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April 23, 2020

VIA ELECTRONIC FILING

Brinda Westbrook-Sedgwick
Commission Secretary
Public Service Commission
of the District of Columbia
1325 "G" Street, N.W., 8th Floor
Washington, D.C. 20005

Re: Formal Case Nos. 1154, 1115 and 1142
[Washington Gas's Supplemental Direct Testimony]

Dear Ms. Westbrook-Sedgwick:

Transmitted for filing is Washington Gas Light Company's ("Company") Supplemental Direct Testimony and accompanying exhibits of Company Witnesses Wayne A. Jacas, Exhibit WG (2A), (2A)-1 and (2A)-2; Aaron C. Stuber, Exhibit WG (2B) and (2B)-1; R. Andrew Lawson Exhibit WG (2C), (2C)-1 and (2C)-2; and Stephen J. Price, Exhibit WG (D).

Sincerely,

Cathy Thurston-Seignious
Supervisor, Administrative and
Associate General Counsel

cc: Per Certificate of Service

BEFORE THE
PUBLIC SERVICE COMMISSION OF THE DISTRICT OF COLUMBIA

FORMAL CASE NO. 1154

IN THE MATTER OF WASHINGTON GAS LIGHT COMPANY'S APPLICATION
FOR APPROVAL OF PROJECTPIPES 2 PLAN

VOLUME 1 OF 1

SUPPLEMENTAL DIRECT TESTIMONY
WG (2A) THROUGH WG (D)

(WITNESSES JACAS, STUBER, LAWSON AND PRICE)

SUPPORTING EXHIBITS
WG (2A)-1 THROUGH WG (2C)-2

(WITNESSES JACAS, STUBER, AND LAWSON)

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DATED: APRIL 23, 2020

WITNESS JACAS
EXHIBIT WG (2A)

BEFORE THE
PUBLIC SERVICE COMMISSION OF THE
DISTRICT OF COLUMBIA

IN THE MATTER OF WASHINGTON GAS LIGHT COMPANY'S APPLICATION FOR APPROVAL OF PROJECTPIPES 2 PLAN	FORMAL CASE NO. 1154

WASHINGTON GAS LIGHT COMPANY
District of Columbia

SUPPLEMENTAL DIRECT TESTIMONY OF WAYNE A. JACAS
Exhibit WG (2A)
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WASHINGTON GAS LIGHT COMPANY

DISTRICT OF COLUMBIA

SUPPLEMENTAL DIRECT TESTIMONY OF WAYNE A. JACAS

Q. **PLEASE STATE YOUR NAME, OCCUPATION, AND BUSINESS ADDRESS.**

A. My name is Wayne A. Jacas, and I am the Director of Construction Program Strategy and Management at Washington Gas Light Company ("Washington Gas" or "Company"). My business address is 6801 Industrial Road, Springfield, VA 22151.

Q. **HAVE YOU PREVIOUSLY PROVIDED TESTIMONY IN THIS PROCEEDING?**

A. Yes, I submitted Direct Testimony in this case detailing and supporting the Company's PROJECT*pipes* 2 (aka "PIPES 2") Plan.

I. PURPOSE OF SUPPLEMENTAL DIRECT TESTIMONY

Q. **WHAT IS THE PURPOSE OF YOUR SUPPLEMENTAL DIRECT TESTIMONY?**

A. The purpose of my Supplemental Direct Testimony, and accompanying exhibits, is to provide updated information on the PIPES 2 Plan and address the following issues identified in Public Service Commission of the District of Columbia ("Commission") Order No. 20313: (1) the interdependency of DC PLUG and the Potomac Electric Power Company's Capital Grid Project ("PEPCO GRID") related work with the Company's PROJECT*pipes* 2 Plan, (2) greenhouse gas ("GHG") emissions and leak reductions, (3) PROJECT*pipes* 2 Plan benefits for the District of Columbia's climate goals, (4) the Cost/Benefit Analysis of further accelerating PROJECT*pipes*, and (5) the Liberty

Management Audit Report. Additionally, my testimony will provide details and support for Program 10 and recommends that the Commission approve Washington Gas's updated PIPES 2 Plan.

Under the updated PIPES 2 Plan, Washington Gas will continue to replace relatively higher risk infrastructure at an accelerated pace through its proposal to increase total expenditures from approximately $135 million, including extension periods under the current PIPES 1 Plan, to approximately $374 million over the next five (5) years (October 1, 2020 - December 31, 2025). This PIPES 2 Plan demonstrates the Company's continued commitment to proactively enhancing safety and improving the reliability of its infrastructure, consistent with Order Nos. 17431, 17602 and 17789, and responds to the federal government's "Call to Action" for accelerated efforts to replace aging gas infrastructure, discussed further below. In addition, under PIPES 2, District of Columbia customers will continue to receive both economic and environmental benefits, which I will describe later in my testimony.

Q. IS IT CORRECT TO SAY THAT WITH THE EXCEPTION OF THE UPDATES IN YOUR SUPPLEMENTAL DIRECT TESTIMONY, WHICH YOU DESCRIBE BELOW, EVERYTHING ELSE IN YOUR DIRECT TESTIMONY REMAINS AS YOU PROPOSED IN DECEMBER 2018?

A. Yes.

II. IDENTIFICATION OF EXHIBITS

Q. DO YOU SPONSOR ANY EXHIBITS IN SUPPORT OF YOUR TESTIMONY?

A. Yes, I sponsor two (2) exhibits. Exhibit WG (2A)-1 includes the updated PIPES 2 Plan scope, cost estimate, and timeline for implementation. Exhibit

WG (2A)-1 also provides the supporting information and justification for the selection of replacement programs for PIPES 2. Exhibit WG (2A)-2 includes the Company's response to the Liberty Management Audit recommendations.

III. WASHINGTON GAS'S PIPES 2 PLAN

Q. HAS THE PROPOSAL FOR PIPES 2 BEEN REVISED FROM THE ORIGINAL PIPES 2 APPLICATION FILED IN 2018?

A. Yes, the Company has updated its PIPES 2 Plan to begin October 1, 2020, through December 31, 2025 and is proposing the inclusion of Program 9, Advanced Leak Detection, and Program 10, Work Compelled by Others. Furthermore, the PIPES 2 Plan filed in December 2018 separated bare and unprotected wrapped steel into two separate programs, *i.e.*, Programs 1 and 2. This has been revised for ease of tracking and reporting to mirror the approved PIPES 1 Plan, such that Program 1 will include Bare and/or Unprotected Wrapped Steel Services and Program 2 will include Bare and/or Unprotected Wrapped Steel Main, including Contingent Main and Affected Services. The Company has also updated its program estimates and costs and provided new leak data tables as provided in Exhibit WG (2A)-1.

Q. PLEASE GIVE A BRIEF SUMMARY OF THE COMPANY'S REVISED PLAN.

A. PIPES 2 contains programs targeting, on an accelerated basis, replacement of relatively higher risk infrastructure in the Company's distribution system along with the corresponding estimated timeline for completion of all projects under each program and the estimated cost of each program. My testimony addresses details and justification for acceleration of distribution facilities replacement programs included in the PIPES 2 Plan, including Program

10 (Work Compelled by Others). Company Witness Stuber addresses updates to the acceleration of transmission facilities replacement programs included in PIPES 2. Company Witness Price addresses the details and support for Program 9 (Advanced Leak Detection) included in PIPES 2. Company Witness Lawson addresses updates to the PROJECT*pipes* surcharge, specifically how the Current Factor for the PROJECT*pipes* Adjustment for the 15 months ending December 31, 2021, ("Plan Year 6") will be calculated and implemented.

The updated PIPES 2 Plan for the next five (5) years totals $374 million, which includes $350.1 million for distribution plant replacement and $23.9 million for transmission plant projects. Washington Gas's updated PIPES 2 Plan, which is attached to my testimony as Exhibit WG (2A)-1, involves the replacement of targeted infrastructure on the Company's natural gas distribution system. Company Witness Stuber describes proposed transmission improvements under PIPES 2. Based on current risk assessment, the distribution and transmission budgets proposed to be invested across the District of Columbia system programs are detailed in Table 3 and Table 4 below.

Table 3: Washington Gas's PIPES 2 Distribution Programs

Program Number	Program Description	Program Budget ($M)
1	Bare Steel and/or Unprotected Wrapped Steel Services	$ 110.1

2	Bare and/or Unprotected Wrapped Steel Main and Services (including Contingent Main[1] and Affected Services[2])	$ 51.1
3	Vintage Mechanically Coupled Main and Services (including Contingent Main and Affected Services)	$ 53.5
4	Cast Iron Main (including Contingent Main and Affected Services)	$ 12.6
5	Copper Services	$ 16.9
6	Distribution Gauge Lines	$ 2.1
7	Regulator Station Enhancements	$10
8	Low-Pressure Service Replacements/ Transfers	$ 11.8
9	Advanced Leak Detection	$2
10	Work Compelled by Others	$80.0

Table 4: Washington Gas's PIPES 2 Transmission Programs

Program Number	Program Description	DC's Portion of Program Budget ($M)
1	Transmission and High-Pressure Pipe Replacement	$ 14.1
2	Remote Control Valves	$ 2.4
3	Transmission and High-Pressure Block Valve Replacement	$ 1.1
4	Transmission and High-Pressure Valve Riser Replacement	$ 0.1
5	Replacement of Components of DOT Transmission and High-Pressure Pipes to Enable the Use of In-line Inspection Tools	$ 6.2

[1] As described in Exhibit WG (2A)-1, Contingent main reflects instances where non-program specific main (i.e., pre-1975 Plastic, Protected Wrapped Steel, etc.) materials are encompassed within the bounds of program eligible materials and logically group with program eligible main for replacement.
[2] As described in WG (2A)-1, affected services (i.e., pre-75 Plastic, Protected Wrapped Steel, Copper, etc.) will be replaced when exposed and connected to a portion of main in a program.

Q. WHY IS WASHINGTON GAS TARGETING THE DISTRIBUTION SYSTEM FACILITIES LISTED ABOVE FOR REPLACEMENT IN THE PIPES 2 PLAN?

A. Each of the distribution materials has been identified through the Company's Distribution Integrity Management Program ("DIMP") which is a required plan under federal law.[3] PIPES 2 allows the Company to continue its accelerated replacement activities consistent with the Company's DIMP Plan.

Consistent with the approach in our prior filings in Formal Case No. 1115, and as explained in Exhibit WG (2A)-1, the Company analyzed the updated leak and maintenance history of its main and service pipes, by material type, for the period January 2015 through December 2019. The Company's analysis of this data was used to reconfirm the population of main and service pipes to be replaced in PIPES 2.

Q. YOU INDICATED THE RELATIVELY HIGHER RISK PIPE WOULD BE SELECTED BASED ON LEAK RATES AS IDENTIFIED THROUGH THE DIMP. CAN YOU PLEASE PROVIDE DATA TO SUPPORT THESE SELECTIONS?

A. Yes. The information provided in this testimony, and more specifically in Exhibit WG (2A)-1, details the rationale behind the Company's determination to establish the PIPES 2 distribution programs as listed in Table 3.

Q. DOES DC PLUG AND THE POTOMAC ELECTRIC POWER COMPANY'S CAPITAL GRID PROJECT ("PEPCO GRID") RELATED WORK HAVE INTERDEPENDENCY WITH THE COMPANY'S PROJECT*pipes* 2 PLAN?

[3] *See* Pipeline Inspection, Protection, Enforcement, and Safety Act of 2006 § 9, 49 U.S.C. § 60109 (2006); 49 CFR Part 192 Subpart P.

A. Yes. DC PLUG and PEPCO GRID related work involves the Company's PROJECT*pipes* eligible materials approved by the Commission[4] and is addressed in detail under the proposed Program 10.

Q. WHY IS WASHINGTON GAS PROPOSING PROGRAM 10?

A. The Company is proposing Program 10 (Work Compelled by Others) to further enhance the safety of its distribution system in the District of Columbia. Program 10 is composed of the District of Columbia Department of Transportation ("DDOT") Advance of Pavement ("AOP"), DC PLUG, and PEPCO GRID projects that intersect the Company's facilities. The Company's PROJECT*pipes* program has encountered continued upward pressure from this Work Compelled by Others, as it relates to the replacement of bare steel, unprotected wrapped steel, vintage mechanically coupled wrapped steel, and cast-iron main including contingent main and affected services, with timeframes required for Work Compelled by Other conflicting with work that is governed by the annual prioritization for risk-based work. However, this main continues to be in the population of materials identified as relatively higher risk, and accelerating its replacement will reduce risk and enhance the safety of the Company's distribution system by making sure that the piping is not adversely impacted by the construction activities of other entities.

The Company has known examples of leaks occurring during and shortly after others are working in proximity to cast iron facilities. The subsequent leaks on these facilities create safety concerns. Therefore, accelerating the replacement of these facilities not only enhances the safety and reliability of the

[4] Formal Case Nos. 1093 and 1115, Order No. 17431 (March 31, 2014).

system, it will potentially avoid leaks caused by this new work performed by others and incremental Operation and Maintenance (O&M) and restoration costs. In addition, accelerating the replacement of these facilities reduces future impacts on customers and local businesses by eliminating the need for duplication of construction zones and repetitive disruption to the community that would otherwise occur if the PIPES work is undertaken out of synch with the Work Compelled by Others.

Furthermore, Washington Gas has seen an escalation in approved funding for work by DDOT and approved DC PLUG[5]/PEPCO GRID[6] programs which intersect with the Company's facilities. The PROJECT*pipes* work compelled by others is estimated to cost approximately $198.4 million over the next five (5) years. The estimated value of intersecting PROJECT*pipes* materials with work compelled by others is detailed in Table 5 below.

TABLE 5 - ESTIMATED VALUE OF WORK TO BE COMPELLED BY OTHERS THAT INTERSECTS WITH PROJECT*pipes*

PROJECT*pipes* Plan Year	DDOT AOP	PEPCO DC PLUG	PEPCO GRID	Grand Total
Year 6 (10/1/2020 - 12/31/2021)	$15,167,776	$24,470,291	$1,107,084	$40,745,151
Year 7	$12,162,372	$20,329,165	$1,295,420	$33,786,957

[5] Formal Case No. 1145, Order No. 19167 at paragraphs 219 and 248 (November9, 2017).
[6] Formal Case No. 1144, Order No. 20203 at paragraph 5 (August 9, 2019)

(1/1/2022 - 12/31/2022)				
Year 8 (1/1/2023 - 12/31/2023)	$12,527,243	$28,105,565	$0	$40,632,808
Year 9 (1/1/2024 - 12/31/2024)	$12,903,060	$28,105,565	$0	$41,008,625
Year 10 (1/1/2025 - 12/31/2025)	$13,290,152	$28,948,732	$0	$42,238,884
Year 6-10 Total	**$66,050,603**	**$129,959,318**	**$2,402,504**	**$198,412,425**

Q. WHY SHOULD PROGRAM 10 BE INCLUDED IN THE COMPANY'S ACCELERATED REPLACEMENT PROGRAM RATHER THAN AS "NORMAL" REPLACMENT?

A. The accelerated replacement of this relatively higher risk pipe meets the PROJECT*pipes* requirements approved by the Commission[7] and is prudent, as it will potentially avoid leaks on this pipe which further enhances the safety and reliability of the Company's system in the impacted areas. Furthermore, in Order No. 17602,[8] the Commission stated that it wanted "high risk pipes to be replaced proactively regardless of whether they were originally slated for normal replacement or not and we have given WGL the flexibility to move mains and services that would otherwise be 'normal replacement' or 'AOP-related projects' into the APRP bucket if they are pipes that meet the APRP criteria." Therefore, Program 10 meets the requirements set forth by the Commission for inclusion in the PROJECT*pipes* Plan.

[7] Order No. 17431 at paragraph 68.
[8] Formal Case No. 1115, Order No. 17602 at paragraph 50 (August 21, 2014).

Q. WHAT ARE THE BENEFITS OF WASHINGTON GAS'S PROGRAM 10?

A. The Commission funding of PROJECT*pipes* Program 10 is critical to the Company's efforts to proactively enhance the reliability and safety of its natural gas distribution system and address the Company's overall increasing leaks, by allowing dedicated funding for this kind of work so that the funding for risk-based prioritized work is not totally depleted.

Furthermore, Program 10 will benefit both the Company and ratepayers, because it further accelerates the replacement of eligible pipe that would have eventually been replaced within PROJECT*pipes* and may result in sharing of expenses (such as paving) with other parties. Program 10 also will cause less disruption to customers and the citizens of the District of Columbia by coordinating construction activity.

Q. IF THE COMPANY DOES NOT SPEND THE TOTAL ALLOTTED PROGRAM 10 BUDGET IN A GIVEN YEAR, HOW WILL THE REMAINING PROGRAM 10 BUDGETED DOLLARS BE USED?

A. The Company proposes to carry-over the remaining funds into the following year to address Program 10 projects and/or reallocate the funds to more relatively higher risk main and/or service projects in the other programs, depending on knowledge of upcoming Program 10 work across the five (5) years of this Plan.

IV. THE DISTRICT OF COLUMBIA CLIMATE GOALS, GREENHOUSE GAS, AND LEAK REDUCTION

Q. WILL THE PROPOSED REPLACEMENTS IN THE COMPANY'S PIPES 2 PLAN REDUCE GHG EMISSIONS?

A. Yes. The Company projects that PIPES 2 will reduce GHGs released from its distribution system by an estimated total of 17,017 metric tons of carbon dioxide (CO2 equivalent) and estimated total equivalent of cars removed from the road over the program duration of 3,642. The calculations and details of the year-over-year GHG reduction, by program, in PIPES 2 is provided in Table 4 of Exhibit WG (2A)-1.

Q. WHAT IMPACT WILL THE PIPES 2 PLAN REPLACEMENTS HAVE ON LEAK RATES?

A. The Company will continue to track the number of gas leaks on its piping system. Although year-to-year variations may arise due to continued aging infrastructure, the leak rate (excluding leaks from third-party excavation damages) for pipe replaced will decrease over the course of the plan. However, it is critical to note that the remaining pipe will continue to age and the leak rate on the remaining targeted pipe can be expected to increase until replaced. Put simply, the Company's distribution system continues to age, and the Company expects the leak rate for both targeted and non-targeted pipe to increase as a result. Thus, the overall leak rate may continue to increase until the cumulative amount of pipe replaced through PROJECT*pipes* offsets the impact of the remaining pipe on the leak rate level.

Q. PLEASE EXPLAIN HOW THE PIPES 2 PROGRAM HELPS TO MEET THE DISTRICT OF COLUMBIA'S CLIMATE GOALS?

A. The Company's accelerated replacement program assists in meeting the District's climate goals by reducing potential leaks and methane gas emissions on the distribution system. The estimated GHG emissions reductions associated with the continuation of the pipeline replacement program during the remaining portion of the 40-year period are expected to lead to a cumulative emissions reduction of 1,015,488 metric tons through 2054. Finally, PROJECT*pipes* is forecasted to result in an average annual reduction of fugitive emissions of approximately 2 percent per year through 2040. In the final 10 years of the PROJECT*pipes* plan, the reduction rate is forecasted to increase to 3% per year, thereby reducing total fugitive GHG emissions, which is supportive of the primary goal of the District's Climate Plan.

V. COST BENEFIT ANALYSIS AND FURTHER ACCELERATION OF PIPES

Q. WAS A COST/BENEFIT ANALYSIS CONDUCTED ON PROJECT*pipes*?

A. Yes**.** The Commission approved Jacobs Consultancy ("Jacobs") to perform a cost/benefit analysis for the further acceleration of the PROJECT*pipes* program and minimization of future leaks, that addresses Grade 1 hazardous leaks not caused by excavation damage. The PROJECTpipes – Cost Benefit Analysis performed by Jacobs ("CBA") was filed on July 31, 2019, in compliance with the Company's merger commitment.[9]

Q. WHAT WERE THE FINDINGS OF THE COST/BENEFIT ANALYSIS PERFORMED BY JACOBS?

[9] Formal Case No. 1142, Order No. 19396, Appendix A, Merger Commitment No. 54 (June 29, 2018).

A. The CBA concluded that the use of Optimain's Project Risk scenario provides a better benefit-cost ratio (BCR), which supports the Company's current method of selecting projects based on Optimain's Project Risk assessment. Jacobs also concluded "[t]he PROJECTpipes programs productively target mains and services material that result in all Grade Leaks, potentially reducing the number of leaks by 3,650, of which more than 386 could be Grade 1 hazardous leaks."[10] Additionally, Jacobs concluded that "WGL's Distribution Integrity Management Plan provides support for the inclusion of Programs 3, 5, and 8 on safety and system integrity grounds. Incorporating copper, and vintage mechanical coupled mains and services increased the number of Grade 1 hazardous leaks [avoided] and all grade leaks by 27 and 101, respectively, over the remaining 35 years."[11] These findings support PROJECT*pipes* as an effective program designed to enhance the safety and improve the reliability of relatively higher risk natural gas facilities while reducing GHG emissions. Finally, Jacobs concluded that "a shortened program duration, while improving the cost benefit B/C ratio, is not advisable based on the level of mains replacement to complete PROJECT*pipes* by 2054."[12]

Q. DID THE COMPANY FILE A PROPOSAL TO FURTHER ACCELERATE PROJECTPIPES?

A. Yes**.** Washington Gas filed a proposal for the acceleration of PROJECT*pipes* to a 30-year program, on July 8, 2019, in compliance with the

[10] CBA at 29.
[11] CBA at 29.
[12] CBA at 29-30.

Company's merger commitment.[13] The proposal provided the analysis supporting the further acceleration of the PROJECT*pipes* program, including the corresponding investment amounts for each distribution program. The proposal would enable the Company to further accelerate the proactive replacement of relatively higher risk piping in its District of Columbia service territory to enhance the safety and improve the reliability of its distribution system based on the programs originally filed in this proceeding.

Q. WHAT RISKS ARE ASSOCIATED WITH THE FURTHER ACCELERATION OF PROJECTPIPES?

A. The acceleration to a 30-year plan and the added resources needed to accomplish this acceleration will introduce significant schedule risk in the early years of the proposal, as Washington Gas will need to rapidly expand its qualified resources and associated support functions in the District of Columbia beyond levels contemplated in the plan as originally filed. The execution of the proposal also may be disrupted (*i.e.*, schedules, pace of planned replacement, and qualified contractor resources) by external factors, such as those inherent in the Company's newly added Program 10 Work Compelled by Others: (1) projects that are increasingly being compelled by DDOT; (2) the anticipated increased underground utility construction activity associated with DC PLUG; and (3) more recently, the PEPCO GRID projects requiring relocation or replacement of Company facilities.

Q. DOES THE COMPANY RECOMMEND MOVING FORWARD WITH FURTHER ACCELERATION OF PROJECTPIPES?

[13] Formal Case No. 1142, Appendix A, Merger Commitment No. 74.

A. No. The Company prefers to maintain the program duration which is currently scheduled to be completed by 2054. The Company's recommendation is also supported by the CBA prepared by Jacobs.

VI. LIBERTY MANAGEMENT AUDIT

Q. WHAT WAS THE SCOPE OF THE LIBERTY MANAGEMENT AUDIT?

A. Per Commission Order No. 18723, the Company engaged Liberty Consulting Group to conduct an independent management audit of PROJECT*pipes* ("Liberty Management Audit"). The scope of the Liberty Management Audit was to determine whether the PROJECT*pipes* projects that were being recovered through the surcharge mechanism: (1) are timely; (2) are consistent with the Annual Project List submitted by Washington Gas; and (3) consist of projects from Programs 1, 2 and 4 that meet the four requirements set forth in Paragraph 68 of Order No. 17431. The management audit period for PROJECT*pipes* covered Year 1 (June 1, 2014 - September 30, 2015) through part of Year 4 (June 30, 2018).

Q. HOW EXTENSIVE WAS THE LIBERTY MANAGEMENT AUDIT?

A. The audit engagement with the Company spanned 20 months and included over a thousand man hours between the Liberty Consulting Group and Company personnel, as well as approximately 333 data requests with subparts and responses.

