was the company’s “demonstrated commitment” to safety. “Vermont Gas has provided ample evidence that its design for the Project meets or exceeds all applicable federal and state standards and that the Company will implement robust operational and monitoring controls.” (“Discussion” following Finding 284).

Quality assurance was one of the principal standards and controls the Commission relied upon – and in particular, **quality assurance with regard to coatings**. Finding 264 of the Commission’s order in Docket No. 7970 stated that the pipeline would be constructed under a quality assurance plan that addresses “pipe inspection... applying and testing field-applied coating, lowering of the pipeline into the ditch, padding and backfilling...” Finding 265 stated that the company “will have a quality assurance inspection and testing program for the pipe coating that will cover the surface quality of the bare pipe, surface cleanliness and chlorides, blast cleaning, application temperature control, adhesion, cathodic disbondment, moisture permeation, bending, coating thickness, holiday detection and repair.”

The facts found in the company’s documents reveal widespread, open violation of this commitment. Defective coatings were found on pipe and on the canusa sleeves that cover welds. Then it was discovered that the patch kits used to repair the pipeline themselves were defective,

so canusa sleeves had to be placed over the patch kits as well – but some batches of the canusa sleeves themselves had defective coatings. All of this had to be repaired in the field by Over & Under and then Michels’ employees.

Discovery response 1-114.1, consists of “Inspection Reports.” The following entry (with slight variations) **appears on 45 different days:**

There are several coating crews now so I am unable to observe/report on all coating/sleeves. All reports turned in are a spot check status as I overlook 3 to 5 different crews depending on the day.

Coatings are essential to public safety. One inspector was covering 3 to 5 coating crews. He was performing only “spot checks.” The inspector complained of inability to inspect on 45 different occasions.

The company’s response to the Department when Department engineer Morris raised these concerns was to dismiss them as unnecessarily protective. Yes, there was only one inspector for three coating crews, the company wrote in its formal QA report (attached), but “There is no requirement, either contractual or statutory” to having a coating report for each coating application...” In other words, the company views its commitments as not including inspection of all coatings before the pipeline is buried.

Besides which, the company wrote, the lack of good coatings is not a safety problem. The company wrote that commissioning of the CP system “at the time of gas-up” and a “direct assessment survey” would provide any mitigation that might be needed. But PHMSA explains that both good coatings *and* CP are necessary. And a “direct assessment survey” does not include

visual inspection. The only way to visually inspect exterior coatings is by inspecting them before the pipe is buried, or by excavating the pipe later.

Coatings also were damaged during HDD installation -- and were not repaired. The company wrote that the coatings did not need to be repaired because “The commissioning of the cathodic protection (CP) system and a direct assessment survey... will provide additional mitigation to address this concern.”

Sixty-six canusa sleeves from batches that were found to be defective had been buried before the defect was discovered. Testing by the manufacturer showed that the coating failure was occurring but that it did not reach the inner-most coating. The 66 sleeves were left in the ground. Christopher LaForce, March 2, 2017, Report on Canusa Shrink Sleeve Peel Tests.

It turned out that the sleeves left in the ground (also known as wraps) were not adequate. An in-line investigation of another pipeline revealed “significant pipe degradation (resultant from the wrap).” The Department’s engineer asked the Department’s pipeline expert, Mr. Berger, for his advice. He responded that he possessed confidential information about canusa sleeve failure and could not answer the question. August 30, 2017 Morris/Berger emails.

Eight hundred feet of the ANGP also was buried with backfill that, according to “a variety” of witnesses, had “broken glass... chunks of metal and other household garbage/trash” mixed in with the backfill. These could compromise coatings. The company did not find and remove the glass, metal and other garbage during the two attempts it made to excavate the pipeline. The company stopped looking. Finding the glass, metal and garbage was unnecessary, the company

stated, because the CP system would be placed into operation “at the gas-up of the pipeline” and because there would be a direct assessment survey. 10/1915 Corrective/Preventative Action Plan.

There is no record of how many times repaired but uninspected pipeline or sleeve was buried, but the inspectors’ notes, the QA report, and Department documents reveal this was a common occurrence. The company’s QA report acknowledges there were 340 weld sleeves that lacked adequate records of repair. An email from the Department’s engineer to the Department’s expert, Mr. Berger (attached) refers to the problems that required repair on the pipes (not the sleeves over the welds) as occurring at “multiple locations” on the ANGP of an “unknown number.” There is no usable record of where those locations are. Neither station number nor GPS data were created to record where repaired-but-uninspected pipe or sleeves have been buried.

The CP system that the company repeatedly stated would mitigate the failure to inspect coatings and the known coating defects in fact was not placed into commission “at time of gas-up.” The pipeline was gassed up on April 12, 2017. In August of 2017, VGS expert Adam Gero wrote that “VGS is still working on the finalization of the CP.” He wrote that he expected completion of the CP system in the “mid-fall” of 2017. There are no records which have been produced by the company which indicate the system has yet been commissioned.

It appears now that the ANGP has been gassed up, but without CP protection, for nearly a year.

