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September 16, 2020

BY ELECTRONIC FILING

Rosemary Chiavetta, Secretary
Pennsylvania Public Utility Commission
Commonwealth Keystone Building
400 North Street, Filing Room
Harrisburg, PA 17120

Re: Meghan Flynn, et al., Docket Nos. C-2018-3006116 & P-2018-3006117 (consolidated)
Melissa DiBernardino, Docket No. C-2018-3005025 (consolidated)
Rebecca Britton, Docket No. C-2019-3006898 (consolidated)
Laura Obenski, Docket No. C-2019-3006905 (consolidated)
Andover Homeowner's Association, Inc.; Docket No. C-2018-3003605 (consolidated)
v. Sunoco Pipeline L.P.

**SUNOCO PIPELINE L.P. MOTION IN LIMINE AND REQUEST FOR
EXPEDITED 7-DAY RESPONSE**

Dear Secretary Chiavetta:

Enclosed for electronic filing with the Commission is Sunoco Pipeline L.P.'s Motion in Limine to (1) Limit Relief and Issues Regarding Mariner East 1 and Associated Evidence and (2) Request for Expedited 7-Day Response Period. Because this document does not contain new averments of fact, it does not require a verification.

If you have any questions regarding this filing, please do not hesitate to contact me.

Very truly yours,

/s/ Whitney E. Snyder

Thomas J. Sniscak
Whitney E. Snyder
Counsel for Sunoco Pipeline L.P.

WES/das
Enclosure

cc: Honorable Elizabeth Barnes (by email ebarnes@pa.gov)
Per Certificate of Service

**BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION**

MEGHAN FLYNN et al.	:	Docket Nos.	C-2018-3006116 (consolidated)
	:		P-2018-3006117
MELISSA DIBERNARDINO	:	Docket No.	C-2018-3005025 (consolidated)
REBECCA BRITTON	:	Docket No.	C-2019-3006898 (consolidated)
LAURA OBENSKI	:	Docket No.	C-2019-3006905 (consolidated)
ANDOVER HOMEOWNER'S ASSOCIATION, INC.	:	Docket No.	C-2018-3003605 (consolidated)
	:		
	:		
v.	:		
	:		
SUNOCO PIPELINE L.P.	:		

NOTICE TO PLEAD

Pursuant to 52 Pa. Code §§ 5.403 and 5.243(e), you are hereby notified that, if you do not file a written response to the enclosed Motion in Limine within seven (7) days from service of this notice, a decision may be rendered against you. Any Response to the Motion in Limine must be filed with the Secretary of the Pennsylvania Public Utility Commission, with a copy served to counsel for Sunoco Pipeline, L.P., and where applicable, the Administrative Law Judge presiding over the issue.

File with:

Rosemary Chiavetta, Secretary
Pennsylvania Public Utility Commission
Commonwealth Keystone Building
400 North Street, Second Floor
Harrisburg, PA 17120

**BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION**

MEGHAN FLYNN et al.	:	Docket Nos. C-2018-3006116 (consolidated)
	:	P-2018-3006117
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ANDOVER HOMEOWNER’S ASSOCIATION, INC.	:	Docket No. C-2018-3003605 (consolidated)
	:	
	:	
v.	:	
	:	
SUNOCO PIPELINE L.P.	:	

**SUNOCO PIPELINE L.P.’S
MOTION IN LIMINE TO (1) LIMIT RELIEF AND ISSUES REGARDING MARINER
EAST 1 AND ASSOCIATED EVIDENCE AND (2) REQUEST FOR EXPEDITED 7-DAY
RESPONSE PERIOD**

In accordance with 52 Pa. Code §§ 5.403 and 5.243(e), Sunoco Pipeline L.P. (“SPLP”), by its undersigned counsel, requests Your Honor find the relief requested regarding the Mariner East 1 (ME1) pipeline for a remaining life study is moot and preclude evidence in support of such relief from admission into the record. SPLP also requests Your Honor order an expedited response period of seven days to this Motion because granting this Motion will substantially limit the amount of hearing time needed for the September 29, 2020-October 14, 2020 hearings.

SPLP notes that it has already filed a Motion for Summary Judgment based on the lack of evidence to support the relief requested. The current Motion is yet another reason to preclude these issues from the case.

I. INTRODUCTION AND SUMMARY OF ARGUMENT

1. As Your Honor predicted, Flynn Complainants’ requested relief of a Remaining Life Study for the ME1 pipeline is now moot given the outcome of the Commission’s Bureau of

Investigation and Enforcement's (BI&E) formal complaint proceeding (BI&E Complaint Proceeding).¹ As of September 8, 2020,² the Commission entered a final order that cannot be appealed approving the Joint Petition for Settlement (Settlement) of that proceeding, which includes a requirement for SPLP to have an independent contractor perform a Remaining Life Study on the entirety of the ME1 pipeline and provide a public summary. *BI&E v. SPLP*, Docket No. C-2018-3006534, Opinion and Order (Order entered Aug. 19, 2020).

2. That Complainants may argue here for different relief regarding the Remaining Life Study does not overcome mootness. *Petition of the Office of Small Business Advocate Requesting the Pennsylvania Public Utility Commission to Conduct a Formal Investigation of Pennsylvania-American Water Company's Interruption of Service in Western Pennsylvania*, P-00062244, 2007 WL 517086 (Order entered Feb. 8, 2007) (dismissing OSBA petition for investigation as moot where Commission initiated its own investigation and rejecting OSBA arguments that petition was not moot because it requested differing relief). Moreover, Complainants have already raised and been heard on their arguments that the Remaining Life Study required in the Morgantown docket and their arguments that the Settlement was somehow insufficient or inadequate were rejected.³

¹ Second Interim Order at p. 8 (Order entered Mar. 12, 2019).

² While the Opinion and Order was entered on August 19, 2020, it did not become final as to approving the Settlement until both BI&E and SPLP accepted the Commission's modifications of the Settlement therein, which occurred on September 8, 2020.

³ Over SPLP's objections, Flynn Complainants were granted intervenor status in the BI&E Complaint Proceeding, were provided the opportunity to be heard on this issue, and provided extensive comments including an affidavit from Dr. Zee regarding the Remaining Life Study as set forth in the Settlement. Your Honor considered these materials and did not modify the Settlement. Flynn Complainants had the opportunity to but did not file exceptions to Your Honor's decision approving the Settlement and Remaining Life Study, nor did Flynn Complainants file any comments to the Commission's two tentative orders. Thus, Complainants

3. The mootness of the relief requested coupled with the lack of evidence to support any other relief for these issues means these issues should be stricken from the case and testimony on these issues should not be admitted. There is no need to waste time and resources of all on this issue which has been decided. The only expert testimony in this proceeding regarding integrity management of the ME1 pipeline is that of Dr. Zee, and Flynn Complainants have admitted that his conclusions are limited to recommending a Remaining Life Study be undertaken.⁴ Thus, there are no grounds for any relief other than a Remaining Life Study based on alleged integrity management, cathodic protection, and corrosion control issues for ME1. Therefore, these issues should be stricken from this proceeding and all associated testimony and exhibits should be precluded from admission into the record, which include portions of Dr. Zee's testimony and exhibits as well as portions of SPLP witnesses Garrity and Fields testimony and exhibits. Dr. Zee's materials are specifically identified in Paragraph 26 *infra*. If this Motion is granted, SPLP will specifically identify prior to hearing the portions of Mr. Field and Garrity's testimony and exhibits that will not be introduced into the record pursuant to such ruling.

4. Litigating moot issues is a waste of resources of all parties, Your Honor, and the Commission.

had the opportunity to be heard on the issue multiple times but did not pursue that opportunity and are precluded from collaterally attacking the Remaining Life Study the Commission ordered.

⁴ Flynn Complainants' Answer to SPLP Motion for Partial Summary Judgment on Integrity Management, Corrosion Control and Cathodic Protection at ¶ 33 (pp.15-16) ("In closing, for an expert to be able to form an opinion as to the present, likely condition of the 12-inch and 8-inch lines, a good deal more information would be required than has been supplied to Matergenics to date."), ¶ 44(p.27) ("Dr. Zee was asked whether an investigation was warranted. His definitive answer is in the affirmative. His opinions, therefore, do not go beyond that answer.").

II. Legal Standards

A. Standard for Mootness

5. Where relief requested in a proceeding is granted in another proceeding, the Commission has recognized the mootness of the proceeding seeking similar relief:

It is well-settled that an actual case or controversy must exist at all stages of the administrative process or the case will be dismissed as moot. *See Faust v. Cairns*, 242 Pa. 15, 88 A. 786 (1913); and *Musheno v. Dept. of Public Welfare*, 829 A.2d 1228, 1231 (Pa. Cmwlth. 2003). As this Commission, upon its own motion, initiated an investigation, to be directed by staff, into the PAWC water line breaks and outages throughout PAWC's service territory, including the Pittsburgh area, the remedy sought by OSBA's petition has been accomplished. Accordingly, there is no longer a controversy in this matter. Furthermore, OSBA's assertion that this Commission's order entered on January 5, 2007, does not provide a remedy if the investigation finds that PAWC is providing inadequate service is incorrect. While the Commission instituted investigation is non-prosecutory in nature, it does permit the Commission to direct PAWC to perform corrective or remedial actions, if warranted, in order to ensure that the provision of reasonable, safe, adequate and sufficient service. Finally, nothing in the January 5, 2007 order would preclude OSBA from filing, after the completion of the Commission's investigation, a formal complaint pursuant to section 701, 66 Pa.C.S. §701, to seek whatever remedy it deems appropriate. In sum, as OSBA's request is superseded by this Commission's order entered on January 5, 2007, OSBA's petition is dismissed as moot.

Petition of the Office of Small Business Advocate Requesting the Pennsylvania Public Utility Commission to Conduct a Formal Investigation of Pennsylvania-American Water Company's Interruption of Service in Western Pennsylvania, P-00062244, 2007 WL 517086 (Order entered Feb. 8, 2007) (hereafter *Petition of OSBA*).

6. Similarly, where relief requested has otherwise already been provided, the Commonwealth Court and the Commission have held the underlying issue to be moot. *Utility Workers Union of America, Local 69, AFL-CIO v. Public Utility Com'n*, 859 A.2d 847, 849–50

(Pa. Cmwlth. 2004) (holding Complaint that utility used outside contractor for meter reading moot where since complaint filed utility hired as employee meter reader and that situation did not meet three exceptions to mootness doctrine of “conduct at issue is likely to be repeated but will necessarily escape judicial review,” “a great public interest in the resolution of the controversy,” or “one party will suffer a substantial detriment if the controversy is not judicially resolved.”); *Cohane v. PECO Energy Co.*, Docket No. Z-01550143, 2005 WL 2170360, at *3 (Order entered Aug. 12, 2005) (holding complaint that utility placed cash only payment restriction on account moot where utility removed cash only payment restriction).

B. Standard for Motion in Limine

7. Under 52 Pa. Code § 5.403, ALJs are vested with the responsibility and authority to control the scope of the evidence admitted to the record and should eliminate proposed evidence and testimony that is either inadmissible or relate to matters that are outside the scope matters raised in the complaint:

- (a) The presiding officer shall have all necessary authority to control the receipt of evidence, including the following:
 - (1) ***Ruling on the admissibility of evidence.***
 - (2) ***Confining the evidence to the issues in the proceeding*** and impose, where appropriate:
 - (i) Limitations on the number of witnesses to be heard.
 - (ii) Limitations of time and scope for direct and cross examinations.
 - (iii) Limitations on the production of further evidence.
 - (iv) Other necessary limitations.
- (b) The presiding officer will actively employ these powers to direct and focus the proceedings consistent with due process.

...

52 Pa. Code § 5.403 (emphasis added).

8. It is well settled under the Commission’s Rules and Regulations that the presiding ALJ has the authority to control the receipt of evidence in a proceeding. 52 Pa. Code § 5.403; *See*

also *PA PUC v. Penn Estates Utilities, Inc.*, Dkt. No. R-00005031 et al., Opinion and Order (Order entered Feb. 9, 2001) (“This authority includes disposition of the admissibility of evidence as well as imposition of limitations on the scope of evidence to be presented on issues raised in a proceeding. As factfinder, the ALJ determines the direction and focus of a proceeding, consistent with due process”).

9. ALJs have utilized the authority granted by Section 5.403 to exclude evidence or testimony that is inadmissible, improper, or outside the scope of the issues in the proceeding. *See, e.g., Pa. PUC v. PPL Electric Utilities Corporation*, Dkt. Nos. R-2015-2469275, et al. (ALJ Colwell Sixth Prehearing Order issued July 14, 2015) (granting a motion in limine to exclude testimony on issues that were not properly within the scope of the proceeding); *Pa. P.U.C. v. Phila. Gas Works*, Dkt. No. M-00021612, 2002 WL 32063825 (Opinion an Order Dec. 19, 2002) (affirming ALJ’s grant of motion in limine to strike witness statement and certain exhibits in entirety); *Re Structural Separation of Bell Atlantic-Pennsylvania, Inc. Retail and Wholesale Operations*, Dkt. No. M-00001353, 2000 Pa. PUC LEXIS 59 at *7-9 (Final Order entered September 28, 2000) (affirming the decision of the Administrative Law Judge in that case to exclude certain evidence as “beyond the scope of the proceeding”).

III. ARGUMENT

A. The Relief Requested Is Moot

10. Your Honor has already recognized that the requested relief of a Remaining Life Study could become moot. As Your Honor stated in denying SPLP’s request to strike Flynn Complainants’ request for a Remaining Life Study:

Paragraphs 111-118 allege Sunoco has failed to share a written integrity management program or risk analysis or relevant portions thereof with the public and that it is in violation of 49 CFR §§ 195.452(b)(c) and (j). Paragraph 118 requests an independent

contractor to conduct a remaining life study of the ME1 and 12-inch workaround pipelines. **I am not persuaded by Sunoco's argument to strike these paragraphs even though they are similar relief as requested by I&E in a separate proceeding. . . . In the event that this relief requested becomes moot at a future date because it occurs as a result of the resolution of the I&E complaint proceeding, it may be denied as moot or Complainants may withdraw this request for relief.**

Second Interim Order at p. 8 (Order entered Mar. 12, 2019) (emphasis added).