Q. WHAT IS WASHINGTON GAS'S CONCLUSION ON THE LIBERTY MANAGEMENT AUDIT?

A. The Company agrees with the overall finding of Liberty Consulting Group's Final Report Management Audit of PROJECT*pipes* that Washington

Gas has made great strides from Year 1 to Year 4 in the program and in the cost management of PROJECT*pipes*. Liberty's key findings that support the Company's position are as follows:

1. "WGL has made large strides in developing a program management approach and program since CPSM group creation."[14]
2. "WGL has made efforts to improve estimate quality. Management evaluates unit rate variances annually."[15]
3. "Management made progress in establishing better definition of its cost performance expectations. Some sound baselines now exist for regular progress measurement, reporting, and analysis."[16]
4. "The methods described by management and by procedures conformed generally to what we view as industry norms. We did have that ability in Years 3 and 4, which confirmed their general suitability, and made clear the large impacts that developing government requirements have had on productivity. Our most important conclusion about field performance is that it did not suffer material deficiencies - - expectations about estimated unit costs are what proved unreasonable."[17]
5. "Overall, WGL has had access to sufficient resources to spend close to the annual amounts qualifying for accelerated rate recovery."[18]

[14] Formal Case No. 1115, Final Report Management Audit of PROJECT*pipes* at 8 (April 19, 2019) ("Audit Report").
[15] Audit Report at 10.
[16] Audit Report at 11.
[17] Audit Report at 4.
[18] Audit Report at 12.

6. "WGL made significant strides in program management in Years 3 and 4 - - particularly after establishment of the CSPM group. WGL has brought management of PROJECT*pipes* under essential control. We address below the improvements that management has made to do so. Those improvements continue, and as management has advanced their implementation, the quality of WGL's management of the program has improved commensurately."[19]
7. "Year 4 has seen improvement in some key unit performance and rates, and therefore costs."[20]
8. "At the execution level, management has applied an effective system for controlling the costs of contractors, who perform all replacement work."[21]

Overall, this independent management audit indicates that the Company has successfully managed PROJECT*pipes*.

Q. DID THE LIBERTY CONSULTING GROUP MAKE ANY RECOMMENDATIONS IN THE MANAGEMENT AUDIT OF PROJECTPIPES?

A. The Liberty Consulting Group made 24 recommendations in the Management Audit. As stated above, the Company agrees with the overall finding that Washington Gas has made great strides from Year 1 to Year 4 in the program and cost management of PROJECT*pipes*. The Company has implemented, or is in the process of implementing, measures consistent with

[19] Audit Report at 4.
[20] Audit Report at 4.
[21] Audit Report at 10.

the Management Audit recommendations. The Company explains its responses to the recommendations in more detail in Exhibit WG (2A)-2.

Q. DOES THAT COMPLETE YOUR SUPPLEMENTAL DIRECT TESTIMONY?

A. Yes.

WITNESS JACAS
EXHIBIT WG (2A)-1

Washington Gas's Updated PROJECT*pipes* 2 Plan: Distribution Replacements

Introduction

Washington Gas Light Company ("Washington Gas" or "the Company") is proposing the next five-year portion (referred to as "PIPES 2" or the "PIPES 2 Plan") of its originally estimated 40-year PROJECT*pipes* plan for the Commission's consideration. The purpose of this exhibit is to provide the analysis supporting Years six through ten of the distribution system programs proposed in the Company's PIPES 2 Application. The Company's PIPES 2 Plan, including the corresponding investment amounts for each distribution program, are described in this document. PIPES 2 will enable the Company to continue to accelerate the proactive replacement of relatively higher risk piping in its District of Columbia service territory to enhance the safety and improve the reliability of its distribution system. The proposed scope and investment of the Company's PIPES 2 transmission system programs are described separately by Company Witness Stuber.

This document includes the sources of data, assumptions, and calculations made for the supporting analysis for distribution system PIPES 2 Plan programs. The leak rates for services and main pipe are shown on Tables 1 and 2 and in Figures 1 through 6. The estimated timeline for completion of each of the programs and the projected scope and costs of each program for the next five years are shown in Table 3. The estimated reduction in greenhouse gas emissions is shown on Table 4.

The PIPES 2 Plan

Washington Gas proposes the PIPES 2 plan for eligible infrastructure replacements consistent with the approach in the prior filings in Formal Case No. 1115. The Company analyzed the updated leak and maintenance history of its main and service pipes by material type for the period January 2015 to December 2019. The Company's analysis of this data was used to reaffirm or update the population of main and service pipes to be replaced in PIPES 2. The analysis has also led Washington Gas to develop 10 distinct programs to proactively enhance safety and improve the reliability of its distribution system in the District.

Each of the program-specific tables shown below present the miles of main, including "contingent main", number of services, planned duration, estimated average unit costs in 2021 dollars, and the anticipated 5-year investment with an average annual inflation rate of 3%.

The Company is seeking approval to continue the next 5 years of the program, the PIPES 2 Plan. The overall remaining duration of the Company's PIPES plan is 35 years, consistent with the originally estimated 40 years. The table below shows durations by program presented in the original filings as compared to this filing.

Comparison of Program Durations		
Program	Original Duration (Years)	Proposed Remaining Duration (Years)
Program 1: Bare and/or Unprotected Wrapped Steel Service Replacements	Revised[1]	10
Program 2: Bare and/or Unprotected Wrapped Steel Main Replacement (including Contingent Main and Affected Services)	Revised[2]	35
Program 3: Vintage Mechanically Coupled Wrapped Steel Services and Main (including Contingent Main and Affected Services)	New	10
Program 4: Cast Iron Main Replacement (including Contingent Main and Affected Services)	40	35
Program 5: Copper Services	New	35
Program 6: Critical Valve Gauge Line Replacement	New	10
Program 7: Regulator Station Enhancement	New	10
Program 8: Low Pressure Service Replacement	New	10
Program 9: Advance Leak Detection (ALD)	New	35
Program 10: Work Compelled by Others (i.e. AOP, PEPCO GRID, DC PLUG)	New	35

[1] FC 1115 only included targeted unprotected wrapped steel services.
[2] FC 1115 only included targeted unprotected wrapped steel main.

Currently, the overall PROJECT*pipes* plan is estimated to be completed by 2054, which is consistent with the Company's original filing. As the table above shows, the duration for Program 1, Bare Steel and/or Unprotected Wrapped Steel Services and Program 3, Vintage Mechanically Coupled Wrapped Steel Services and Main (including Contingent Main and Affected Services), are both 10 years in order to support the front-ended replacement of these relatively higher risk segments of pipe from the distribution system. The duration of Program 2, Bare and/or Unprotected Wrapped Steel Main Replacement (including Contingent Main and Affected Services) is extended to 35 years to reflect both the relatively lower leak rates and the expansion of the program to include all unprotected wrapped steel vs. the previously included targeted. The duration of Program 4, Cast Iron Main Replacement (including Contingent Main and Affected Services), is unchanged and reflects the relatively lower leak rates and the overall scope of the population. The duration of Program 5[3] reflects the fact that Copper Services have the 4th highest leak rate of services behind Bare Steel, Vintage Mechanically Coupled Wrapped Steel, and Unprotected Wrapped Steel. The duration of Program 6 reflects the individual relative risk not measured in typical leak-based metrics, which is described fully below. The duration of Programs 7 and 8 reflect the relative reduced risk associated with over pressurization of the distribution system not measured in typical leak-based metrics which is described fully below. The duration of Program 9 reflects the Company's commitment to incorporate data on leak flow rate that is derived from advanced leak detection ("ALD") technology and leak quantification methodologies to further into its prioritization of pipe replacement projects, during the PIPES program. The duration of Program 10 reflects the increase of work compelled by others (i.e. District of Columbia Department of Transportation, PEPCO GRID, DC PLUG, etc.) that meets the PROJECT*pipes* material requirements[4]. The duration of all the programs, including the new programs, remain within the originally estimated planned total duration of 40 years. The Company evaluates the risk prioritization of materials to determine its set of targeted materials and then evaluates the population of targeted materials to determine the duration of each program. The planned duration of each program is presented in Table 3.

The proposed PIPES 2 distribution system programs are described below, including remaining units, projected unit costs, and the total projected 5-year spend for which the Company is seeking approval. All remaining miles of main, service replacements, and service changeovers were extracted from the Company's GE Smallworld system as of January 2020. Miles of main are based on the lengths of main segments recorded. This information may change depending on ongoing data review and Quality Assurance/Quality Control and will be reflected in the Company's filings of annual project lists. The

[3] Order No. 17500, Paragraph 30
[4] Order No. 17431, Paragraph 68

number of service replacements and transfers are based on the number of unique service tees. A single service tee can have multiple service segments. However, it is the Company's policy to replace existing services with a full-length single service segment. Therefore, when estimating the number of services to be replaced it is appropriate to count service tees.

In addition to the targeted relatively higher risk main pipe, the Company has also projected the units for "contingent main." "Contingent main" reflects instances where non-program specific main (*i.e.* pre-75 Plastic, Protected Wrapped Steel, etc.) materials are encompassed within the project bounds of program eligible materials and are therefore logically grouped with those program eligible mains for replacement. Inclusion of the costs associated with replacing these mains with polyethylene is requested because of associated construction efficiencies and costs savings. Moreover, it will avoid creating separate cathodic protection areas and/or low-pressure regulator stations and legacy low-pressure systems, which could often result if these pipes are not replaced at the same time. Overall, Contingent Main is projected to be approximately 4% of the total miles of main to be replaced in PROJECT*pipes*.

Also, to remain in compliance with current Washington Gas standards, affected services (*i.e.* pre-75 Plastic, Vintage Mechanically Coupled, Protected Wrapped Steel, Copper service, etc.) will be replaced when exposed and connected to a portion of main in a program. Costs associated with the replacement of affected services will be included in the respective project costs.

For each of the ten PIPES 2 programs, program-specific tables are shown below which present the miles of main including contingent, number of services, other units, planned duration, estimated average unit costs in 2021 dollars, and the anticipated 5-year investment with an average annual cost escalation rate of 3%.

<u>Program Units and Costs</u>

- Program 1 - Bare and/or Unprotected Wrapped Steel Service Replacement
    - Estimated remaining duration: 10 Years for Bare and/or Unprotected Wrapped Steel Services.
    - Washington Gas has updated the cost of replacement and program duration based on enhanced cost estimation methods:
        - Average costs for service replacement are a blended rate of projected costs using historical actuals based on length and size of service.
        - Unit prices have been escalated by 3% annually to reflect cost escalations.

- Consistent with current leak data as shown in Table 1: Service Leaks by Material (Jan 2015- Dec 2019), this program has one of the shortest remaining durations of all the programs, as can be seen in Table 3: Cost by Year.
- Bare Steel services has the 2nd highest grade 1 leak rate of 5.74 grade 1 leaks per 100 segments.
- Unprotected Wrapped Steel services has the 3rd highest grade 1 leak rate of 1.60 grade 1 leaks per 100 segments.
- This also includes replacement and inclusion for cost recovery under this program any services that are branched from any existing Bare and/or Unprotected Wrapped Steel services which are replaced.
- The proposed units to be completed are presented below:

Program 1: Bare and/or Unprotected Wrapped Steel Service Replacement	
Remaining Bare and/or Unprotected Wrapped Steel Services to be Replaced	9,339
Remaining Duration (Years)	10
Average Cost per Service without Main Replacement (2021 $s)	$24,715
5-Year Projected Spend	$110.1M

- Program 2 – Bare and/or Unprotected Wrapped Steel Main Replacement (including Contingent Main and Affected Services)
  - Estimated remaining duration: 35 years
  - Washington Gas has updated the cost of replacements and program duration based on enhanced cost estimation methods:
    - Average costs for service replacement are a blended rate of projected costs using historical actuals based on length and size of service.
    - Main unit costs are a blended rate of projected costs using historical actuals based on size of main pipe.
    - Unit prices have been escalated by 3% annually to reflect cost escalations.

- Consistent with current leak data as shown by Table 1 and Table 2, this program is comparatively a lower priority as can be seen in Table 3: Cost by Year.
- Bare Steel main has the highest grade 1 leak rate at 4.44 grade 1 leaks per mile.
- Unprotected Wrapped Steel main has the 3rd highest grade 1 leak rate at 1.67 grade 1 leaks per mile.
- This also includes replacement and inclusion for cost recovery under this program any services that are fed from any existing Bare Steel and/or Unprotected Wrapped Steel main which are replaced or transferred.
- The proposed units to be completed are presented below.

Program 2: Bare and/or Unprotected Wrapped Steel Main Replacement	
Remaining Miles of Bare and/or Unprotected Wrapped Steel Main as of January 2020	78.3
Contingent Miles of Main as of January 2020	6.1
Remaining Services to be Replaced including Affected Services	3,591
Remaining Services to be changed over	2,873
Remaining Duration (Years)	35
Average Cost per Service with Main Replacement (2021 $s)	$8,015
Average Cost per Change over (2021 $s)	$2,907
Average Cost per foot of Main (2021 $s)	$1,220
5-Year Projected Spend	$51.1 M

- Program 3 – Vintage Mechanically Coupled Pipe Wrapped Steel Main and Service (vintages 1952-1956 and 1962-1965) Replacement (including Contingent Main and Affected Services)
  - Estimated remaining duration: 10 years.

- Washington Gas has updated the cost of replacements and program duration based on enhanced cost estimation methods:
  - Average costs for service replacement are a blended rate of projected costs using historical actuals based on length and size of service.
  - Main unit costs are a blended rate of projected costs using historical actuals-based size of main pipe.
  - Unit prices have been escalated by 3% annually to reflect cost escalations.
- Consistent with current leak data as shown by Table 1: Service Leaks by Material (Jan 2015- Dec 2019) and Table 2: Main Leaks by Material, this program is a priority as can be seen in Table 3: Cost by Year.
- Vintage Mechanical Coupled services has the highest grade 1 leak rate of 6.01 grade 1 leaks per 100 segments.
- Vintage Mechanical Coupled main has the 2nd highest grade 1 leak rate at 3.29 grade 1 leaks per mile.
- This also includes replacement and inclusion for cost recovery under this program any services that are branched from any existing Vintage Mechanically Coupled Wrapped Steel services which are replaced or transferred.
- The proposed units to be completed are presented below:

Program 3: Vintage Mechanically Coupled Main and Service including Contingent Main and Affected Services	
Remaining Miles of Main as of January 2020	11.2
Contingent Miles of Main as of January 2020	3.2
Remaining Services to be Replaced including Affected Services[5]	1,378
Remaining Services to be Replaced without Main	689
Remaining Services to be changed over	684

[5] 689 of these services will be replaced without associated main replacement.

Remaining Duration (Years)	10
Average Cost per Service without Main Replacement (2021 $s)	$24,715
Average Cost per Service with Main Replacement (2021 $s)	$8,015
Average Cost per Change over (2021 $s)	$2,907
Average Cost per foot of Main (2021 $s)	$797
5-Year Projected Spend	$53.5 M

- Program 4- Cast Iron Main Replacement and Affected Services (including Contingent Main and Affected Services)
  - Estimated remaining duration: 35 years.
  - Washington Gas has updated the cost of replacement and program duration for all cast iron mains and the associated contingent mains based on enhanced cost estimation methods:
    - Average costs for service replacement are a blended rate of projected costs using historical actuals based on length and size of service.
    - Main unit costs are a blended rate of projected costs using historical actuals based on size of main pipe.
    - Unit prices have been escalated by 3% annually to reflect cost escalations.
  - Consistent with current leak data shown in Table 2: Main Leaks by Material, cast iron main remains a priority but is relatively lower in order as compared to other PIPES 2 Programs.
  - This also includes replacement and inclusion for cost recovery under this program any services that are branched from any affected services which are replaced or transferred.
  - Cast Iron main has the 4th highest grade 1 leak rate at 1.21 grade 1 leaks per mile.
  - The proposed units to be completed are presented below:

Program 4- Cast Iron Main Replacement including Contingent Main and Affected Services	
Remaining Miles of Main as of January 2020	404.9
Contingent Miles of Main as of January 2020	9.6
Remaining Services to be Replaced including Affected Services	12,068
Remaining Services to be changed over	30,442
Duration (Years)	35
Average Cost per Service with Main Replacement (2021 $s)	$10,024
Average Cost per Change over (2021 $s)	$4,645
Average Cost per foot of Main (2021 $s)	$1,602
5-Year Projected Spend	$12.6 M

- Program 5- Copper Service Replacement
  - Estimated duration: 35 years.
  - Washington Gas has updated the cost of replacements and program duration based on enhanced cost estimation methods:
    - Average costs for service replacement are a blended rate of projected costs using historical actuals based on length and size of service.
    - Unit prices have been escalated by 3% annually to reflect cost escalations.
  - This also includes replacement and inclusion for cost recovery under this program any copper services which experience active leaks during the program period, regardless of quad.
  - Copper services has the 4th highest grade 1 leak rate of 1.51 grade 1 leaks per 100 segments.
  - This also includes replacement and inclusion for cost recovery under this program any services that are branched from any existing copper services which are replaced or transferred
  - The proposed units to be completed are presented below:

Program 5- Copper Services	
Remaining Services to be Replaced as of January 2020	5,892
Duration (Years)	35
Average Cost per Service (2021 $s)	$24,715
5-Year Projected Spend	$16.9 M

- Program 6- Distribution Gauge Lines
  - Estimated duration: 10 years.
  - Washington Gas is targeting the replacement of 532 steel Gauge Lines on critical valves[6].
  - Approximately 61% of gauge line leaks occur on pre-1972 facilities, which supports the estimated replacement of 532 steel Gauge Lines.
  - The Company has identified 111 corrosion leaks out of 157 total leaks on gauge lines from years 2015 thru 2019.
  - Annual inspection data will be used to determine the priority of replacement.
  - The proposed units to be completed are presented below:

Program 6- Distribution Gauge Lines	
Critical Valves with Steel Gauge Lines to be replaced	532
Duration (Years)	10
Average Cost per Valve (2021 $s)	$9,270
5-Year Projected Spend	$2.1 M

[6] Critical valves are used to control or shut off the flow of gas to an area during an emergency. The area controlled by critical valves is designated as a safety sector.

- Program 7- Regulator Station Enhancements
  - Estimated duration: 10 years.
  - Washington Gas has projected the cost of replacement and program duration for regulator stations based upon prior similar construction efforts.
  - The Company has a total of 91 low-pressure ("LP") regulator stations in the District of Columbia
  - The Company will be replacing bypass valves at regulator stations that divide differing Maximum Allowable Operating Pressure (MAOP) systems (or, in some cases add an additional valve) and relocating LP regulator station control lines into existing vaults where most of these regulators are located.
  - The relative reduced risk associated with over-pressurization of the distribution system is not measured in typical leak-based metrics.
  - Regulator Stations will be prioritized based on consequences of failure considerations, including but not limited to miles of main and/or the number of services fed by the regulator station, and operational considerations.
  - The proposed units to be completed are presented below:

Program 7- Regulator Station Enhancements	
Regulator Stations	91
Duration (Years)	10
Average Cost per Regulator Station	$257,500
5-Year Projected Spend	$10 M

- Program 8 – Low Pressure Service Replacements.
  - Estimated duration: 10 years.
  - Washington Gas has estimated the cost replacement / change over based on the costs used to estimate Program 1.
  - This program will transfer the customers connected to the Low Pressure system to a medium pressure system that is available with only incidental main work (i.e., retirement of LP main) thus reducing the potential for an over-pressurization incident and provide the added benefits of enhanced safety features that come with having

Medium-Pressure facilities (i.e., house regulator with an internal pressure relief, EFV, improved locatability, improved reliability from water outages, reducing the consequences if over-pressurization were to occur).

- Services within this program will be prioritized based on consequences of failure considerations. Consequences will be calculated based in part on nearby facility types along with estimates of the maximum occupancy totals, and the structure use.
- This also includes replacement and inclusion for cost recovery under this program any services that are branched from any affected services which are replaced or transferred.
- The proposed units to be completed are presented below:

Program 8 - Low Pressure Service Replacements	
Services to be Replaced and connected to Medium Pressure	1,218
Services to be changed over to Medium Pressure	2,332
Duration (Years)	10
Average Cost per Service (2021 $s)	$24,715
Average Cost per Change over (2021 $s)	$2,907
5-Year Projected Spend	$11.8 M

- Program 9 – Advanced Leak Detection
  - See full testimony provided by Steve Price in Exhibit WG (D).

Program 9 – Advanced Leak Detection	
Duration (Years)	35
5-Year Projected Spend	$2 M

- Program 10 – Work Compelled by Others (i.e. AOP, DC PLUG, PEPCO GRID)
  - Estimated duration: 35 years
  - Washington Gas will estimate the cost of replacement based on the costs used to estimate Program 1 through 5 according to material type.
  - Washington Gas is targeting the replacement of PIPES eligible material with relatively lower pipe risks that are required to be replaced due to activities performed by others (for example DDOT or PEPCO) that present an additional risk because of the work in close proximity to the pipe.
  - This program will allow the Company to prioritize the highest risk mains and services in Programs 1 through 8 because of this new threat of work being performed around the facility.
  - PEPCO, in coordination with DDOT, continues the undertaking of DC PLUG in an effort to underground 26 overhead feeders alongside more than 40 miles of existing Washington Gas cast iron, bare and/or unprotected wrapped steel, and vintage mechanically coupled main
  - PEPCO is now also beginning construction on the 6-year PEPCO GRID project which includes installing 10 miles of underground transmission line intersecting existing Washington Gas facilities.
  - This program will also include contingent main and affected services.
  - This also includes replacement and inclusion for cost recovery under this program any services that are branched from any affected services which are replaced or transferred.

Program 10 – Work Compelled by Others (i.e. AOP, DC PLUG, PEPCO GRID)	
Duration (Years)	35
5-Year Projected Spend	$80 M

In sum, the Company is requesting the approval of PIPES 2 for the next 5 years of the program (Oct 2020-Dec 2025) in the amount of $374 million, which includes $350.1 million for distribution replacements and $23.9 million for transmission replacements (*see* Witness Stuber Testimony and Exhibit WG (2B)-1). This amount, which includes an annual inflation over the 5-year period of 3%, is intended to be invested across the distribution system programs as follows given the Company's current risk assessment:

- $110.1 million for Program 1 projects;
- $51.1 million for Program 2 projects;

- $53.5 million for Program 3 projects;
- $12.6 million for Program 4 projects;
- $16.9 million for Program 5 projects;
- $2.1 million for Program 6 projects;
- $10 million for Program 7 projects;
- $11.8 million for Program 8 projects;
- $2 million for Program 9 projects; and
- $80 million for Program 10 projects.

The Company anticipates that the annual spend on each of the programs may vary each year based on changes in schedules and priorities due to changing risk profiles, operational conditions and/or opportunities for construction efficiency. The Company will continue to provide annual updates on the PIPES 2 Plan, by program, in its annual reporting. Table 3 shows the expected duration of each program and the projected investment for the next 5 years.

Data Sources and Collection

Washington Gas utilized data obtained from the Company's GE Smallworld system, Asset Manager system, and Asset Resource Manager (ARM), formerly referenced as Work Management Information System ("WMS"). All three systems were used to gather leak data. Smallworld was also utilized to identify the total known population of main and services. The current population of mains and services was again extracted in January 2020. This information may change depending on ongoing data QA/QC and will be reflected in the Company's filings of annual project lists. Washington Gas is committed to improving processes including the review and maintenance of our records. These on-going record research activities could result in the populations presented being updated as needed.

Both ARM and Smallworld were used to collect pipe attributes, such as length, size, material, system pressure, year of installation, as well as the geographical information (quad map, county and state) where the pipe is located. The following information and analysis is developed from and supported by these systems and their associated data.

Service Pipe Information Gathering/Results and Analysis

Consistent with the approach in prior PIPES filings, Washington Gas obtained the leak and maintenance history of service pipe by material type for the updated period of January 2015 to December 2019 (*see* Table 1). The leaks presented in Table

1 meet the federal Department of Transportation ("DOT") categorization of the targeted threats of Corrosion Failure, Pipe Weld or Joint Failure, and Equipment Failure. The DOT categories of Natural Force Damage, Excavation Damage, Other Outside Force Damage, Incorrect Operations, and Other Cause have been excluded in the analysis as these categories do not directly reflect the actual condition or performance of the pipe. ARM and Smallworld were used to develop the following data on service pipes in the District of Columbia distribution system.