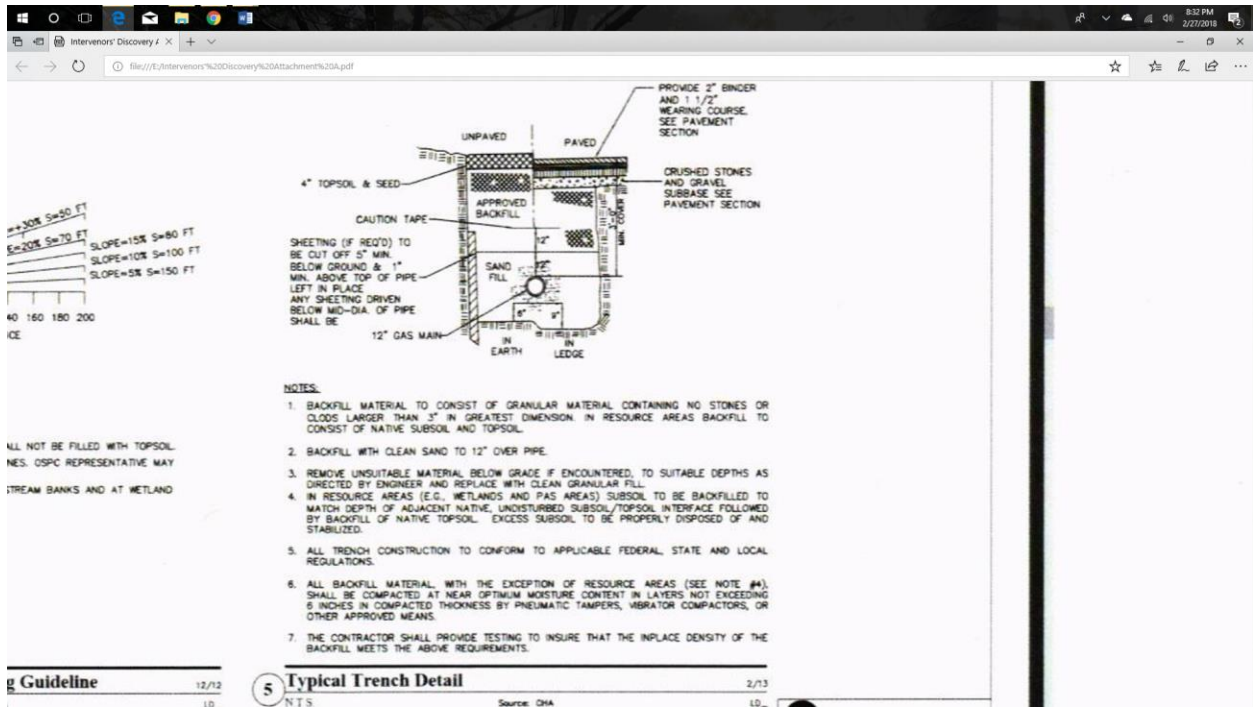
As noted above, PHMSA states that “Experience has shown that corrosion can do significant damage to a pipeline if CP is not adequate, even for a period of a few months.” PHMSA Pipeline Construction; FAQs, Question 4.

The public is now in precisely the situation that, according to PHMSA, should never have happened. There was no inspection of 2/3 to 3/5 of the repaired pipe coatings and repaired canusa sleeve coatings (there was one inspector for 3 to 5 coating crews). The CP system has not been operational for nearly a year of operation. Each of the two “necessary” “layers of protection” are missing.

Only by excavating and inspecting the entire pipeline can inspections determine if the coatings of the pipeline and of the sleeves are adequate.

VIOLATIONS 2(A)-(F). CLEAN SAND WAS NOT PLACED UNDER AND OVER THE PIPE.

The trench detail plans submitted to the Commission prior to issuance of the CPG are set forth in Discovery Attachment A and Answer to Request to Discovery Question 1-12 (Agreeing that Attachment A was the trench construction detail plan submitted to the Commission to obtain the CPG.) The details from Attachment A are reproduced here:



The diagram shows the pipe entirely surrounded by “SAND FILL.” It shows a minimum depth of sand fill of 6” on earth trench bottom and 9” on ledge trench bottom. It shows 12” of SAND FILL above the pipe. Above the SAND FILL its shows “APPROVED BACKFILL.”

Note 1 states: “BACKFILL MATERIAL TO CONSIST OF GRANULAR MATERIAL CONTAINING NO STONES OR CLODS LARGER THAN 3” IN GREATEST DIMENSION. IN RESOURCE AREAS BACKFILL TO CONSIST OF NATIVE SUBSOIL AND TOPSOIL.”

Note 2 states: “BACKFILL WITH CLEAN SAND TO 12” OVER PIPE.”

Note 6 states: “ALL BACKFILL MATERIAL, WITH THE EXCEPTION OF RESOURCES AREAS (SEE NOTE #4) SHALL BE COMPACTED AT NEAR OPTIMUM MOISTURE CONTENT TO LAYERS NOT EXCEEDING 6 INCHES IN COMPACTED

THICKNESS BY PNEUMATIC TAMPERS, VIBRATOR COMPACTORS, OR OTHER APPROVED MEANS.”

Note 7 states: “THE CONTRACTOR SHALL PROVIDE TESTING TO INSURE THAT THE INPLACE DENSITY OF THE BACKFILL MEETS THE ABOVE REQUIREMENTS.”

As noted above, Finding 264 of the Commission’s order in Docket No. 7970 stated that the pipeline would be constructed under a quality assurance plan that addresses “pipe inspection... applying and testing field-applied coating, lowering of the pipeline into the ditch, **padding and backfilling...**” (Emphasis added.) Finding 270 stated that the company “**will only use suitable backfill** material that will not shield the cathodic protection system or cause coating damage to the pipeline.” (Emphasis added.) The Certificate of Public Good stated, in paragraph 2 that “Construction of the proposed Project shall be in accordance with plans and evidence as submitted in this proceeding.” Discovery Attachment A is the only plan submitted by the company to the Commission showing what that “padding” and “suitable backfill” would consist of – 6 to 9 inches of clean sand under the pipe, 12 inches of clean sand over the pipe and approved backfill on top of that.

The purposes of requiring clean sand or other select backfill under the pipe are not just to avoid abrading the pipe coating and to provide support to withstand loading. A third, important purpose, is to prevent corrosion. The varying oxygen and moisture of native soils can accelerate corrosion, and nongranular objects can “shield” the pipeline and thereby render CP ineffective. The company did not understand this until the Department explained this to the company in June

of 2016. David Berger email to John McCauley June 20, 2016; John St. Hilaire email to GC Morris, July 1, 2016.

Violation 2(a). Neither clean sand nor any other fill was placed under the pipe in numerous locations in 2014 and 2016.

The company's written specifications for its contractors in 2014 explicitly authorized the contractors to lay the coated pipe directly on trench bottom. VGS Answers to Discovery Requests 1-85 through 1-96, and Discovery Requests Attachments D and E.