11. The relief requested here (a Remaining Life Study to be conducted by an independent consultant) is now moot because it has been granted in the BI&E Complaint Proceeding. As the Commission held in *Petition of OSBA*, where relief requested in one proceeding is granted in another proceeding, the proceeding seeking similar relief becomes moot. This case involved OSBA petitioning the Commission to institute an investigation into PAWC's water line breaks and outages where the Commission three days later ordered its own investigation into the issue. The Commission held over OSBA's exceptions that the OSBA petition was moot because "the remedy sought by OSBA's petition has been accomplished." The Commission did not find persuasive OSBA's arguments that the Commission's investigation was not exactly what OSBA requested because nothing prevented OSBA from pursuing further remedies for violations found pursuant to the investigation.

12. The same is true here. Flynn Complainants are seeking an independent consultant to perform a Remaining Life Study of the ME1 pipeline. The Commission ordered just that when it approved the Settlement, which includes the following term:

SPLP agrees to retain an independent expert to conduct a Remaining Life Study that will consist of a summary of SPLP's Integrity Management Plan ("IMP"), a remaining life evaluation of ME1, calculations that are described in more detail in the bullet paragraphs that appear below, and will be forward-looking in manner, and intended to assess the longevity of ME1.

The Remaining Life Study should be conducted by a qualified independent expert that has conducted independent studies for, but not limited to, governmental entities, such as the Pipeline and Hazardous Materials Safety Administration (“PHMSA”) or State Commissions, and the Pipeline Research Counsel International (“PRCI”), American Petroleum Institute (“API”), or the Interstate Natural Gas Association of America (“INGAA”). Within thirty (30) days of entry of a Commission Order approving any settlement of this matter, SPLP shall provide I&E with a list of three (3) proposed independent experts, along with contact information, a brief description of the expert’s background and a disclosure as to whether the proposed expert performed any work in relation to ME1 as well as a description of that work. I&E will select one (1) expert from the list provided by SPLP and SPLP will hire and pay the expert to complete and review the study. The expert shall complete the Remaining Life Study within six (6) months from being contracted by SPLP. A summary of the expert’s findings shall be made public (excluding proprietary or confidential security information (CSI)).

The Parties agree that the Remaining Life Study will include the following:

- ME1 corrosion growth rate based on the most recent In-Line-Inspection run, sectionalized as appropriate;
- Supporting documentation to demonstrate the corrosion growth rate. This may include a graph estimating corrosion growth from installation of ME1 to the present time;
- Retirement thickness calculations that consider: (1) pressure design thickness; and (2) minimum structural thickness;
- Remaining life calculations by: (1) segment; (2) age; (3) coating type; and (4) soil conditions;
- A schedule identifying portions of the pipeline to be replaced or remediated over the next five (5) years;
- A summary of the portions of ME1 that were previously retired with an explanation of the characteristics of the pipeline sections that led to the replacements;
- A listing and description of threats specific to ME1, with a summary of how each threat and the associated risks are mitigated;
- A summary of the top ten (10) highest risks identified on ME1 with an explanation as to how the risks are mitigated;
- An explanation of how anomalies, dents and ovalities are formed on the pipeline and addressed by mitigative measures;
- A summary of the leak history on ME1 including a description of the size of each leak;

- A discussion of the history of ME1, including when cathodic protection was installed, when coating was applied, and the various measures performed by SPLP, including the implementation of new procedures; and
- A discussion to illustrate how managing integrity lengthens pipeline life.

For so long as ME1 remains in Highly Volatile Liquid (“HVL”) service, SPLP agrees to supplement the Remaining Life Study by providing a summary report on an annual basis that summarizes SPLP’s continual process of evaluation and assessment to maintain the pipeline integrity of ME1. The report will also include a list of the next year’s planned preventative and mitigative actions (such as system improvements) and a list of integrity enhancements that were performed on ME1 the prior year, as required by and consistent with the applicable 49 C.F.R. Part 195 requirements. The public version of the report shall not contain information that is proprietary or contains information subject to the Public Utility Confidential Security Information Disclosure Protection Act, 35 P.S. §§ 2141.1 to 2141.6, and the Commission’s regulations implementing such Act at 52 Pa. Code §§ 102.1 -102.4.

Settlement at III.B.

13. The Commission made three modifications to this term, which SPLP and BI&E accepted. *BI&E v. SPLP*, Docket No. C-2018-3006534, Opinion and Order (Order entered Aug. 19, 2020). First, the Commission precluded *ex parte* conversations between SPLP or BI&E and the independent consultant. Second, the Commission put procedures in place for SPLP to review the Remaining Life Study for Confidential Security Information and directly submit the study to BI&E, requiring the document to be in a locked PDF format for SPLP’s review and affidavits from both the independent consultant and SPLP attesting to the fact that SPLP did not alter the study. Third, the Commission put similar procedures in place for the public summary of the Remaining Life Study. The relief Complainants request has already been granted and is moot.

14. Complainants may argue that their requested relief is not moot because they want a Remaining Life Study they prefer. Such arguments fail based on *Petition of OSBA*, where the Commission rejected OSBA’s arguments that its petition was not moot because OSBA wanted

similar but differing relief. The Commission's reasoning applies here too because just like OSBA there, here Complainants will have access to the public summary of the Remaining Life Study and could pursue additional relief at a later time based on those results.

15. Moreover, such arguments opposing the terms of the Remaining Life Study have already failed. Flynn Complainants were granted intervention in the BI&E Complaint proceeding and the ability to file comments. Flynn Complainants submitted comments that included as an exhibit an affidavit from Dr. Zee. Regarding the Remaining Life Study, Flynn Complainants and Dr. Zee alleged in the BI&E Complaint proceeding that the "inspection and studies the settlement proposes going forward are seriously deficient" and raised the same recommendations and issues raised here. Compare *BI&E v. SPLP*, Flynn Comments at Exhibit A, pp. 13-20 (Dr. Zee Affidavit making recommendations relating to Remaining Life Study), with Dr. Zee Direct Testimony at 31:18-39:6, 41:26-41:42 (making recommendations for Remaining Life Study). Flynn Complainants also alleged in their comments that the independent expert is not independent. *Id.* at Comments pp. 10-11. Your Honor considered these comments and did not find them meritorious when approving the Settlement without modification. *BI&E v. SPLP*, Docket No. C-2018-3006534, Initial Decision (ID entered Dec. 18, 2019); Interim Order (Order entered Oct. 11, 2019) (denying BI&E and SPLP Motions to Strike Flynn Complainants Comments regarding ME1 pipeline). Flynn Complainants did not file exceptions to the Recommended Decision nor did they file comments to either of the Commission's two Tentative Orders. They cannot now collaterally attack the Commission's approval of the Settlement and the Remaining Life Study term.

16. Complainants may also argue one of the three exceptions to the mootness doctrine may apply. These arguments also fail. The three exceptions to the mootness doctrine are: "conduct at issue is likely to be repeated but will necessarily escape judicial review," "a great public interest

in the resolution of the controversy,” or “one party will suffer a substantial detriment if the controversy is not judicially resolved.” *Utility Workers Union of America, Local 69, AFL-CIO v. Public Utility Com'n*, 859 A.2d 847, 849–50 (Pa. Cmwlth. 2004). In *Utility Workers*, the Commonwealth Court held none of these exceptions applied to overcome mootness regarding a complaint that the utility had used an outside contractor for meter reading where during the pendency of the proceeding the utility hired the outside contractor as an employee.

17. Regarding exception 1, conduct likely to be repeated that will escape judicial review, the court explained there was no record evidence that the conduct there would be repeated or that the issue would escape judicial review if repeated. So too here. SPLP is legally obligated through its assent to the Settlement as modified in the Commission’s Order to have an independent consultant complete the ME1 Remaining Life Study and public summary. If these documents reveal violations, BI&E or Complainants could attempt to pursue relief based thereon. There is no evidence that the issue would escape judicial review.

18. Regarding exception 2, great public interest in the resolution of the controversy, the court explained there was no great public interest because there was no indication that the utilities conduct harmed the public. The same is true here. As Complainants admitted, Dr. Zee cannot conclude the ME1 pipeline is unsafe, let alone that SPLP’s alleged conduct will harm the public.

19. Regarding exception 3, a substantial detriment to one of the parties if the controversy is not judicially resolved, there is no detriment to any party here. The “controversy” here is whether a Remaining Life Study should be performed for ME1. There can be no harm to Complainants where SPLP is legally obligated to have such Study performed including a public summary. The relief requested is moot.

B. Issues and Evidence Regarding Integrity Management, Cathodic Protection, And Corrosion Control Should Be Removed From This Proceeding

20. Because the relief requested for a Remaining Life Study on the ME1 pipeline is moot coupled with Flynn Complainants admissions that the only expert testimony on the issue does not go beyond concluding a Remaining Life Study is warranted, these issue should be stricken from the case and testimony on these topics should not be admitted. This will result in conservation of significant resources of all parties, Your Honor, and the Commission. There is no reason to litigate a moot issue and Your Honor has the authority to limit this issues and evidence thereof. *Supra* Section II.B.

21. The relief requested for integrity management, corrosion control, and cathodic protection is limited to a Remaining Life Study and there is no evidence that supports any other relief based on these issues.

22. Flynn Complainants have specified that the relief they request for alleged pipeline integrity, corrosion control, and cathodic protection issues for the ME1 pipeline is for a remaining life study of the ME1 pipeline conducted by an independent expert. Flynn Complainants' Answer to SPLP Motion for Partial Summary Judgment on Integrity Management, Corrosion Control and Cathodic Protection at ¶¶ 1 (p.19), 6(p.11), 21(p.5) (filed August 13, 2020). Flynn Complainants expressly denied that they were seeking to have the ME1 pipeline shut down prior to a Remaining Life Study, but instead they were seeking "to shut down the older pipelines only after an investigation has concluded that they cannot be safely operated or that Sunoco is not likely to operate them safely." *Id.* at ¶ 21(p.5).

23. Flynn Complainants admit that Dr. Zee's testimony does not conclude that the ME1 pipeline is in fact unsafe, but instead that such determination cannot be made without a Remaining Life Study.

In closing, for an expert to be able to form an opinion as to the present, likely condition of the 12-inch and 8-inch lines, a good deal more information would be required than has been supplied to Matergenics to date.

Id. at ¶ 33 (pp.15-16). Complainants also admit that Dr. Zee’s “conclusions” do not go beyond recommending a Remaining Life Study:

Dr. Zee was asked whether an investigation was warranted. His definitive answer is in the affirmative. His opinions, therefore, do not go beyond that answer.

Id. at ¶ 44 (p.27).

24. While other Complainants may have requested other types of relief related to ME1 based on integrity management, cathodic protection, or corrosion control issues, there is absolutely no evidence to support such relief. The only expert testimony that any Complainants presented on this issue is that of Dr. Zee and as stated above, Flynn Complainants admit his testimony does not go beyond the conclusion that a Remaining Life Study is needed.

25. Removing this issue from the case will result in substantial saving of time and resources for all parties, Your Honor, and the Commission. If this issue is not removed from the case, SPLP predicts it will have extensive cross examination at hearing for Dr. Zee, and it is likely Complainants will have substantial cross on the issue for SPLP Witnesses Garrity and Field. Removing the issue from the case will save significant hearing time. Moreover, this is an issue that will require extensive briefing by the parties and extensive consideration by Your Honor and likely the Commission. There is no reason to waste everyone’s time and resources litigating an issue that is moot.

26. Accordingly, SPLP moves to preclude from admission into the record the following testimony and exhibits:

- Dr. Zee Direct Testimony at:
 - 6:1 (“8-inch pipeline and the”)
 - 6:4 (“the subject 8-inch pipeline and”)
 - 6:20 (“the 8-inch Mariner East 1 (ME1) and”)
 - 6:22 (“their”)
 - 7:27 (“We..”) through 7:29
 - 7:38-39
 - 9:39 (“8-inch and”)
 - 11:9-14 (including table)
 - 12:18-17:13
 - 19:18-21:45
 - 23:18-24:43
 - 25:11-25:29
 - 25:34-26:39
 - 31:19-20 (“8-inch ME1 AND” and “pipelines”)
 - 31:25-26 (“8-inch Mariner East 1 (“ME1”) and”)
 - 32:2-6
 - 34:28-39:6
 - 40:22-37
 - 41:19-24
 - 41:45 (“and 8-inch”)
 - 42:11-12 (“8-inch pipeline and the”)
 - 42:19 (“8-inch pipeline and the”)
 - 42:22 (“8-inch pipeline and the”)
 - 42:26 (“these pipelines”)

A redline version of the public Direct Testimony of Dr. Zee is attached as **Exhibit A**.

- Dr. Zee Direct Exhibits:
 - Exhibit 2, pdf pages 17-176 (Repair and maintenance records for 8-inc ME1 pipeline)
 - Exhibit 4, documents with file names beginning with bates ranges 5721, 5738, 5751, 5764 (PHMSA Accident Report Forms for ME1 pipeline)
 - Exhibit 5 (Right-of-way walking reports for ME1 pipeline)
 - Exhibit 6 (Strain gauge and top of pipe monitoring data and reports for ME1 pipeline)
 - Exhibit 7 (ME1 8-inch pipeline inspection report)
 - Exhibit 9 (ME1 CIS documents) at:
 - o pdf pages 195-699, bates range 32304-32809
 - o pdf pages 710-738, bates range 32819-32844
 - o pdf pages 742-748, bates range 32851-32857
 - o pdf pages 810-837, bates range 32919-32946
 - o pdf pages 866-886, bates range 32975-32995
 - o pdf pages 899-903, bates range 33008-33012
 - Exhibit 10 (Summary of ME1 CIS data) at:
 - o pdf pages 9 through the first row of page 10
 - o pdf page 15, second and third row
 - o pdf pages 17-19
 - Exhibit 11 (ME1 CIS data)
- Dr. Zee Surrebuttal Testimony at:
 - o 3:14-15 (“JF-5...”)
 - o 3:23-26 (“As for ...”)
 - o 4:14-15 (“Every single ... Morgantown.”)
 - o 4:27-28 (“if there...Matergenics.”)
 - o 4:31 (“Both respect to Morgantown in particular and”)
 - o 4:39-40 (“The inspection... October 15, 2019.”)
 - o 5:7-7:29
 - o 8:7 (“both the 8-inch and”)
 - o 8:14-16 (“Along more... bad.”)
 - o 8:27-9:5

- 9:9 (“ME1 and”)
- 9:17-10:4, including table
- 10:14 (“ME1 and”)
- 10:27-10:30
- 12:1-2
- 12:30-39
- 13:17-21
- 13:35-39
- 14:17 (“Furthermore, ...”) through 14:19
- 14:32 (“8-inch and”)
- 14:34 (“other than ... recently.”)
- 14:37-16:22
- 17:33-21:32
- 23:27-25:23
- 26:16-20
- 26:35-36 (“The wall thickness... Morgantown.”)
- 27:1-4

A redline version of the public Surrebuttal Testimony of Dr. Zee is attached as **Exhibit B**.