The results have been "unitized" on leaks per 100 service segments basis in order to make a comparison of the service performance by materials. Table 1 shows that the top four materials ranked by leaks per 100 service segments are Bare Steel, Vintage Mechanically Coupled, Unprotected Wrapped Steel, and Copper. In fact, these four material types accounted for approximately 78% of all service leaks and represent 22% of the service segments. These material types are addressed for replacement in Programs 1, 2, 3, 4 and 5 either specifically or as affected services.

TABLE 1 SERVICE LEAKS BY MATERIAL Jan 2015 - Dec 2019
(EXCLUDING THIRD PARTY DAMAGE, OPERATIONS AND OTHER)

Service Material	Number of Service Segments	Number of Leaks	Leaks per 100 Service Segments	Rank
Vintage Mech. Coupling	1,131	92	8.1	1
Bare Steel	8,209	653	8.0	2
Unprotected Wrapped Steel	13,923	366	2.6	3
Copper	12,854	295	2.3	4
Protected Wrapped Steel	3,821	75	2.0	5
Pre-75 Plastic	7,727	79	0.9	6
Plastic	113,430	234	0.2	7

Figures 1 and 2 show the number of leaks per 100 service segments that occurred by material type from January 2015 to December 2019. This data shows that for the period between January 2015 to December 2019, Bare Steel, Unprotected Wrapped Steel services, Vintage Mechanically Coupled Wrapped Steel ("VMC"), and Copper have elevated leak rates as compared to the other materials. These results are consistent with the Company's DIMP Plan. As such, the Company is

continuing to focus on the replacement of these materials through its current accelerated replacement program and proposed PIPES 2 Plan.

In summary, based upon the analysis of the leak history of services in the District of Columbia over the period of January 2015 to December 2019, the Company's proposed PIPES 2 Plan for distribution system facilities replacements is targeting the appropriate service materials. The planned replacement is consistent with the Company's DIMP Plan. The replacement of these services with polyethylene service pipe also offers a lasting means of reducing greenhouse gas emissions and improving reliability.

Main Pipe Information Gathering/Results and Analysis

Consistent with the approach in prior filings, Washington Gas reviewed the leak and maintenance history of main pipe by material type for the updated period of January 2015 to December 2019 (See Table 2). The leaks presented in Table 2 meet the DOT categorization of the targeted threats of Corrosion Failure, Pipe Weld or Joint Failure, and Equipment Failure. The DOT categories of Natural Force Damage, Excavation Damage, Other Outside Force Damage, Incorrect Operations, and Other Cause have been excluded in the analysis as these categories do not directly reflect the actual condition or performance of the pipe.

TABLE 2 MAIN LEAKS BY MATERIAL Jan 2015-Dec 2019
(EXCLUDING THIRD PARTY DAMAGE, OPERATIONS AND OTHER)

Main Material	Miles of Main	Number of Leaks	Leaks per Miles of Main	Rank
Bare Steel	23	231	10.2	1
Vintage Mech. Coupling[3]	23	145	6.4	2
Cast Iron[7]	410	1,876	4.6	3
Unprotected Wrapped Steel	56	186	3.3	4
Protected Wrapped	296	213	0.7	5
Plastic	416	56	0.1	6

[7] The CI mileage used to calculate the leak rate includes reconditioned pipe. The Company is only proposing to replace the miles in Program 4.

The results shown in Table 2 are "unitized" on a leaks per mile of main basis in order to make a comparison of the main pipe performance by materials. Table 2 shows that the top materials ranked by leaks per mile of main are Bare Steel, Vintage Mechanically Coupled Wrapped Steel, Cast Iron, and Unprotected Wrapped Steel. In fact, these material types accounted for approximately 90% of all leaks on main pipe but make up only 42% of the total main pipe. Program 2 addresses all Bare and/or Unprotected Wrapped Steel main with affected services and contingent mains. Program 3 addresses all remaining Vintage Mechanically Coupled main with affected services and contingent mains. Program 4 addresses all Cast Iron with affected services and contingent mains.

Figure 3 emphasizes that replacing Bare Steel, Vintage Mechanically Coupled Steel, Cast Iron main, and Unprotected Wrapped Steel with polyethylene pipe also offers a lasting means of reducing greenhouse gas emissions and improving reliability.

In summary, based upon the analysis of the leak history of active mains in the District of Columbia over the period January 2015 to December 2019, the Company’s proposed PIPES 2 Plan for distribution main facilities replacements is targeting the appropriate main materials and/or subsets. The planned replacement is consistent with the Company’s DIMP Plan. The Company proposes to continue these replacement programs accordingly.

TABLE 3: PROJECTpipes COSTS AND UNITS BY YEAR

Program	Total Submission	Remaining Duration	2020-21	2022	2023	2024	2025	5-Year Total
			$53.3	**$63.2**	**$74.7**	**$77.2**	**$81.6**	**$350.1**
1	Bare and/or Unprotected Steel Services	10	$12.2	$20.5	$25.1	$26.0	$26.3	**$110.1**
2	Bare and/or Unprotected Steel Main	35	$7.9	$10.5	$10.6	$11.1	$11.0	**$51.1**
3	Vintage Mech. Coupled Main	10	$11.4	$9.6	$9.7	$10.0	$12.8	**$53.5**
4	Cast Iron Main	35	$2.2	$2.5	$2.7	$3.2	$1.9	**$12.6**
5	Copper Services	35	$3.5	$3.2	$3.3	$3.5	$3.5	**$16.9**
6	Gauge Line Replacement	10	$0.1	$0.4	$0.5	$0.5	$0.5	**$2.1**
7	Reg. Station Enhancements	10	$0.8	$1.6	$2.5	$2.5	$2.6	**$10.0**
8	LP Service Replacement	10	$2.0	$2.1	$2.6	$2.6	$2.6	**$11.8**
9	Advanced Leak Detection	35	$0.8	$0.3	$0.3	$0.3	$0.3	**$2.0**
10	Work Complelled by Others	35	$12.5	$12.5	$17.5	$17.5	$20.0	**$80.0**

Total Units replaced / remediated	2020-21	2022	2023	2024	2025	5-Year Total
Services Replaced	1,010	1,251	1,442	1,445	1,460	**6,608**
Service Transferred	348	394	425	426	462	**2,055**
Miles of Main	4.5	4.7	5.1	5.1	5.6	**25.0**
Gauge Lines	16	42	50	50	50	**208**
Regulator Stations	3	6	9	9	9	**36**

TABLE 4 GREENHOUSE GAS REDUCTIONS

			Total Quantity	Units	2020 GHG Reduction	2021 GHG Reduction	2022 GHG Reduction	2023 GHG Reduction	2024 GHG Reduction	2025 GHG Reduction	Cumulative GHG Reduction	Total Equivalent Cars Removed 2020-2025
	Main Replacements	Affected Service Replacements			mTons CO2e	mTons CO2e	mTons CO2e	mTons CO2e	mTons CO2e	mTons CO2e	mTons CO2e	
Program 1: Bare Steel Main and Service		Bare/Unprotected Steel	4166	# of Services	362.6	1,666.0	2,613.5	2,335.6	1,566.8	768.0	9,312.5	1,992.9
Program 2: Bare/Unpotected Steel Main and Service	Bare/Unprotected Steel		6.5	Miles	85.2	158.4	248.7	181.8	123.6	59.4	857.1	183.4
	VMC		0.0	Miles	0.0	0.1	0.1	0.1	0.1	0.0	0.4	0.1
	Protected Wrapped Steel		0.3	Miles	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	-
	Black Plastic		0.0	Miles	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	-
	Plastic		0.2	Miles	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	-
		Bare/Unprotected Steel	217	# of Services	49.7	47.4	37.9	28.4	19.0	9.5	191.9	41.1
		Copper	56	# of Services	1.9	3.6	5.6	4.2	2.6	1.4	19.3	4.1
		Black Plastic	21	# of Services	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	-
		Protected Wrapped Steel	0	# of Services	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	-
		VMC	0	# of Services	-	-	-	-	-	-	-	
Program 3: VMC Main and Service	VMC		7.0	Miles	-	315.8	238.6	175.8	117.2	74.0	921.5	197.2
	Plastic		0.3	Miles	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	-
	Protected Wrapped Steel		1.2	Miles	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	-
		VMC	621	# of Services	277.3	437.9	344.6	256.0	170.7	107.3	1,593.7	341.0
		Copper	142	# of Services	-	16.1	12.7	9.5	6.3	4.0	48.7	10.4
		Black Plastic	23	# of Services	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	-
		Bare/Unprotected Steel	16	# of Services	-	12.4	9.8	7.3	4.9	3.3	37.6	8.0
		Protected Steel	37	# of Services	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	-
Program 4: Cast Iron Main and Services	Cast Iron		1.3	Miles	-	138.7	119.5	96.0	72.6	21.3	448.2	95.9
	Protected Wrapped Steel		0.0	Miles	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	-
	Plastic		0.0	Miles	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	-
	Unprotected Steel		0.0	Miles	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Copper	9	# of Services	-	1.2	0.9	0.7	0.5	0.1	3.4	0.7
		Black Plastic	6	# of Services	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	-
		Protected Wrapped Steel	0	# of Services	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	-
		Bare/Unproteted Steel	21	# of Services	-	16.3	13.0	12.2	8.1	2.4	52.0	11.1
		VMC	0	# of Services	-	-	-	-	-	-	-	-
Program 5: Copper Services		Copper	644	# of Services	8.6	73.9	59.2	44.0	30.0	14.7	230.5	49.3
Program 8: LP Service Replacement		Bare/Unprotected Steel	228	# of Services	12.8	154.4	133.3	121.9	78.0	39.0	539.4	115.4
		Copper	52	# of Services	0.6	5.3	4.2	3.9	2.6	1.3	17.9	3.8
		Protected Wrapped Steel	21	# of Services	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	-
		Black Plastic	62	# of Services	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	-
Program 10: Work by Other	Cast Iron		8.0	Miles	-	773.7	601.9	608.3	397.0	219.8	2,600.7	556.5
	Protected Wrapped Steel		0.1	Miles	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	-
	Plastic		0.1	Miles	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	-
	Bare/Unprotected Steel		0.0	Miles	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Copper	60.0	# of Services	-	5.3	4.2	5.3	3.1	1.6	19.5	4.2
		Black Plastic	48.3	# of Services	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	-
		Protected Wrapped Steel	0.1	# of Services	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	*Assume No Savings*	-
		Bare/Unprotected Steel	151.4	# of Services	-	18.2	17.9	30.1	28.4	28.4	123.1	26.3
		Total			**798.9**	**3,844.6**	**4,465.6**	**3,921.1**	**2,631.3**	**1,355.6**	**17,017.2**	**3,641.7**

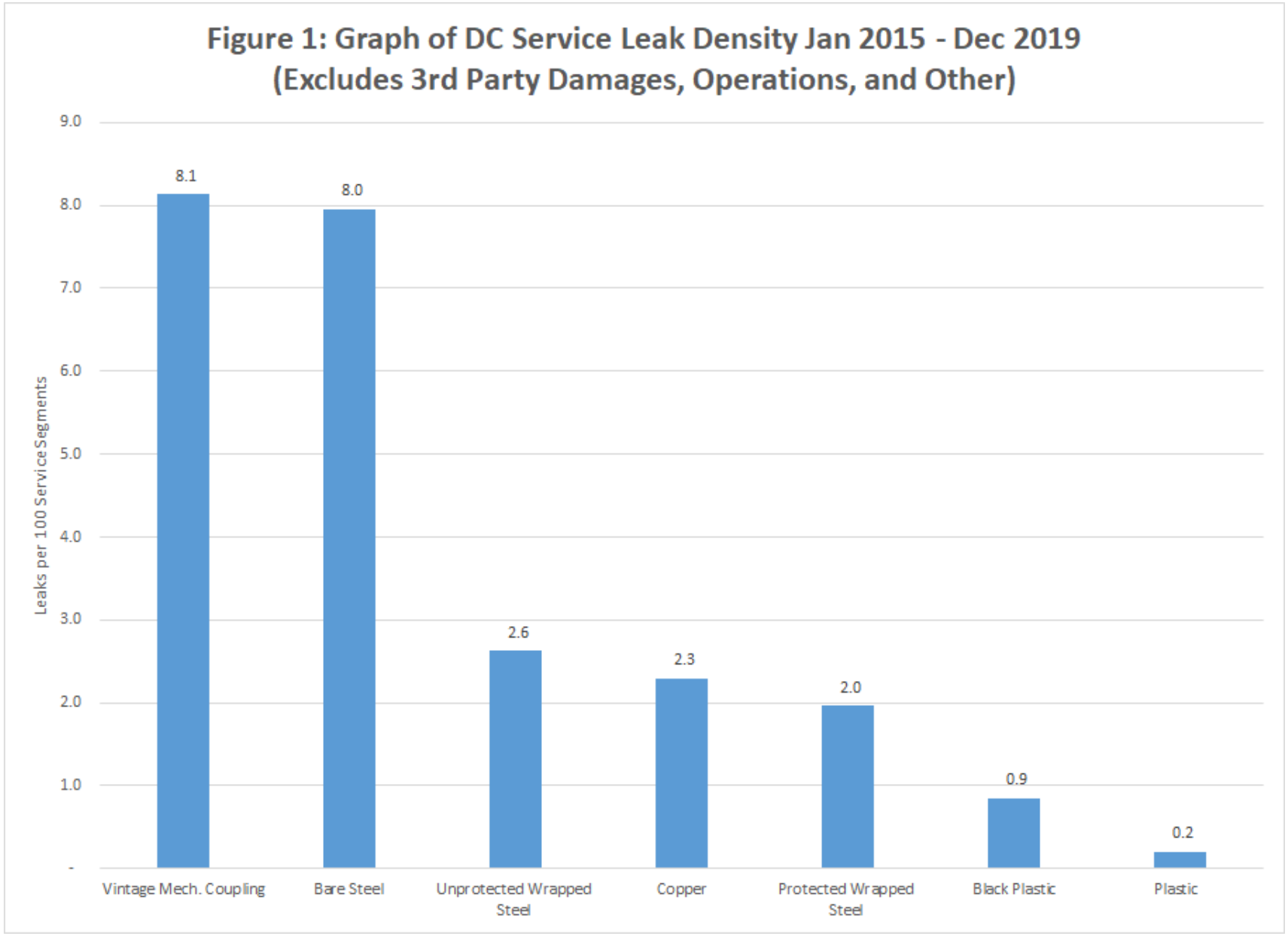


Figure 1: Graph of DC Service Leak Density Jan 2015 - Dec 2019
(Excludes 3rd Party Damages, Operations, and Other)
Leaks per 100 Service Segments
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
-
8.1
8.0
2.6
2.3
2.0
0.9
0.2
Vintage Mech. Coupling
Bare Steel
Unprotected Wrapped Steel
Copper
Protected Wrapped Steel
Black Plastic
Plastic

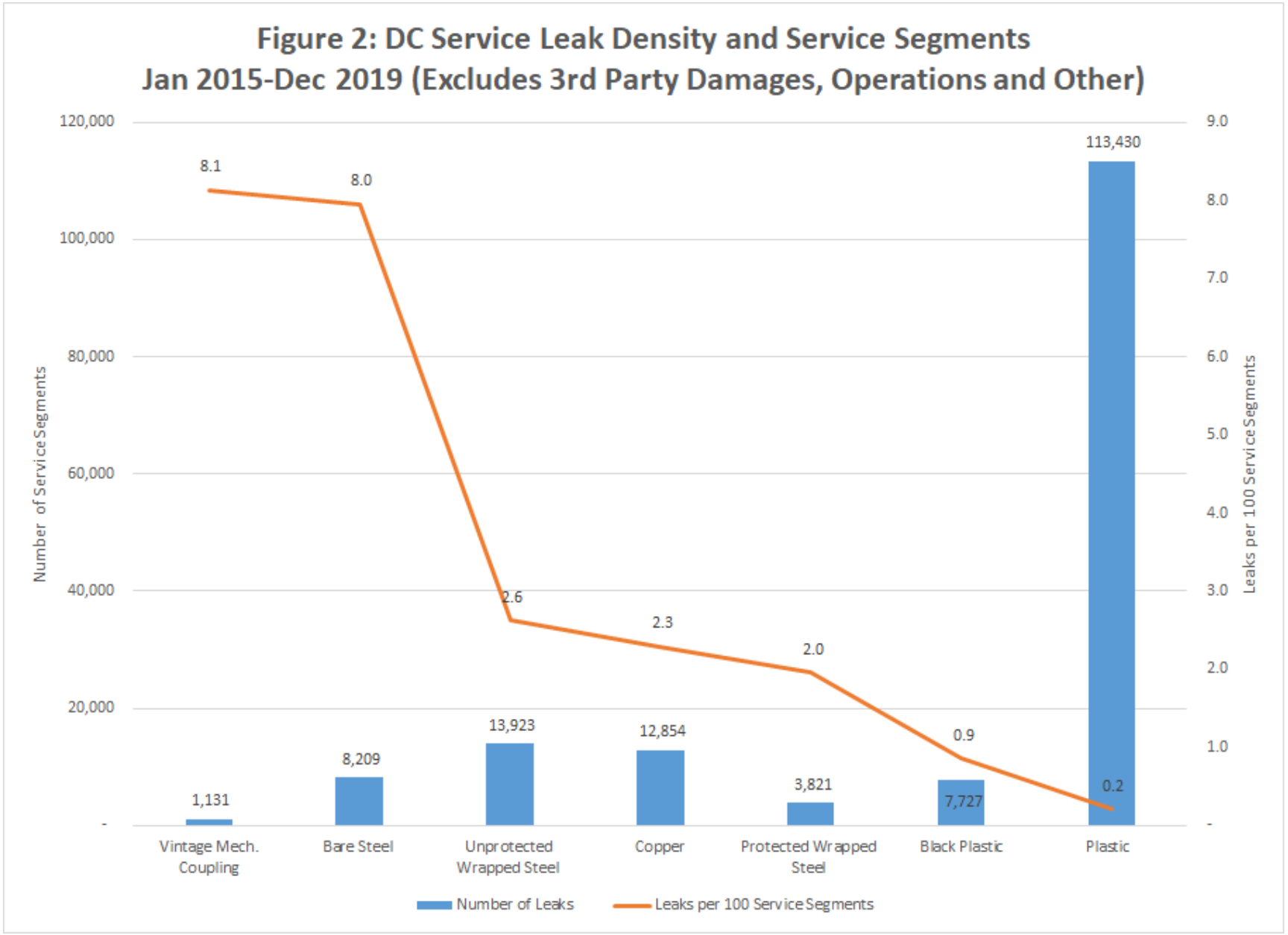


Figure 2: DC Service Leak Density and Service Segments
Jan 2015-Dec 2019 (Excludes 3rd Party Damages, Operations and Other)
Number of Service Segments
Leaks per 100 Service Segments
120,000
100,000
80,000
60,000
40,000
20,000
-
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
-
8.1
8.0
2.6
2.3
2.0
0.9
0.2
1,131
8,209
13,923
12,854
3,821
7,727
113,430
Vintage Mech. Coupling
Bare Steel
Unprotected Wrapped Steel
Copper
Protected Wrapped Steel
Black Plastic
Plastic
Number of Leaks
Leaks per 100 Service Segments

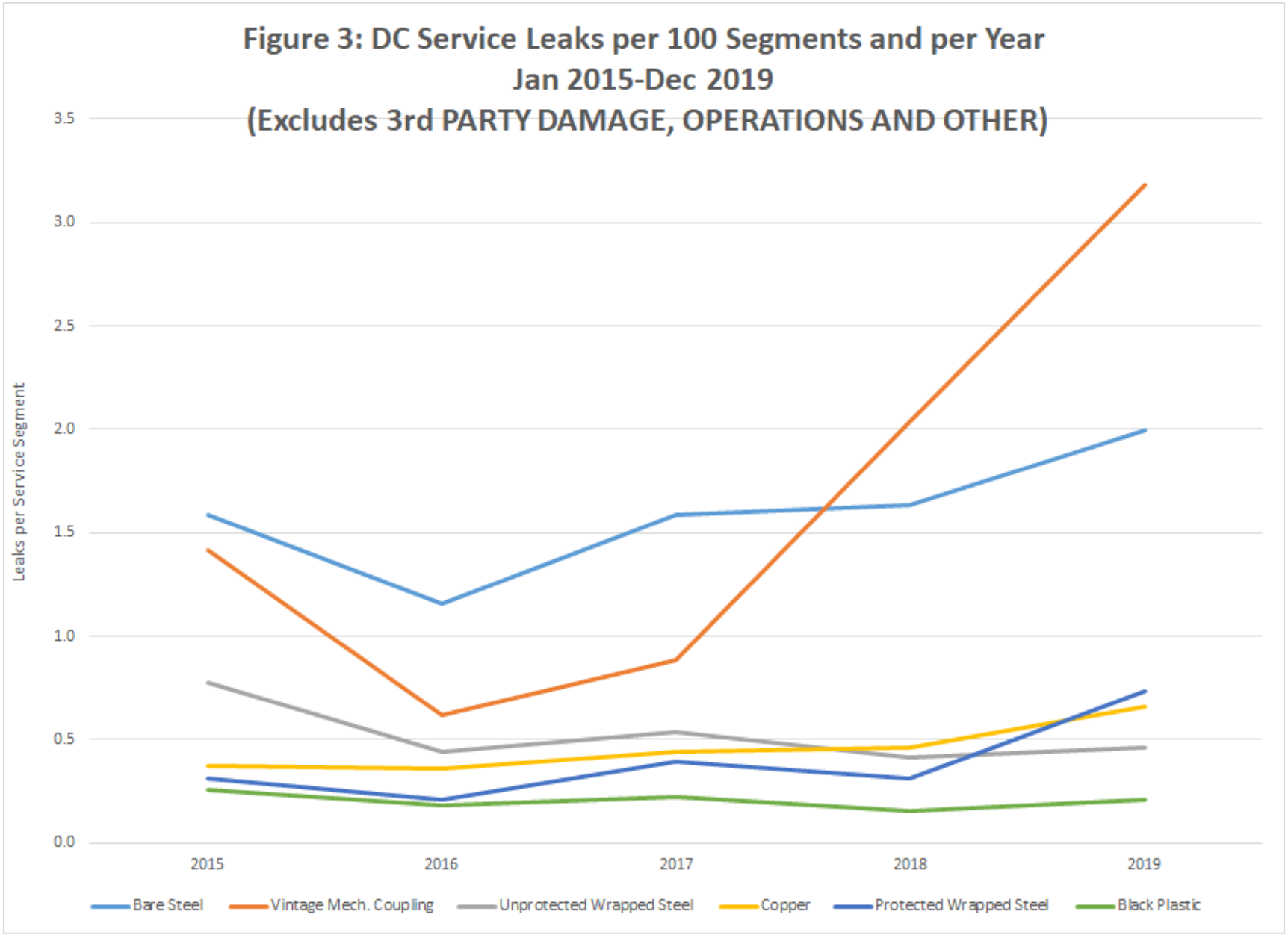


Figure 3: DC Service Leaks per 100 Segments and per Year
Jan 2015-Dec 2019
(Excludes 3rd PARTY DAMAGE, OPERATIONS AND OTHER)
Leaks per Service Segment
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2015
2016
2017
2018
2019
Bare Steel
Vintage Mech. Coupling
Unprotected Wrapped Steel
Copper
Protected Wrapped Steel
Black Plastic