Contractors complied with the company's new specifications by laying the pipe directly on trench bottom. No fill of any kind -- much less clean sand - was placed under the pipe in numerous locations in 2014.

The company lacks a complete record of where this occurred. Discovery Attachment 84.3a., the December 21, 2015 QA Report, states "There was concern as to whether proper backfill was used in all areas where construction occurred in 2014. We are uncertain of specific locations where improper backfill may have been used." However, at least 4,200 feet of pipeline was installed in this manner, from station 240+26 to station 279+75 and from station 564+24 to station 567+84. Adam Gero Memorandum "Addison Natural Gas Project Pipe Laid on Trench Bottom," June 6, 2017.

On June 16, 2016, Vermont's inspector found ongoing construction in which pipe again was being laid directly on trench bottom. "At kickoff Williston station observed pipe laid directly on trench bottom..." And on July 8, 2016, Mr. McCauley wrote: "Observing backfilling at Williston substation. Once again noted pipe directly on bottom of ditch." The company argued to Mr. McCauley that this was entirely proper. McCauley Excerpts.

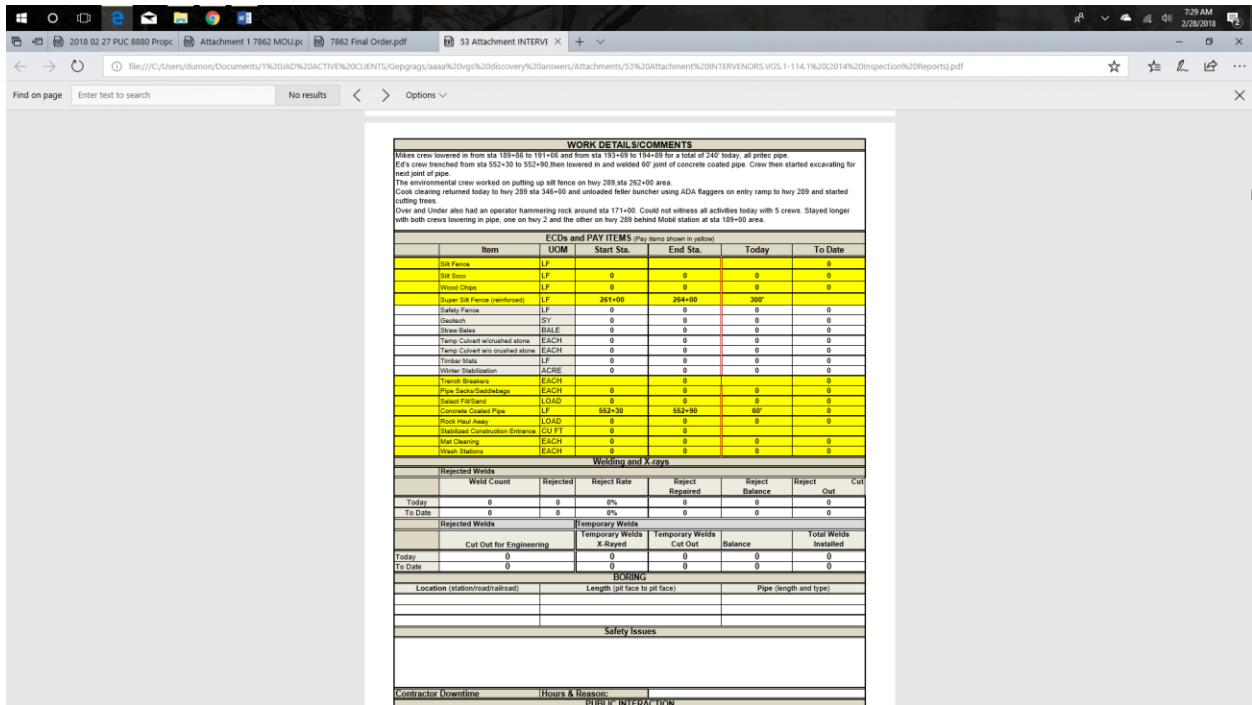
In July 1, 2016, the company agreed not to lay pipe without use of select fill beneath it.

John St. Hilaire email to GC Morris, July 1, 2016

Nonetheless, in September of 2016, the company yet again laid pipe without sand or any other select fill beneath it, in wetlands in New Haven and Monkton (see #5 below). The Department's engineer, Mr. Morris, described this as a repeat of the earlier violations. G.C. Morris email to David Berger 9/8/17. Mr. Morris' email makes clear that the failure to use sand or other select fill beneath the pipe was not restricted to the Red Maple/Green Ash swamp in New Haven – he said this had occurred “several” times, and in an August 7, 2017 email he wrote this had occurred in both Monkton and New Haven. G.C. Morris email to James Porter, August 7, 2017.