- Dr. Zee Surrebuttal Exhibit 3 (PHMSA NOPV regarding ME1)

IV. REQUEST FOR EXPEDITED SEVEN-DAY ANSWER PERIOD

27. SPLP drafted and filed this Motion within eight days of the Commission’s Opinion and Order approving the Settlement becoming final (September 8, 2020) which resulted in the mootness on which this Motion is based. Given the hearings in this matter begin on September 29, 2020 and that a decision granting this Motion will save substantial hearing time, SPLP requests parties be required to file an Answer to this this Motion within seven days.

V. CONCLUSION

WHEREFORE, Sunoco Pipeline, L.P. respectfully requests that Your Honor:

- (1) Grant this Motion in Limine;
- (2) Hold the relief requested for a Remaining Life Study for the ME1 pipeline is moot;
- (3) Preclude from admission into the record evidence identified in Paragraph 26 above;
- and
- (4) Order Answers to this Motion be filed within seven days.

Respectfully submitted,

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Attorneys for Respondent Sunoco Pipeline L.P.

Dated: September 16, 2020

**BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION**

MEGHAN FLYNN	:	
ROSEMARY FULLER	:	
MICHAEL WALSH	:	
NANCY HARKINS	:	
GERALD MCMULLEN	:	DOCKET NOS. C-2018-3006116
CAROLINE HUGHES and	:	P-2018-3006117
MELISSA HAINES	:	
Complainants	:	
v.	:	
	:	
SUNOCO PIPELINE L.P.,	:	
Respondent	:	

**DIRECT TESTIMONY OF
MEHROOZ ZAMANZADEH, Ph.D.
ON BEHALF OF
FLYNN COMPLAINANTS**

1 **Q. Please state your name, position and business address.**

2 A. My name is Mehrooz Zamanzadeh, Ph.D. ("Dr. Zee") I am the founder, president,
3 technical director and chief scientist at Matergenics Inc. in Pittsburgh, Pennsylvania. My
4 business address is 100 Business Center Drive, Pittsburgh, PA 15205.
5
6

7 **Q. Please describe Matergenics, Inc.**

8 A. Matergenics Inc. is a state-of-the-art materials testing laboratory and corrosion
9 engineering firm. We provide root cause failure analysis determinations, inspection and
10 corrosion risk assessment of aging infrastructure and equipment, pipelines, metallurgical
11 testing, coating testing, materials analysis, and cathodic protection analysis. We serve
12 industries including the electric power utility, telecommunication, oil and gas, pipeline,
13 aerospace, automotive, water and wastewater, medical, and manufacturing industries.
14
15

16 **Q: Dr. Zee, is Exhibit Zee-1 a current version of your Curriculum Vitae?**

17
18 A: Yes, it is.
19

20 EXHIBIT ZEE-1 IS OFFERED INTO EVIDENCE
21
22

23 **Q. Please describe your educational and professional experience.**

24 A. I hold a Bachelor of Science and Master of Science in Material Science and Engineering
25 and a Ph.D. in Material Sciences from Pennsylvania State University. I joined the
26 National Iranian Oil Company in 1980 upon completion of my doctoral work. In 1985, I
27 joined Carnegie Mellon University in the capacity of Post-Doctoral Research Associate
28 under a corrosion grant from IBM. From 1987 to 1994, I was employed at Professional
29 Service Industries, Inc. (PSI), a consulting engineering and materials testing firm in
30 Pittsburgh, Pennsylvania as a Technical Manager. In 1994, I established Matco
31 Associates, an engineering and corrosion firm in downtown Pittsburgh, Pennsylvania. In
32 2008, Valmont Industries, a publicly traded company, acquired Matco Associates and
33 later sold it to Exova Group PLC in 2015. In 2017, I was able to regain ownership of the
34 engineering firm that I established and renamed it Matergenics, Inc., where I serve as the
35 founder, president, technical director and chief scientist. I am a National Association of
36 Corrosion Engineers ("NACE") Certified Corrosion Specialist with over 25 years of practical
37 experience in the corrosion engineering management, materials selection and cathodic
38 protection/coatings fields. NACE is the global leader in developing corrosion prevention
39 and control standards, certification and education. Specifically, with respect to corrosion
40 certifications, I am certified by NACE as a Materials Selection/Design Specialist, a Coatings
41 Specialist, a Cathodic Protection Specialist, and as stated above, a Corrosion Specialist. I
42 have worked in the oil and gas, and electric power utility industries throughout my career. I

1 have provided a wide range of materials and corrosion engineering solutions for these
2 industries.

3 **Q. Have you received any industry recognition or awards?**

4 A. I have been the recipient of the Colonel Cox Award for the Appalachian Underground
5 Corrosion Short Course (2010), the NACE International Fellow Award (2008), the
6 American Society for Metals (ASM) International Fellow Award (2006), the ASM
7 Entrepreneur of the Year (2004), and the NACE Outstanding Service Award (1996).

8
9
10 **Q. Have you taught courses that are relevant to this matter?**

11 A. Yes. I have lectured and taught frequently on materials selection, corrosion, coatings,
12 cathodic protection, and failure analysis (fracture mechanics). I have lectured at Carnegie
13 Mellon University and Pennsylvania State University. For technical societies, I have
14 lectured at NACE, American Foundry Society (AFS), ASM, and American Society for
15 Non-Destructive Testing (ASNT). I have also presented at the Electrical Power Research
16 Industry's BC Hydro Corrosion and Degradation Conference, and West Virginia
17 University's Appalachian Underground Short Course. I am a certified NACE Instructor
18 for corrosion engineering, cathodic protection, and condition assessment courses. I am
19 approved NACE instructor for Condition Assessment and Cathodic Protection
20
21

22 **Q. Have you occupied any leadership positions in the corrosion prevention industry?**

23 A. Yes. I have been the chairman and a trustee of the NACE Local Pittsburgh Section.
24

25 **Q. Do you have experience working with pipeline corrosion assessment and evaluating
26 the integrity of underground pipelines?**

27
28 A. Yes. After getting my PhD in Material Sciences, I was employed by NIOC, PSI, Matco
29 and Matergenics, all dealing with pipeline corrosion risk assessment and corrosion
30 mitigation. In addition, I have been a consultant for Kern River Gas Transmission,
31 Schlumberger Subsea Division, Dura-Bond Industries (including Dura-Bond Coating
32 Duquesne, Dura-Bond Pipe Steelton, and Dura-Bond Pipe McKeesport), and many
33 others.
34
35

36 **Q. What is the scope of your current responsibilities?**

37
38 A.
39 • Management of Capital Projects
40 • Setting Up Corrosion Risk Assessment/Corrosion Mitigation Programs,
41 • Coating Selection/Application, Cathodic Protection, Corrosion Inhibitors System
42 Design and Selection

- Technical CP Audits and Troubleshooting in Corrosion Control Programs
- Failure Analysis Root Cause Determination
- Engineering Studies and Technical Consultation
- Writing Standards/Certification Programs for Corrosion Assessment and Corrosion Control
- Managing and setting up Big QA/QC Corrosion Risk Data Centers
- Setting up Corrosion Engineering Courses: NACE Approved Instructor

Q. Can you identify some of the standard practices that you have been active in developing?

- A. [STG 05](#) Cathodic/Anodic Protection
[STG 08](#) Corrosion Management
[STG 41](#) Electric Utility Generation, Transmission, and Distribution
[STG 35](#) Pipelines, Tanks, and Well Casings
[TGC 527](#) Consensus-Corrosion Prevention and Control Planning Standard and
[TEG 187X](#) Microbiologically Influenced Corrosion

Q. How much writing have you done in your field?

- A. I've published dozens and dozens of articles in professional journals, some of them having been professionally referred. Topics that are pertinent to this proceeding include (a) AC interference and corrosive soils; (b) corrosion risk assessment and mitigation strategies; (c) coating selection; (d) cathodic protection.

Q. Are you the holder of any patents?

- A. Yes, I was the principal investigator and lead contributor for more than three dozen patents. Some of them have related to coatings and corrosion resistant materials.

Q. What are some examples of projects that Matergenics has worked on?

- A. Project examples:

- Corrosion control and cathodic protection in oil and gas production: transmission and distribution.
- Corrosion Risk Assessment and Corrosion Mitigation in Electrical Utility and Oil/Gas Industries. His analysis and identification of serious corrosion and stress corrosion

cracking problem within a refinery after Hurricane Katrina saved the company approximately 1 million dollars in corrosion repair costs.

- Corrosion control in refining units, Atmospheric Unit Overhead, Hydrogen Units, Water/Waste Water Treatment systems in refinery applications for NIOC.
- Development of an innovative corrosion monitoring and investigative technique for high mass utility poles for Valmont Industries. This method enables the client to assess whether a structure should be repaired or replaced. He has also provided product and process improvements for enhanced corrosion protection for utility poles.
- Corrosion control of underground pipelines through application of coatings and cathodic protection
- Corrosion control: storage tanks/piping
- Corrosion monitoring: test coupons, electrochemical techniques and NDT

Q. Have you been qualified as an expert witness in corrosion prevention by courts and/or administrative tribunals?

A. Yes. I was qualified as an expert witness in corrosion prevention in the following matters:

- *Alcan International Limited and Solvay Fluorides, Inc. v The S.A. Day Manufacturing Co., Inc.*, No. 94-CV-286H, 1999 WL 605702, United States District Court, W.D. New York (July 14, 1999)
- *Barrett v. Renz TDBA et al.*, No. GD-00-011610, 2001 WL 3700087, Court of Common Pleas of Pennsylvania (November 12, 2001)
- *Sports & Exhibition, et al. v Johnstown Welding, et al.*, No. GD04007881, 2001 WL 36265390, Court of Common Pleas of Pennsylvania (November 30, 2001)
- *Michael Schmelzer v Hilton Hotels Corp.*, No. 05-cv-10307, 2007 WL 4247050, United States District Court, S.D. New York (October 3, 2007) and
- *McWane, Inc. d/b/a Clow Valve Company v Chevron U.S.A., Inc.; Diamond Oil Co. and Oskaloosa Gas & Oil, Inc.*, No. LALA074105, 2008 WL 6259643, District Court of Iowa, Mahaska County (August 11, 2008).

Q. Have you testified at trials and hearings as an expert witness on corrosion issues?

A. Yes. In addition to the cases listed above, I have testified in trials and hearings in the following matters: *William Paul, et al. v CDG Engineers & Associates et al.*, Circuit Court of Pike County, Alabama (July 22nd, 2007); *Panama City Beach Condos Limited Partnership v Axis Surplus Insurance Co.*, No. 5:06-cv-00198-RS-AK, 2007 WL 4659621, United States District Court, N.D. Florida, Panama City Division (October 18, 2007); *Steinberg v Hussey Cooper et al.*, San Diego Superior Court Case No. GIC784469 (October 2007); *Kane County Public Building Commission v Wight and Company*, Kane County Judicial Center, St. Charles, IL; Gen. No. 03 LK 475 (October 2007).

1 **Q. Do you have other relevant experience as a corrosion expert in legal matters?**

2 A. Yes. I have provided deposition testimony in the following matters: *Lang v Progressive*
3 *Exp. Ins. Co. No. 11-C-0188*, 2012 WL 1409936, United States District Court, E.D.
4 Wisconsin (April 20, 2012); and *Elkins Constructors, Inc. v American Builders &*
5 *Contractors Supply Co., Inc., et al.*, Nos. 312010CA085219, 312010CA075220, 2013
6 WL 12321353, Florida Circuit Court (October 30, 2013).
7
8

9 **Q. Dr. Zee, are you generally familiar with the allegations of the Flynn defendants**
10 **concerning the condition of the 8-inch ME1 pipeline and the 12-inch bypass**
11 **pipeline?**
12

13 A. Yes, I am.
14

15 **Q. Dr. Zee, are you generally familiar with the allegations of the PUC's bureau of**
16 **Investigation & Enforcement in its December, 2018 Complaint against Sunoco?**
17

18 A. Yes, I am.
19

20 **Q. Then, is it safe to say that issues have been raised in both cases that implicate**
21 **cathodic protection, pipeline coatings, side drain measurements, close interval**
22 **surveys, microbiological induced corrosion, ILI tools, integrity management and**
23 **other aspects of evaluating and maintaining HVL pipelines?**
24

25 A. Yes, those issues are all involved in this case.
26

27 **Q. Are those all aspects of integrity management with which you are familiar?**
28

29 A. Yes, they all are matters with which I am very familiar.
30

31 **Q. Do you believe that based upon your education, training and experience you are**
32 **capable of rendering an opinion to a reasonable professional certainty on the**
33 **following matters:**
34

35 **(1) whether or not Sunoco's integrity management program complies with good**
36 **engineering practices as well as its own internal integrity management plan**
37 **document;**
38

1 (2) whether or not Sunoco's operation of the ~~8-inch pipeline and the~~ 12-inch
2 pipeline should be reviewed for corrosion risk both externally and internally;
3

4 (3) whether or not Sunoco's operation of ~~the subject 8-inch pipeline and the~~ 12-inch
5 pipeline should be reviewed for safety considerations from a corrosion risk point
6 of view; and
7

8 (4) whether or not Sunoco should continue operating these pipelines without a
9 thorough investigation by an independent expert.
10

11 A. The answer to this question is definitely "yes."
12

13 *FLYNN DEFENDANTS OFFER DR. ZEE AS AN EXPERT QUALIFIED TO TESTIFY AS*
14 *TO THE MATTERS TO WHICH HE HAS STATED HE IS CAPABLE OF RENDERING*
15 *AN OPINION TO A REASONABLE PROFESSIONAL CERTAINTY.*
16

17 **Q. What was your firm, Matergenics, retained to do in this case?**
18

19 A. We were retained to (a) review certain public and highly confidential documents, and (b)
20 review the condition of the ~~8-inch Mariner East 1 (ME1) and the~~ 12-inch portion of the
21 Mariner East 2 (ME2) workaround pipelines. Both of these pipelines date back to the
22 1930's. Finally, we were asked to make recommendations concerning ~~their~~ future
23 maintenance and/or operation from corrosion point of view.
24

25
26 **Q. Dr. Zee, how did Matergenics go about preparing your analysis?**
27

28 A. At Matergenics my staff and I work collaboratively under my supervision.
29
30

31 **Q. Can you provide an overview of the materials that you reviewed?**
32

33 A. Documents were provided by Flynn attorney Michael Bomstein to Matergenics, Inc. as
34 pdf files. These included both public documents and confidential and highly confidential
35 documents. 31,521 pages of materials were supplied. Of these, 3390 were identified as
36 "public." The balance were marked "Confidential/Highly Confidential."
37

38 On August 9, 2019, an *in camera* inspection took place on premises of
39 Matergenics. Under supervision of a Sunoco attorney, Matergenics staff were permitted
40 to examine additional documents stamped "Confidential Security Information" ("CSI").
41 Staff were not allowed to take notes or photocopy any of the CSI materials.
42

1 The initial *in camera* review has shown that the CSI materials consisted of a
2 pipeline integrity management (“IM”) manual and hazard assessments dated 2013, 2017
3 and 2018. Matergenics does not here comment on the hazard assessments.