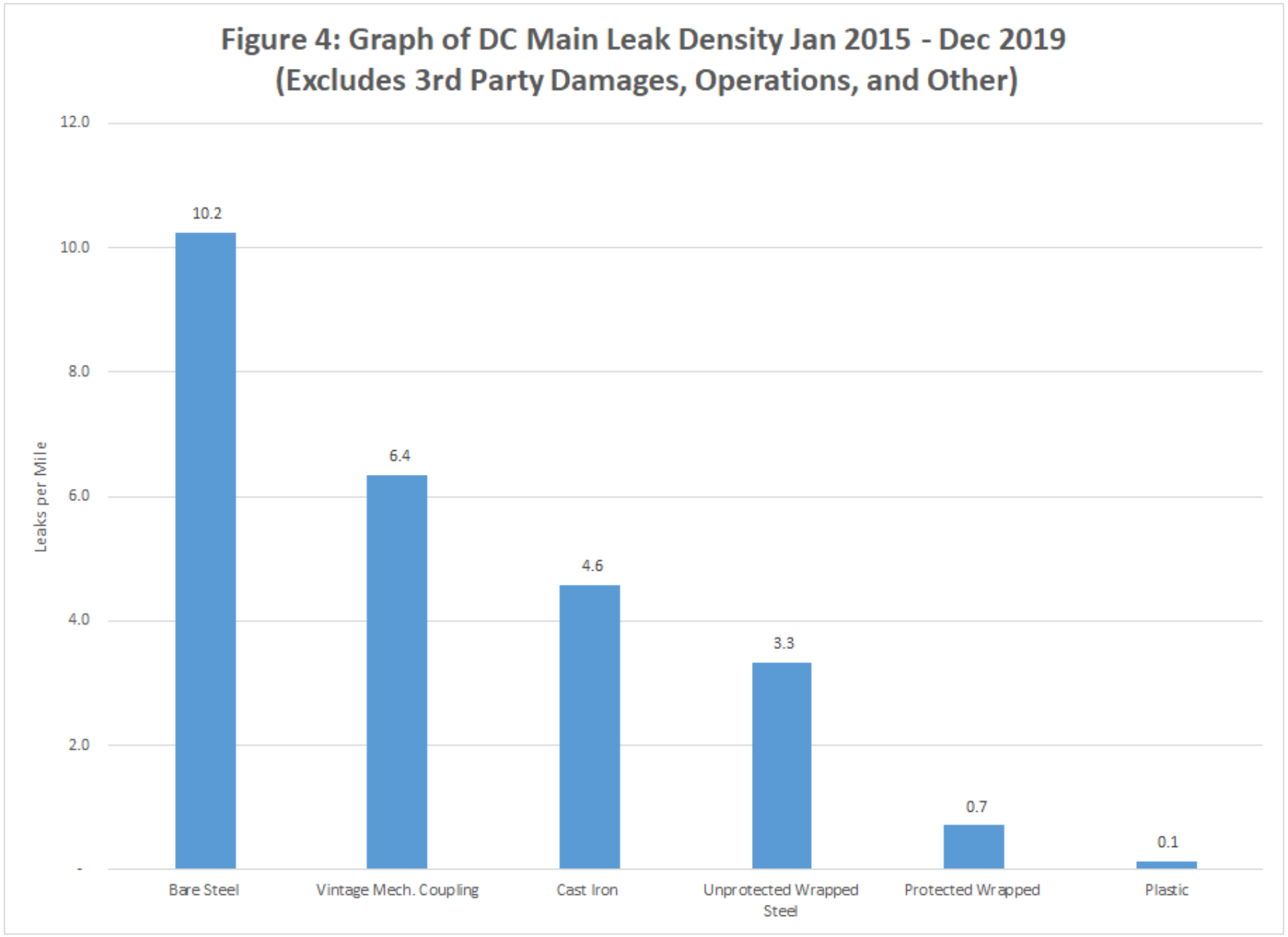
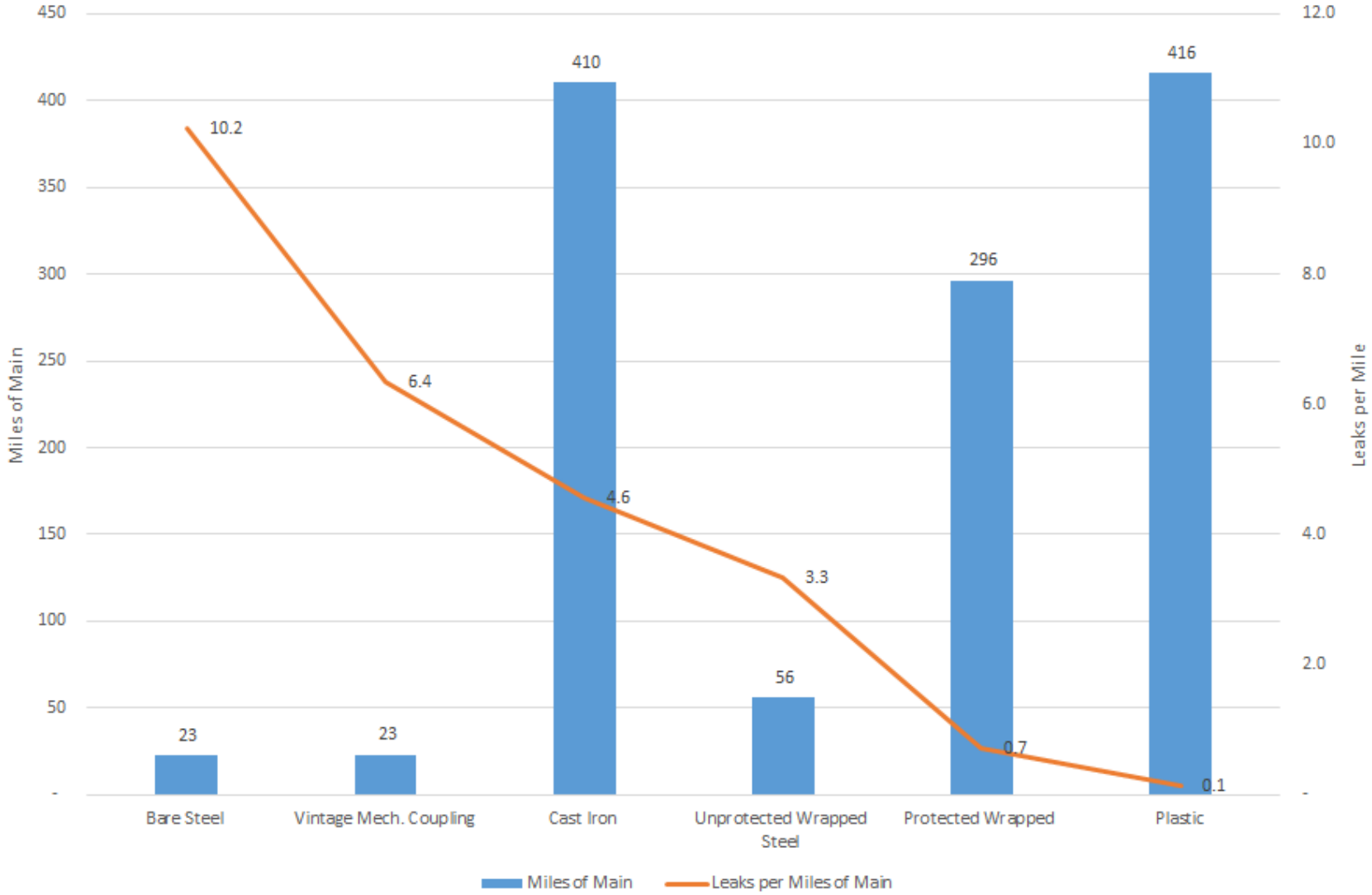


Figure 4: Graph of DC Main Leak Density Jan 2015 - Dec 2019
(Excludes 3rd Party Damages, Operations, and Other)
Leaks per Mile
12.0
10.0
8.0
6.0
4.0
2.0
-
10.2
6.4
4.6
3.3
0.7
0.1
Bare Steel
Vintage Mech. Coupling
Cast Iron
Unprotected Wrapped Steel
Protected Wrapped
Plastic

Figure 5: DC Main Leaks per Mile and Miles of Main Jan 2015-Dec 2019 (Excludes 3rd PARTY DAMAGE, OPERATIONS AND OTHER)



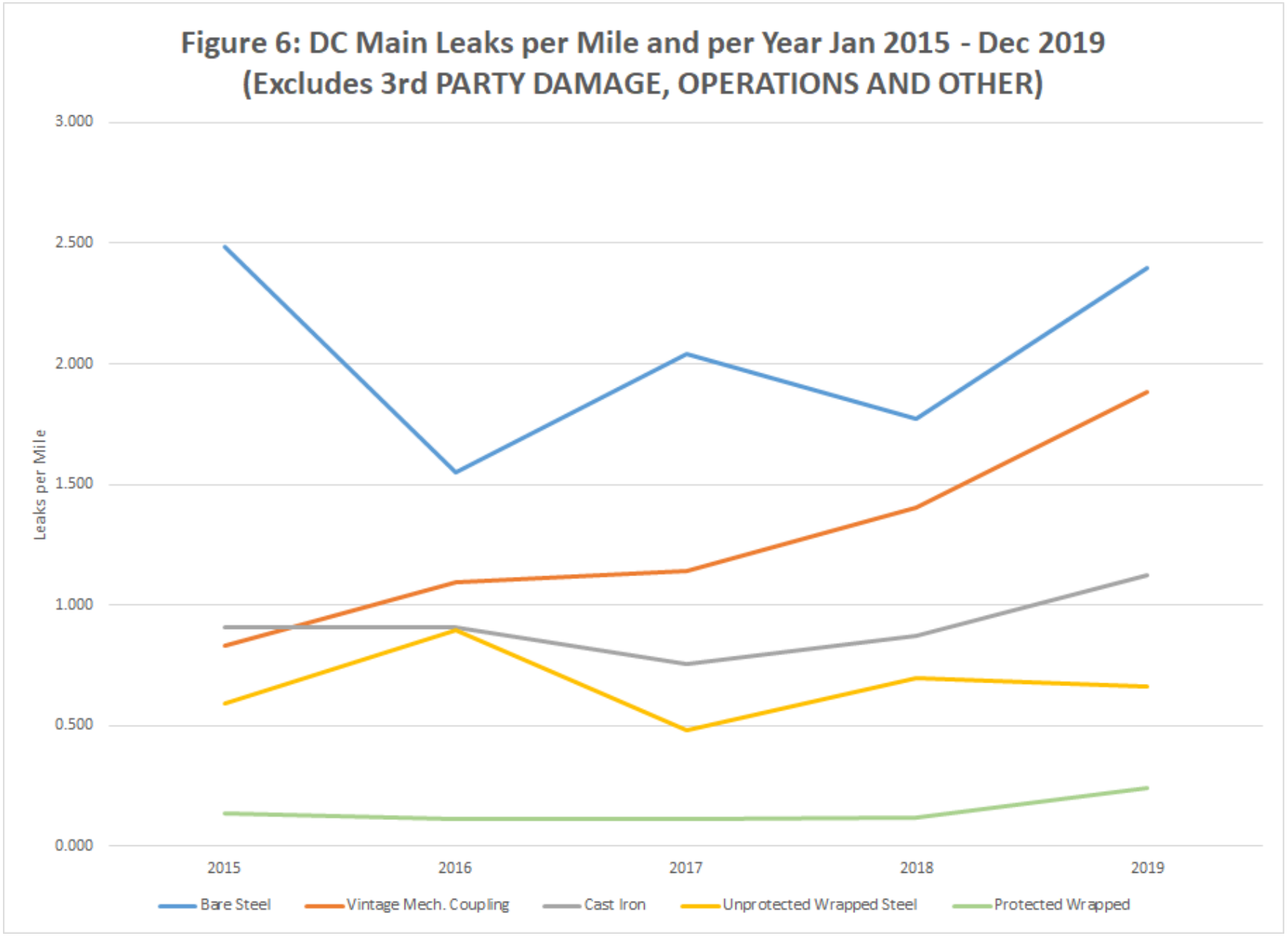


Figure 6: DC Main Leaks per Mile and per Year Jan 2015 - Dec 2019
(Excludes 3rd PARTY DAMAGE, OPERATIONS AND OTHER)
Leaks per Mile
3.000
2.500
2.000
1.500
1.000
0.500
0.000
2015
2016
2017
2018
2019
Bare Steel
Vintage Mech. Coupling
Cast Iron
Unprotected Wrapped Steel
Protected Wrapped

WITNESS JACAS
EXHIBIT WG (2A)-2

EXHIBIT WG (2A)-2

LIBERTY AUDIT RECOMMENDATIONS

1. **PREPARE FOR STAKEHOLDER DIALOGUE A PROPOSAL TO ELIMINATE SERVICE-ONLY REPLACEMENTS (PROGRAM 1), MAKING THEM PART OF MAIN REPLACEMENTS UNDER PROGRAMS 2 AND 4.**

   - **RESPONSE:** Washington Gas's Distribution Integrity Management Program (DIMP) performance measures (leak rates by material and type of facility) and the current risk model continues to demonstrate the need to maintain the priority of a targeted services-focused program. Therefore, Washington Gas has updated its PIPES 2 Plan to maintain Program 1 as a service only program.

2. **PREPARE FOR STAKEHOLDER DIALOGUE A PROPOSAL TO ELIMINATE THE "OPTIMAIN TOP-3" COMPONENT OF REPLACEMENTS, EMPLOYING A PRIORITIZATION METHOD THAT EMPHASIZES SMALL DIAMETER PIPES SUBJECT TO MUCH HIGHER FAILURE RATES.**

   - **RESPONSE:** The Company continues to assert that working through main projects initiated as a result of risk analysis, based on the risk reduced per dollar spend metric, is the most effective method for prioritizing projects and maximizes the amount of risk removed in the District of Columbia for a given funding level. Such a metric would consider all Optimain projects, including the Top 3, but would not dictate that the Top 3 Optimain projects be undertaken unless their risk reduced per dollar spent supports undertaking the project at that time. Additionally, Liberty Consulting Group recommended the elimination of the Optimain Top-3 requirement[1]. Therefore, the Company has proposed to eliminate the Optimain Top-3 project component in its PIPES 2 Plan.

3. **CONTINUE TO ACCOUNT FOR PRESSURE DIFFERENCES THAT RESULT WHEN REPLACEMENTS PRODUCE PRESSURE INCREASES IN ONLY PART OF CONTIGUOUS AREAS OR NEIGHBORHOODS.**

   - **RESPONSE:** Washington Gas is mindful of safety issues in the uprating of its system from low to medium pressure and has long-established procedures in place outlining the requirements for planning and implementing the uprating of existing distribution main. Furthermore, the Company, after the industry incident in Massachusetts, implemented an internal task force and made additional enhancements to practices in design, damage prevention and work execution**.** In addition, the Company, in its PIPES 2 Plan, proposed the addition of two (2) programs to further enhance the safety and reliability of its distribution system with

[1] Liberty Management Audit Page 23 Recommendation 2

- Program 7 (Regulator Station Enhancements) and Program 8 (Low-Pressure Service Replacements/Transfer).

4. ENHANCE EFFORTS ALREADY UNDERWAY TO PROVIDE A FULL AND ACCURATE IDENTIFICATION OF THE TYPES AND MATERIALS EMPLOYED IN UNDERGROUND INFRASTRUCTURE.

- **RESPONSE:** Washington Gas has implemented several record correction initiatives and includes ongoing efforts in its Distribution Integrity Management Program (DIMP) Plan to identify additional information needed and plans to collect that information to enhance knowledge of the system. From 2017 to 2019, the Company has targeted facilities pipes with unknown pipe attributes in an effort to clean up its geographic information system, Smallworld. From 2018 to 2019, the Company's mapping group created and implemented a number of proactive queries and reports which target missing information related to EFV, TSV, pipe size, pipe material and year of installation of Smallworld. The results of the queries and reports were used to make several corrections and updates in Smallworld. Furthermore, the Company will continue its records correction initiatives and to enhance its GIS system to better inform the iterative risk-based decision-making process.

5. PROMPTLY COMPLETE THE DESCRIBED PROGRAM MANAGEMENT MEASURES NOW UNDERWAY.

- **RESPONSE:** Through the standing up of the Construction Program Strategy and Management ("CPSM") department in 2016, Washington Gas has implemented or plans to implement the enhancement measures listed below by the dates provided below:
    - PROJECT*pipes* dashboard - December 2017
    - Monthly executive governance presentation – February 2018
    - Process tracking report (RRC & Gap Report) – August 2016
    - Variance tracking meetings report – December 2018
    - Additional measures being taken to enhance the management of PROJECT*pipes.*
        - CSL Report – May 2017
        - BCA Held Open Report – Dec 2018
        - Lessons Learned- January 2019
    - Update of Program Implementation Plan (PIP) – July 2020
    - PROJECT*pipes* dedicated Project Manager – August 2019

6. CONDUCT SKILLS ASSESSMENTS AND DEVELOPMENT PLANS TO FURTHER THE PROJECT MANAGEMENT SKILLS AND CAPABILITIES ENHANCEMENT NOW UNDERWAY.

- **RESPONSE:** The Construction, Compliance and Pipeline Safety division developed and received approval to augment its construction management department with dedicated project management staff with a manager position and one employee dedicated for PROJECTpipes. These positions were both hired as of August 2019. Additionally, the division's management team routinely conducts employee skills assessments and develops plans for enhancing its project management capabilities as a routine course of business, including providing training opportunities to the positions annually. The Company hosted a Project Management Professional (PMP) certification class attended by multiple employees directly involved with PROJECT*pipes* in February 2020.

7. INCORPORATE ROUTINE MEASUREMENT OF ACTUAL VERSUS PLANNED UNIT COSTS AS PART OF ONGOING PERFORMANCE MEASUREMENT, AND, AS IT CONTINUES TO EXAMINE PERFORMANCE VARIANCES, IDENTIFY, REPORT ON, AND ANALYZE OTHER METRICS MATERIAL TO ENSURING CONTINUING PROGRAM SUCCESS.

- **RESPONSE**: The CPSM department developed a monthly dashboard in December 2017 to capture and analyze actual versus planned performance, measured in both dollars and units completed. CPSM will continue to capture and communicate such metrics to Construction and other relevant departments to improve program performance. Additionally, Washington Gas will file a report semi-annually on actual versus planned performance, measured in both dollars and units completed. The Company will file the semi-annual report each August 31st throughout PROJECTpipes 2 Plan if the project year is equivalent to a calendar year still.

8. COMPLETE MEASURES UNDERWAY TO INCREASE FOCUS ON D.C.-SPECIFIC PERFORMANCE.

- **RESPONSE:** Washington Gas will file its Program Implementation Plan ("PIP") by May 29, 2020, which will include the documents recommended by The Liberty Consulting Group (program plan documents, forecasts, performance projections and a life of program plan). Should the PIP not be completed by May 29, 2020, Washington Gas agrees to file (1) a progress report regarding the impending completion of the PIP; and (2) any outstanding documents and PIP details by no later than July 1, 2020. Additionally, the Company will include the following information in the PIP:
    - A fully integrated, formally documented scheduling program and capability;
    - The revised Program Implementation Plan;
    - A forecast of estimated costs to install the full scope of the current 4- Year Plan, based on soundly derived, projected unit rates and escalated costs;
    - A projection of uninstalled quantities of main and services (versus plan) at the end of Year 4;

- An assessment of the schedule slippage impact of uninstalled quantities of main and services in the first four years, and the resulting cost impact in escalated dollars; and
- A life of program plan (40 years) using soundly derived unit rates and escalated costs, including an appropriately-derived contingency element.

9. RE-DEFINE "NORMAL" REPLACEMENT IN LIGHT OF EXPERIENCE AND CURRENT INFRASTRUCTURE AND RISKS AND EVALUATE THE INSTITUTION OF A WORK COMPLETION CONDITION TO EXPEDITED RECOVERY OF PROGRAM EXPENDITURES.

- **RESPONSE:** The purpose of the PROJECT*pipes* Program is to facilitate expedited replacement activities of relatively higher risk pipe that enhance the safety and improve the reliability of Washington Gas's distribution system for its customers and the public. Accordingly, Washington Gas will continue to evaluate its higher-risk pipe and present the Commission and stakeholders the pipe populations to be replaced and their associated costs within the PROJECT*pipes* Program. The Company will continue to seek recovery through the Commission-approved cost recovery mechanism[2], only on replacement activities eligible within approved PROJECT*pipes* plans. Costs that are not eligible for recovery within the program will be included in future requests for base rate recovery. Additionally, Merger Commitment No. 72 in Formal Case No. 1142 will prevent recovery of any costs above 120% of the rolling two-year annual average program cost for Programs 1 and 2 and any costs more than 120% of the Class 3 estimate for Program 4., treating them as normal replacement costs to be recovered through base rates.

10. COMPLETE EFFORTS TO PRODUCE A SERIES OF PROGRAM PLAN DOCUMENTS, FORECASTS, PERFORMANCE PROJECTIONS, AND A LIFE OF PROGRAM PLAN (40 YEARS) USING SOUNDLY DERIVED UNIT RATES AND ESCALATED COSTS, INCLUDING AN APPROPRIATELY-DERIVED CONTINGENCY ELEMENT.

- **RESPONSE:** See the response to Recommendation 8.

11. EXPAND USE OF COST ESTIMATES IN COST MANAGEMENT AND IN THE PROJECT COST ESTIMATE PROCESS AND THE REVISED PROGRAM IMPLEMENTATION PLAN TO INCORPORATE EXPLICIT STATEMENTS ABOUT EXPECTATIONS AND INTENDED USE.

- **RESPONSE:** The Company is currently performing project-specific American Association of Cost Engineering ("AACE") International Class 3 estimates for all projects included on each PROJECT*pipes* annual project list in accordance with Order No. 18815. Washington Gas proposes that AACE Class 3 estimates remain in effect for Program 4 (Cast Iron), in order to support Merger Commitment 72

[2] FC 1115 Order No 17602 Paragraph 50

conditions. Washington Gas will file the results of the evaluation of Class 3 estimates and the cost management documentation with the Commission by April 1, 2021. Washington Gas recommends that it be released from its current obligation of performing AACE Class 3 estimates for any other PROJECT*pipes* programs. Additionally, Liberty Consulting Group recommended the elimination of the Class 3 Cost estimate requirements on smaller projects, to exclude most of Program 1 projects and those in Program 2 and 4 with comparatively very low costs and standard execution requirements because they believe "the requirement can be eliminated for a substantial body of low-cost projects without impairing project management effectiveness.[3]" Furthermore, the Company can utilized its current annual enhanced cost estimating methodology starting in September 2018 to complete the estimation of these projects.

12. UNDERTAKE A SERIES OF ADDITIONAL ACTIONS TO OPTIMIZE PREPARATION AND USE OF ESTIMATES.

- **RESPONSE:** Washington Gas has documented its estimation methodology to allow for consistent status updates and analyses of estimates, and produce regular reports comparing estimated versus actual costs as of December 2018.

13. EVALUATE ELIMINATION OF CLASS 3 COST ESTIMATE REQUIREMENTS ON SMALLER PROJECTS, TO EXCLUDE MOST OF PROGRAM 1 PROJECTS AND THOSE IN THE OTHER TWO PROGRAMS WITH COMPARATIVELY VERY LOW COSTS AND STANDARD EXECUTION REQUIREMENTS.

- **RESPONSE:** The Company will file the results of the evaluation of Class 3 estimates with the Commission by April 1, 2021. Washington Gas believes that it would be most appropriate to make Class 3 estimates optional, instead of mandated, to allow the Company to exercise an appropriate level of control regarding estimates. As Liberty's recommendation suggest, the Class 3 estimate is not appropriate for all project sizes. Additionally, Merger Commitment No. 72 in Formal Case No. 1142 provides an additional cost management measure for PROJECT*pipes*.

14. ENHANCE THE PROVISION OF INSIGHTFUL ANALYSIS OF COST PERFORMANCE ISSUES AND PROVIDE COST MANAGEMENT SUPPORT TO THE PROGRAM.

- **RESPONSE:** Washington Gas will report semi-annually on the reports, processes and executives involved in the cost management function, no later than August 31st throughout PROJECTpipes 2 Plan if the project year is equivalent to a calendar year still. Additionally, the Company embarked on the development of a pay item rejection reporting mechanism and intends on completing by December 31, 2020.

[3] Liberty Management Audit Page 69 Recommendation 13.

15. PROMPTLY COMPLETE DEVELOPMENT OF A PROCESS FOR REGULARLY MEASURING PLANNED AND ACTUAL EXPENDITURES TO PRODUCTION FOR TERMS OF MAINS AND SERVICES.

- **RESPONSE**: The CPSM monthly PROJECT*pipes* dashboard first developed in December 2017 and has subsequently been updated in Spring 2018 and Summer 2019 satisfies this recommendation. CPSM continues to refine its monthly dashboard to highlight for executives actual versus planned information for mains and services throughout the relevant project year.