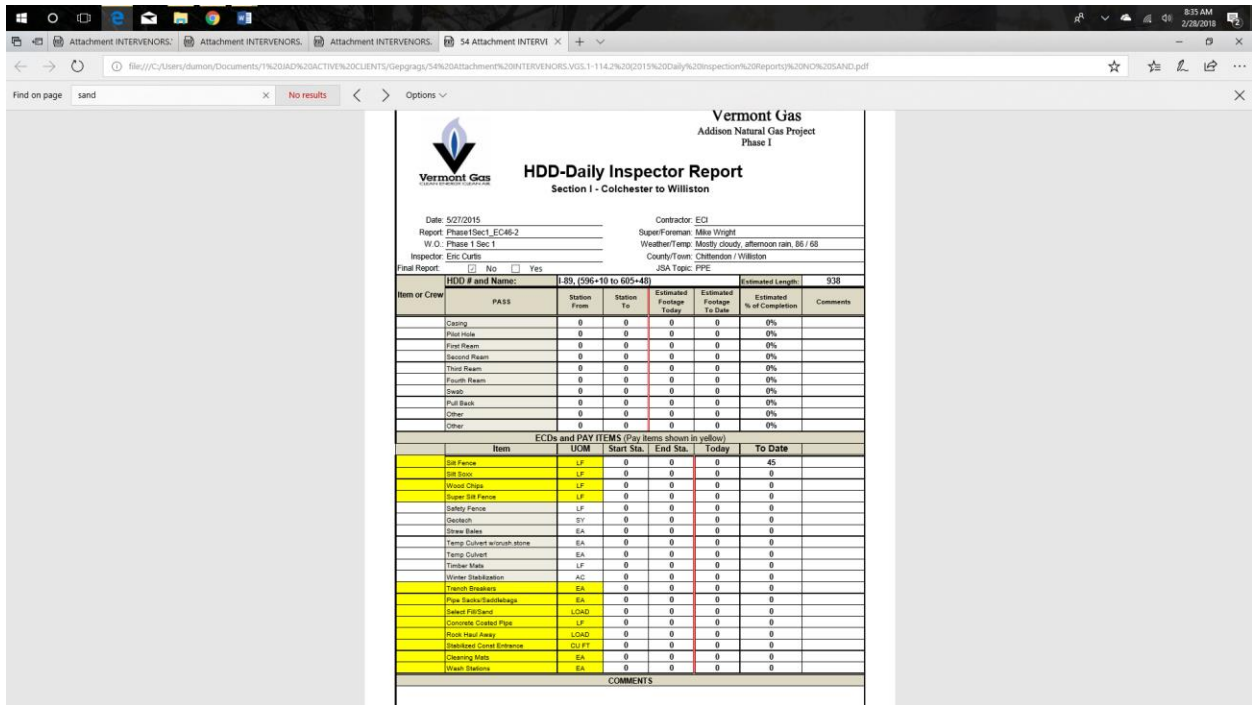
Violation 2(b). In 2014, in those locations where the pipe was not placed directly on trench bottom, there is no record that clean sand or other select fill was placed under and over the pipeline.

The company's daily inspection records in 2014 contained columns for stating the number of loads of “select fill/sand” used in each location. These records reveal that all of the pipeline construction which occurred in 2014 lacked sand or substitute select fill; if sand or substitute select fill in fact was used, there is no record of its use. The daily records state “0” in this category every day. The following, from September 9, 2014, by Inspector J.R. Kelch, is a typical example:



Violation 2(c). In 2015, there is no record of sand or substitute select fill under and over the pipeline.

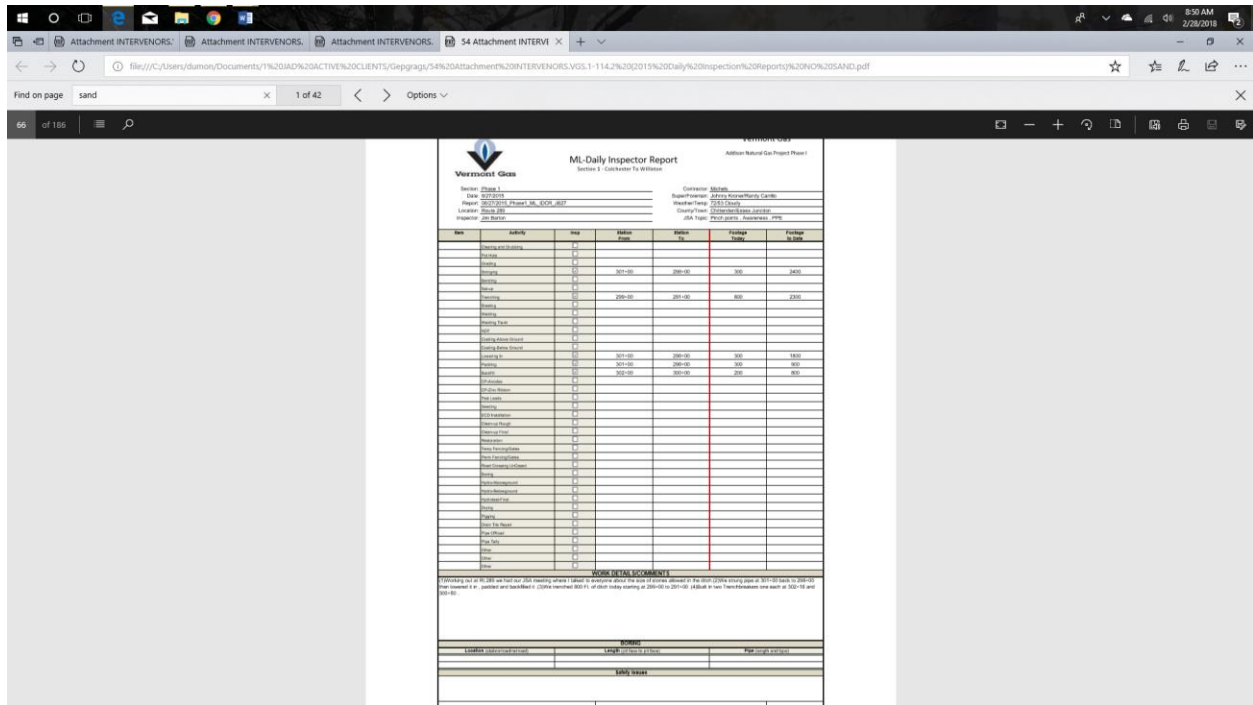
By 2015, the company’s contractor specifications had been changed to require that backfill be placed under the pipe but left it to the contractor to decide not to use clean sand if the contractor believed other materials were adequate. Records for 2015, however, do not indicate that any sections of the pipeline received clean sand or received substitutes. The inspection reports for some of the year contain a column for indicating if “select fill/sand” was used. They are uniformly marked “0.” The May 27, 2017 report, for example, is copied here:



If sand was used, or a substitute for sand was used, there is no record of where either was used, or what the substitute was.

Violation 2(d). In late 2015 and 2016, the company ceased recording whether select backfill of any kind was being used.

The inspection reports for late 2015 and 2016 contained no place to record whether sand or select fill was used. The report of August 27, 2015, for example states that the crew discussed the size of stones allowed in the ditch and that pipe was laid down, padded and backfilled, but there is no mention of sand or select fill:



Violation 2(e). In 2016, other records show a very small amount of sand was used, and in many areas neither clean sand nor a substitute was used.