4 On January 6, 2020, we were given the opportunity to examine the IM data as
5 well as ancillary material referred to in the CSI documents. We were allowed to take
6 notes on this occasion.

7 Matergenics further notes that it understands Flynn counsel has requested an
8 opportunity for us to participate in the excavation and condition assessment of portions
9 of the ME1 and ME2 pipeline. At the time of this report we have not yet been able to do
10 so.

11 Pursuant to certain discovery orders in this case relative to production of
12 documents, we also reviewed:

- 13 • Records confirming tests and upgrades in Chester and Delaware Counties since
14 January 1, 2013
- 15 • Integrity Management Plans
- 16 • Documents summarizing maintenance and upgrades in Chester and Delaware
17 Counties performed since January 1, 2015
- 18 • Documents reflecting leaks, punctures and ruptures on the ~~8-inch and~~ 12-inch
19 pipelines since January 1, 1986
- 20 • 1052 pages (39 pdf files) of Close Interval Surveys (CIS) furnished in late,
21 December, 2019

22 We have examined the documents produced by Sunoco and find that there are 215
23 inspection and repair records covering 2013 to 2016 and one comprehensive inspection
24 report from April 2014. ~~We have seen three pipeline integrity summaries for ME1
25 covering 2016 to 2018. There also were ILI inspection anomaly reports for ME1
26 covering 2017 to 2018.~~

27 There also were right of way (ROW) reports for the period April 20, 2019 to June
28 16, 2019. There were documents reflecting leaks, punctures and ruptures going back to
29 2002.

30 Finally, there were numerous records extraneous to the purpose of our technical
31 review, including legal documents, a first responders’ manual, and so on.

32 ~~Relative to the Morgantown accident of April, 2017, we have reviewed a
33 summary report as well as the pleadings and the joint motion for settlement approval.~~

34 It is our understanding that Flynn counsel was unable to secure access to the
35 Reliable searchable software platform in its review of the Sunoco documents.
36 Matergenics was able to obtain the Foxit PhantomPDF software and that software was
37 used to look for key words in the 31,521 pages of materials. As with any such software,
38

no one claims it has a 100% success rate and it is acknowledged, therefore, that relevant documents may not have been identified.

Q. Can you comment on aging pipelines and corrosion failure in general?

A. In general, aging underground pipelines are at risk of corrosion failure due to coating degradation, external corrosion and stress corrosion cracking. Corrosion failures in aging pipelines are either sudden catastrophic ruptures or gradual leaks due to localized corrosion and cracking. Many factors associated with these corrosion areas are coating failure, degradation, disbondment, blistering, delamination, mechanical pressure and stress concentration, galvanic action, corrosive ions, the presence of moisture, corrosive soils, stray current interference, AC interference, inadequate cathodic protection and shielding. These areas have a much higher statistical probability of catastrophic failure and rupture.

Most of the time initiation of stress corrosion cracking (SCC) and pitting corrosion are detected by coincidence in excavation and digs and is not targeted or predicted by analysis of corrosion performance parameters. Internal or ILI tools have limited capability for detecting or identifying stress corrosion cracking and pitting corrosion initiation.

It may be noted that aging, by itself, may not result in corrosion of a steel pipeline. In theory, it is possible that there will be constant/consistent soil conditions, coating conditions, absence of potential damage mechanisms/threats throughout the service life. But in reality, this just does not happen. Coating degrade and disbondment take place.

A pipeline will be exposed to various potential damage mechanisms/threats throughout its service life. If these damage mechanisms/threats are not identified, controlled and/or mitigated in time, it could result in pipeline failure. Typically, aging presents corrosion problems as well as corrosion induced cracking.

Cast iron, wrought iron and bare steel pose the highest risk compared to coated carbon steel. As the pipeline ages, coating on the pipeline could damage/disbond/delaminate and result in corrosion with age at the exposed areas in the aggressive soil conditions.

In our opinion, integrity assessment must be in place for aging pipelines. It is necessary that there be (a) External corrosion direct assessment (ECDA); (b) Internal corrosion direct assessment (ICDA); and (c) Stress Corrosion Cracking Direct assessment (SCCDA).

Q. What are the primary forms of corrosion attack in corrosive soils?

1 A. The two main forms of corrosion that have been observed are localized, (pitting)
2 corrosion and stress corrosion cracking. Both pitting corrosion and stress corrosion
3 cracking are localized in nature and occur when corrosive ions are exposed to the steel
4 surface under disbonded/delaminated coating or at coating defects.

5
6 Pitting corrosion is a type of corrosion that is confined to small area. It usually is
7 an autocatalytic process in the absence of AC/DC stray current corrosion. Active pitting
8 corrosion is considered structural corrosion when the corrosion penetrates the steel.
9 Pitting corrosion can be initiated due to presence of corrosive ions under a disbonding
10 coating that acts as a shield to cathodic protection or in the presence of AC interference.

11
12 Stress corrosion cracking (SCC) is a form of corrosion cracking that is associated
13 with near-neutral pH or high pH. For near neutral pH stress corrosion cracking, the
14 electrolyte contains a dilute solution of carbon dioxide and bicarbonate ions with a pH
15 between 6 and 7. This type of corrosion cracking is associated with limited branch
16 transgranular cracking and the crack walls contain corrosion products. High pH SCC is
17 caused by a solution of carbonate ions with pH between 9 and 10.5 exhibiting
18 intergranular cracking with limited branching. Stress corrosion cracking can initiate
19 under disbonded coatings that may shield cathodic protection.

20
21 **Q. Can you explain the role of coatings in corrosion protection?**

22
23 A. One of the oldest measures of corrosion protection is to coat the substrate with a
24 polymeric material. An organic coating can protect a metal substrate by two
25 mechanisms:

- 26
27
 - Serving as a barrier for the reactants: water, oxygen, and various ions.
 - Serving as a reservoir for corrosion inhibitors that may assist the surface in resisting
28 corrosion attack.

29
30
31 **Q. Are there different types of coatings?**

32
33 A. There are a number of different types of coatings that have been used specifically to
34 provide corrosion protection for buried or submerged metal structures including coal-tar
35 based coatings, polyolefins, shrink sleeves, wax-based coatings, asphalt, urethanes and
36 blends, epoxy phenolics, polyureas, esters, and fusion bonded epoxy coatings (FBEs).

37
38 **Q. Have you prepared summaries that identify repair reports that show the coatings**
39 **found on the ~~8-inch and~~ 12-inch pipelines?**

40
41 A. Yes as you can see from the two tables below. **Exhibit 2** shows the documents reviewed.

1
2
3

Summary of Sunoco Pipeline 12.750-Inch Pipe Repair Reports¹

~~Summary of Sunoco Pipeline 8.625-Inch Pipe Repair Reports²~~

1 **Q. For the 12-inch pipeline, what did you notice about corrosion associated with bare**
 2 **pipes?**

3
 4 A. For the seven months that we had information for, bare pipe had the greatest amount of
 5 corrosion.

6
 7 **Q. What is cathodic protection?**

8
 9 A. Cathodic protection ("CP") is a method for reducing corrosion by minimizing the
 10 potential difference between the anode and cathode. In this method, a current is applied
 11 from an outside source to the structure to be protected, such as a pipeline. When enough
 12 current is applied, the whole structure, (pipeline) will exhibit one potential and the anodic
 13 sites on a pipe will cease to exist.

14 In soil environments, cathodic protection is effective if the real potential of steel
 15 (without the ohmic drop) is more negative than -850 mV with respect to a
 16 copper/saturated copper sulphate reference electrode.

17
 18 ~~**Q. Can you tell from the documents what CP criteria were used on the ME1 pipeline?**~~

19
 20 ~~A. From the documents, it is not clear what CP criteria was used on ME1 pipeline. Sunoco's~~
 21 ~~answer to the I&E complaint acknowledges not meeting the minimum -850mV CSE~~
 22 ~~(Copper-Copper Sulphate reference Electrode) NACE SP0169 CP criterion. Lab analysis~~
 23 ~~reported that the leak is due to microbiologically influenced corrosion, or MIC. In the~~
 24 ~~case of MIC, the polarized potential of -950 mV CSE or more negative should be~~
 25 ~~considered. No data or reference that shows that the potential is maintained at more~~
 26 ~~negative than -950 mV CSE.~~

27
 28
 29 ~~**Q. Are there NACE standards that have a bearing on this issue?**~~

30
 31 ~~A. Yes, for example:~~

32
 33
 34 ~~**NACE SP0169-2013 Extract:**~~

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~~Q. What did you learn about Sunoco's cathodic protection from review of records in the I&E proceeding?~~

~~A. From Appendix C of the Joint Settlement motion, at page 8, it was reported that "At station 2459+00, which is approximately 1,030 feet from the leak, SPLP's records indicated cathodic protection readings of 628 mV in 2016 and 739 mV in 2015. Adequate cathodic protection is achieved at a negative cathodic potential of 850 mV or lower". From readings, it is evident that the potentials are maintained at more positive than 850 mV CSE. Moreover, ON potentials are recorded. There is no mention of OFF potentials."~~

~~From those documents, including Sunoco's Answer, it appears that Sunoco's position is that a negative potential of 850 mV need not be maintained because Sunoco has taken other approved steps to protect against corrosion. This alternative scheme is referred to below as the "100 mV criterion". Sunoco gives the impression that the 100 mV criterion was used as the pipe is 9 decades old, the coating might have degraded, and, could be due to economic reasons. However, this criterion is not valid in the presence of anaerobic bacteria or galvanic action.~~

~~Q. Can you explain the role of anaerobic bacteria in this process?~~

~~A. Yes, we can start with an NACE standard:~~

~~NACE Publication 35108-2008 SG, One Hundred Millivolt (mV) Cathodic Polarization Criterion Extract:~~

~~Although most pipeline operators using the 100 mV cathodic polarization criterion follow a procedure similar to the above, they typically consider the applicability of the 100 mV criterion before undertaking these. As previously discussed, the effectiveness of the 100 mV cathodic polarization criterion is problematic on pipelines operating at elevated temperature or exposed to anaerobic bacteria because in either condition, 100 mV of polarization is not always sufficient to mitigate corrosion.~~

Effect of Anaerobic Bacteria

The presence of anaerobic bacteria, as demonstrated in one investigation,¹⁸ suggests an increase in the minimum polarization value to the 200 to 300 mV range. A similar increase in the -850 mV_{CSE} potential criterion is also true in the presence of anaerobic bacteria.

Q. Can you explain the challenges with 100?

A. Moreover, the major disadvantage of this criterion is that polarized potentials could fall in the range of Stress Corrosion Cracking (SCC) on a pipeline. At room temperature of about 21°C, the potential range is from about 550 mV CSE to 700 mV CSE. For susceptible pipelines in ambient temperature conditions, polarized potentials within this range should be avoided.

Q. Are there any charts that help explain the difficulty of successfully maintaining the 100 mV criterion?

A. Yes, see below:

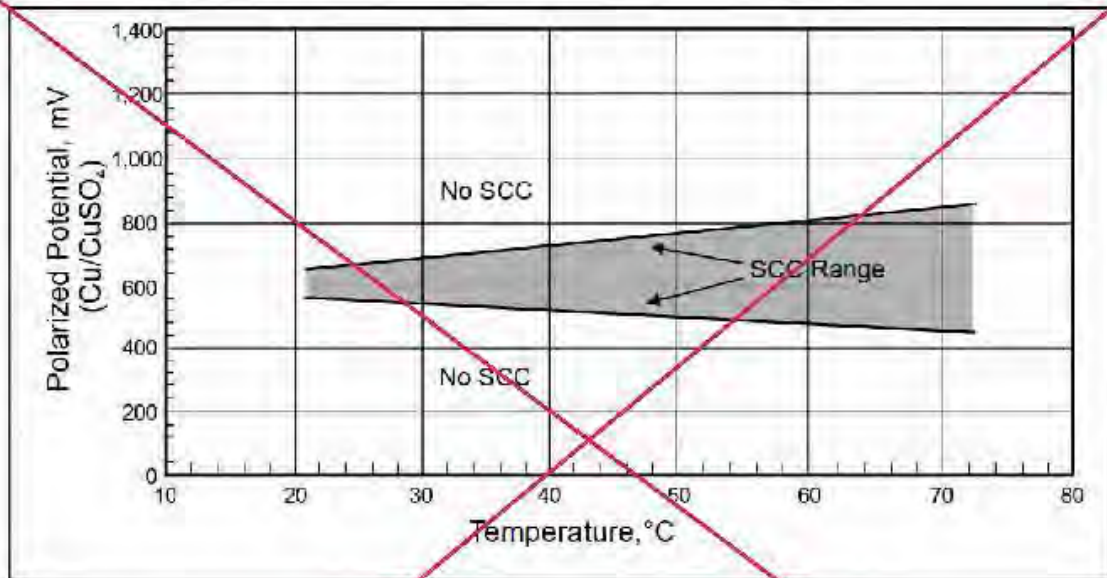
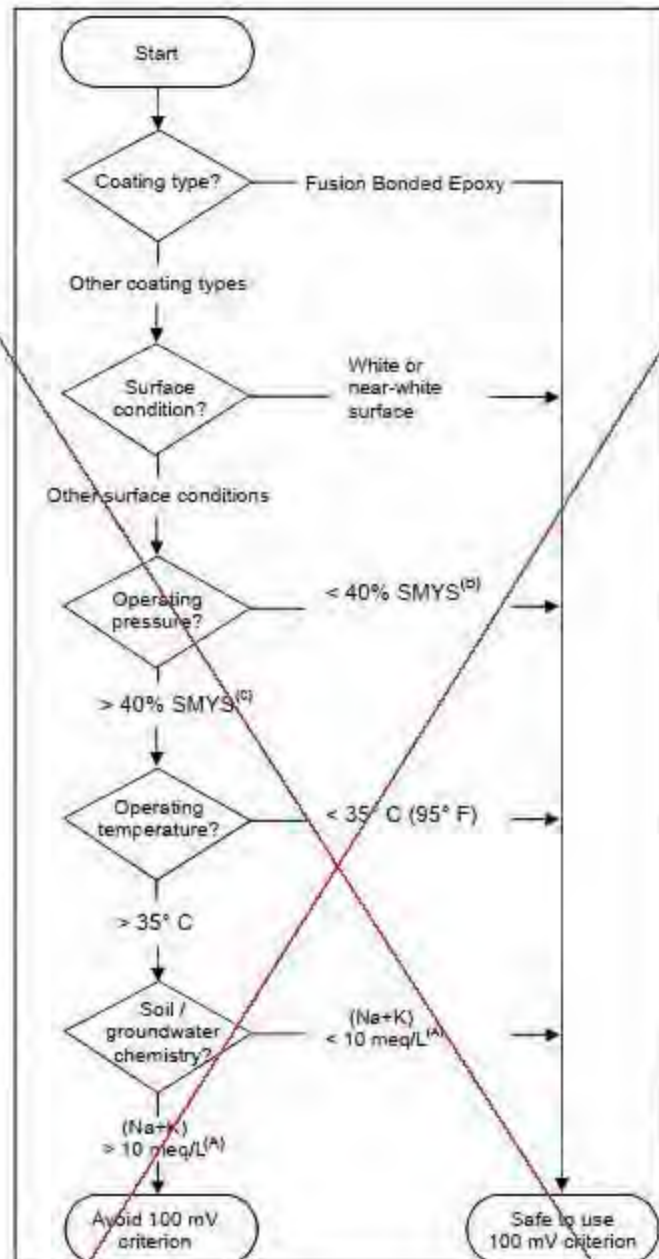


FIGURE – SCC Range in Carbonate/Bicarbonate Environments

Reference: NACE Publication 35108-2008-SG, One Hundred Millivolt (mV) Cathodic Polarization Criterion (Figure 23)



Flow diagram for decision-making with respect to the use of the 100 mV cathodic polarization criterion^(A) to avoid the possibility of high-pH SCC.