16. IMPLEMENT AN ORGANIZATIONAL STRUCTURE AND DISCIPLINE, SUPPORTED BY STRONG SKILLS AND CAPABILITIES, TO PERFORM ACCURATE, INSIGHTFUL SCHEDULING AND ANALYSIS OF PROJECT AND PROGRAM SCHEDULE PERFORMANCE.

- **RESPONSE:** Washington Gas will make best efforts to keep the current profile of the dedicated PROJECT*pipes* Project Manager in place but will assert its expertise in organizational design and management responsibilities as necessary to run the business. Additionally, the Company will continue implementing processes such that this position assists in facilitating the additional reporting requirements, on a project-by-project basis, and assisting in ensuring the projects are moving through the processes already established, as well as documenting variances to the plan.

17. CREATE AND DOCUMENT PROCESSES FOR CREATING A PROGRAM MASTER SCHEDULE, ASSIGNING ACCOUNTABILITY FOR SCHEDULE PERFORMANCE, AND PROVIDING FOR ONGOING ANALYSIS OF SCHEDULE VARIANCES AND MEANS TO CONTROL THEM.

- **RESPONSE:** Washington Gas will provide a Program Master Schedule in the updated Program Implementation Plan. Additionally, the Company will provide stakeholders the analysis used to assess, track, and control scheduling variances on an annual basis with the reconciliation reporting.

18. REGULARLY PREPARE GROUND-UP ANALYSES OF CREW REQUIREMENTS THAT CONSIDER A RANGE OF WORK LEVELS CONSISTENT WITH NEW BUSINESS AND REGULAR REPLACEMENT UNCERTAINTIES, THAT USE SOUND EXPECTATIONS ABOUT FUTURE UNIT RATES, AND THAT OBJECTIVELY RE-EVALUATE AN APPROACH THAT EXCLUDES USE OF IN-HOUSE CREWS FOR REPLACEMENT WORK.

- **RESPONSE:** Washington Gas regularly performs both long-term, ground-up assessments and short-term refreshes of its crew needs and how to fulfill them. This involves anticipating future work levels consistent with uncertainties in work volume

and future costs which primarily occurs in concert with annual budgeting activities and/or any planned changes to work levers. The company has reviewed this approach at various intervals, however continues to reaffirm its strategy of using competitive jurisdictionally based blanket contracting in recent resource decisions.

19. STRONGLY SUPPORT AND PARTICIPATE IN WORK FORCE DEVELOPMENT EFFORTS UNDERTAKEN IN COOPERATION WITH GOVERNMENT AND PUBLIC-INTEREST RESOURCES.

- **RESPONSE:** Washington Gas has several initiatives to help ensure future availability of resources that appear very much aligned with Liberty's recommendation. The Company has several ongoing initiatives, including a crew leader development program and construction supervisor development program, to develop the workforce for both crew leaders and qualified oversight personnel to increase the quantity of qualified resources and add to the supply of knowledgeable resources. An independent Analysis of Economic Benefits conducted by NERA Consulting in Exhibit WG (A)-4, supports the Company's workforce benefits. In addition, AltaGas agreed to fund $6M over two years to further workforce development efforts in the District of Columbia, including the Mayor's DC Infrastructure Academy, with $2M of this total being allocated specifically to a program for growing District of Columbia-based contractor capacity. [Formal Case No. 1142, Order No. 19396, Appendix A at 4-5 (June 29, 2018).]

20. MUCH MORE PROACTIVELY REPORT PROGRAM PROGRESS, PROBLEMS, AND ACTION PLANS TO SENIOR LEADERSHIP, WHICH NEEDS TO REMAIN SIGNIFICANTLY ENGAGED IN CHALLENGING MANAGEMENT'S PERFORMANCE IN MANAGING THE PROGRAM.

- **REESPONSE:** Washington Gas's programmatic approach relies on a matrix organization where individuals work together within their existing reporting hierarchies. The matrix includes required resources from other Company departments to complete key processes and is reflective of the fact that most construction related processes should not differ based on eligibility within PROJECT*pipes*. The matrix resources help form the Accelerated Replacement Programs Operating Committee ("ARPOC"), which serves the key role of providing cross functional oversight and coordination of the information reporting aspects of the Washington Gas accelerated replacement programs. The next level of program oversight is the ARP Executive Steering Committee ("AESC"). The ARP Executive Steering Committee comprise of the Vice President of Construction, Compliance and Safety, Vice President and Chief Accounting Officer, and Executive Vice President of Strategy and Public Affairs. The Construction Program Strategy and Management ("CPSM") team provides program performance information to the ARPOC and AESC on a monthly basis at a minimum. CPSM's monitoring and reporting developments have enhanced the proactive nature of identifying and raising up to senior leadership any potential or existing issues in program performance. Additionally, the

Company's ARP Governance Committee routinely discusses progress, issues, and action items related to PROJECT*pipes*. Both the CPSM and ARP Governance Committee activities assist senior leadership in remaining significantly engaged with PROJECT*pipes* and other Washington Gas accelerated pipe replacement programs. The ARPOC formation began in January 2013 and was meeting regularly beginning in 2014 with senior leadership in attendance. Soon thereafter the AESC and formalized reports in February 2018.

21. WORK WITH PUBLIC AUTHORITIES TO SECURE AS FLEXIBLE A SET OF WORKING CONDITIONS AS CONFORMS TO GOVERNMENT'S REQUIREMENTS AND EXPECTATIONS.

- **RESPONSE:** Washington Gas will continue to work with DDOT, Urban Forestry, and all permitting entities to remove some of the working restrictions currently in place. Washington Gas will document the times when it scheduled construction to align with another agency's or utility's construction project; explain how the construction costs were apportioned among the coordinating entities; explain how it prioritized the safety of its distribution system during these coordination efforts; and provide estimated cost savings, when feasible. The Company will provide these details about its coordination efforts during the PIPES 2 Program on an annual basis.

22. WORK WITH OTHER UNDERGROUND UTILITIES TO UPDATE CONSTRUCTION MAPS TO CONTAIN ALL EXISTING AND ABANDONED FACILITIES ALONG PLANNED MAIN AND SERVICE REPLACEMENT ROUTES.

- **RESPONSE**: Washington Gas is willing to explore this recommendation with other utilities and government agencies performing work within the public space but is not in a position to unilaterally undertake such a significant project. There currently is no agreement or system which captures or maintains "construction maps." Further complicating such an effort is the fact that most, if not all, public mapping systems are not yet spatially accurate but instead are dimensioned off of various land-based references. Any such system would represent a work in progress for an undefined period of time as the location of abandoned facilities would not be known unless they were uncovered by other activities. In no case would such maps be a substitute for electronic locating, consistent with the Underground Facilities Protection laws.

23. Develop and execute a directional drilling pilot program for residential or side streets.

- **RESPONSE**: Washington Gas will continue to utilize directional drilling, where appropriate, for the installation of its facilities.

24. Conduct a structured, quantitative evaluation of converting to digital GPS mapping.

- **RESPONSE:** Washington Gas has long-term plans to explore conflation studies which would be necessary to accurately spatially locate active gas facilities consistent with GPS accuracy. Initial incremental changes are being evaluated

consistent with this recommendation. These efforts include incorporating spatially accurate aerial views which can be utilized as accurate references for new facility installation, as well as exploratory reviews of industry GPS-enabled field, as-builting initiatives and technologies.

ATTESTATION

I, WAYNE A. JACAS, whose Testimony accompanies this Attestation, state that such testimony was prepared by me or under my supervision; that I am familiar with the contents thereof; that the facts set forth therein are true and correct to the best of my knowledge, information and belief; and that I adopt the same as true and correct.

WAYNE A. JACAS

4/17/2020

DATE

WITNESS STUBER
EXHIBIT WG (2B)

BEFORE THE
PUBLIC SERVICE COMMISSION OF THE
DISTRICT OF COLUMBIA

IN THE MATTER OF WASHINGTON GAS LIGHT COMPANY'S APPLICATION FOR APPROVAL OF PROJECTPIPES 2 PLAN	FORMAL CASE NO. 1154

WASHINGTON GAS LIGHT COMPANY
District of Columbia

SUPPLEMENTAL DIRECT TESTIMONY OF AARON C. STUBER
Exhibit WG (2B)
(Page 1 of 1)

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Exhibits

EXHIBIT WG (2B)

WASHINGTON GAS LIGHT COMPANY

DISTRICT OF COLUMBIA

SUPPLEMENTAL DIRECT TESTIMONY OF AARON C. STUBER

Q. PLEASE STATE YOUR NAME, OCCUPATION AND BUSINESS ADDRESS.

A. My name is Aaron C. Stuber and I am Director of Technical Engineering Services at Washington Gas Light Company ("Washington Gas" or "Company"). My business address is 6801 Industrial Road, Springfield, VA 22151.

Q. HAVE YOU PREVIOUSLY SUBMITTED DIRECT TESTIMONY IN THIS PROCEEDING?

A. Yes, on December 7, 2018, I submitted my Direct Testimony in this proceeding, Formal Case No. 1154, proposing five transmission programs for the PROJECT*pipes* 2 ("PIPES 2") Plan.

I. IDENTIFICATION OF EXHIBITS

Q. DO YOU SPONSOR ANY EXHIBITS IN SUPPORT OF YOUR TESTIMONY?

A. Yes, I sponsor one (1) exhibit. Exhibit WG (2B)-1 provides updated supporting information for the transmission programs proposed in the PIPES 2 Plan.

II. PURPOSE OF TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR SUPPLEMENTAL DIRECT TESTIMONY?

A. The purpose of this Supplemental Direct Testimony, along with an accompanying exhibit, is to provide updates to the cost, timing and number of

projects included in the PIPES 2 transmission programs that are included in my Direct Testimony and exhibit.

III. UPDATES TO TRANSMISSION PROGRAMS

Q. PLEASE EXPLAIN WHY THESE UPDATES ARE NECESSARY.

A. My Direct Testimony, submitted in December 2018, proposes the inclusion of transmission programs as part of the PIPES 2 Plan. However, more than 16 months have passed since I proposed the inclusion of these programs, and the years, cost estimates, and projects require updating. For example, because approximately 16 months have passed since my Direct Testimony, the 5-year timeframe of PIPES 2 has changed from the originally proposed October 1, 2019 through December 31, 2024, to October 1, 2020 through December 31, 2025. As a result, some projects originally proposed have been completed, eliminated or reprioritized while other new projects have been identified. The updates described in this testimony are further detailed in Exhibit WG (2B)-1.

Q. PLEASE GIVE A BRIEF SUMMARY OF THE UPDATES TO TRANSMISSION PROGRAM 1 – UNITED STATES DEPARTMENT OF TRANSPORTATION ("DOT") TRANSMISSION AND HIGH-PRESSURE PIPE REPLACEMENT.

A. Because the replacement schedule of the previously identified Strip 1 coincides with the Virginia Department of Transportation's ("VDOT") project to widen a section of Leesburg Pike, the Company has continued to actively work on this project. As a result, the timeframe of this project has been updated from October 1, 2019 through December 31, 2023, to October 1, 2020 through December 31, 2023. In addition, the total estimated cost of the project has been

updated from $101.4 million to $76.6 million of which $12.9 million is allocated to the District of Columbia.

In addition to the Strip 1 update, the replacement of the previously identified segment of Strip 6 is now planned to be constructed in 2021. The estimated cost has also been updated from $7.7 million to $7.0 million of which $1.2 million is allocated to the District of Columbia.

Q. PLEASE GIVE A BRIEF SUMMARY OF THE UPDATES TO TRANSMISSION PROGRAM 2 – REMOTE CONTROL VALVE INSTALLATION.

A. The cost estimates for projects in this program have been revised to reflect costs experienced on similar projects. The estimated cost of this program from October 1, 2020 through December 31, 2025 has been updated from $16.3 million to $14.1 million of which $2.4 million is allocated to the District of Columbia.

Q. PLEASE GIVE A BRIEF SUMMARY OF THE UPDATES TO TRANSMISSION PROGRAM 3 – DOT TRANSMISSION AND HIGH-PRESSURE BLOCK VALVES.

A. The projects in this program have been reprioritized based on updated risk information. The estimated cost of this program from October 1, 2020 through December 31, 2025 has been updated from $6.4 million to $6.3 million of which $1.1 is allocated to the District of Columbia.

Q. PLEASE GIVE A BRIEF SUMMARY OF THE UPDATES TO TRANSMISSION PROGRAM 4 – RISER REPLACEMENT FOR DOT TRANSMISSION AND HIGH-PRESSURE VALVES.

A. Two of the previously included projects in this program were eliminated due to the valves being identified for replacement in other programs. The estimated cost of this program from October 1, 2020 through December 31, 2025 has been updated from $722,000 to $819,000 of which $138,000 is allocated to the District of Columbia.

Q. PLEASE GIVE A BRIEF SUMMARY OF THE UPDATES TO TRANSMISSION PROGRAM 5 – REPLACEMENT OF COMPONENTS OF DOT TRANSMISSION AND HIGH-PRESSURE PIPES TO ENABLE THE USE OF IN-LINE INSPECTION TOOLS.

A. The identified projects and cost estimates for the projects in this program have been updated. In addition, a new strip (Strip 4) has been identified to be made “piggable” to lower risk. A “piggable” pipeline is a pipeline that is designed to allow a standard in-line inspection tool to negotiate it, which normally requires a constant bore, sufficiently long radius bends and traps to launch and receive the pigs. The estimated cost of this program from October 1, 2020 through December 31, 2025 has been updated from $34.5 million to $36.6 million of which $6.2 million is allocated to the District of Columbia.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.

WITNESS STUBER
EXHIBIT WG (2B)-1

WASHINGTON GAS'S UPDATED PIPES 2 PLAN FOR TRANSMISSION FACILITIES REPLACEMENT

Background:

The purpose of this report is to provide details on the five transmission system PIPES 2 programs proposed by Washington Gas. These programs are:

- Program 1 – U.S. Department of Transportation ("DOT") Transmission and High-Pressure Pipe Replacement
- Program 2 – Remote Control Valve Installation
- Program 3 – DOT Transmission and High-Pressure Block Valve Replacement
- Program 4 – DOT Transmission and High-Pressure Valve Riser Replacement
- Program 5 – Replacement of Components of DOT Transmission and High-Pressure Pipes to Enable the Use of In-line Inspection ("ILI") Tools

PROGRAM 1 – DOT Transmission and High-Pressure Pipe Replacement

Introduction:

There are approximately 674 miles (177 miles DOT transmission and 497 miles high pressure) of coated and protected steel mains that make up the transmission system delivering gas throughout the Company's service territory. As part of the Company's Transmission Integrity Management Program ("TIMP") and consistent with the Pipeline and Hazardous Materials Safety Administration's ("PHMSA") recommendations for maximum allowable operating pressure ("MAOP") verification, Washington Gas extensively reviewed and collected data for the Company's DOT transmission[1] and high-pressure[2] pipelines. The documents that were reviewed included, but were not limited to, original installation records, or "as-builts," pipeline procurement records, field notes, historical memos, prior studies of the transmission system, pressure test records, up-

[1] DOT transmission pipe is pipe with MAOP equal to or greater than 20 percent of specified minimum yield strength ("SMYS")
[2] High-pressure pipeline is defined as having MAOP greater than 60 pounds per square inch (psig) and less than 20 percent SMYS.

rating records, laboratory reports, x-ray records and project binders. The review was conducted to understand the original installation parameters of the DOT transmission and high-pressure pipelines that constitute the transmission mainlines and laterals. Washington Gas refers to the mainlines of the transmission and high-pressure system as "strips." There are currently 49 distinct strips throughout Washington Gas's system. The strips are comprised of sections of both DOT transmission and high-pressure mains.

The majority of these strips support the entire Washington Gas system and all costs associated with operating and maintaining these strips are allocated to customers in three jurisdictions served by Washington Gas: Virginia, Maryland and the District of Columbia. As discussed in Witness Lawson's testimony, the Company's District of Columbia jurisdiction is allocated approximately 17% of these costs, which is based on the average of Peak Day and Annual Normal Weather Therm Sales. Some transmission strips only provide natural gas to a specific jurisdiction surrounding their physical location and are known as "spur lines." These spur lines do not support the entirety of the Washington Gas system and all costs associated with operating and maintaining these pipes are directly assigned to the jurisdiction in which they are located.

Based on the Company's review of its DOT transmission and high-pressure pipelines, at this time there are two transmission strips identified for continued full or partial replacement. The Company anticipates identifying additional strips for replacement in the future as a result of the implementation of new PHMSA regulations, integrity management assessments and continued MAOP records review for those pipelines. The projects identified for this program are described below.

1. Strip 1

The Strip 1 mainline runs within the Virginia Department of Transportation ("VDOT") rights-of-way from western Fairfax County (near Dranesville), through Falls Church, to eastern Fairfax County (near Seven Corners) along Leesburg Pike (Route 7) and Arlington Boulevard (Route 50). The Strip 1 mainline is a DOT transmission and high-pressure pipeline, which includes 16-inch and some 24-inch diameter pipe, was constructed in 1948 with welded joints and mechanically (Dresser style) coupled joints.

The majority (approximately 95%) of the materials used for construction of this line were low frequency electric resistance welded ("ERW") pipe.[3] The pipeline has 325 and 260 psig MAOPs that are separated by a pressure reducing station. These MAOPs produce a specified minimum yield strength ("SMYS") ranging from 11% to 29% and were established via the "grandfather clause" (49 CFR §192.619(c)). Over the years, Washington Gas has upgraded the Strip 1 pipeline, including the installation of weld-over sleeves on the Dresser couplings for reinforcement. In addition, portions of the mainline have been up-rated four times in order to increase the capacity of the pipeline.

Because this pipeline is the oldest transmission line in the Company's system, the majority of its MAOP was determined pursuant to a section of 49 CFR §192.619(c) of the DOT regulations that provides for establishing MAOP by relying on previous operating history and does not provide a stated safety factor between the current MAOP and the highest test pressure as required by other sections in this subpart.

The Company cannot conduct a hydro test to requalify this line in order to establish a safety factor because of the possibility of water leaking past the Dresser couplings and into the weld-over sleeves. Any water that leaks into the weld-over sleeve would not be able to be detected and removed, causing corrosion concerns. In addition, there are risks associated with hydro testing a 72 year old pipeline, like the Strip 1 mainline, which includes many taps and spurs connected to regulator stations feeding distribution systems. Additionally, conducting a hydro test in a heavily traveled thoroughfare such as along Route 7 could pose a potential public risk, and therefore is not preferred.

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[3] According to PHMSA's "Fact Sheet: Pipe Manufacturing Process": "Electric resistance welded (ERW) pipe is manufactured by cold-forming a sheet of steel into a cylindrical shape. Current is then passed between the two edges of the steel to heat the steel to a point at which the edges are forced together to form a bond without the use of welding filler material. Initially this manufacturing process used low frequency A.C. current to heat the edges. This low frequency process was used from the 1920's until 1970. In 1970, the low frequency process was superseded by a high frequency ERW process which produced a higher quality weld. Over time, the welds of low frequency ERW pipe was found to be susceptible to selective seam corrosion, hook cracks, and inadequate bonding of the seams, so low frequency ERW is no longer used to manufacture pipe. The high frequency process is still being used to manufacture pipe for use in new pipeline construction." *See*, http://primis.phmsa.dot.gov/comm/FactSheets/FSPipeManufacturingProcess.htm

The low frequency ERW pipe that makes up Strip 1 is considered an inferior quality pipe by PHMSA. Washington Gas assigns the second highest contribution to the pipe manufacturing threat in the TIMP risk model for this seam type (lap welded pipe has the highest contribution). The combination of a higher manufacturing risk factor, along with the lack of a pressure test that gives this pipeline an adequate safety factor and the construction methodology of using reinforced Dresser couplings, elevates this segment as one of the top priorities for pipe replacement.

Based on its TIMP review, the Company has identified a portion of the Strip 1 pipeline for accelerated replacement for the PIPES 2 Plan proposed in this Application. It consists of approximately 6.5 miles of 16-inch and 24-inch diameter sections located in Leesburg Pike (Route 7), running from Tyco Road to the Company's Dranesville Gate Station (near Bishopsgate Way) and is within a very heavily traveled part of the Leesburg Pike in Fairfax County, Virginia.

The Strip 1 project proposed for replacement in this proceeding is a distinct project that has been selected for accelerated replacement in this PIPES 2 Plan because of its location, condition, importance to system reliability and regulatory requirements.

Replacing the 6.5 mile section of pipe in Leesburg Pike between Tyco Road and Dranesville Gate Station is the best and most feasible solution to address concerns about age, the inferior manufacturing process for low frequency ERW pipe, construction methodology, and inadequate pressure test. The Company proposes to replace this section of the Strip 1 mainline with a 24-inch diameter line with a MAOP of 325 psig, including inlets to existing regulating equipment. Replacing this pipeline with a size less than 24-inch would be imprudent given that the 16-inch portions of the pipeline were installed 72 years ago. The existing pipeline that will be replaced will be abandoned as part of this project.

Construction is in progress and is expected to be completed in 2023. The replacement schedule coincides with VDOT's project to widen Leesburg Pike between Jarrett Valley Drive and Reston Ave. (VDOT's road widening project begins 0.5 miles west of the start of the Company's pipe replacement project). VDOT started its road widening project in 2018 and plans to complete the project in 2024. The new Strip 1

pipeline will be designed to be in the VDOT road and right-of-way areas. This is a heavily traveled thoroughfare in Fairfax County which will require extensive traffic control measures to be installed, some of which must be dismantled each day of construction. As a result, Washington Gas expects to install approximately 40 feet of new main per week per crew.

From October 2020 through 2023 the Company expects to spend $76.6 million for this project of which $12.9 million would be allocated to the District of Columbia.

2. Strip 6

The Strip 6 mainline runs within VDOT rights-of-way from eastern Fairfax County (near Seven Corners) along Arlington Boulevard (Route 50), through Rosslyn and across the Key Bridge into Washington, DC. Strip 6, a DOT transmission and high-pressure pipeline, consists of 16" and 24" pipe and was constructed in 1948 and 1951. The project involves replacing approximately 2,500 linear feet of 16-inch-diameter lap welded[4] steel DOT transmission pipeline, running along Arlington Blvd (or Route 50), from the Company's Rosslyn Pressure Reducing Station to south of the N. Rhodes Street overpass.

The pipeline has 260 and 215 psig MAOPs that are separated by a pressure reducing station. These MAOPs produce a SMYS ranging from 8% to 24%. Multiple pipe samples from Strip 6 were taken by Washington Gas to establish the location of installed lap welded pipe. Lab results from analysis of the pipe indicate that a portion of Strip 6 was constructed with low yield strength (28,000 psi) lap welded pipe. In the section of pipe with a 215 psig MAOP, this change in pipe material from what was thought to be

[4] According to PHMSA's "Fact Sheet: Pipe Manufacturing Process": "In the lap welding process, steel was heated in a furnace and then rolled into the shape of a cylinder. The edges of the steel plate were then "scarfed." Scarfing involves overlaying the inner edge of the steel plate, and the tapered edge of the opposite side of the plate. The seam was then welded using a welding ball, and the heated pipe was passed between rollers which forced the seam together to create a bond. The welds produced by lap welding are not as reliable as those created using more modern methods. The American Society of Mechanical Engineers (ASME) has developed an equation for calculating the allowable operating pressure of pipe, based on the type of manufacturing process. This equation includes a variable known as a "joint factor", which is based on the type of weld used to create the seam of the pipe." *See*, http://primis.phmsa.dot.gov/comm/FactSheets/FSPipeManufacturingProcess.htm

installed increases the SMYS on the pipe from 13% to 18%. The 215 psig MAOP for the 2,500 foot segment to be replaced was determined pursuant to 49 CFR §192.557 of the DOT regulations that allows for up-rating of steel pipelines to a pressure that produces a hoop stress of less than 30% of SMYS. This methodology does not include a pressure test safety factor as prescribed by 49 CFR §192.619 of the DOT regulations. Washington Gas proposes replacing the lap welded pipe, which is the highest contribution to the pipe manufacturing threat in the TIMP risk model. Moreover, the existing pipe is of a lower grade than the pipe that Washington Gas has historically installed and is also considered an inferior quality pipe by PHMSA. In 49 CFR §192.113 of the DOT regulations, lap welded pipe is assigned a 0.8 joint factor in the pipe design equation. The majority of other pipe seam types have a 1.0 joint factor. The acceptable design pressure is lowered for joint factors that are less than 1.0. Hydro testing a 69-year-old pipeline like Strip 6 is not preferred due to the potential public risk posed by a pressure test in a crowded thoroughfare and such as along Arlington Blvd.