Sand-purchase invoices show that only 350 cubic yards of screened sand were purchased in all of 2016. (The purchases for sand to place into sandbags is not included.) This would provide select backfill for about 2000 feet of pipeline. Sand Purchase Invoices

Other records show that the pipeline was constructed on sandbags spaced 15 feet apart with no sand or select fill between the sandbags. Either the gaps between sandbags were left empty or regular backfill was used. What follows is one example. It is a daily report for November 2, 2016, by Inspector Scott Carlson. It states that the pipeline was lowered down onto sandbags spaced 15 feet apart, with no fill between the sandbags. The sandbags are the “padding” cited in the narrative.

Attachment INTERVENORS... Attachment INTERVENORS... Attachment INTERVENORS... 7 Attachment INTERVENORS... 9:16 AM 2/26/2018

file:///C:/Users/damon/Documents/1%20AD%20ACTIVE%20CLIENTS/Geopragi/aaa%20vgy%20Discovery%20Answers/Attachments/7%20DataAttachment%20INTERVENORS.VOL.1-74.6%202016%20Backfill%20Reports%20nc%20select%20backfill%20column%20an

Find on page bag 4 of 678 Options

PROJECT NAME: Phase 7 Looping DATE: 11-2-2016
 PROJECT JOB #: CONTRACTOR: Michels
 PROJECT LOCATION: 263+20 to 265+00
 WEATHER CONDITIONS: 56 Sunny

LOWEDED-IN:	FROM STA.	TO STA.	DAILY TOTAL
	263+20	265+00	180'

PADDING:	EACH	FROM STA.	TO STA.	DAILY TOTAL
SANDBAG SUPPORT	12'	263+20	265+00	180'
BENTONITE				
PADDING BERM				

BACKFILL:	FROM STA.	TO STA.	DAILY TOTAL
N/A			

SAFETY: REMARKS:

ONE CALLS MADE	YES <input type="checkbox"/>	NO <input checked="" type="checkbox"/>	
SAFETY MTG CONDUCTED	YES <input checked="" type="checkbox"/>	NO <input type="checkbox"/>	Holliness/Pinch Points
TRAFFIC CONTROL BARRIERS & SIGN	YES <input checked="" type="checkbox"/>	NO <input type="checkbox"/>	Fence and cones installed at end of day
PPE USE COMPLIANCE	YES <input checked="" type="checkbox"/>	NO <input type="checkbox"/>	
WORK SITE HOUSEKEEPING	YES <input checked="" type="checkbox"/>	NO <input type="checkbox"/>	
JOB SITE SECURED	YES <input checked="" type="checkbox"/>	NO <input type="checkbox"/>	

ENVIRONMENTAL CONCERNS:

COMMENTS:
 All O.Q.'s verified prior to tasks being performed. Michels employees lowered in Phase VII 18" pipe and padded ditch from station 263+20 to 265+00. All work went smoothly and without incident. Road cut was backfilled with flowable fill and we will complete backfill and padding tomorrow.

INSPECTOR NAME: Scott Caplan
 INSPECTOR SIGNATURE: *Scott Caplan*
 CHIEF INSPECTOR REVIEW:

Other inspector reports show that the pipe was lowered onto sandbags that had some backfill added but not along the entire distance. What follows is the June 11, 2016 report by Stephen Taylor.³

The screenshot shows a Microsoft Word document titled 'Attachment INTERVENERS'. The document is a project report form for 'Addition Natural Gas Project Phase 1' dated 6/11/16. The contractor is 'Michels'. The project location is 'Drizzle/RAIN 50's'. The weather conditions are 'Drizzle/RAIN 50's'. The form includes a table for 'LOWERED-IN' pipe measurements, a table for 'PADDING' (SANDBAG SUPPORT, BENTONITE, PADDING BERM), and a table for 'BACKFILL'. The safety checklist includes items like 'ONE CALLS MADE', 'SAFETY MTG CONDUCTED', 'TRAFFIC CONTROL BARRIERS & SIGN', 'PPE USE COMPLIANCE', 'WORK SITE HOUSEKEEPING', and 'JOB SITE SECURED'. The environmental concerns section is empty. The inspector's name is Stephen Taylor, and the signature is Stephen L. Taylor.

PROJECT NAME:	Addition Natural Gas Project Phase 1	DATE:	6/11/16
PROJECT JOB #:	28757	CONTRACTOR:	Michels
PROJECT LOCATION:			
WEATHER CONDITIONS: Drizzle/RAIN 50's			
LOWERED-IN:	FROM STA.	TO STA.	DAILY TOTAL
line pipe	885+20	887+00	180
PADDING:			
EACH	FROM STA.	TO STA.	DAILY TOTAL
SANDBAG SUPPORT	885+20	887+00	
BENTONITE			
PADDING BERM			
BACKFILL:			
FROM STA.	TO STA.	DAILY TOTAL	
885+40	886+00	120	
SAFETY:			
ONE CALLS MADE	YES <input checked="" type="checkbox"/>	NO <input type="checkbox"/>	REMARKS:
SAFETY MTG CONDUCTED	YES <input checked="" type="checkbox"/>	NO <input type="checkbox"/>	
TRAFFIC CONTROL BARRIERS & SIGN	YES <input checked="" type="checkbox"/>	NO <input type="checkbox"/>	
PPE USE COMPLIANCE	YES <input checked="" type="checkbox"/>	NO <input type="checkbox"/>	
WORK SITE HOUSEKEEPING	YES <input checked="" type="checkbox"/>	NO <input type="checkbox"/>	
JOB SITE SECURED	YES <input checked="" type="checkbox"/>	NO <input type="checkbox"/>	
ENVIRONMENTAL CONCERNS:			
COMMENTS:			
INSPECTOR NAME: Stephen Taylor			
INSPECTOR SIGNATURE: Stephen L. Taylor			
CHIEF INSPECTOR REVIEW:			

Violation 2(f). In 2014, 2015, and 2016, the company kept no records showing that the required depth of sand or select fill was measured or inspected.