^(A) The safe use of the 100 mV cathodic polarization criterion in accordance with this chart does not guarantee that high pH SCC does not occur, only that it is extremely unlikely.

^(B) SMYS = specified minimum yield strength.

^(C) Based on laboratory analysis of limited field data.

FIGURE – Flow Diagram for Decision-making with Respect to the Use of the 100mV Cathodic Polarization Criterion to Avoid the Possibility of High-pH SCC

Reference: NACE Publication 35108-2008-SG, One Hundred Millivolt (mV) Cathodic Polarization Criterion (Figure 24)

1 **Q. Then, can you summarize your view on the -850 mV criterion?**

2
3 A. Yes. To summarize, just as the -850 mV CSE polarized potential criterion needs to be
4 more electronegative in the presence of sulfate reducing bacteria, the same is the case for
5 the 100 mV cathodic polarization criterion.
6

7
8 **Q. What are the other conditions where -850 mV criterion should be carefully**
9 **considered?**

10
11 A. In the presence of Stray current and Alternate Current Interference conditions.
12
13

14 **Q. What is stray current corrosion?**

15
16 A. Stray current corrosion is due to currents following through paths other than the intended
17 circuit. This type of corrosion is localized in coated pipes and takes place at discharge
18 points (pinholes and mechanically damaged areas). Failure can occur in a rather short
19 service time.
20

21 No information was provided to us regarding stray current surveys. Sunoco needs
22 to disclose if any stray current survey was performed on this ME1 line. If performed, data
23 should be submitted for review. Stray current corrosion is a major concern for accelerated
24 corrosion.
25

26
27 **Q. What is the role of alternating current interference in pipeline corrosion?**

28
29 A. Typically, coated pipelines are located near electric transmission lines and run parallel to
30 high voltage transmission lines (HVTL). AC interference can take place by conduction
31 or an induction mechanism causing corrosion in the blistered areas of the coating. The
32 presence of AC interference can cause serious pitting corrosion even on pipes under
33 cathodic protection. This is even the case if the -850 mV CSE criterion is met.
34 Uncertainties exist as to the reason for this.
35

36 No information was provided on AC interference surveying. Sunoco needs to
37 disclose if any survey was performed on this ME1 line. If performed, data should be
38 submitted for review.
39
40
41
42

1 **Q. What is the role of microbiological induced corrosion (MIC) in pipelines?**

2
3 A. Generally, underground pipelines are protected from corrosion by coating and CP.
4 However, the protective measures are not always effective to protect the pipelines,
5 especially when the coating is disbonded and the CP current is shielded from reaching the
6 trapped water/liquid. As a result, bacteria growth occurs on pipelines under disbonded
7 coating.

8
9 Since nearly all soils are naturally rich with microbiological activity, detecting
10 presence of MIC on external side of the buried structures and pipelines is really
11 challenging. CP and coating are the only mitigation options for MIC on direct buried
12 pipe. Sunoco needs to disclose if any soil analysis was performed at the site of the
13 Morgantown accident.

14
15 **Q. Can you explain Cathodic Protection Shielding by Protective Coatings**

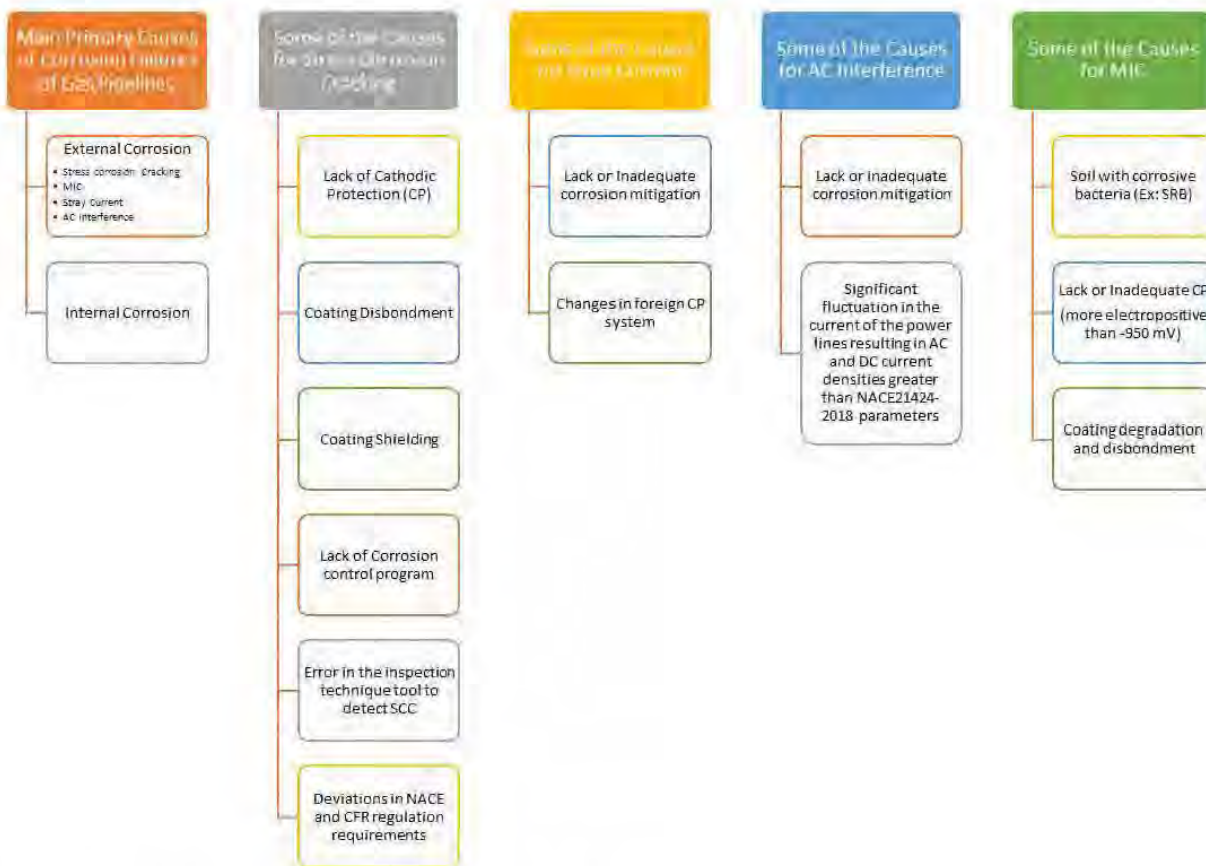
16
17 A. Cathodic protection shielding is defined as preventing or diverting the cathodic protection
18 current from its intended path. Many companies are aware of the problems with CP
19 shielding, yet some continue to use the same coating types and construction practices that
20 have tendencies to cause CP shielding because of economics involved. Information
21 relating to this problem in the case of ME1 is missing.

22
23 Several pipeline operators now list *CP shielding disbonded coatings* as their
24 leading root cause of external corrosion. Coating systems like coal tar can cause
25 increased demands on a CP system and often present difficulties in achieving adequate
26 protection levels. If coatings disbond from the pipe and if electrolytes can enter into this
27 area, a serious corrosion condition can result because the protective CP current may be
28 shielded from reaching any active corrosion cells.

29
30 Depending on a coating resistivity, water absorption, pH and oxygen permeation,
31 the risk of corrosion of the underlying metal can be light uniform to significant corrosion,
32 SCC or bacterial corrosion.

33
34 **Q. Have you prepared an overview of factors that may contribute to corrosion?**

35
36 A. Yes, see the chart below: Presence of DC power source near the pipeline, and shielding
37 coatings for MIC.



1
2
3 **Q. You've done a technical review of the Flynn production documents furnished to you**
4 **by counsel, is that correct?**

5
6 **A. Yes, we have.**

7
8 **Q. Let's start with your review of the public documents. What did you find from the**
9 **Public 104 documents? (Exhibit Zee-3)**

10
11 **A. Public 104 Documents:**

12
13 A total of 172 document files were identified in this folder. These documents all fall
14 within the range of SPLP00002625 to SPLP00005708

15
16 The documents in this folder are primarily legal documents related to the original
17 civil suit and ex parte emergency order of PA PUC BIE v. Sunoco Pipeline, and a few
18 other related civil suits (Dinniman v. Sunoco Pipeline and Andover Homeowner's
19 Association v. Sunoco Pipeline). Numerous parties filed petitions to intervene in this
20 matter.

21
22 There are some more technical documents in this folder, including a Pennsylvania
23 Coordinated Response Exercise for First Responders (CORE) Emergency Response

Manual (SPLP00004529), and Energy Transfer Standard Operating Procedure (SOP) documents related to the following

- Aboveground Components / Overhead Crossings – SPLP00003961
- Annual Corrosion Control Surveys – SPLP00004140
- Emergency Response Training Exercises – SPLP00004817
- Investigation of Pipeline Anomalies -SPLP00004244
- Hazardous Liquids Pipeline Shutdown and Startup – SPLP00003838
- Structure to Electrolyte Potential Measurement – SPLP00004042
- Pressure Protection and Relief Valve Capacity Verification – SPLP00004330
- Public Awareness Plan – SPLP00004447

Numerous other Energy Transfer SOPs are found in these 8 specific document files as well. These SOPs may be important in ascertaining the adequacy of the Sunoco Pipeline / Energy Transfer operating procedures.

Q. What did you find from the public 113 documents? (Exhibit Zee-4)

A. Public 113 Documents:

A total of 7 document files were identified in this folder. These documents all fall within the range of SPLP00005715 to SPLP00005777.

A total of 6 documents are United States Department of Transportation Accident Reports – Hazardous Liquid Pipeline Systems for the Mariner East 1 (ME1) pipeline from 3-22-2002 to 4-26-2017. Failure causes include pinhole leaks, Viton O-ring leaks, improper plug installation, and “undetermined.” These may be important. They are summarized as follows:

- SPLP00005715: Report dated 3-22-2002. Accident occurred at Tinicum, Delaware County, PA, on 2-21-2002. Summary follows.

“COMPLAINT OF ODORS BY PROPERTY OWNER LED TO INTEGRITY TESTING AND EXCAVATION ALONG A PARALLEL SECTION OF 8-INCH AND 12-INCH PETROLEUM PRODUCT LINES. THIS INVESTIGATION RESULTED IN DETERMINATION THAT 12-INCH LINE WAS LEAKING ADJACENT TO COMMERCIAL BUSINESS (HOTEL). NO EVACUATIONS WERE NECESSARY. RESPONSE WAS LIMITED TO LOCAL FIRE DEPARTMENT AND TOWNSHIP OFFICIALS. PA DEP, US COAST GUARD, US FISH & WILDLIFE AND OPS HAVE MADE ON-SITE INSPECTIONS OF THE LEAK LOCATION. NO IMPACT TO DARBY CREEK IS EVIDENT. **THE ROOT CAUSE OF THIS FAILURE CAN NOT CONCLUSIVELY BE DETERMINED SINCE THE FAILED SECTION OF PIPELINE CAN NOT BE RETRIEVED BECAUSE OF THE RISK OF DAMAGING AN ADJACENT BUILDING DUE TO ITS CLOSE PROXIMITY TO THE PIPELINE.** THE PIPELINE SECTION AT THE LEAK IS APPROXIMATELY 12 FEET DEEP FOR A CROSSING OF DARBY CREEK. THE PIPELINE HAD ILI BY A HIGH-RESOLUTION ULTRASONIC PIG DEVICE IN OCTOBER 2001 WITH REPORT BEING RECEIVED IN JANUARY 2002. THE SECTION OF LINE THAT LEAKED HAD A REPORTED FEATURE AND WAS SCHEDULED TO BE FIELD INVESTIGATED AFTER THE DISCOVERY OF THE LEAK. IN ORDER TO GATHER ADDITIONAL

1 INFORMATION ABOUT THE FAILED SECTION OF PIPE, A VIDEO CAMERA WAS RUN INSIDE
2 THE FAILED PIPE SECTION TO LOCATE AND EXAMINE THE FAILURE LOCATION. THIS
3 INTERNAL VIDEO INSPECTION CONFIRMED THE LOCATION OF THE LEAK AS BEING THE
4 SAME LOCATION AS THAT REPORT BY THE ILI. BASED ON THE AVAILABLE INFORMATION,
5 THE LEAK APPEARS TO BE CORROSION RELATED, EXACT CAUSE UNKNOWN.”

- 6
7
8 • SPLP00005721: Report dated 12-23-2008. Accident occurred at Murrysville,
9 Westmoreland County, PA, on 11-25-2008.