The proposed construction area is located both in the travel lanes of Route 50 and alongside the highway right-of-way and will involve interrupting the west bound lanes of Route 50 at times. This section of Route 50 has a high vehicular volume that will require extensive traffic control measures to be installed and dismantled each day of construction. Because this is a main commuter artery into the District of Columbia, it is anticipated that work in Route 50 will be restricted to night hours which will reduce the efficiency of the work crews. To reduce these challenges, Washington Gas is coordinating with Arlington County to use a vacant property at the intersection of Route 50 and Fairfax Drive to directionally drill the majority of the new pipeline. This would allow the majority of the pipeline to be installed in an existing utility corridor and eliminate the challenges of working under bridges and in Route 50. The only anticipated work in Route 50 for the drill project would be the eastern tie-in location, which would require the pipeline to cross the road. It is estimated that the project could be completed between January and November. The construction period for work in the road for this project is limited to April 2 through October 31 because the VDOT limits the use of steel plates in the road from November 1 through April 1. A portion of the new pipeline is designed to be located in Route 50 and

the right-of-way areas and would require steel plates to be used during non-construction periods of the day for safety.

The replacement of this segment on Strip 6 is planned to start in 2021 and is estimated to take approximately 1 year to complete and cost approximately $7.0 million of which $1.2 million would be allocated to the District of Columbia.

Program 2 – Remote Control Valve Installation

Introduction:

Remote Control Valves ("RCVs") allow for valves located on the transmission system to be operated by a qualified employee from a remote location. For Washington Gas, this remote location is Gas Control at the Springfield Center.

49 CFR §192.935 requires the pipeline operator to take additional measures to prevent or mitigate the consequences of pipeline failures. A risk analysis to address the use of RCVs is discussed in 49 CFR §192.935(c). The Washington Gas TIMP had an independent third-party conduct a risk-based engineering study to ascertain the need for and identification of appropriate locations of RCVs in the transmission system. Based on this analysis, and with additional Company analysis, Washington Gas identified potential locations to install new RCVs or to retrofit existing valves to be operated remotely in case of a pipeline emergency.

The addition of RCVs is a preventative and mitigative measure that directly impacts and enhances system safety and integrity. The RCVs will allow Washington Gas to shut off critical valves around the system from Gas Control in case of an emergency. A pipeline rupture would be considered an emergency, and without the use of RCVs, there would likely be greater greenhouse gas ("GHG") emissions if the valves used to isolate the rupture required manual closing. The congested traffic in the metro Washington, DC and surrounding areas at times impedes timely access to pipeline equipment. RCVs would enable Washington Gas to more quickly isolate high risk segments in the event of a pipeline incident. Safety of the public will be enhanced with a shorter isolation time

which will help minimize potential consequences and allow emergency responders quicker access to the affected area.

The addition of these valves will improve overall system safety, especially for critical and sensitive locations within the metro Washington, DC area. In addition, the shorter isolation time of a pipeline failure also reduces the potential for the emission of GHGs which would be considerable due to the high operating pressures of this transmission pipe.

This program will accelerate the installation of RCVs. The installation of each RCV will occur over a two-year time period, with the easement being obtained in the first year and construction occurring during the second year. The Company proposes to install 4 RCVs starting in 2020 through 2024 at a total cost of approximately $14.1 million of which $2.4 million would be allocated to the District of Columbia. The locations and estimated costs of the 4 valves identified are listed below in Table 1.

Table 1 – Remote Control Valves Planned for Installation

Strip	Location	Valve Name / Number	Estimated Start Date	Estimated Completion Date	Estimated Cost
14	MD	Valve 2	January 2020	December 2021	$2,666,000
14	MD	Valve 5	January 2021	December 2022	$3,690,000
2	VA	Valve 18	January 2022	December 2023	$3,801,000
15	MD	Valve 13	January 2023	December 2024	$3,917,000

Note: 1.) The installation of the RCV located on Strip 14, Valve 2 will occur over a 2-year period. Only the charges that occur after October 2020 will be included in the PIPES 2 surcharge.
2.) The estimated completion date is the pipe completion date. Full project close-out and cost recordation is expected 6 months from this date.

Program 3 – DOT Transmission and High-Pressure Block Valve Replacement

Introduction:

Transmission and high-pressure block valves are located throughout the Washington Gas DOT transmission and high-pressure system, as required by CFR 192. They can be used, in cases of emergency, to safely control/eliminate pressure to specific areas, as required. They are also used to reduce pressure to allow for a variety of construction activities to occur. Installation dates of transmission valves range from the 1940's to present. There are over 1,100 transmission and high-pressure valves in the system.

Transmission valves are inspected, lubricated, and tested annually. Certain valves have been identified as becoming increasingly difficult to operate. With the excessive force required to operate these valves there is a high risk that the valve could break and become inoperable. Table 2 below lists the 10 valves that are currently identified as difficult to operate (although in the future, this program may also include valves that are not able to provide a positive shutoff). These valves are gear-operated or quarter-turn plug valves that were installed in the 1940's, 1950's and 1960's.

The valve replacement program directly impacts and enhances safety and integrity of the system by allowing a segment of pipe to be isolated in the event of a pipeline incident. In addition, the replacement of difficult to operate valves has the potential to reduce emission of GHGs which would be considerable due to the high operating pressures of this transmission pipe by allowing for the isolation of shorter segments of pipe via properly functioning valves.

This program will accelerate the replacement of transmission and high-pressure block valves. The block valve replacement program is expected to continue for a minimum of 8 years and will cost approximately $10.4 million. In addition, the Company expects to identify additional valves in the future that will require replacement. The Company expects to spend approximately $6.3 million on this program through 2025 of which $1.1 million would be allocated to the District of Columbia.

Table 2 – Block Valve Planned Replacements

Valve/Strip Number	Mainline or Spur	Location State / Quad	Installation Year	Valve Type	Estimated Start Date	Estimated Completion Date	Estimated Cost
13 Strip 1	M	VA / S004SW	1948	Gear / Plug	January 2021	December 2021	
1 Strip 6	M	VA / S004SW	1948	Gear / Plug	January 2021	December 2021	$2,176,000
1 Strip 5	M	VA / S004SW	1947	Gear / Plug	January 2021	December 2021	
2 Strip 6	M	VA / O004SW	1948	Gear / Plug	January 2022	December 2022	$919,000
12 Strip 6	M	VA / J002NW	1951	Gear / Plug	January 2023	December 2023	$1,537,000
7 Strip 4	M	VA / U017SW	1956	Gear / Plug	January 2024	December 2024	$834,000
9 Strip 4	M	VA / Q016SW	1957	Gear / Plug	January 2025	December 2025	$849,000
6 Strip 4	M	VA / V017SW	1956	Gear / Plug	January 2026	December 2026	$880,000
3 Strip 9	M	DC / D005NE	1955	Gear / Plug	January 2027	December 2027	$2,051,000
6 Strip 13	M	MD / Q028NW	1955	Gear / Plug	January 2028	December 2028	$1,100,000

Note: 1.) The estimated completion date is the pipe completion date. Full project close-out and cost recordation is expected 6 months from this date.

Program 4 - DOT Transmission and High-Pressure Valve Riser Replacement:

Introduction:

Transmission and high-pressure valves are located throughout the Washington Gas DOT transmission and high-pressure system, as required by CFR 192. They are equipped with a ¾" wrapped steel pressure gauge riser on either side, and ¾" wrapped steel grease risers. The pressure gauge risers are used for installing one up-stream and one downstream pressure gauge when the valves are operated. These gauges enable pressures to be monitored while the valve is being used for reducing pressure during an emergency or a downstream tie in. The pressure gauge risers operate at the same pressure as the transmission line at all times. The grease risers are used to lubricate the DOT transmission and high-pressure valves during annual maintenance.

Table 3 lists 4 transmission valves that are currently identified as having corrosion issues with these risers. These risers are inspected annually during valve maintenance to assess their condition. Each year, upon inspection, additional valve risers are identified

as needing to be replaced. Most of these facilities are in the street and subject to the effects of road salt. Repair of leaking risers may result in a pressure reduction in the transmission pipeline, which, depending on the time of year and location, could adversely impact the Company's ability to serve customers. Washington Gas proposes a proactive replacement of corroded risers under controlled conditions which would not impact service to customers. A prioritized list of these facilities has been compiled and a multi-year replacement program is planned.

The Transmission and High-Pressure Valve Riser Replacement Program directly impacts and enhances transmission system safety and integrity, eliminating them as a future source of high-pressure gas leaks and GHG emissions.

This program will accelerate the replacement of transmission and high-pressure valve risers and is expected to continue for a minimum of 5 years. For the 2 locations identified, the program will cost approximately $140,000 over 1 year of which $24,000 would be allocated to the District of Columbia. The Company anticipates identifying additional valve risers in need of replacement during this 5-year period. $150,000 has been budgeted each year, for years 2022 through 2025, for projects that have not yet been identified. For these additional projects, $115,000 would be allocated to the District of Columbia.

Table 3 – Valve Riser Replacements

Mainline or Spur	LOCATION State/Quad	STRIP #	VALVE #	Estimated Start Date	Estimated Completion Date	Estimated Cost
M	DC / B002SE3	23	9	January 2021	December 2021	$81,000
M	MD / Q027SE	9	18	January 2021	December 2021	$59,000

Notes: 1.) The estimated completion date is the pipe completion date. Full project close-out and cost recordation is expected 6 months from this date.

Program 5 – Replacement of Components of DOT Transmission and High-Pressure Pipes to Enable the Use of In-line Inspection ("ILI") Tools

Introduction:

Washington Gas proposes this transmission system replacement program to replace components of DOT transmission and high-pressure pipes to enable the use of ILI tools (see Figure 1). Assessment of pipelines using these tools will help the Company to better address threats, such as external corrosion, and other pipeline defects, which can negatively impact pipeline integrity. CFR 192 Subpart O requires pipeline operators to assess the integrity of their transmission pipelines every seven years. The Company currently meets this requirement by conducting Direct Assessments ("DA"), specifically External Corrosion Direct Assessment ("ECDA") in its High Consequence Areas ("HCAs") on 85% of its transmission pipelines. ECDA is an integrity assessment method intended to identify areas that have a high likelihood of external corrosion. However, this method does not identify all areas on the pipe where corrosion may be occurring.

ILI is a methodology that can detect the presence, location and magnitude of corrosion or other pipe defects that may exist and is more comprehensive than an ECDA assessment. Some ILI tools are also capable of examining the pipe for other features such as dents or cracks. Unfortunately, ILI tools are unable to pass through some appurtenances of the pipe, for example, valves that are not full port (such as plug or reduced port valves), and certain pipe fittings such as short radius elbows and large diameter non-barred tees. These valves and fittings that are located on a pipeline need to be replaced to allow the use of ILI tools (that is, to make them "piggable"[5]). In addition, launchers and receivers (see Figure 2) need to be installed to insert and remove the ILI tool from the pipeline.

[5] A piggable pipeline is a pipeline that is designed to allow a standard in-line inspection tool to negotiate it, which normally requires a constant bore, sufficiently long radius bends and traps to launch and receive the pigs.

Figure 1 – Example of an in-line inspection tool in the pipe

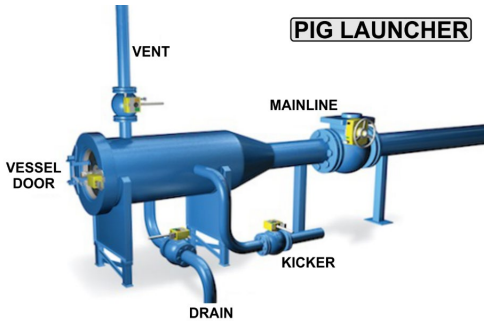

Figure 2 – Example of a pig launcher

As seen in Table 4 below, ILI is a better assessment method and can identify 6 of 9 threats to transmission pipe while ECDA can only identify 1 of 9 threats.

Table 4

Assessment Method	Construction Defects	Manufacturing Defects	Internal Corrosion	Equipment Failure	External Corrosion	Stress Corrosion Cracking	Weather and Outside Force	3rd Party Damage	Incorrect Operations
ECDA	No	No	No	NA	**Yes**	No	No	No	No
ILI	**Yes**	**Yes**	**Yes**	NA	**Yes**	**Yes**	No	**Yes**	No

Due to recent incidents on gas transmission pipelines, in 2015, the National Transportation Safety Board ("NTSB") made the following pipeline "safety recommendations" to PHMSA:

- P-15-18 – Require all gas transmission ("GT") pipelines to be piggable by either reconfiguring the pipeline to accommodate ILI tools or through using new technology that permits the inspection of previously uninspectable pipelines; priority should be given to the highest-risk GT pipelines considering age, pressure, diameter, and class location (supersedes P-11-17)
- P-15-20 – Identify all operational complications that limit the use of inline inspection (ILI) tools in piggable pipelines, develop methods to eliminate the operational complications, and require operators to use these methods to increase the use of ILI tools
- P-15-21 – Develop and implement a plan for eliminating the use of Direct Assessment ("DA") as the sole integrity assessment method for GT pipelines

In March 2016 PHMSA issued a Notice of Proposed Rulemaking ("NPRM") which emphasizes the use of ILI. It is clear that PHMSA views ILI as a better assessment method than ECDA. The proposed rule (49 CFR §192.921(a)(6)), as written, only allows ECDA as an assessment method if the pipeline is not capable of inspection by ILI tools. In addition, the NTSB has identified that 68% of intrastate pipelines are piggable.[6] Only 15% of the Company's transmission pipelines are currently piggable.

The Company has prioritized the replacement of non-piggable components on Strips 24, 14, 15 and 4 as discussed in the following sections. The integrity of these pipelines would benefit from future assessments using an ILI.

Proposed Projects for Transmission Program 5

1. Strip 24

Strip 24 mainline runs from Brandywine, Maryland along Rte. 301 to Central Avenue and along Central Avenue and up the CSX right-of-way to near Bowie, Maryland. It is a DOT transmission pipeline which is made up of 14.6 miles of 12-inch pipe and 9.4 miles of 16" pipe. The pipeline was constructed in the late 1960s and the early 1990s. The earlier vintage pipe was coated with coal tar (a legacy coating) while the more recent pipe was coated with Pritec (a newer high-performance coating).

A baseline assessment of Strip 24 occurred in 2016. The mainline pipe was assessed using the ECDA assessment method while the cased pipe segments were assessed using a robotic Pipetel ILI tool.[7] It was discovered that in areas where the ECDA and ILI assessments overlapped, the ILI picked up moderate to severe corrosion where there were no indications from the ECDA assessment. Subsequent exploratory evaluation of field applied coal tar coating at pipe joints found that it was disbonding in some locations and shielding the pipe from cathodic protection as well as inhibiting indications from being detected during the ECDA assessment. Since it was discovered

[6] NTSB Safety Study, PB2015-102735, *Integrity Management of Gas Transmission Pipelines in High Consequence Areas*, page 57.

[7] The Pipetel ILI tool is a self-propelled, remotely controlled, battery operated ILI tool that has limited rangeability of 1,500 to 2,000 feet. The tool is limited to portions of the pipeline that are free from unpiggable obstructions.

that some of the pipe examined had more significant corrosion than indications from the ECDA suggested, it was determined that ILI would be a more appropriate assessment method for portions of Strip 24 that have field applied coal tar coating. As a result of this finding, Washington Gas will be working to make the section of Strip 24 that was coated with coal tar piggable before its next planned assessment in 2022. This segment of pipe is approximately 11.8 miles long. It begins near the intersection of Rte. 301 and Rte. 4 and ends near Bowie, Maryland just south of Annapolis Road. The newer sections of pipe that are coated with Pritec will not be made piggable at this time and will continue to be assessed by ECDA.

The replacement of non-piggable components will allow for a free-swimming pig to pass through the pipeline and will include the installation of a launcher and receiver for inserting and removing the ILI tool from the pipeline. A free-swimming pig moves through the pipe due to differential pressure in lieu of a battery operated robotic ILI, which has limited travel distance. The replacement of components to enable ILI tools on Strip 24 is a multiyear project that is planned for completion in 2021.

2. Strips 14 and 15

Strips 14 and 15 are a continuous segment of pipe that begins in Rockville, Maryland that runs through various private rights-of-way and easements to I-495 and River Road and then down River Road to Washington, DC and into Georgetown. Strips 14 and 15 are both DOT transmission pipelines that are 24” in diameter. Strip 14 was constructed in 1965 and is 10.6 miles in length. Strip 15 was constructed in 1962 and is 9.5 miles in length.

Strips 14 and 15 pass through many densely-populated areas and are classified as HCAs. Over 50% of Strip 14 is located within an HCA and almost all of Strip 15 is located within an HCA. In addition, there were two leaks on Strip 15 in Washington, DC that were attributed to external corrosion, resulting in it having a high threat of external corrosion. In terms of reliability, a service interruption on either Strip 14 or 15 would have a high outage consequence for the Washington, DC metro area.

The replacement of non-piggable components will allow for a free-swimming pig to pass through the pipeline and will include the installation of a launcher and receiver for inserting an ILI tool into and removing it from the pipeline. The replacement of components to enable ILI tools on Strips 14 and 15 is a multiyear project that is planned to begin in 2021 and continue through 2024.

Strip 4

Strip 4 begins in West Springfield, Virginia at Washington Gas's Ravensworth Peak Shaving Plant and runs through various private rights-of-way and easements, eastward to Springfield, where it crosses under I-95 and ends in Alexandria, Virginia. It is a 24" DOT transmission pipeline that was installed in 1956-57 and is 9.62 miles in length.

Strip 4 passes through many densely-populated areas. 8.34 miles, or 87% of Strip 4, are located inside HCAs. Running an in-line inspection tool would allow the Company to better assess the condition of the entire line (including several sections of cased pipe). In addition, there have been two leaks on Strip 4 in recent years (2007 and 2015) that were attributed to third party damage and construction practices.

Due to the age of the pipe, its recent leak history, its location being predominantly in HCAs and its impact on system reliability, the Company has prioritized this line to be made piggable in order to assess the pipe and prevent future failures due to corrosion and/or dents.

The replacement of non-piggable components will allow for a free-swimming pig to pass through the pipeline and will include the installation of a launcher and receiver for inserting an ILI tool into and removing it from the pipeline. The replacement of components to enable ILI tools on Strips 4 is a multiyear project that is planned to begin in 2025 and continue for an estimated 3 years.

The Company proposes to replace components on portions of Strips 24, 14, 15 and 4 in order to enable pigging, and estimates investing approximately $36.6 million on

this program between 2021 and 2025 of which $6.2 million would be allocated to Washington, DC. These costs are identified in Table 5.

Table 5 – Pipelines Identified for Replacing Components to Enable ILI Tools

Strip Number	State	Location	Retrofit	Planned Remediation Years	Estimated Cost
24	MD	Prince Georges County	Replace Plug Valves and Unpiggable Fittings	2021	$4,618,000
14/15	MD/DC	Montgomery County and DC	Replace Plug Valves and Unpiggable Fittings	2021, 2022, 2023, 2024, 2025	$21,986,000
4	VA	Fairfax County	Replace Plug Valves and Unpiggable Fittings	2025, 2026, 2027	$26,336,000

This transmission program is an eligible infrastructure replacement program which reduces risk and directly impacts and enhances the safety and integrity of the system by identifying areas where corrosion or pipe defects exist so that they can be remediated when warranted. In addition, the remediation of corrosion or pipe defects reduces the potential for GHG emissions due to leaks, which could be considerable due to the high operating pressures of high-pressure and transmission pipe.

Conclusion/Summary:

Based on the analysis described above, Washington Gas proposes five PIPES 2 infrastructure replacement programs targeting safety and risk lowering improvements to the Company's transmission assets. The replacement of the vintage DOT transmission and high-pressure pipelines, the installation of RCVs, the replacement of aging DOT transmission and high-pressure block valves, the replacement of valve gauge and grease risers and the replacement of components of DOT transmission and high-pressure pipes to enable the use of in-line inspection tools will, or have the potential to reduce GHG emissions, and to enhance transmission system safety and reliability and will reduce transmission system risk. The replacement of the vintage DOT transmission and high-pressure pipelines and the installation of RCVs as well as replacement of DOT

transmission and high-pressure block valves, DOT transmission and high-pressure valve riser replacement and the replacement of components of DOT transmission and high-pressure pipes to enable the use of in-line inspection tools are not being installed to extend the facilities to serve new customers and will not result in increased revenues.

Transmission Allocable - PIPES 2 Plan

Year	10/2020-12/2021	2022	2023	2024	2025	5-Year Total
Program						
Program 1 - Transmission and High Pressure Replacement	$ 42,215,000	$ 23,599,000	$ 17,731,000	$ -	$ -	$ 83,545,000
Program 2 - Remote Control Valves	$ 2,897,000	$ 3,684,000	$ 3,786,000	$ 3,707,000	$ -	$ 14,074,000
Program 3 - Transmission and High Pressure Block Valve Replacement	$ 2,176,000	$ 919,000	$ 1,537,000	$ 834,000	$ 849,000	$ 6,315,000
Program 4 - Transmission and High Pressure Valve Riser Replacement	$ 140,000	$ 162,000	$ 167,000	$ 172,000	$ 178,000	$ 819,000
Program 5 - Replacement of Components of DOT Transmission and High Pressure Pipes to enable the use of In-line Inspection (ILI) Tools	$ 7,422,000	$ 5,999,000	$ 6,657,000	$ 8,516,000	$ 8,019,000	$ 36,613,000
Grand Total	**$ 54,850,000**	**$ 34,363,000**	**$ 29,878,000**	**$ 13,229,000**	**$ 9,046,000**	**$ 141,366,000**
DC Jurisdictional Allocation	16.890%	16.890%	16.890%	16.890%	16.890%	16.890%
Total DC Transmission Expenditures	**$ 9,264,000**	**$ 5,804,000**	**$ 5,046,000**	**$ 2,234,000**	**$ 1,528,000**	**$ 23,877,000**

ATTESTATION

I, AARON C. STUBER, whose Testimony accompanies this Attestation, state that such testimony was prepared by me or under my supervision; that I am familiar with the contents thereof; that the facts set forth therein are true and correct to the best of my knowledge, information and belief; and that I adopt the same as true and correct.

AARON C. STUBER

4/16/2020

DATE

WITNESS LAWSON
EXHIBIT WG (2C)

BEFORE THE
PUBLIC SERVICE COMMISSION OF THE
DISTRICT OF COLUMBIA

IN THE MATTER OF WASHINGTON GAS LIGHT COMPANY'S APPLICATION FOR APPROVAL OF PROJECTPIPES 2 PLAN	)	FORMAL CASE NO. 1154

WASHINGTON GAS LIGHT COMPANY
District of Columbia

SUPPLEMENTAL DIRECT TESTIMONY OF R. ANDREW LAWSON
Exhibit WG (2C)
(Page 1 of 1)

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Exhibits

EXHIBIT WG (2C)

WASHINGTON GAS LIGHT COMPANY

DISTRICT OF COLUMBIA

SUPPLEMENTAL DIRECT TESTIMONY OF R. ANDREW LAWSON

Q. PLEASE STATE YOUR NAME, OCCUPATION, AND BUSINESS ADDRESS.

A. My name is R. Andrew Lawson. I am employed as Regulatory Affairs Manager at Washington Gas Light Company ("Washington Gas" or "Company"), 6801 Industrial Road, Springfield, Virginia, 22151.

Q. HAVE YOU PREVIOUSLY SUBMITTED DIRECT TESTIMONY IN THIS PROCEEDING?

A. Yes, I previously submitted Direct Testimony in which I supported the Company's request for continuation of the surcharge for PROJECT*pipes* ("PIPES 2 Surcharge") to recover eligible infrastructure replacement costs (consistent with the Unanimous Agreement of Stipulation and Full Settlement approved in Formal Case No. 1115)[1] for the second phase of the Company's PROJECT*pipes* Plan ("PIPES 2 Plan").