There is no documentation in 2014 or 2015 that sand or select fill was measured to a depth of 6 inches on top of soils, 9 inches on top of rock, and 12 inches above the pipe, in those locations where records show that select fill of any kind was used.

In 2016, there is no record at all of the use of sand or select fill (except the sand purchase invoices, showing purchase of 350 c.y.), so there are no records of depth.

³ Each whole number in the station number represents 100 feet. For example, the distance from 885.00 to 886.00 is 100 feet; to 885.20 it would be 120 feet.

If contractors did measure depth, and then filled to those depths, there is no record that the contractors' measurements or depths were ever inspected. It was an honor system. It was an honor system that did not require those whose work was not being inspected to record that they were complying.

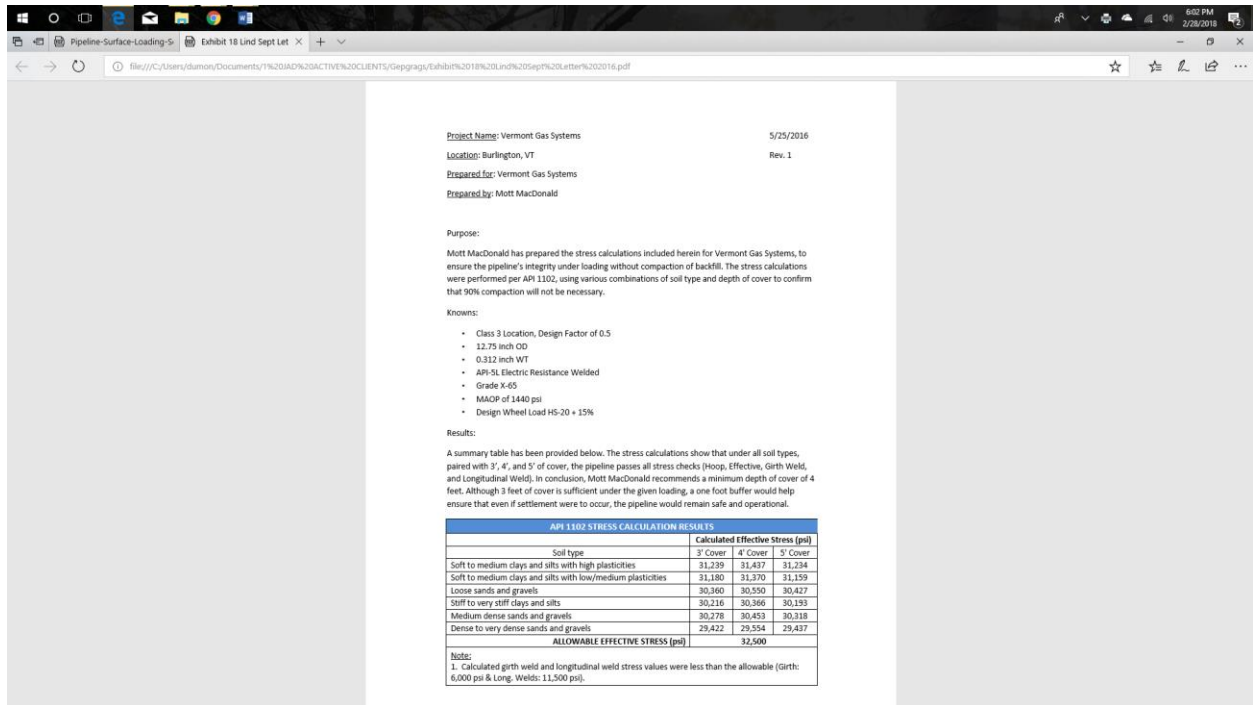
The Commission relied on the fact that “the Company will implement robust operational and monitoring controls.” (“Discussion” following Finding 284). A construction process that did not require contractors to *record* compliance with construction standards, and did not require inspectors to *inspect* compliance, lacks “robust operational and monitoring controls.”

Safety Violations 3(a)-(d). Screening, Inspection, Compaction and Compaction Testing of Regular Backfill Did Not Occur.

The CPG plans required that regular backfill be placed over the select backfill, and that it must be: i) screened and inspected to ensure no rocks or soil clods over 3 inches in length were present, ii) compacted in 6-inch layers; iii) compacted to 90% within the VELCO ROW, iv) tested to insure proper compaction had occurred and then v) covered with topsoil.

Properly inspected and compacted backfill is absolutely necessary for pipeline safety in the VELCO ROW because *load-bearing calculations were based on compacted soils*. The load-bearing calculations were from the industry standard, which is American Petroleum Institute (“API”) Recommended Practice (“RP”) 1102, “Steel Pipelines Crossing Railroads and Highways” (7th ed. 2007). This will be discussed in detail next. However, first it is important to note that properly inspected and compacted backfill is absolutely necessary to comply with the CPG as well as with safety, because the CPG required compliance with the VELCO MOU, and *the VELCO*

MOU was based upon the same API RP 1102 load-bearing calculations. See, e.g., the May 25, 2016 Mott MacDonald Report which the company relies upon:



API RP 1102, as noted above, is the industry standard. PHMSA relies upon it. See, e.g., attached PHMSA PIPA Recommended Practice ND 13, and PHMSA Interpretation Response #PI-75-0116. A copy is attached. For many years, it was believed that RP 1102 was conservative. Recent research has shown, however, that RP 1102 under-predicts load and is not conservative. Its under-prediction arises from the distinction between its origin and its current use. It was developed, and its data derives from, studies of pipelines installed by boring holes under highways. It is now being used to predict stresses on pipelines installed by means of open cut trenches from which native soil and subsoils have been removed and then either returned or replaced. F. Zhang,

B. Sand, N Branam and M. Van Alter, A New Approach to Determine the Stresses in Buried Pipes Under Surface Loading, Proceedings of the 2016 11th International Pipeline Conference, IPC2016-64050. The pipeline industry, at least in Canada, is now suggesting that it not be used. D. Warman, J. Hart and R. Francini, Final Report of the Canadian Energy Pipeline Association: Development of a Pipeline Surface Loading Screening Process & Assessment of Surface Load Dispersing Methods, 2009 (attached).