10
11 **KIEFFNER FAILURE ANALYSIS REVEALED IMPROPER INSTALLATION OF THE**
12 **PLUG AS THE PRIMARY CAUSE OF THE FAILURE AND DEFORMATION OF THE**
13 **TOR FITTING AS A CONTRIBUTING FACTOR. OUR PROCEDURES WERE**
14 **AMENDED PER PHMSA REQUEST AND EMPLOYEES WERE RE-QUALIFIED WITH THE**
15 **NEW PROCEDURES.**

- 16
17
18 • SPLP00005725: Report dated 5-6-2015. Accident occurred at Glen Mills,
19 Delaware County, PA, on 4-10-2015. Summary follows.

20
21 “On 4/10/2015 at approximately 15:05 a landowner telephonically reported a petroleum odor to
22 the SPLP Control Center. The line was shutdown and field personnel were dispatched to the area
23 and detected a rainbow sheen on an intermittent drainage swale in a wooded area adjacent to the
24 pipeline ROW. Emergency Response and Incident Command was initiated and the source of the
25 odor was traced to the Point Breeze to Montello 12" refined products pipeline system. This area of
26 the pipeline was excavated and a Plidco repair clamp was used to effect repair at the failure
27 location. Permanent repair via cut out and replacement was planned however the area of the failure
28 was located in a wetland area that is subject to PA DEP permitting. Permit approval process
29 significantly delayed permanent repair. As of 7/10/2017 the failed section was cut out and
30 replaced. **The failed section was sent to a laboratory for failure analysis. The failure analysis**
31 **report confirmed that the cause of the failure was external corrosion. The most likely**
32 **mechanism for the external corrosion was coating failure which caused localized shielding of**
33 **the CP.** In 2016, Def/MFL/SMFL/LFM and UT Crack ILI tools were run and subsequent repairs
34 and replacement of sections of this pipeline were affected including the cut out and replacement of
35 this failed section of pipe. Subsequent to the repair program a hydrostatic pressure test was
36 completed to requalify the MOP.”

- 37
38
39 • SPLP00005738: Report dated 6-22-2016. Accident occurred at Aston,
40 Delaware County, PA on 5-27-2016. Summary follows.

41
42 “On Friday, 5/27/2016 at 13:04, a High-High LEL Alarm Condition Triggered a Facility Lockout
43 at Twin Oaks meter station and pipeline shut down. Event notification was sent to supervision and
44 field personnel were dispatched to investigate. Leak was discovered at the receiving pig trap door.
45 Response included isolation of the pig trap and flaring of the remaining product contained in the
46 pig trap. **When purged and made safe to open, the pig trap door was assessed and it was**
47 **determined that the O-Ring door seal had failed which caused the release.** A new O-Ring was
48 installed, leak tested and the pipeline was returned to normal operation.”
49
50
51

- SPLP00005751: Report dated 9-13-2016. Accident occurred at Allegheny Township, Blair County, PA, on 8-16-2016.

“On Tuesday, 8/16/2016, a High-High Alarm Condition triggered a Facility Lockout at Hollidaysburg Pump Station. Event notification was sent to supervision. Field personnel were dispatched to investigate. Leak was discovered at the receiving pig trap closure. Response included isolation of the pig trap and flaring of the remaining product contained in the pig trap. When purged and made safe to open, the pig trap closure assembly was assessed. **Investigation determined the pig trap closure O-Ring had failed which was the immediate cause of the release.** A new O-Ring was installed, leak tested and the pipeline was returned to normal operations.”

- SPLP00005764: Report dated 4-26-2017. Accident occurred at Morgantown, Berks County, PA, on 4-1-2017. Summary follows.

“On April 1, 2017 at 15:57, a call was received by the Sunoco Pipeline LP (SPLP) Control Center via the company emergency number from a landowner reporting a possible leak along the pipeline ROW at 5530 Morgantown Rd, Morgantown, PA. Internal notifications were made and SPLP field personnel were immediately dispatched to the field to investigate. Field personnel arrived onsite at approximately 17:00 and confirmation of the release was made at approximately 17:04. NRC notification was made at 17:59 (Report 1174615) that same day. Required follow up report to NRC was made on April 3, 2017 at 15:46 (Report 1174748) updating the volume released to 20bbbls and also providing updated coordinates of the release location.”

“The pipeline was shut down and the affected area was isolated via upstream and downstream mainline valves. Product was displaced and the isolated segment was nitrogen purged. **Subsequent excavation revealed the source of the leak as an external corrosion pinhole. The affected section of piping was cut out and replaced and the failed section was sent to a 3rd party laboratory for failure analysis. Failure analysis indicated that the leak occurred at the bottom of the pipe at an area of external corrosion coincident with the heat affected zone of a girth weld. The failure analysis confirmed the cause as external corrosion and indicated that microbiologically induced corrosion (MIC) may have contributed to the observed external corrosion.**”

Even though the performance of failure analyses were mentioned in some of the accident reports, the technical review of documents did not identify any such failure analyses. Failure analysis of an accident should be made available in the public domain. Two of the reports in particular, are important (SPLP00005725 and SPLP00005764) because they specifically state external corrosion as the root cause of failure.

1 file (SPLP00005777) is an unreadable (too small) spreadsheet which may be presumed to be a summary of ME1 accidents over time. Even under high magnification the text lacks sufficient resolution to be readable. **It would be very useful to obtain this spreadsheet, or at least a readable copy.**

1 **Q. Please comment on the documents you found in Public 165, 166 and 169 from 6-17-**
2 **19.**

3
4 *A. Public 165 166 169 Documents (6.17.19):*

5
6 A total of 3 document files were identified in this folder (SPLP00005786,
7 SPLP00005837, SPLP00005843).

8
9 All are incomplete segments of hearing testimony from the PUC and the PA
10 Environmental Hearing Board ranging from 3-2-2017 to 5-10-2018. A search of the
11 major keywords using the Foxit PhantomPDF software found only 1 document
12 (SPLP00005843) with much discussion/comment related to the keywords.
13

- 14 • Pennsylvania Environmental Hearing Board meeting, March 2, 2017, pages 559,
15 567-568. Tree roots are attracted to pipe by the cathodic protection system; and
16 can cause coating failure (p. 559). Coating over welded areas; and installation of
17 pipe (pp. 567-568).

18
19 p. 559

20
21 **Q. Why can't you replant trees in the right-of-way itself?**

22
23 **A.** Trees in relationship to the pipeline right-of-way cause two issues. It obstructs
24 visibility from an areal patrol inspection, we 're required to inspect our right-of-
25 way very often by the federal government. And from the sky is the most efficient
26 way to perform that inspection. The other problem is trees for the most part can
27 have invasive roots and they're attracted to the pipe by the cathodic protection
28 system. Electrical current that we use to protect the pipeline. Those roots will
29 wrap around the pipe and they can actually damage the coating that we use to
30 protect the pipe and it will prematurely cause coating failure and failure that needs
31 — cause to go repair the pipe.
32

33
34 pp. 567-568

35
36 **Q. Can you tell me the purpose of the timber mats?**

37
38 **A.** Timber mats is another means of dispersing the load of the equipment and prevent
39 compaction. The equipment itself has low pressure design in both low pressure
40 tires or tracks, depending on the type of equipment.

41
42 So definitely when you get to wetlands and soft areas, you put timber mats down
43 so the equipment won't sink and/or compact the ground.
44

45 After the travel lane' s established, the surveyors come back through and they'll
46 stake out a center of where the pipe is supposed to go for the ditch crew, and that's

1 basically a backhoe or another type of rotary excavator that will excavate the
2 ditch, separate the topsoil and the subsoil. Behind them comes a crew with the
3 truck crew, sometimes at the same time, sometimes ahead or behind, will string
4 out the pipe along one side of the right-of-way.

5
6 Union welders come in. They weld up every joint of pipe. Every joint of pipe gets
7 x-ray inspected to make sure the welds are solid and good. After the welds are
8 complete, the coating crew comes through and they apply the protective coating
9 over the welded areas because the pipe is coated but the weld areas have to be
10 bare steel for the welding process.

11
12 So then they inspect the coating to make sure that it's that there's no dents,
13 gouges, scrapes, pock marks. They lower the pipe into the excavation. They once
14 again inspect the coating to make sure it didn't get damaged during the lowering
15 in process. Coating is very important to the pipe.

16
17
18 **Q. Please comment on the documents you found in Public 165, 166 and 169 from 6-19-**
19 **19.**

20
21 *A. Public 165 166 169 Documents (6.19.19):*

22
23 A total of 3 document files were identified in this folder (SPLP00006922,
24 SPLP00006941, SPLP00006952.

25
26 Two (SPLP00006922 and SPLP00006941) are Sunoco direct testimony before the
27 PUC dated 3-1-2018; and one is an incomplete segment of hearing testimony from the
28 PUC dated 7-18-2017 (SPLP00006952). A search of the major keywords using the Foxit
29 PhantomPDF software found little of relevance.

30
31
32 **Q. Now, let's switch to documents stamped "confidential/highly confidential." What**
33 **did you find in No. 104, the ROW walking reports?**

34
35 *A. Highly Conf 104 – ROW Walking Reports (6.17.19) (Exhibit Zee-5)*

36
37 A total of 56 document files were identified in this folder, ranging from SPLP00000047
38 to SPLP00000263.

39
40 Sunoco right-of way (ROW) patrol reports of ME1 to PUC covering the time
41 period from 4-20-2019 to 6-16-2019, as one of the requirements of PUC to allow re-
42 establishment of ME1 operation. The following four pdf documents provide in an
43 abbreviated form the data included in all the daily reports for the Sunoco ME1 right-of-
44 way (ROW) inspections as required by PUC; extending from 4-20-2019 to 6-16-2019.

- 45
46
 - SPLP00000103 (ROW Inspection 4-20-2019 to 5-6-2019).

- SPLP00000167 (ROW Inspection 5-7-2019 to 5-22-2019).
- SPLP00000235 (ROW Inspection 5-24-2019 to 6-9-2019).
- SPLP00000235 (ROW Inspection 6-10-2019 to 6-16-2019).

What is important here is that the report forms were designed for both right-of-way patrols and leak surveys. No leak surveys were conducted by Sunoco.

Q. Now, let's switch to documents stamped "confidential/highly confidential." What did you find in No. 104, Strain Gauge Top of Pipe Reports dated 6-17-19?

A. Highly Conf 104 – Strain Gauge Top of Pipe Reports (6.17.19)

A total of 81 document files were identified in this folder, ranging from SPLP00000267 to SPLP00002583.

Sunoco ME1 subsidence inspection data reports to PUC covering the time period from 1-10-2019 to 4-11-2019, as one of the requirements of PUC to allow re-establishment of ME1 operation. The reports are mainly data tables; and include the following.

- Ground elevation monitoring – data tables provided in reports
- Top of pipe elevation monitoring – data tables provided in reports.
- Kiefner daily strain gauge report – only a link to a secure website is provided.

Nothing abnormal was found in the inspection data.

Q. Did you review other documents from the 6-19-19 folder?

A. Highly Conf Docs Folder; 104 and 175-177 Highly Confidential Subfolders (6.19.19)

The 104 sub-folder contained 30 documents (ranging from SPLP00005892 to SPLP00006910) and the 175-177 sub-folder contained 1 document (SPLP00007001). Documents in the 104 sub-folder included the following types of reports.

- ME 1 pipeline stress monitoring reports – data tables provided in reports.
- ME 2 alternative construction methods notifications.
- ME 1 top of pipe elevation monitoring reports – data tables provided in reports.
- ME 1 remediation grout program reports.
- ME 1 natural ground elevation monitoring reports – data tables provided in reports.

Nothing abnormal was reported in the monitoring reports.

1 The one document in the 175-177 sub-folder was a set of 33 aerial surveys of Mariner
2 East 1.

3 **Q. Did you review 6-26-19 document production 1, 10 and 13 (Exhibit Zee-6)**

4
5
6 *A. 6.26.19 SPLP Production – Highly Conf CSI Docs Highly Confidential 1, 10, 13*

7
8 A total of 1647 document files were identified in this folder, ranging from
9 SPLP00015477 to SPLP00028647.

10
11 Of these, 1406 document files are judged to be irrelevant to the purposes of our
12 litigation support. These documents fall into the following general categories.

- 13
14
- 15 • Unreadable test results.
 - 16 • Test plans and requests.
 - 17 • Discussion outlines.
 - 18 • Mill test reports.
 - 19 • ISNetworld OQ reports.
 - 20 • Personnel lists and personnel qualifications of all types (including welding and NDT).
 - 21 • Radiological inspections and qualifications.
 - 22 • Line testing task reports.
 - 23 • ILI inspection anomaly reports for anomalies such as deformation and other non-
 - 24 corrosion/coating types.
 - 25 • Welding procedure specifications/
 - 26 • Weld coupon test reports.
 - 27 • Site inspections.
 - 28 • Work permits.
 - 29 • Work site safety and hazard analyses.
 - 30 • Instrument calibration.

31 The remaining 241 documents may be relevant to litigation support. Relevant
32 document types include:

- 33
- 34 • ~~Integrity summaries. There are 3 integrity summaries (SPLP00008132,~~
35 ~~SPLP00008142, SPLP00008154) For Mariner East 1. All three summaries provide~~
36 ~~metal loss (corrosion) summaries in table form, post repairs.~~ [REDACTED]

37 [REDACTED]

38 [REDACTED]

39
40 [REDACTED]

41 [REDACTED]

42 [REDACTED]

- ILI inspection anomaly reports for Mariner East 1, specifically identifying external metal loss (corrosion). All of these reports were generated during the 2017-2018 time period. These reports also include pit depth measurements. There are 22 documents of this type, identified as the following.

[REDACTED]

We concur with the opinion of Richard B. Kuprewicz that “There are certain anomalies or imperfections in pipelines, including corrosion threats, that ILI assessments cannot reliably determine.” The implication is that many cases of external metal loss (corrosion) may have been overlooked by ILI inspection, and this list of anomaly reports does not reflect the extent of the probable external metal loss / corrosion problem along the Mariner East 1 pipeline. ILI cannot detect initiation of corrosion and certain type of coating disbondments.

- ~~• Pipeline Inspection. There is 1 comprehensive pipeline inspection report dated 4-3-14; SPLP00018052. (Exhibit Zee 7) Although corrosion data was not identified, it was decided to keep this document in the relevant category.~~
- Pipeline Inspection and Repair – Maintenance Record. There are 215 such reports (Exhibit Zee-2); and the SPLP numbers will not all be listed here. These documents all fall within the range of SPLP00008166 to SPLP00030663. This classification is based on an inclusion of a pipeline inspection and repair maintenance form by itself;

or including other documentation. These reports cover the time period from 2013 to 2016.