I. PURPOSE OF TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

The purpose of my Supplemental Direct Testimony is to update the Company's proposed PIPES 2 Surcharge based on the Supplemental Direct

[1] Formal Case No. 1115, *In the Matter of the Application of Washington Gas Light Company for Approval of a Revised Accelerated Pipe Replacement Program,* Joint Motion for Approval of Unanimous Agreement of Stipulation and Full Settlement filed December 10, 2014.

Testimony of Company Witnesses Jacas, Stuber and Price and to reflect the passage of time since my Direct Testimony was filed.

II. IDENTIFICATION OF EXHIBITS

Q. DO YOU SPONSOR ANY EXHIBITS IN YOUR TESTIMONY?

A. Yes. I sponsor two exhibits. Exhibit WG (2C)-1 provides the calculation of the PIPES 2 "Current Factor" (described in Section III below) for the first year of the PIPES 2 Plan. Exhibit WG (2C)-2 provides preliminary bill impact calculations for proposed expenditures in Plan Years 2-5 of the PIPES 2 Plan, which will be based on the twelve months ended December of each year. I am not proposing any updates to my originally filed Exhibit WG (C)-3, which includes tariff revisions related to the PIPES 2 Plan.

III. PIPES 2 SURCHARGE

Q. ARE YOU PROPOSING ANY CHANGES TO THE COMPANY'S PIPES 2 COST RECOVERY PROPOSAL?

A. No, I am not. The sole purpose of this Supplemental Direct Testimony is to update my exhibits as described above.

Q. DOES THAT CONCLUDE YOUR SUPPLEMENTAL DIRECT TESTIMONY?

A. Yes, it does.

WITNESS LAWSON
EXHIBIT WG (2C)-1

WASHINGTON GAS LIGHT COMPANY - DISTRICT OF COLUMBIA
CALCULATION OF PIPES 2 SURCHARGE -
OCTOBER 2020-DECEMBER 2021

Formal Case No. 1154
Exhibit WG(2C)- 1
Current Factor

Line No.	Description			OCT 2020 - DEC 2021
1	Plant additions (Page 2 of 10)			$111,120,605
2	Rate of Return on Investment (Page 2 and 3 of 10)			$9,978,164
3	Revenue Conversion Factor (Page 4 of 10)	Ln 2 * 1.404408		$14,013,414
4	Depreciation (Pages 5,6 and 7 of 10)		$	3,351,531
5	Interest Synchronization (Page 7 of 10)		$	(1,007,024)
6	Carrying Cost a/			n/a
7	TOTAL COSTS	Lines 3+4+5+6		$16,357,921
8	ALLOCATION b/	%		
9	Residential	62.23%		$10,179,534
10	Commercial & Industrial	20.74%		$3,392,633
11	Group-Metered Apartments	8.31%		$1,359,343
12	Interruptible	8.72%		$1,426,411
		100.00%		$16,357,921
13	BUDGETED THERMS c/			
14	Residential			125,066,000
15	Commercial & Industrial			123,023,000
16	Group-Metered Apartments			39,295,000
17	Interruptible			106,337,000
				393,721,000
18	CURRENT FACTOR			
19	Residential		$	0.0814
20	Commercial & Industrial		$	0.0276
21	Group-Metered Apartments		$	0.0346
22	Interruptible		$	0.0134

a/ Amount to be determined when annual reconciliation performed
b/ Based on net rate base in Class Cost of Service Study in Case No. 1137 (Page 9 of 10).
c/ Based on budgeted normal weather therms for October 2020-December 2021.(Page 8 of 10)

WASHINGTON GAS LIGHT COMPANY - DISTRICT OF COLUMBIA
PIPES 2 EXPENDITURES (OCTOBER 2020 - DECEMBER 2021)

	Distribution Services A	Distribution Mains B	Tranmission Mains C	Total D	Cummulative E	Average Rate Base F	Depreciation Reserve G	Accuumulated Deferred Income Tax H	Net Rate Base I	Return On Net Rate Base J
Oct 15-Sept 20				$120,812,954			$4,423,500	$ (31,025,630)	$ 85,363,824	
Oct-20	$ 1,996,917	$ 1,556,417	$ 617,600	$ 4,170,933	$124,983,887	$ 122,898,421	$ 5,008,991	$ (32,171,626)	$ 85,717,804	$ 540,838
Nov-20	$ 1,996,917	$ 1,556,417	$ 617,600	$ 4,170,933	$129,154,821	$ 127,069,354	$ 5,190,538	$ (33,317,622)	$ 88,561,194	$ 558,779
Dec-20	$ 1,996,917	$ 1,556,417	$ 617,600	$ 4,170,933	$133,325,754	$ 131,240,287	$ 5,378,410	$ (34,463,619)	$ 91,398,259	$ 576,679
Jan-21	$ 1,996,917	$ 1,556,417	$ 617,600	$ 4,170,933	$137,496,687	$ 135,411,221	$ 5,572,607	$ (35,609,615)	$ 94,228,999	$ 594,540
Feb-21	$ 1,996,917	$ 1,556,417	$ 617,600	$ 4,170,933	$141,667,621	$ 139,582,154	$ 5,773,128	$ (36,755,611)	$ 97,053,415	$ 612,361
Mar-21	$ 1,996,917	$ 1,556,417	$ 617,600	$ 4,170,933	$145,838,554	$ 143,753,087	$ 5,979,974	$ (37,901,607)	$ 99,871,506	$ 630,142
Apr-21	$ 1,996,917	$ 1,556,417	$ 617,600	$ 4,170,933	$150,009,487	$ 147,924,021	$ 6,193,145	$ (39,047,603)	$ 102,683,272	$ 647,882
May-21	$ 1,996,917	$ 1,556,417	$ 617,600	$ 4,170,933	$154,180,421	$ 152,094,954	$ 6,412,641	$ (40,193,599)	$ 105,488,714	$ 665,583
Jun-21	$ 1,996,917	$ 1,556,417	$ 617,600	$ 4,170,933	$158,351,354	$ 156,265,887	$ 6,638,461	$ (41,339,596)	$ 108,287,831	$ 683,245
Jul-21	$ 1,996,917	$ 1,556,417	$ 617,600	$ 4,170,933	$162,522,287	$ 160,436,821	$ 6,870,606	$ (42,485,592)	$ 111,080,623	$ 700,866
Aug-21	$ 1,996,917	$ 1,556,417	$ 617,600	$ 4,170,933	$166,693,221	$ 164,607,754	$ 7,109,075	$ (43,631,588)	$ 113,867,091	$ 718,447
Sep-21	$ 1,996,917	$ 1,556,417	$ 617,600	$ 4,170,933	$170,864,154	$ 168,778,687	$ 7,353,869	$ (44,777,584)	$ 116,647,234	$ 735,988
Oct-21	$ 1,996,917	$ 1,556,417	$ 617,600	$ 4,170,933	$175,035,087	$ 172,949,621	$ 7,604,988	$ (45,923,580)	$ 119,421,052	$ 753,490
Nov-21	$ 1,996,917	$ 1,556,417	$ 617,600	$ 4,170,933	$179,206,021	$ 177,120,554	$ 7,862,432	$ (47,069,577)	$ 122,188,546	$ 770,951
Dec-21	$ 1,996,917	$ 1,556,417	$ 617,600	$ 4,170,933	$183,376,954	$ 181,291,487	$ 8,126,200	$ (48,215,573)	$ 124,949,715	$ 788,373
	$ 29,953,750	$ 23,346,250	$ 9,264,000	$ 183,376,954		$ 160,149,151	$ 6,766,571	$ (42,261,975)	$ 111,120,605	$ 9,978,164

Washington Gas Light Company
Utility Cost of Capital
District of Columbia

Formal Case No. 1154
Exhibit WG (2C)-1
Current Factor

Twelve Months Ended September 30, 2015

Formal Case No. 1137

Description	Capital Structure Ratio	Cost	Return
A	B	C	D = B * C
Short Term Debt	3.090%	1.06%	0.033%
Long-Term Debt	39.660%	5.83%	2.312%
Preferred Stock	1.550%	4.79%	0.074%
Common Equity	55.700%	9.25%	5.152%
Total			7.57%

WASHINGTON GAS LIGHT COMPANY - DISTRICT OF COLUMBIA
REVENUE CONVERSION FACTOR

Ln. No.	Description	Reference	Amount
A	B	C	D
1	State Tax Rate	Statutory	8.250%
2	Federal Tax Rate	Statutory	21.00%
3	Federal Tax Rate Net of State Taxes	=Ln. No. 2*(1-Ln. No.1)	19.27%
4	Composite Tax Rate	=Ln. No.1 + 3	27.518%
5	Compliment of Composite Tax Rate	=1-Ln. No.4	72.483%
6	Revenue Gross Up, Excluding Uncollectible Accounts	=1/Ln. No.5	1.379643
7	Uncollectible Rate	Case No. 1137	1.7950%
8	Uncollectible Conversion Factor	=Ln. No.6 X Ln.No. 7	0.024765
9	Revenue Conversation Factor	=Ln No.6 + 8	1.404408

WASHINGTON GAS LIGHT COMPANY - DISTRICT OF COLUMBIA
ANNUAL PLANT BALANCES AND DEPRECIATION EXPENSE

	PLANT EXPENDITURES				DEPRECIATION EXPENSE						
	Distribution Services	Distribution Mains	Transmission Mains	Total Plant	Distribution Services	Distribution Mains	Transmission Mains	Total Depr. Exp. b/	Monthly Depreciation	Accumulated Depreciation	Deferred Income tax
	A	B	C	D	E	F	G	H	I	J	K
Depreciation Rates a/					2.40%	2.07%	1.13%				
Oct 15-Sept 20 c/				$120,812,954					$168,898	$ 4,833,768	($31,025,630)
Oct-20	$1,996,917	$1,556,417	$617,600	$4,170,933	$3,994	$2,685	$582	$6,325	$175,223	$ 5,008,991	$ (32,171,626)
Nov-20	$1,996,917	$1,556,417	$617,600	$4,170,933	$3,994	$2,685	$582	$6,325	$181,547	$ 5,190,538	$ (33,317,622)
Dec-20	$1,996,917	$1,556,417	$617,600	$4,170,933	$3,994	$2,685	$582	$6,325	$187,872	$ 5,378,410	$ (34,463,619)
Jan-21	$1,996,917	$1,556,417	$617,600	$4,170,933	$3,994	$2,685	$582	$6,325	$194,197	$ 5,572,607	$ (35,609,615)
Feb-21	$1,996,917	$1,556,417	$617,600	$4,170,933	$3,994	$2,685	$582	$6,325	$200,521	$ 5,773,128	$ (36,755,611)
Mar-21	$1,996,917	$1,556,417	$617,600	$4,170,933	$3,994	$2,685	$582	$6,325	$206,846	$ 5,979,974	$ (37,901,607)
Apr-21	$1,996,917	$1,556,417	$617,600	$4,170,933	$3,994	$2,685	$582	$6,325	$213,171	$ 6,193,145	$ (39,047,603)
May-21	$1,996,917	$1,556,417	$617,600	$4,170,933	$3,994	$2,685	$582	$6,325	$219,495	$ 6,412,641	$ (40,193,599)
Jun-21	$1,996,917	$1,556,417	$617,600	$4,170,933	$3,994	$2,685	$582	$6,325	$225,820	$ 6,638,461	$ (41,339,596)
Jul-21	$1,996,917	$1,556,417	$617,600	$4,170,933	$3,994	$2,685	$582	$6,325	$232,145	$ 6,870,606	$ (42,485,592)
Aug-21	$1,996,917	$1,556,417	$617,600	$4,170,933	$3,994	$2,685	$582	$6,325	$238,470	$ 7,109,075	$ (43,631,588)
Sep-21	$1,996,917	$1,556,417	$617,600	$4,170,933	$3,994	$2,685	$582	$6,325	$244,794	$ 7,353,869	$ (44,777,584)
Oct-21	$1,996,917	$1,556,417	$617,600	$4,170,933	$3,994	$2,685	$582	$6,325	$251,119	$ 7,604,988	$ (45,923,580)
Nov-21	$1,996,917	$1,556,417	$617,600	$4,170,933	$3,994	$2,685	$582	$6,325	$257,444	$ 7,862,432	$ (47,069,577)
Dec-21	$1,996,917	$1,556,417	$617,600	$4,170,933	$3,994	$2,685	$582	$6,325	$263,768	$ 8,126,200	$ (48,215,573)
	$29,953,750	$23,346,250	$9,264,000	$183,376,954				$94,870	$3,292,432		

a/ Based on Commission rates approved in Formal Case No. 1137.
b/ Total Depreciation has been reduced by 5.3% to reflect the cost of retired plant
c/ Starting balances represent balances from PIPES 1 Extension Current Factor Filing in FC1115, filed March 31, 2020

E. Annual Depreciation Rates[1019]

FC 1137 Commission GR 4-1
Attachment 4-1(1)
Page 1 of 2

WASHINGTON GAS LIGHT COMPANY - DISTRICT OF COLUMBIA
Comparison of Current and SFAS 143 Accrual Rates
Current: VG Procedure / RL Technique
Updated: VG Procedure / RL Technique
Accretion Rate: 3.32 Percent

Statement A

Account	Description	Current Investment	Current Net Salvage	Current Total	SFAS 143 Investment	SFAS 143 Net Salvage	SFAS 143 Total
A		B	C	D=B+C	E	F	G=E+F
	STORAGE AND PROCESSING PLANT						
	Allocated Property						
361.00	Structures and Improvements						
	Maryland (Rockville)	2.76%	0.89%	3.64%	2.39%	0.76%	3.16%
	Virginia (Ravensworth)	2.83%	0.51%	3.34%	2.47%	0.50%	2.97%
	Total Account 361.00	2.69%	0.71%	3.40%	2.43%	0.63%	3.06%
362.00	Gas Holders						
	Maryland (Rockville)	1.67%	0.56%	2.23%	1.69%	0.57%	2.26%
	Virginia (Ravensworth)	1.76%	0.33%	2.08%	1.79%	0.34%	2.13%
	Total Account 362.00	1.70%	0.46%	2.17%	1.73%	0.47%	2.20%
363.50	Other Equipment						
	Maryland (Rockville)	2.69%		2.69%	5.37%	0.11%	5.48%
	Virginia (Ravensworth)	-0.57%	6.10%	5.53%	1.97%	1.54%	3.51%
	Total Account 363.50	2.09%	1.46%	3.53%	4.55%	0.46%	5.00%
	Total Allocated Property	1.87%	0.57%	2.44%	2.02%	0.50%	2.52%
	Total Storage and Processing Plant	1.87%	0.57%	2.44%	2.02%	0.50%	2.52%
	TRANSMISSION PLANT						
	Assigned Property						
365.20	Rights of Way						
366.00	Meas. and Reg. Station Structures						
367.10	Mains - Steel	1.02%	0.15%	1.17%	0.90%	0.10%	0.60%
369.00	Measuring and Regulating Equipment	1.91%	0.21%	2.12%	1.09%	0.20%	1.29%
	Total Assigned Property	1.50%	0.18%	1.69%	0.82%	0.15%	0.97%
	Allocated Property						
365.20	Rights of Way						
	District	1.76%		1.76%	0.33%		0.33%
	Maryland	1.68%		1.68%	1.60%		1.60%
	Virginia	1.29%		1.29%	1.16%		1.16%
	Total Account 365.20	1.55%		1.55%	1.15%		1.15%
366.00	Meas. and Reg. Station Structures						
	Maryland	1.98%		1.98%	0.33%	1.24%	1.57%
	Virginia	2.04%	0.20%	2.24%	1.33%	0.02%	1.35%
	Total Account 366.00	2.01%	0.12%	2.13%	1.00%	0.44%	1.44%
367.10	Mains - Steel						
	District	0.98%	0.15%	1.13%	1.05%	0.10%	1.15%
	Maryland	1.56%		1.56%	1.44%	-0.03%	1.41%
	Virginia	1.54%	0.25%	1.79%	1.47%	0.10%	1.57%
	Total Account 367.10	1.50%	0.11%	1.61%	1.42%	0.03%	1.45%
369.00	Measuring and Regulating Equipment						
	District	1.67%	0.21%	1.88%	-0.18%	0.20%	0.02%
	Maryland	1.92%	0.29%	2.21%	0.29%	2.40%	2.69%
	Virginia	1.61%	0.48%	2.09%	0.66%		0.66%
	Total Account 369.00	1.82%	0.35%	2.17%	0.36%	1.66%	2.02%
	Total Allocated Property	1.53%	0.18%	1.81%	1.07%	0.56%	1.63%
	Total Transmission Plant	1.61%	0.18%	1.79%	1.03%	0.50%	1.53%
	DISTRIBUTION PLANT						
	Assigned Property						
376.00	Structures and Improvements						
376.10	Mains - Steel	1.28%	0.37%	1.65%	0.87%	0.39%	1.26%
376.20	Mains - Plastic	1.61%	0.46%	2.07%	1.53%	0.57%	2.10%
376.30	Mains - Cast Iron	0.47%	1.16%	1.63%	-1.78%	1.14%	-0.64%
376.40	Mains - Copper						
377.00	Compressor Station Equipment						
378.00	Measuring and Regulating Equipment	1.19%	0.11%	1.30%	1.08%	0.11%	1.19%
380.10	Services - Steel	1.67%	1.53%	3.20%	1.18%	0.91%	2.09%
380.20	Services - Plastic	1.92%	0.68%	2.60%	1.42%	0.73%	2.15%
380.30	Services - Copper	1.07%	1.40%	2.47%	-1.86%	1.46%	-0.40%

1019 The following tables are from Commission Exhibit No. 9 (WGL's Response to Commission Data Requests, Question No. 4-1.)

CALCULATION OF INTEREST SYNCHRONIZATION

		Year
1	**Plant Additions**	$111,120,605
2	**Debt Return %**	0.02345
3	**Line 1 *Line 2**	$2,605,778
4	**Tax Rate**	$0.27518
5	**Line 3 * Line 4**	$717,045
6	**Revenue Conversion Factor**	$1.404408
7	**Line 5 * Line 6**	($1,007,024)

CALCULATION OF DEPRECIATION w/ REVENUE CONVERSION FACTOR

			Year
8	**Depreciation Amount (Workpaper 3)**	$	3,292,432
9	**Tax Rate Compliment**		0.72483
10	**Line 8 * Line 9**		$2,386,437
11	**Revenue Conversion Factor**		$1.404408
12	**Line 10 * Line 11**		$3,351,531

WASHINGTON GAS LIGHT COMPANY - DISTRICT OF COLUMBIA
BUDGET THROUGHPUT THERMS
Fifteen Months Commencing October 2020

Formal Case No. 1154
Exhibit WG(2C)-1
Current Factor

Line No.	Description	October-20	November-20	December-20	January-21	February-21	March-21	April-21	May-21	June-21	July-21	August-21	September-21	October-21	November-21	December-21	Total
1	**BUDGET THERM SALES - CYCLE**																
2	D.C. - Firm Sales - Res	2,432,000	6,552,000	11,317,000	16,841,000	16,896,000	13,414,000	9,280,000	4,503,000	2,315,000	1,560,000	1,559,000	1,556,000	2,440,000	6,562,000	11,328,000	108,555,000
3	D.C. - Firm Sales - C&I	1,687,000	1,911,000	4,360,000	5,486,000	5,829,000	4,863,000	3,724,000	2,266,000	1,716,000	1,677,000	1,673,000	1,695,000	1,802,000	2,011,000	4,549,000	45,249,000
4	D.C. - Firm Sales - GMA	373,000	897,000	1,461,000	1,838,000	1,957,000	1,575,000	1,205,000	649,000	370,000	363,000	349,000	351,000	370,000	894,000	1,457,000	14,109,000
5	Total D.C. Firm Sales	4,492,000	9,360,000	17,138,000	24,165,000	24,682,000	19,852,000	14,209,000	7,418,000	4,401,000	3,600,000	3,581,000	3,602,000	4,612,000	9,467,000	17,334,000	167,913,000
6	**BUDGET DELIVERY THERMS - CYCLE**																
7	D.C. - Firm Delivery - Res	369,000	996,000	1,722,000	2,564,000	2,572,000	2,042,000	1,412,000	684,000	351,000	236,000	236,000	235,000	370,000	998,000	1,724,000	16,511,000
8	D.C. - Firm Delivery - C&I	3,005,000	3,450,000	7,236,000	9,269,000	9,725,000	8,092,000	6,534,000	4,050,000	3,146,000	2,994,000	2,979,000	3,021,000	3,172,000	3,593,000	7,508,000	77,774,000
9	D.C. - Firm Delivery - GMA	642,000	1,601,000	2,625,000	3,311,000	3,525,000	2,833,000	2,167,000	1,141,000	635,000	631,000	610,000	611,000	638,000	1,597,000	2,619,000	25,186,000
10	Total D.C. Firm Delivery	4,016,000	6,047,000	11,583,000	15,144,000	15,822,000	12,967,000	10,113,000	5,875,000	4,132,000	3,861,000	3,825,000	3,867,000	4,180,000	6,188,000	11,851,000	119,471,000
11	D.C. - Interruptible Delivery	4,197,000	7,440,000	10,787,000	12,501,000	12,166,000	11,372,000	7,719,000	4,833,000	3,725,000	3,376,000	3,282,000	3,616,000	3,814,000	7,055,000	10,454,000	106,337,000
12	**BUDGET THERM SALES - CYCLE**																
	D.C. - Firm Total - Res	2,801,000	7,548,000	13,039,000	19,405,000	19,468,000	15,456,000	10,692,000	5,187,000	2,666,000	1,796,000	1,795,000	1,791,000	2,810,000	7,560,000	13,052,000	125,066,000
	D.C. - Firm Total - C&I	4,692,000	5,361,000	11,596,000	14,755,000	15,554,000	12,955,000	10,258,000	6,316,000	4,862,000	4,671,000	4,652,000	4,716,000	4,974,000	5,604,000	12,057,000	123,023,000
	D.C. - Firm Total - GMA	1,015,000	2,498,000	4,086,000	5,149,000	5,482,000	4,408,000	3,372,000	1,790,000	1,005,000	994,000	959,000	962,000	1,008,000	2,491,000	4,076,000	39,295,000
	Total D.C. Firm Total	8,508,000	15,407,000	28,721,000	39,309,000	40,504,000	32,819,000	24,322,000	13,293,000	8,533,000	7,461,000	7,406,000	7,469,000	8,792,000	15,655,000	29,185,000	287,384,000