API RP 1102 contains the equations that were used by CHA to engineer the ANGP. Mott MacDonald Report, *supra*. RP 1102 includes the following assumptions:

§4.2.1: Uniform soil support exists for the entire length of the pipeline (i.e., not acceptable to rest pipeline on sandbags).

§4.2.2: Voids between pipe and adjacent soil must be minimized (see §6.2.2). (Again, resting pipeline on sandbags not acceptable).

§4.3.1: Vehicle crossings must be as near as possible to be at right angle (90 degrees) and in no event less than 30 degrees. (Emphasis added.) (VGS and VELCO have not included this restriction in their MOU.)

§4.4: Wet soils should be avoided. Depth of cover must be 4 feet. (“Sink in Swamp” method used in Monkton and New Haven incompatible.)

§4.6.1.2: Site specific unusual situations such as "frost heave" "shrinking or swelling soils" or "local instability" must be separately considered and are not addressed by API 1102. (“Oozing” wet soils from New Haven and Monkton wetlands not addressed by RP 1102.)

§6.2.1.3. Bedding must be uniformly provided throughout. (Again, use of sandbags without sand fill not compatible.)

§6.2.2: “Backfill should be compacted sufficiently to prevent settlement detrimental to the facility to be crossed. Backfill should be placed in layers of 12 in. (305 mm) or less (uncompacted thickness) and compacted thoroughly around the sides and over the pipe to densities consistent with that of the surrounding soil. Trench soil used for backfill (or a substituted backfill material) must be capable of producing the required compaction. In

addition to being properly compactable, padding and backfill must be of appropriate quality to prevent damage to pipeline and/or casing coatings.” (Emphasis added.)

Violation 3(a). There exist no records showing that backfill was being: i) screened and inspected to ensure no rocks or soil clods over 3 inches in length were present, ii) compacted in 6-inch layers; iii) compacted to 90% within the VELCO ROW, or iv) tested to insure proper compaction had occurred.

The company hired and formally designated “inspectors.” Neither the inspectors nor the workers they were inspecting kept any records of backfill screening, backfill inspection, backfill layering, backfill compaction or backfill testing.

Proper compaction of backfill is one of the most critical elements of pipeline safety within the VELCO ROW and anywhere a VELCO truck or other heavy equipment would cross. This pipeline was constructed without requiring contractors to *record* backfill screening, backfill inspection, backfill layering, backfill compaction and backfill testing. It was constructed either without *inspection* of backfill screening, backfill inspection, backfill layering, backfill compaction or backfill testing or without requiring inspectors to document their inspections. This hardly seems to have been a construction process with “robust operational and monitoring controls.”

Violation 3(b). The company changed the screening standards so they would be less protective than the CPG standards.

The company’s specifications to contractors changed the screening standard from 3 inches to 6 inches in 2015. ANGP Project Directive dated 8/31/15. The company did not consult with the Department, or inform the Commission, before changing the specifications that had been submitted to the Commission. From that date forward, backfill with rocks and clods of soil larger than 6 inches was used.

Violation 3(c). Backfill compaction testing did not occur except in 11 locations, where more than half of the compaction was found substandard.

There is no record that any construction contractor or the company tested backfill compaction, with two exceptions. Eight tests were done by Knight Engineering, in 2015, within the VELCO ROW. Five showed inadequate compaction. Additional testing was performed at 3 VELCO ROW sites in April of 2016. One of the 3 additional sites failed. No other tests were ever done.

Emails authored by the company's Vice President, who had been placed in charge of this project, and one of Mott MacDonald's inspectors, set forth the company's view of compaction testing. The letter post-dates the Knight Engineering testing. Mott MacDonald provided inspectors on behalf of the company. Inspector Mike Reagan emailed Vice President St. Hilaire that "GC," the Department's engineer, "is back on the issue if [sic] compaction on the VELCO easement. Just a heads up, he talked to some operators today. So except [sic] a call tomorrow. I was just notified by a VELCO inspector." Mr. St. Hilaire replied: "Compaction or placing pipe on bottom of trench?" Mr. Reagan replied "Compaction the original spec." Mr. St. Hilaire then replied: "I thought we took that out?" The inspector replied: "I did to [sic] we went thru it hope CHA did it. I thought this was all set..." John St. Hilaire emails with Michael Reagan June 29, 2016.

Intervenors thus far have seen no record of any testing that was done outside of the VELCO ROW -- at road crossings in residential areas, for example. The API RP 1102 standards, and calculations, apply to all road crossings, inside or outside the VELCO ROW. Every pipeline must

be constructed so that so that a lumber truck, milk tanker truck or other fully loaded truck, does not rupture the pipeline when passing down an unpaved road that crosses a pipeline.⁴

Violation 3(d). Backfill compaction throughout the VELCO ROW and at road crossings probably does not meet the safety standard.

It is probable that much of the backfill throughout the VELCO ROW does not satisfy the 90% compaction pipeline safety requirement. The only evidence that exists is the data from the 11 sites tested by Knight Engineering. Six of the 11 sites tested failed. Intervenors are aware of no record of compaction testing at road crossings.

Violation 4. Zinc Ribbon Corrosion Protection for High Risk Areas Was Not Installed, or There Is No Record of Where It Was Installed.

An ARK engineering report issued in 2013 required that heightened corrosion protection be utilized in 27 high-risk areas (such as wetland areas that are parallel to or cross the VELCO ROW) by installation of zinc ribbon. This requirement was incorporated into plans provided to each contractor. PHMSA rules required that the written plans be adhered to. 49 C.F.R. §192.303. Vermont law and the CPG required compliance with PHMSA regulations. PUC Rule 6.154; CPG ¶ 3.

There is no record of installation of the zinc ribbon in the New Haven Red Maple/Green Ash wetland and from station number 889 to station number 892, in St. George.