[REDACTED]

Q. What did you find from the 12-11-19 document production relative to coating specs? (Exhibit Zee-8)

A. Flynn 12.11.19 SPLP Production – Highly Conf CSI Files \ Flynn Se 2, No. 19 - Coating Specs

A total of 10 document files were identified in this folder, ranging from SPLP00031735 to SPLP00031805. These are coating specification documents, with effective dates ranging from 2/6/15 to 11/1/18. They are titled as follows.

- SPLP00031735 – Coating Selection Criteria, Effective Date 2/6/15.
- SPLP00031737 – Coating for Above Ground Piping or Structures, Effective Date 11/1/18.
- SPLP00031744 – Coating of Transition Piping From Below to Above Ground; Effective Date 10/1/15.
- SPLP00031747 – Wax Coating for Buried or Submerged Fittings, Valves, Tie-Ins, & Repairs to Linepipe Coating; Effective Date 10/1/15.
- SPLP00031752 – Coating of Field Joints, Valves, Tie-Ins, Girth Welds, and Short Sections of Pipe Using Two Part Epoxy; Effective Date 11/1/16.
- SPLP00031756 – Plant Applied External Fusion Bonding Epoxy Pipe Coating; Effective Date 2/6/15.
- SPLP00031776 – External Coating of Girth Welds with Fusion Bonded Epoxy; Effective Date 10/1/15.
- SPLP00031783 – Concrete Over-Coating for Pipe Coated with Fusion Bonded Epoxy; Effective Date 2/6/15.
- SPLP00031798 – Concrete Overcoating for Pipe Form Method for Field Application; Effective Date 2/6/15.

- SPLP00031805 – Application of “Rapid Set” Concrete Over Pipeline Girth Welds; Effective Date 2/06/15.

As these are all relatively recently issued specifications, covering the period 2015 to 2018, it is our opinion that these specifications do not have an impact on our analysis, conclusions, and opinions concerning the current condition of the aging pipeline coatings.

[REDACTED]

Q. Did you review the recent document production stamped SPLP 32110 – 33161?

A. Yes, Flynn December 23, 2019 Production, SPLP 32110 – 33161. (Exhibit Zee-9)

Q. What are these documents?

A. These documents are close interval survey plots.

Q. What information is present in the plots?

A. The plots consists of ON potential survey data.

Q. Is the provided information sufficient or do you want more information?

A. Along with the plots, it would have been better if the following information was also provided:

- Type of CP System
- CP Design
- Date of CP system Installation
- If CP system is Impressed Current, Details of Rectifier settings/reads
- Procedure followed for CIS and additional measurements

Q. Does these plots contain any information on additional measurements?

A. Yes, lateral potentials or side-drain potential data is also recorded.

Q. What standard could be referenced for lateral potentials or side-drain potential survey?

A. NACE SP0207-2007

1
2
3
4 **Q. Can you provide an overview of lateral potentials or side-drain potential survey?**

5
6 A. Side-drain potential survey, additional measurements, must be performed at the same
7 time and same locations along the pipeline as the close-interval survey (CIS)
8 measurements. Side-drain potentials should be measured and recorded on both sides of
9 the pipe at the start of each survey run or may also be measured and recorded at areas
10 indicating possible problems i.e., at low-potential sites and at the sites where structure-to-
11 soil potentials changes abruptly.
12

13
14 **Side-Drain Potential Survey:**

15
16 A cell-to-cell surface potential gradient survey consisting of a series of side-drain
17 potentials measured along a pipeline.

18 It is recommended that side-drain potentials should be compared with potentials
19 taken directly over the pipeline. More electronegative side-drain potentials compared to
20 the potentials taken directly over the pipeline indicates that the flow of current in the soil
21 is towards the pipeline; assuming steady soil conditions, current density and coating
22 conditions.
23

24 **Q. What are the challenges with lateral potentials and side-drain potential survey?**

25
26 A.
27

- Minor measurement errors due to incorrect placement of the reference electrodes can
- 28 result in misinterpretation of the data.
- 29 • Under certain conditions, a relatively strong localized anodic cell could exist on the
- 30 bottom of the pipe with the top of the pipe serving as a cathode and negative side-
- 31 drain readings could be measured while severe corrosion is actually occurring on the
- 32 bottom of the pipe at this location.

33

34 **Q. What are the findings from the review of CIS documents?**

35
36 A. A summary of the newly produced documents is attached as Exhibit 10. Review of CIS
37 data suggests that the electrode placed directly above the pipe is connected to the positive
38 terminal of the voltmeter and the offset electrode to the negative terminal and side-drain
39 potentials were measured on both sides of the pipe. Negative side-drain potential reads
40 indicate that current is flowing towards the pipe.
41
42

- **Corrpro** measured and recorded depolarized potential (A) and ON potential (B). This
- 43 data assists in determining the voltage shift (B – A). However, **Titan Corrosion**
- 44 **Services (TSC)** and **CP Data manager** has measured and recorded only ON
- 45 potentials, no baseline information is available.

- [REDACTED]
- [REDACTED]
- [REDACTED]
 - Potential reads show possible presence of anodic conditions on the pipeline at this location.
 - If direct assessment was performed, Matergenics expresses interest to know the results.
 - If direct assessment was not performed and no further steps were taken, Matergenics as an independent expert would like to perform CIS at this location.
- It was observed that potentials at some locations are more electropositive than -0.500V. Some of the locations are identified and reported in **Exhibit 10**.
- It was observed that some of the side drain reads were taken at more electronegative locations and not at less electronegative locations. Some of the locations are identified and reported in **Exhibit 10**.
- It was observed that ON potentials at some locations are in the range -3V to -15.5V. This is not normally observed and the reason for this must be investigated. Very high potentials could result in coating disbondment.
- Matergenics expresses interest to know the soil conditions at the low potential regions. If no soil data is available, Matergenics would like to perform soil resistivity measurements and collected soil samples for detailed lab analysis.

Q. From the CIS plots, can you comment that CIS survey was performed in accordance with IM?

A. During the review of appendix D (ECDA Plan) of IM manual, it was observed that CIS (SPLP00032017) could be performed in three conditions:

- [REDACTED]
- [REDACTED]
- [REDACTED]

CIS performed by Corrpro clearly indicates that the CP system can be interrupted. In that case, either ON/OFF survey or depolarized survey should have been performed by (TSC) and CP Data manager instead of ON survey. Matergenics expresses interest to know the reason for choosing ON survey.

Q. You have mentioned that potentials at some locations are more electropositive than -0.500V. What does that mean?

A. [REDACTED] Observed potential reads indicate that the pipeline section is not

A.

[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]	[REDACTED]

Q. At my request, Dr. Zee, have you delineated the proper scope of pipeline evaluation and assessment relative to the Mariner East ~~8-inch ME1 and~~ 12-inch bypass pipelines?

Based on Matergenics' technical expertise and years of experience in pipeline corrosion risk assessment, the scope of work needed for proper evaluation and assessment of the ~~8-inch Mariner East 1 ("ME1") and~~ 12-inch Mariner East ("ME2") workaround pipelines can be divided into two parts for better evaluation and assessment of the coating, cathodic protection (CP) system, CIS on the selected areas of the pipeline, and soil resistivity measurements.

Part 1 covers on-site testing on the live pipeline which is a non-destructive testing (NDT). The tests covered under NDT are soil resistivity/corrosivity measurements, collection of soil samples close to the pipeline and potential measurements. The recommended non-destructive testing will not have any adverse effects on the mechanical integrity of the live pipeline.

~~Part 2 covers lab testing of the ME1 pipe remnant samples from the independent lab that has performed the analysis. Also, part 2 covers testing of soil samples collected from site, corrosion products if present on the ME1 pipe remnant samples, liquid samples from coating blisters and coating samples collected from the ME1 pipe remnant samples. The testing described in part 2 is a destructive testing.~~

Q. Please provide an overview of the on-site testing protocol.

A. The following should be performed based on pre-assessment/In-Line Inspection (ILI) in selected areas:

- A. CIS in selected areas based on the previous ILI data;
- B. Soil Resistivity and Barnes Layer Testing and Analysis;
- C. Soil Sampling and Field Testing for Corrosivity

A. Description of CIS Survey at Selected Areas

During CIS, there is not any disruption to the service of the pipeline and most importantly the CIS test does not result in any compromise to the pipeline. During CIS, a connection is made to the pipe test lead in a test station or the structure, and the pipe to soil potential is measured at 5-foot increments along the pipeline. Distance measuring is conducted using the survey wire in conjunction with an electronic distance counter to measure how much wire has been dispensed.

Pipe to soil potentials are measured as the reference electrodes are moved down the pipeline. These potentials are the basis of the CIS and provide a continuous pipe to soil profile of the pipeline in the form of graph.

Interruption: During CIS survey, both ON and OFF potentials are recorded. To record OFF potentials, all the line rectifiers that affect the line section being surveyed are interrupted using synchronized interrupters. Synchronized interrupters switch the rectifier current at various ratios of “on” time to “off” time mostly at 4:1.

Data Logger: The data loggers or computerized voltmeters Allegro QX is used for CIS to record all of the required data during a CIS. Apart from the data loggers or computerized voltmeters, a wire dispensing system should also be used. The survey wire, 1.5-mile spool of #32 awg or 3-mile spool of #34 awg coated copper wire, would be used for maintaining constant electrical contact with the pipeline through connections made at test stations.

Pipe Locator: In order to accurately record the pipeline pipe to soil potentials, pipe locator is used to place the reference electrodes over the pipeline. In this case, the

1 engineer recording the CIS data would follow the engineer locating the pipeline
2 immediately ahead of him.

3 4 5 **B. Soil Resistivity and Barnes Layer Testing and Analysis**

6
7 In general, we consider two methods to measure soil resistivity, as follows:

- 8 1. Wenner four-pin method, recommended for in-situ soil resistivity measurement and
9 soil layer analysis (Barnes analysis);
- 10 2. Soil box method, recommended for resistivity measurement of soil samples.

11
12 *ASTM G57* - This standard covers the equipment and procedures for measurement of soil
13 resistivity. The standard describes two sets of equipment and procedures. One for *in situ*
14 measurement of soil resistivity in the field, and another for measurement of soil
15 resistivity of collected soil samples from the field. The latter can be performed in the
16 laboratory or in the field. Our soil resistivity field measurements involve the use of four
17 metallic pins (1 ft length approximately) driven into the ground. The instrument supplies
18 a current to soil through outer pins and the voltage difference is read between the inner
19 pins. To measure the soil resistivity at different depths, measurements can be performed
20 with different spacing between the pins.

21 22 **C. Soil Sampling and Field Testing for Corrosivity**

23
24 In accordance with ASTM D4220 / D4220M, the following procedure needs to be used to
25 collect soil samples:

26 Soil samples will be collected from area (≥ 8 ft) to the pipeline and 5 feet deep.

- 27 1. The collected soil samples will be placed in clean plastic container.
- 28 2. Soil samples will be identified with tags, labels, and markings prior to transporting
29 them.
 - 30 1. Job name or number, or both,
 - 31 2. Sampling date,
 - 32 3. Sample/boring number and location,
 - 33 4. Depth or elevation, or both,
 - 34 5. Sample orientation,
 - 35 6. Collector name (minimum CP1 Technician)
 - 36 7. Special shipping laboratory handling instructions, or both including
37 sampling orientation

500 grams of soil is the minimum amount needed to perform the basic protocol. Once the soil samples are received at Matergenics Pittsburgh Lab, the procedures described in Part 2, Laboratory Testing, will be used for corrosivity determination.

Q. What is the recommended on-site testing protocol for digs?

A. Three 500 ft segments of the pipe should be selected for close interval survey (provided the pipe segments in these areas are not replaced and are the original coated pipes). The dig location selections should be based on previous CIS data, soil resistivity and corrosion characteristics. Excavation would be the responsibility of SPLP.

At all dig sites (3), soil, corrosion products and disbonded coating samples should be collected, labeled, logged in chain of custody form, and submitted to an independent lab. If no disbondment or other feature of interest was identified, samples would be discarded in the field. If SCC, localized corrosion or another feature of interest was found, small pipe sections should be cut and the samples should be shipped overnight to the lab.

The following tests will be performed on the exposed pipe section:

1. Visual examination, photographic documentation and macro-examination by digital microscope (Non-Destructive testing).
2. Coating Thickness Measurement by Positector 6000 (Non-Destructive testing).
3. pH measurement under disbonded coating by pH paper (Non-Destructive testing).
4. Blister liquid sampling for laboratory analysis (Non-Destructive testing).
5. Delaminated coating sample collection for laboratory analysis.
6. Adhesion testing near delaminated areas (Destructive testing).
7. Collection of corrosion products if present.

~~Q. What is your recommended laboratory testing protocol?~~

~~A. The following laboratory testing of collected samples (soil, corrosion products, disbonded coating samples and cut pipe sections) should be performed: Metallurgical Failure Evaluation and Soil Corrosivity Determination.~~

~~A. Metallurgical Failure Evaluation~~

~~(1) The failure analysis of cut pipe sections should include the following:~~

- (a) Photographic documentation throughout project work.
- (b) Visual examination including close-up inspection for contamination, texture, defects, microstructure, and cross-sectional examination using a low magnification stereo microscope.
- (c) Metallographic preparation and examination (cutting, mounting and etching with a 2% nital solution) of selected steel pipe areas.
- (d) Metallurgical cross-sectional optical microscopy to evaluate coating and substrate characteristics including microstructure, defects, voids, porosity, number of coating layers, layer thickness, contamination, and general characteristics.
- (e) Fourier transform infrared spectroscopy (FTIR) on both sides of coating sample to identify the coating system functional group chemistry and determine if degradation or contaminants are present.
- (f) Scanning electron microscopy - energy dispersive x-ray spectroscopy (SEM-EDS) on fracture surface(s) of ruptured pipe at fracture initiation. If inorganic contaminants are identified on the coating surface, x-ray diffraction (XRD) may be performed.
- (g) X-ray diffraction of corrosion products on fracture surface(s).
- (h) Tensile, Charpy and Hardness testing to determine mechanical properties of steel pipe.
- (i) Chemical analysis of steel pipe to determine properties.
- (j) Adhesion testing of coating per ASTM D3359 and / or ASTM D4541 to determine adhesion.
- (k) Soil testing (chlorides, sulfates, resistivity, corrosion rate, etc.) of collected soils. (Description of soil testing detailed separately below.
- (l) Final technical report providing the results of the examination, including analysis of data, determination and conclusions as to the cause of failure.