Income Statement Summary

Twelve Months Ended September 30, 2015 – Average Rate Base

Description	Reference — Sc-Pg-Ln	Reference — Allocator	District of Columbia Rate Making Total	RES-HTG/CLG	RES-NON H/C-GMA	RES-NON H/C-OTH	C&I H/C < 3075	C&I H/C > 3075	C&I NON H/C	GMA H/C < 3075	GMA H/C >3075	GMA NON H/C	NON FIRM
A	B	C	F	G	H	I	J	K	L	M	N	O	P
Operating Revenues	RV:1:35		$ 164,242,733	$ 73,313,997	$ 1,270,652	$ 1,318,589	$ 6,202,199	$ 33,958,583	$ 7,735,276	$ 857,484	$ 18,258,903	$ 2,480,430	$ 11,877,842
Operating Expenses													
Gas Purchased	EX:2:45		$ 0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Operation - Other than Gas Purchased			68,502,174	38,104,787	1,484,502	1,142,157	1,891,450	7,357,318	1,428,132	191,383	3,332,019	549,022	5,340,449
Maintenance	EX:4:22		14,223,895	9,485,174	165,931	300,371	463,182	1,690,180	341,508	35,768	798,225	132,982	807,884
Depreciation	EX:6:21		16,517,901	9,235,068	200,548	278,173	533,453	2,312,298	414,242	48,725	1,002,923	195,029	1,215,800
Amortization of Capitalized Software	AL:6:36	O&M Adjusted	2,649,984	1,761,860	75,769	52,957	80,993	287,088	58,325	7,920	120,728	21,838	176,800
Amortization of Chalk Point / MD Post 1998 Inter	AL:5:3	Net_Rate_Base	-	-	-	-	-	-	-	-	-	-	-
Amortization of General Plant	AL:5:3	Net_Rate_Base	1,190,955	650,117	14,588	20,882	37,196	192,889	28,158	3,483	70,571	11,298	93,884
Amortization of Unrecovered Plant Loss Chillum	AL:5:3	Total_Weather_All_NW	160,431	68,554	244	878	3,184	30,542	2,438	767	14,811	1,251	25,845
Interest on Customer Deposits	RV:1:5	Gas_Sales_Ex_Non_Firm	89,001	30,746	508	548	2,572	14,171	3,196	360	6,440	1,041	-
Interest on Supplier Refunds	AL:1:5	Annual_Plnt_NW	-	-	-	-	-	-	-	-	-	-	-
General Taxes	EX:8:24		44,044,615	15,364,422	139,895	277,407	1,487,220	8,428,422	1,912,677	187,549	3,087,115	580,882	12,070,737
Other Income Taxes		Tax_Factor	(1,679,614)	557,595	117,557	119,481	(225,742)	(1,931,192)	(478,000)	(50,041)	(805,767)	(130,073)	1,145,547
Expenses Before Federal Income Taxes	= Ln. 2 > Ln. 14		$ 135,768,823	$ 76,279,031	$ 2,178,853	$ 2,218,633	$ 4,195,518	$ 18,230,289	$ 3,710,895	$ 425,980	$ 4,306,097	$ 1,346,287	$ 20,878,615
Federal Income Taxes		Tax_Factor	$ (4,745,549)	$ 1,073,451	$ 353,170	$ 358,880	$ (674,182)	$ (5,501,349)	$ (1,430,200)	$ (150,335)	$ (2,423,723)	$ (300,772)	$ 3,441,501
Investment Tax Credit Adjustments		Tax_Factor	(284,380)	93,557	19,721	20,040	(37,870)	(307,190)	(78,862)	(8,395)	(135,340)	(21,821)	182,172
Deferred Income Taxes		Tax_Factor	11,948,111	(3,900,623)	(822,217)	(835,531)	1,578,878	12,807,630	3,329,854	349,906	8,642,677	909,767	(3,012,160)
Loss-Disposition of Utility Plant			-										
Total Operating Expenses	= Ln. 16 > Ln. 19		$ 142,807,402	$ 73,147,416	$ 1,730,328	$ 1,760,052	$ 5,058,345	$ 25,228,458	$ 5,530,287	$ 617,256	$ 11,391,711	$ 1,842,431	$ 16,600,119
Net Operating Income	= Ln. 1 > Ln. 20		$ 11,435,331	$ 166,581	$ (460,278)	$ (441,463)	$ 1,143,855	$ 8,727,127	$ 2,204,989	$ 234,207	$ 3,864,792	$ 617,920	$ (4,622,477)
Net Income Adjustments													
AFUDC	AL:5:3	Net_Rate_Base	$ 110,661	$ 65,348	$ 1,458	$ 2,077	$ 3,730	$ 16,373	$ 2,833	$ 350	$ 7,698	$ 1,146	$ 9,636
Overheads - Net of Tax													
LCP Equity Accrual		Tot_Dist_Plnt	-	-	-	-	-	-	-	-	-	-	-
Net Operating Income - Adjusted			$ 11,546,332	$ 231,929	$ (458,810)	$ (439,387)	$ 1,147,583	$ 8,743,500	$ 2,207,823	$ 234,557	$ 3,872,489	$ 619,148	$ (4,612,842)
Net Rate Base	RB:1:23		$ 261,682,301	$ 154,694,864	$ 3,466,026	$ 4,910,422	$ 8,848,022	$ 38,763,454	$ 8,701,820	$ 828,102	$ 18,223,989	$ 2,710,449	$ 22,832,330
Return Earned	= Ln. 26 / Ln. 27		4.41%	0.15%	-13.24%	-8.85%	12.97%	22.56%	32.94%	28.29%	21.25%	22.84%	-20.20%

Washington G[illegible]ht Company
Allocation Factors Base [illegible]ormal Weather Study

Twelve Months Ended September 2015 - Average

L-1)

Description	Reference Sc-Pg-Ln	Allocator	WG	DC	MD	VA	DC	MD	VA
A	B	C	D	E	F	G	H	I	J
1 **Firm Annual Weather Gas**									
2 TOTAL FIRM WEATHER GAS - NW	NW Study	Firm_Weather_NW	992,859,488	157,482,574	420,485,726	414,891,188	0.158615	0 423510	0 417875
3 TOTAL FIRM THERM SALES - NW	NW Study	Annual_ Firm_NW	1,412,692,822	222 384,780	608,345,699	581,962,342	0.157419	0.430628	0.411953
4 TOTAL FIRM THERM SALES - NW(sales only)		Annual_ Firm_Sales_NW	881,798,947	138,148,309	337,828,596	405,822,043	0.156666	0 383113	0.460221
5 **Non-Firm Annual Weather Gas**									
6 June Sales	Financial Stmt.		15,746,659	4,929,972	7,009,517	3,807,171			
7 July Sales	Financial Stmt.		14,935,002	4,620,003	6,823,859	3,491,141			
8 Aug. Sales	Financial Stmt.		15,098,239	4,526,325	7,031,280	3,540,634			
9 Total Summer Usage	=7+8+9		45,779,901	14,076,300	20,864,655	10,838,946			
10 Annualization Factor	Constant		4	4	4	4			
11 Annualized Summer Usage	=10*11		183,119,602	56,305,199	83,458,620	43,355,783			
12 Watergate Usage	Financial Stmt.		1,024,221	1,024,221					
13 Calculated Base Usage	=12+13		184,143,823	57,329,420	83,458,620	43,355,783			
14 Actual Usage	NW Study		269,846,750	90,011,016	117,653,395	62,182,340			
15 Weather Usage	=15-14		85,702,927	32,681,596	34,194,775	18,826,556			
16 Total Interruptible Therm Sales - NW			246,743,342	87,275,395	102,215,503	57,252,444			
17 Weather Gas Interruptible - NW			66,817,657	29,150.113	21,631,482	16,036,062			
18 TOTAL FIRM THERM SALES - NW(Delivery only)		Annual_ Firm_Delivery_NW	512,114,782	84,236,472	251,738,011	176,140,299	0.164487	0.491566	0.343947
19 TOTAL ALL WEATHER GAS	=2+18	Total_Weather_All_NW	1,059,677,145	186,632,687	442,117,208	430,927,250	0.176122	0.417219	0.406659
20 TOTAL ANNUAL THERM SALES	=4+17	Annual_Total_NW	1,659,436,164	309,660,175	710,561,203	639,214,786	0.186606	0.428194	0.385200
21 Deductions for Pipeline :									
22 Propane Holding		Annual_Prop_Hold						0.000000	0 000000
23 Propane Gasified		Firm _Weather_NW							
24 Total Pipeline Deductions	=22+23								
25 ANNUAL THERMS ADJUSTED	=20-25	Pipeline_NW	1,659,436,164	309,660,175	710,561,203	639,214,786	0.186606	0.428194	0.385200
26 FIRM ANNUAL PIPELINE	=4-25	Firm_Pipe_ Ann_ Adj	1,412,692,822	222,384,780	608,345,699	581,962,342	0 157419	0.430628	0.411953
27 FIRM ANNUAL PIPELINE(Sales only)	=4-25	Firm_Pipe_ Ann_Sales_ Adj	881,798,947	138,148,309	337,828,596	405,822,043	0.156666	0 383113	0 460221
28 **Peak Day Therm Sales- Normal Weather**									
29 Weather Gas	NW Study	Peak_Day _Weather	15,694,510	2,370,607	6,750,070	6,573,833	0.151047	0.430091	0.418862
30 Base Gas	NW Study	Peak_Day_Base	1,065,340	164,968	478,975	421,397	0 154850	0.449598	0.395552
31 Total Peak Day Therms	=31+32	Peak_Day_Total	16,759,850	2,535,575	7,229,045	6,995,230	0.151289	0 431331	0 417380
32 PEAK DAY AND ANNUAL SALES	=20+33/2	Comp_Peak_ Ann_NW					0 168947	0.429763	0 401290
33 TOTAL WINTER THERMS (NOV-APR)	NW Study	Wintr_Pipe_NW	1,294,032,462	236,166,578	550,137,200	507,728,684	0.182504	0 425134	0 392362

Exhibit WG (D)-4
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Formal Case No. 1154
Exhibit WG (2C) -1
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WITNESS LAWSON
EXHIBIT WG (2C)-2

2021 - 2024 PROJECT*pipes* 2 Bill Impact Estimate

Line No.	Description		2022	2023	2024	2025
1	Plant additions (page 2)		$ 68,952,817	$ 120,998,520	$ 175,658,393	$ 230,274,958
2	Return on Plant	Line 1 * 7.57%	$ 5,220,712	$ 9,161,315	$ 13,299,847	$ 17,435,100
3	Revenue Conversion Factor	Line 2 * 1.404408	$ 7,332,010	$ 12,866,223	$ 18,678,411	$ 24,485,994
4	Depreciation a/		$ 1,849,248	$ 3,391,734	$ 5,066,003	$ 6,793,236
5	Interest Synchronization		$ (624,881)	$ (1,096,542)	$ (1,591,894)	$ (2,086,853)
6	TOTAL COSTS		$ 8,556,377	$ 15,161,415	$ 22,152,521	$ 29,192,377
7	ALLOCATION a/	%				
8	Residential	62.23%	$ 5,324,633	$ 9,434,949	$ 13,785,514	$ 18,166,416
9	Commercial & Industrial	20.74%	$ 1,774,593	$ 3,144,478	$ 4,594,433	$ 6,054,499
10	Group-Metered Apartments	8.31%	$ 711,035	$ 1,259,914	$ 1,840,874	$ 2,425,887
11	Interruptible	8.72%	$ 746,116	$ 1,322,075	$ 1,931,700	$ 2,545,575
12		100.00%	$ 8,556,377	$ 15,161,415	$ 22,152,521	$ 29,192,377
13	BUDGETED THERMS b/					
14	Residential		102,186,390	102,697,322	103,210,809	103,726,863
15	Commercial & Industrial		101,880,870	102,390,274	102,902,226	103,416,737
16	Group-Metered Apartments		31,854,480	32,013,752	32,173,821	32,334,690
17	Interruptible		84,332,565	84,754,228	85,177,999	85,603,889
18	CURRENT FACTOR					
19	Residential		$ 0.0521	$ 0.0919	$ 0.1336	$ 0.1751
20	Commercial & Industrial		$ 0.0174	$ 0.0307	$ 0.0446	$ 0.0585
21	Group-Metered Apartments		$ 0.0223	$ 0.0394	$ 0.0572	$ 0.0750
22	Interruptible		$ 0.0088	$ 0.0156	$ 0.0227	$ 0.0297

ESTIMATED AVERAGE INCREMENTAL BILL IMPACT FOR PROJECTpipes 2

	Class	Avg Annual Usage	2022	2023	2024	2025
23	Residential Heating	709	$ 36.94	$ 65.14	$ 94.70	$ 124.17
24	Commercial & Industrial < 3,075	1,467	$ 25.55	$ 45.05	$ 65.50	$ 85.89
25	Commercial & Industrial > 3,075	18,498	$ 322.20	$ 568.09	$ 825.91	$ 1,082.96
26	Group-Metered Apartments < 3,075	1,360	$ 30.36	$ 53.52	$ 77.81	$ 102.03
27	Group-Metered Apartments > 3,075	16,706	$ 372.90	$ 657.47	$ 955.86	$ 1,253.36
28	Interruptible	361,274	$ 3,196.30	$ 5,635.49	$ 8,193.11	$ 10,743.09

a/ Based on net rate base in Class Cost of Service Study in Case No. 1137 (Page 9 of 9).
b/ The budgeted therms for Calendar Year 2021 estimating annual throughput growth of 0.5% annually

ATTESTATION

I, R. ANDREW LAWSON, whose Testimony accompanies this Attestation, state that such testimony was prepared by me or under my supervision; that I am familiar with the contents thereof; that the facts set forth therein are true and correct to the best of my knowledge, information and belief; and that I adopt the same as true and correct.

R. ANDREW LAWSON

4/20/2020
DATE

WITNESS PRICE
EXHIBIT WG (D)

BEFORE THE
PUBLIC SERVICE COMMISSION OF THE
DISTRICT OF COLUMBIA

IN THE MATTER OF	)	
WASHINGTON GAS LIGHT COMPANY'S APPLICATION FOR APPROVAL OF PROJECTPIPES 2 PLAN	)	FORMAL CASE NO. 1154

WASHINGTON GAS LIGHT COMPANY
District of Columbia

SUPPLEMENTAL DIRECT TESTIMONY OF STEPHEN J. PRICE
Exhibit WG (D)
(Page 1 of 1)

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EXHIBIT WG (D)

WASHINGTON GAS LIGHT COMPANY

DISTRICT OF COLUMBIA

SUPPLEMENTAL DIRECT TESTIMONY OF STEPHEN J. PRICE

Q. PLEASE STATE YOUR NAME, OCCUPATION AND BUSINESS ADDRESS.

A. My name is Stephen J. Price. I am Assistant Vice President of Safety, Quality and System Protection at Washington Gas Light Company ("Washington Gas" or "Company"). My business address is 6801 Industrial Road, Springfield, Virginia, 22151.

I. QUALIFICATIONS

Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE.

A. I earned a Bachelor of Arts (History) degree from Dickinson College in Carlisle, PA in 1981 and a Juris Doctor (Law) degree from Louisiana State University in Baton Rouge, LA in 1984. I served on active duty in the Judge Advocate General's Corps upon graduation from law school until 1991, when I then entered the private practice of law, while also continuing my Army career in the United States Army Reserve. I retired from the Army Reserve in the rank of Colonel (06) in 2013, after 30 years of service. I joined Washington Gas in the General Counsel's office in 1997 performing legal work for the Company until 2010 (with an interruption of 1 year, when I was mobilized to active military duty from September 2005 until September 2006).

In 2010, I assumed the responsibilities as Division Head of Construction and Field Operations, in the Operations, Engineering and Construction Services

department ("OECS" (now "Utility Operations" or "UO")). In that role, I was in charge of the workforce responsible for responding to and investigating odor calls and monitoring and repairing all identified leaks in accordance with industry standards.

In January 2018, pursuant to a reorganization of Utility Operations, I assumed the responsibilities for Safety, Quality (Compliance) and System Protection, also within Utility Operations. In my current role, as Assistant Vice President, I am responsible for the safety programs administered by the Safety Department, and for the support provided by the Safety Department to each department and division within WGL Holdings, Inc. I also am responsible for the department engaged in compliance with U.S. Department of Transportation ("DOT") Pipeline Safety regulations, whose primary role is to conduct quality and compliance audits of the operations and construction workforce, investigate and respond to all Commission concerns and inquiries, and develop and manage systems and processes to conduct quality management reviews for continuous improvement of pipeline safety performance. Lastly, I am responsible for the System Protection department which includes Leak Survey, Damage Prevention and Corrosion - all functions intended to either prevent leaks on the system from occurring (Damage Prevention and Corrosion), or to identify leaks proactively (Leak Survey) and provide remedial protection where appropriate (Corrosion). My responsibilities also include the meter services division, which is responsible for the accountability and management of meters installed and removed from the system.

Q. HAVE YOU PREVIOUSLY FILED TESTIMONY BEFORE STATE REGULATORY COMMISSIONS?

A. Yes. I filed Direct, Supplemental Direct and Rebuttal Testimony in Case No. 9481, and Rebuttal Testimony in Case No. 9605, before the Maryland Public Service Commission. I filed Direct and Rebuttal Testimony, and provided live Rejoinder Testimony, in Case No. PUR-2018-00080 before the Virginia State Corporation Commission.

II. PURPOSE OF SUPPLEMENTAL DIRECT TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR SUPPLEMENTAL DIRECT TESTIMONY?

A. The purpose of my Supplemental Direct Testimony is to propose an expansion of the second PROJECT*pipes* Program ("PIPES 2" or "PIPES 2 Plan") to include recovery for an Advanced Leak Detection ("ALD") pilot program. In addition, I address the interdependency between the proposed Mercury Regulator Replacement Program ("MRRP"), addressed in Formal Case No. 1157, and the PIPES 2 Plan.

III. ORGANIZATION OF TESTIMONY

Q. HOW IS YOUR TESTIMONY ORGANIZED?

A. My testimony is organized into three additional sections. Section IV addresses exhibits provided to support my testimony and Section V describes my proposal to include ALD in the PIPES 2 Plan. Section VI addresses the interdependence of the MRRP and the PIPES 2 Plan.

IV. IDENTIFICATION OF EXHIBITS

Q. DO YOU SPONSOR ANY EXHIBITS IN SUPPORT OF YOUR TESTIMONY?

A. No, there are no supporting exhibits.

V. ADVANCED LEAK DETECTION

Q. PLEASE PROVIDE AN OVERVIEW OF ALD TECHNOLOGY AND ITS PURPOSE.

A. ALD technology refers to high sensitivity methane detectors (i.e., rapidly measuring and collecting methane concentrations in parts per billion) mounted on vehicles equipped with Global Positioning Systems ("GPS") that collect latitude and longitude coordinates while wind speed, wind direction, and methane concentration data is being collected. This data will assist the Company in augmenting the prioritization of pipe replacement through the inclusion of data on calculated leak volumes and reducing methane emissions.

Q. WHY ARE YOU PROPOSING TO INCLUDE ALD IN PIPES 2?

A. Over the course of multiple proceedings, including PIPES 2, the Company has noted increased interest from stakeholders on the use of ALD. If this ALD effort proves successful, it will help prioritize pipe replacement to reduce leaks, and it should achieve larger methane emissions reductions sooner over the course of the accelerated pipe replacement program. Reducing greenhouse gas ("GHG") emissions sooner over the course of the program is supportive of District climate policy on GHG reductions.

Q. HOW WILL THE COMPANY INCORPORATE DATA FROM ALD TECHNOLOGY INTO THE PIPE REPLACEMENT PROJECTS?

A. The Company will incorporate data derived from ALD technology and leak quantification methodologies into its prioritization of pipe replacement projects for selected programs during the PIPES 2 term. As the Company works to enhance

its predictions of future leak occurrences through leak quantification methodologies, it will also integrate data from ALD technology into its analysis. The goal of this program is two-fold: (1) to maintain the safety-based prioritizing of pipe replacements, while also achieving reductions in lost gas through prioritizing pipe replacements on segments with higher leak flow rates while taking safety into account; and (2) to utilize predictive analytics that will enhance the Company's ability to proactively reduce or avoid leaks at a faster rate through pipe replacement.

Q. PLEASE DESCRIBE HOW THE COMPANY PROPOSES TO IMPLEMENT ALD IN PIPES 2.

A. For PIPES 2 Program 1, service only projects, the Company proposes to determine a list of services scheduled for replacement in the upcoming PIPES 2 construction year, currently based on a service leaks per quad ranking. Once the list is developed and approved through the Commission process, and prior to the construction year, Washington Gas will use ALD technology to leak survey the services scheduled for that year to determine if any are currently leaking. All leaking services will be replaced as a priority over non-leaking services where feasible. Under the Company's proposal, the additional cost of the ALD leak survey activities will be recoverable through the PIPES 2 recovery mechanism and will be in addition to the funds agreed to for the other PIPES 2 programs.

For PIPES 2 Programs 2, 3, and 4—the main and service replacement projects—the Company will prioritize using a combination of safety, construction drivers, and leak flow rate information. This combined prioritization will be achieved by first generating a risk ranking (score, level, or other ranking) for each main and service replacement project based on Washington Gas's DIMP and

risk modeling tool. Once a list of projects is determined for the upcoming construction year, based on safety rankings and construction drivers (advance of paving or "AOP," DC PLUG, Pepco's Capital Grid Project, *etc.*), and prior to the start of the construction year, the Company will perform a survey of the safety-based planned projects (Programs 2, 3 and 4) using ALD technology. Assuming a roughly equivalent safety risk, scheduling prioritization for the group of safety-based projects will incorporate the leak flow rate data derived using advanced leak detection technology. Thus, leak flow rate per mile will be used to sub-prioritize among project areas with comparable risk ranks. Project areas with higher leak flow rates per mile will be prioritized sooner than other project areas that have a comparable risk ranking but a lower leak flow rate. In addition, factors such as construction efficiencies, logistics, and coordination with other construction activities (AOP, DC PLUG and Pepco's Capital Grid Project, and other utility and road-based construction projects) will also be considered in the scheduling of projects.

Q. WHY DOES WASHINGTON GAS PROPOSE TO IMPLEMENT ALD AS A PILOT PROGRAM?

A. The Company proposes to launch ALD as a pilot program in PIPES 2 because ALD technology presents a new approach for the Company to evaluate. Washington Gas acknowledges it will take time for the Company to deploy and incorporate ALD into its practices, just as it will take time for the Company to learn the proper application of ALD within current Washington Gas protocols. For example, ALD technology must be used within the context of the Company's safety policies for determining pipe replacement, and within the real-world

constraints of work mandated by outside programs, such as work in advance of paving, DC PLUG, or Pepco's Capital Grid Project.

Q. HOW WILL THE COMPANY ADMINISTER THE ALD TECHNOLOGY WITHIN THE PROJECTPIPES PROGRAM?

A. The service provider of ALD technology and data analytics used by the Company will be at the sole discretion of Washington Gas and may include multiple providers within the course of the PIPES 2 Plan.

Q. HOW WILL ALD PROGRAM COSTS BE RECOVERED?

A. Washington Gas proposes that the estimated cost of $2 million over the five-year PIPES 2 period for this program will be included in the PIPES 2 surcharge.

Q. HOW WILL THE ALD PROGRAM BE EVALUATED AND ASSESSED?

A. After each year of completed PIPES 2 work, the Company will prepare a report that describes the use of ALD and leak quantification methodologies within the context of PIPES 2 projects. This report will also evaluate the effectiveness of these new tools and technologies, as they relate to risk assessment improvement and methane emission reduction. This report will be shared with relevant stakeholders.

VI. MERCURY REGULATOR REPLACEMENT PROGRAM

Q. IS THERE INTERDEPENDENCY BETWEEN THE PROPOSED MERCURY REGULATOR REPLACEMENT PROGRAM ADDRESSED IN FORMAL CASE NO. 1157 AND THE PIPES 2 PLAN?

A. Yes. In its MRRP Implementation Plan, dated August 30, 2019, filed in Formal Case No. 1157, the Company estimated that there are approximately

2,800 mercury service regulator locations that intersect with PROJECT*pipes* over the next 10 years. As noted in its response to Commission Data Request No. 2-1(a) in Formal Case No. 1157, filed on March 10, 2020, the Company's estimate of the number of potential mercury service regulator locations in the District of Columbia has not changed significantly since August 30, 2019. Washington Gas plans to replace those 2,800 mercury service regulators as part of its PROJECT*pipes* activities. Recognizing the overlay between PROJECT*pipes* and the Company's proposed MRRP Implementation Plan, the plan excludes the approximately 2,800 PROJECT*pipes*-related mercury service regulators to assure consistency in cost recovery.

Q. IF THE COMMISSION ORDERS A MORE RAPID COMPLETION OF SURVEY AND REPLACEMENT OF ALL MERCURY REGULATORS IN THE DISTRICT, WOULD THAT IMPACT THE BENEFICIAL INTERDEPENDENCE WITH THE PIPES 2 PLAN, AS DESCRIBED ABOVE?

A. Yes. The shorter the time period ordered for completion of the MRRP, the fewer mercury regulators would be replaced through PIPES 2. For every location of a potential mercury regulator not addressed through PIPES 2, the MRRP would address the survey of that location and the replacement of a mercury regulator if found at that location.

Q. DOES THAT CONCLUDE YOUR SUPPLEMENTAL DIRECT TESTIMONY?

A. Yes, it does.

ATTESTATION

I, STEPHEN J. PRICE, whose Testimony accompanies this Attestation, state that such testimony was prepared by me or under my supervision; that I am familiar with the contents thereof; that the facts set forth therein are true and correct to the best of my knowledge, information and belief; and that I adopt the same as true and correct.

STEPHEN J. PRICE

April 22, 2020

DATE

CERTIFICATE OF SERVICE

I, the undersigned counsel, hereby certify that on this 23rd day of April 2020, I caused copies of the foregoing to be hand-delivered, mailed, postage-prepaid, or electronically delivered to the following:

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