The evidence from the deposition of the foreman from Michels, however, suggested that the zinc ribbon could not have been installed at the New Haven site. The site was extremely

⁴ The standard specifications provided to contractors required 95% compaction for road crossings. API RP 1102 says the compaction must be “consistent” with adjoining soils.

difficult to work in. One excavator, even though it was on mats, slid into the wetland and could not get out. Other equipment had to be brought in to remove it. Immediately after the pipe was sunk into the soils, the mats were removed and taken away. Bubolz depo. tr. 62, 113-114. It would have been impossible for the ditch for the zinc ribbon to be installed other than by hand-digging. This was a 2500-foot long area. Bubolz depo tr. 32, 102. Hand-digging seems unlikely.

Safety Violation 5. The Unwritten “Sink in Swamp” Method Replaced the Two Approved Methods of Construction in Wetlands.

The CPG required that the ANGP be constructed using the methods described in the construction plan exhibits. PHMSA regulation §192.303 required that written specifications be followed. The filed exhibits contained two methods of construction, the trench method (involving 6” of sand beneath the pipeline, 12” of sand on top of the pipeline, and screened and inspected backfill above the sand) and Horizontal Directional Drilling.

In some wetland areas, however, a third method was adopted, the “sink in swamp” method. It was, according to the foreman on the scene, a method unlike the two methods in the written specifications (open trench construction and HDD). Carl Bubolz depo tr. 28, 42-43, 47-48, 133. The new method consisted of digging trenches on either side of the pipeline and relying on the weight of the pipeline to squeeze soils out from beneath it. No sand or other select backfill was placed beneath the pipe or over the pipe. No inspection was conducted for rocks or soil clods over 3 inches long or 6 inches long (other than the backhoe operators’ observations from the seats of their equipment) for the soil the pipeline ended up resting on, or the soil placed on top of the

pipeline.⁵ A broad surface depression resulted, which filled with water.⁶ The company and its contractors made this method up as they went along. Nothing was in writing. Bubolz depo. tr. 31, 110-111 (no one got out of the equipment to inspect the soils) and 43 (made up at the time).

The sink in swamp method was not restricted to the Red Maple/Green Ash swamp in New Haven; it was used “several” times, in both Monkton and New Haven. G.C. Morris email to David Berger 9/8/17; G.C. Morris email to James Porter, August 7, 2017. It also occurred further south, in another roughly 1300-foot long stretch. Bubolz depo. tr. 78, 122.

The company and its inspectors made no record of the departure from written plans, the absence of sand or select backfill, the failure to inspect regular backfill, or the failure to restore the ground surface to its previous contours. They made no record of which wetland areas were subject to the “sink in swamp” method.

The sink in swamp method came to light when the company filed a nonsubstantial change request because of inability to obtain 4 feet of depth of cover in the Red Maple/Green Ash wetland in New Haven. The company did not disclose that no sand or other select fill was used, that uninspected backfill was used, that this method departed from the company’s written specifications, or that the same sink in swamp method had already been used in Monkton and was also in use further south in New Haven.

Safety Violations 6(a)-(c). No Quality Assurance Plan Was Adopted and Implemented Until Most of the ANGP Had Been Completed; the QA Plan Fails to Address Known Safety Risk and the CPG.

⁵ The CPG-approved plans did not require compaction of regular backfill in wetlands and in Prime Agricultural Soils Areas; only screening and inspection were required.

⁶ A photograph attached, taken by Mr. Bubolz, shows the depression. It had filled with water by the time he took the photograph 8 weeks after the construction.

The CPG required that the company adopt and enforce a written **Quality Assurance** plan as well as a **QA plan specific to coatings**. PUC findings relied on these commitments.

Violation 6(a). In 2014, construction occurred without a QA Plan or QA review.

The company had no QA plan in 2014, when the first 11 miles were constructed -- during which time pipe was laid directly on trench bottoms, contrary to the plans submitted to the PUC the year before.

The company did not begin to draft a QA plan until January of 2015. VGS believed it had developed a complete plan on July 2, of 2015. Excerpts from DPS Engineering Weekly Reports, attached. The first QA review was conducted in December of 2015.

Violation 6(b). In 2015, construction continued despite DPS warnings the QA Plan lacked critical elements.

The Department's engineer warned the company on July, 21, 2015 that "critical elements" of the QA plan were still missing. Excerpts from DPS Engineering Weekly Reports, attached. Construction continued.

Violation 6(c). The company's QA documents do not address known compaction testing failures and their consequences for public safety, or the commitments made to the Board.

The company's December 21, 2015 QA review did not address the results of the 8 sites tested by Knight Engineering in 2015, whether additional testing would be advisable, or the potential consequences of inadequate compaction in the VELCO ROW.

The QA review defended the company's placement of pipe directly on trench bottom, arguing that the company's own specifications allowed this. The QA review did not mention the warning it had been given in 2014 that this practice was unsafe, and its commitment to change the

practice, or the specifications the company had submitted to the Commission in 2013 which barred this practice.

The commitment to quality assurance relied upon by the Commission was not honored.

Environmental Violation. Failure to Use Bentonite Trench Breakers.

Plans were filed with the Commission in February and June of 2013 showing that bentonite trench breakers would be located at all wetland boundaries. Findings 31-33 determined that trench breakers filled with bentonite would be placed at the limits of each wetland. These “act as a plug in the trench to inhibit the migration of water from wetland areas.” Finding 362 found there would be no permanent alterations to any waterways or “the ability of the land to hold water.”

ANR’s water quality permit was based upon the same representations.

If a plug is missing, then the pipeline trench may drain the water from a wetland. This is a potentially irreversible harm.

The discovery provided to Intervenors demonstrates that the company neglected to install bentonite plugs at the edge of 13 wetlands and/or streams. At this time it is not possible for Intervenors to determine which wetlands were affected. The Department’s NOPV treats this as possible cause of stream erosion, and seeks sanctions. That is an important concern, but the unplugging of water from an existing wetland also poses a serious, potentially permanent harm. The company departed from its filed plans without approval from the Commission or even documentation of where and why it was doing so.

CONCLUSION

The scope of the present investigation should be broadened to include the 7 areas of violation set forth above.

Date: February 28, 2018

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