(2) *Examination of the coating chip and dollies with backside of the coating includes:*

- Fourier Transform infrared spectroscopy (FTIR) on both sides of coating sample to identify the coating system functional group chemistry and determine if degradation or contaminants are present.
- Scanning electron microscopy - energy dispersive x-ray spectroscopy (SEM-EDS) on both sides of coating sample to perform elemental analysis of coating and possible contaminants. If inorganic contaminants are identified on the coating surface, x-ray diffraction (XRD) may be performed.

(3) *Examination of the liquid sample includes:*

- Test for chlorides, sulfates, resistivity, corrosion rate.
- MIC test.

(4) Examination of the corrosion products and calcareous deposits include:

- SEM/EDS of corrosion products and AC nodules, if AC corrosion is present.
- XRD analysis of corrosion products and AC nodules, if AC corrosion is present.

B. Laboratory Soil Testing to Determine Corrosivity

Soil corrosivity analysis is very important when coating shields CP.

A. Introduction

A soil from field should be representative of the area of interest, where the stratum of interest contains a variety of soil types. It is desirable to sample each type separately. It may also be necessary to prepare a mixed sample. The sample should be reasonably large and thoroughly mixed so that it will be representative. The soil should be well-compacted in layers in the soil box, with air spaces eliminated as far as practicable.

The measured resistivity will be dependent on the degree of compaction, moisture content, constituent solubility, and temperature. The effect of variations in compaction and moisture content can be reduced by fully saturating the sample before placing it in the soil box. The saturated measurement will provide an approaching minimum resistivity, and can be usefully compared with "as-received" resistivity measurements.

B. Soil pH Test Methods

The recommended standard test method for soil pH is ASTM G51, *Standard Test Method for Measuring pH of Soil for Use in Corrosion Testing*. In ASTM G51, two apparatus are recommended for pH measurement: Calomel and glass electrodes and a portable, battery-powered pH meter

C. Sulfate Test Methods

Based on condition (soil, water, or combination) the following standard test methods for sulfate content are recommended: ASTM C1580, *Standard Test Method for Water-Soluble Sulfate in Soil* and ASTM D4327, *Standard Test Method for Anions in Water by Suppressed Ion Chromatography*

D. Sulfides Content

Sulfide ion, S^{-2} , is found in ground waters and wastewater, causing odor and serious corrosion problems. If acidified, these waters can release hydrogen sulfide (H_2S) which is extremely toxic even at low levels. There is no specific standard to measure soil sulfides; however, since sulfide ions play a critical role in internal corrosion of pipelines in water system, a specific standard test method for sulfide ions in water is developed in ASTM D4658.

E. Sulfides Test Methods

Recommended standard test method for water sulfides content is ASTM D4658, *Standard Test Method for Sulfide Ion in Water*. This test method uses an ion-selective electrode in conjunction with a double junction sleeve type reference electrode to potentiometrically detect Sulfide ions, S^{-2} , in water.

The potentials are read using a pH meter with proper resolution (0.1 mV). Alternatively, ion meters with direct concentration scale for sulfide ions can be used. This test method is applicable in the range from 0.04 to 4,000 milligrams per liter (mg/L) of sulfide.

F. Chloride Content

The presence of chloride ion, Cl^{-} , significantly aggravates the conditions for pitting corrosion of most metals. Chloride ions can attack and destroy the passive films (corrosion product layers) and expose the bare metal substrate to corrosive environment.

Like sulfides, there is no direct standard to measure soil chlorides; however, since chloride ion is under regulation in the water industry, and must be measured accurately, a specific standard test method for chloride ions in water is developed in ASTM D512 and ASTM D4327.

G. Chlorides Test Methods

Recommended standard test method for water chlorides content is ASTM D512, *Standard Test Methods for Chloride Ion in Water*. In this standard, the following three test methods are suggested: Test Method A: mercurimetric titration; Test Method B: silver nitrate titration; and Test Method C: ion-selective electrode method.

H. Soil Water Content

A dry soil, regardless of its type and texture, is a non-corrosive environment, and its

resistivity is usually very high—a very good insulator. It is the moisture in soil that turns it into a corrosive environment. In fact, for most soils resistivity values decreases rapidly until approximately 20% of a soil weight is water. Variations in soil water content is usually drastic due to seasonal variations in rainfall and temperature. Water content of soils also depends on soil drainage capability—a function of soil type and texture (ASTM D2487), particle size (ASTM D422), porosity, and mechanical pressure—which all change with lateral location and depth.

I. Water Content Test Method

Recommended standard test method for water (moisture) content of soil is ASTM D2216, *Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass*. This test method is used to determine the water (moisture) content by mass of soil, rock, and aggregate where the reduction in mass by drying is due to loss of water. The recommended drying temperature in ASTM D2216 is 110°C; nonetheless, this temperature may result in decomposition of organic materials, and conversion of calcium sulfate dihydrate (gypsum) to calcium sulfate hemihydrate that is not normally present in natural materials except in some desert soils. In order to reduce the degree of dehydration of gypsum or to reduce decomposition in highly/fibrous organic soils, it may be desirable to dry the materials at 60°C or in a desiccator at room temperature.

Two test methods are provided in this standard. The methods differ in the significant digits reported and the size of the specimen (mass) required. In method A, the water content by mass is recorded to the nearest 1%. For cases of dispute, method A is the referee method. In method B, the water content by mass is recorded to the nearest 0.1%.

This standard requires the drying of soil in an oven, which takes several hours for proper drying. The following test methods provide less time-consuming processes for determining water content:

- ASTM D4643, *Standard Test Method for Determination of Water (Moisture) Content of Soil by Microwave Oven Heating*;
- ASTM D4944, *Standard Test Method for Field Determination of Water (Moisture) Content of Soil by the Calcium Carbide Gas Pressure Tester*;
- ASTM D4959, *Standard Test Method for Determination of Water Content of Soil by Direct Heating*

J. Corrosion Rate Measurement

Recommended standard test method for evaluating the corrosion rate of test specimens is: ASTM G102, *Standard Practice for Calculation of Corrosion Rates and Related Information from Electrochemical Measurements*. This standard covers the conversion of electrochemical measurements to rates of uniform corrosion. The conversion of polarization resistance values to corrosion rates is reported as mass loss in mils per year for a variety of metals and alloys.

Q. In light of your review of documents, are you in a position to discuss your findings in this case?

A. The Flynn Complainants allege that the aging 8-inch and 12-inch Mariner East pipelines are in poor condition and must be evaluated by an independent expert. The Complaint seeks (a) appointment of an independent expert to conduct a “remaining life study,” and (b) such other relief as may be appropriate.

Initially, Matergenics was retained to assess the condition of these pipelines and make recommendations concerning their future maintenance and/or operation as well as the need for an independent expert to conduct a remaining life study.

As noted more in detail above, we reviewed tens of thousands of pages of materials supplied by Sunoco to Flynn counsel. Among those was Sunoco’s integrity management (“IM”) manual.

The initial *in camera* review of Sunoco’s integrity management (“IM”) manual was notable in two respects. First, the material supplied did not include a great deal of ancillary material that was expressly referred to in the CSI documents: procedures, inspections, data collection processes and reports. Second, we were not permitted the opportunity to copy or make notes on the material that was provided to us. On January 6, 2020 we were allowed a fuller review of the IM materials and were permitted to take notes.

We have now reviewed the entire Integrity Management Plan. The review of the planning document shows it to be reasonably comprehensive and detailed. The plan calls for root cause analyses, close interval surveys, and cathodic protection by maintenance of pipe-to-soil ON potential of greater than -850mV. These are all good engineering practices, as my testimony has otherwise indicated.

Unfortunately, Sunoco’s IM practices have not followed good engineering standards or its own IM plan. For example, even though the Plan specifies the undertaking and completion of root cause analyses (RCAs) for any and all pipeline failures, we have not seen satisfactory documented evidence for these analyses. The close interval surveys that Sunoco recently furnished do not meet the IM plan standards.

We also have documented instances of failure to maintain the pipe-to-soil ON potential of greater than -850 mV, again falling below Sunoco's own written standards.

Failure Analysis Root Cause Determination

Matergenics further notes that it understands Flynn counsel has requested an opportunity for us to participate in condition assessment and the excavation of portions of the ancient pipeline. At the time of this report we have not yet been able to do so.

In the public documents, 8 documents were provided which included multiple Energy Transfer Standard Operating Procedures (SOPs). These SOPs may be important in ascertaining the adequacy of the Sunoco Pipeline / Energy Transfer operating procedures. A total of 6 documents are United States Department of Transportation Accident Reports – Hazardous Liquid Pipeline Systems for the ME1 pipeline from 3-22-2002 to 4-26-2017. Two of the reports in particular, are important (SPLP00005725 and ~~SPLP00005764~~) because they specifically state external corrosion as the root cause of failure. However, accompanying failure analysis and root cause analysis reports were not included in the document production. One Pennsylvania Environmental Hearing Board meeting, March 2, 2017 (SPLP00005843) briefly touched the point that tree roots are attracted to pipe by the cathodic protection system; and can cause coating failure; and also discussed coating over welded areas; and installation of pipe.

~~In the highly confidential documents, a series of 56 Sunoco right of way (ROW) patrol reports of ME1 to PUC covering the time period from 4-20-2019 to 6-16-2019, as one of the requirements of PUC to allow re-establishment of ME1 operation. What is important here is that the report forms were designed for both right of way patrols and leak surveys. No leak surveys were conducted by Sunoco, as they do not appear to have been required by PUC in order for Sunoco to reopen the pipeline.~~

~~A total of 3 integrity summaries were found in the highly confidential documents. [REDACTED] A total of 22 in-line inspection (ILI) anomaly reports obtained during the 2017-2018 time period were related to external metal loss; and include pit depth measurements. We concur with the opinion of Richard B. Kuprewicz that "There are certain anomalies or imperfections in pipelines, including corrosion threats, that ILI assessments cannot reliably determine." The implication is that many cases of external metal loss (corrosion) may have been overlooked by ILI inspection, and this list of anomaly reports does not reflect the extent of the probable external metal loss/corrosion problem along the Mariner East 1 pipeline.~~

A total of 215 Pipeline Inspection and Repair – Maintenance Records were found among the highly confidential documents. This classification is based on an inclusion of a pipeline inspection and repair maintenance form by itself; or including other documentation. These reports cover the time period from 2013 to 2016. [REDACTED]

1 [REDACTED]
2 [REDACTED]
3
4 Pipeline integrity is mostly managed by: (1) close interval surveys; (2) coating
5 surveys; (3) internal corrosion monitoring; and (4) technical training of people in
6 charge. Many pipeline operators don't know the extent of what they have in the ground,
7 or the corrosion conditions that are critical for designing an effective corrosion
8 monitoring/corrosion control strategy.
9

10 Our review of over two thousand Sunoco technical documents shows a pipeline
11 integrity system that lacks a centralized source sufficient to document corrosion
12 incidents, factual corrosion data, corrosion risk assessments/aspects of the aging pipeline
13 and corrosion mitigation.
14

15 Corrosion failures, ruptures and explosions of aging pipelines are made more
16 likely in corrosive soils and when there is a lack of an effective integrity management
17 program that considers disbonded coatings, shielding, MIC and cathodic protection.
18

19 ~~Based on PUC formal complaint dated December 13th 2018 (Appendix C) and the~~
20 ~~fact that (a) the 8 inch line and the 12 inch line date back to the 1930s, and the records~~
21 ~~we have been supplied reflect (b) coatings that shield (interfere with) cathodic protection~~
22 ~~(c) corrosive soils and (d) past incidents/accidents, it is more likely than not that~~
23 ~~accelerated corrosion is taking place that will cause serious damage to people and~~
24 ~~property in high consequence areas.~~
25

26 A remaining life study can only be performed by acquiring solid data regarding
27 corrosion risks and corrosion performance parameters of the pipeline under
28 review. These data should include internal and external corrosion data, AC/DC
29 interference, evaluation of CP performance, evaluation of coating type and adhesion
30 condition, soil corrosivity mapping and DA condition assessment particularly in areas
31 that the protective coating is degrading and shield cathodic protection or corrosion
32 protection is not adequate.
33

34 An appropriate expert will be guided by the well-settled standards set out in
35 ASME B31.4-2002 (Pipeline Transportation Systems for Liquid Hydrocarbons and Other
36 Liquids) as well as ANSI/NACE SP0502-2010 (Pipeline External Corrosion Direct
37 Assessment
38

39 Matergenics as an independent corrosion firm is well qualified to perform the
40 remaining life study on the basis of its technical expertise, and years of experience in
41 pipeline corrosion risk assessment, as well as its existing practice as an independent
42 corrosion engineering consulting business.
43

44 In closing, for an expert to be able to form an opinion as to the present, likely
45 condition of the 12-inch ~~and 8-inch~~ lines, a good deal more information would be

1 required than has been supplied to Matergenics to date. The information needed has been
2 set out in detail above in Part III. The materials furnished, however, raise serious
3 questions as to the condition of these aging pipelines as well as the fitness of Sunoco to
4 operate them.

5
6 **Q. Based upon Matergenics' review of the materials supplied to date, do you have an**
7 **opinion, to a reasonable professional certainty, concerning the matters you were**
8 **asked to review?**

9
10 (1) Based upon the materials we have been permitted to review, Sunoco may be
11 operating an inadequate integrity management program for the ~~8-inch pipeline~~
12 ~~and the~~ 12-inch pipeline considering the leak incidents, age of pipeline and
13 coatings that, if disbonded, shield cathodic protection.

14
15 (2) Based upon the materials we have been permitted to review, important
16 information relative to corrosion data, corrosion risk and corrosion mitigation is
17 lacking.

18
19 (3) Sunoco's operation of the ~~8-inch pipeline and the~~ 12-inch pipeline should be
20 reviewed for corrosion risk both externally and internally;

21
22 (4) Sunoco's operation of the subject ~~8-inch pipeline and the~~ 12-inch pipeline should
23 be reviewed for safety considerations from a corrosion risk point of view; and

24
25 (5) The question of whether or not Sunoco should be permitted to continue operating
26 ~~these~~ pipelines cannot properly be decided without a thorough investigation by an
27 independent expert.

28
29 **Q. Dr. Zee, would you agree that if additional information becomes available it is**
30 **conceivable you would have to review that information to determine whether it**
31 **affects your opinion in this case.**

32
33 **A.** Yes, of course.

CERTIFICATE OF SERVICE

I hereby certify that I have this day served a true copy of the forgoing document upon the persons listed below in accordance with the requirements of § 1.54 (relating to service by a party).

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Dated: September 16, 2020