The Commonwealth of Massachusetts

DEPARTMENT OF PUBLIC UTILITIES

D.P.U. 24-GLR-01 December 31, 2024

Report on the Prevalence of Natural Gas Leaks in the Natural Gas System to the Joint Committee on Telecommunications, Utilities, and Energy, and the Joint Committee on Public Safety and Homeland Security, pursuant to An Act Relative to Natural Gas Leaks, St. 2014, c. 149, § 9.

REPORT TO THE LEGISLATURE ON THE PREVALENCE OF NATURAL GAS LEAKS IN THE NATURAL GAS SYSTEM

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I. INTRODUCTION

Pursuant to An Act Relative to Natural Gas Leaks, St. 2014, c. 149, § 9 ("Section 9" of the "Act"), the Department of Public Utilities ("Department") submits a report on or before December 31 annually which addresses the prevalence of natural gas leaks in the natural gas system to the House and Senate Chairs of the Joint Committee on Telecommunications, Utilities and Energy, and the House and Senate chairs of the Joint Committee on Public Safety and Homeland Security. Specifically, the report must include, but not be limited to, the following: (1) the total number of Grade 1, Grade 2, and Grade 3 leaks as classified in G.L. c. 164, § 144 and reported in the previous year; (2) estimates for lost and unaccounted-for natural gas ("LAUF") and methane emissions as a result of such Grade 1, Grade 2, and Grade 3 leaks; and (3) the time and cost estimates for eliminating the backlog of Grade 1, Grade 2, and Grade 3 leaks. St. 2014, c. 149, § 9. The Department is pleased to present this report to the Joint Committee on Telecommunications, Utilities and Energy and the Joint Committee on Public Safety and Homeland Security for the calendar year ended December 31, 2023.

Natural gas leaks occur in the gas distribution system for several reasons, including the age of the infrastructure, corrosion, and damage from other underground construction projects, also referred to as encroachment.[1] A significant reason for the occurrence of natural gas leaks in Massachusetts is the presence of certain aging, leak-prone infrastructure, including

[1] Encroached pipe includes cast-iron pipe, eight inches or less in diameter, that has been exposed and undermined by a trench crossing the pipeline or by an adjacent, parallel excavation. 220 CMR 113.06, 113.07.

non-cathodically protected steel,[2] cast-iron,[3] and wrought iron.[4] A 2014 study commissioned by the Department estimated that there were over 6,000 miles of aging infrastructure in Massachusetts comprising materials that are vulnerable to natural gas leakage. ICF International, Report on Lost and Unaccounted for Gas (December 23, 2014).[5] The Department has recognized that there may be public safety, service reliability, and environmental issues associated with the continued existence and aging of leak-prone facilities in gas companies' distribution systems. New England Gas Company, D.P.U. 10-114, at 56 (2011); Bay State Gas Company, D.P.U. 09-30, at 133 (2009). Historically, the Department has determined that a

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2 Cathodic protection systems help prevent corrosion from occurring on the exterior of pipes by substituting a new source of electrons, commonly referred to as either a "sacrificial anode" or "impressed current anode." Both systems operate by imparting a direct current onto the buried pipeline, using devices called rectifiers. As long as the current is sufficient, corrosion is prevented, or at least mitigated and held in check. Fact Sheet: Cathodic Protection, United States Department of Transportation, Pipeline & Hazardous Materials Safety Administration, https://primis.phmsa.dot.gov/comm/FactSheets/FSCathodicProtection.htm (last visited November 5, 2024).

3 Gray cast-iron is a cast ferrous material in which a major part of the carbon content occurs as free carbon in the form of flakes interspersed through the metal. Because the carbon flakes do not bond with the ferrous material on the molecular level, the metal is brittle and susceptible to stress cracking under pressure situations. American Gas Association, Gas Piping Technology Committee.

4 Together with cast-iron, wrought iron pipelines are among the oldest energy pipelines constructed in the United States. The degrading nature of iron alloys, the age of the pipelines, and the pipe joint designs have greatly increased the risk involved with the continued use of such pipelines. Pipeline Replacement Background, United States Department of Transportation, Pipeline & Hazardous Materials Safety Administration, https://www.phmsa.dot.gov/data-and-statistics/pipeline-replacement/pipeline-replacement-background (last visited November 5, 2024).

5 https://www.mass.gov/files/documents/2016/08/vt/icf-lauf-report.pdf.

sustained replacement of aging infrastructure facilities is appropriate and desirable from a public policy perspective, given the potential benefits to public safety, service reliability, and the environment. Boston Gas Company/Colonial Gas Company/Essex Gas Company, D.P.U. 10-55, at 121 (2010); D.P.U. 10-114, at 56; D.P.U. 09-30, at 133-134. The Department also acknowledges continuing stakeholder discussions and legislative and policy changes around the future of natural gas infrastructure, and the Department will remain engaged in those initiatives.

The Department and the gas industry are addressing the challenges posed by certain aging infrastructure in several ways. First, recognizing the public safety and environmental issues posed by natural gas leaks, the Department has taken proactive steps to address issues regarding the replacement or repair of leak-prone infrastructure. In the early 1990s, the Department promulgated regulations (220 CMR 113.00) prohibiting the installation of cast-iron pipe for the distribution of gas after April 12, 1991. Beginning in 2009, the Department began approving targeted infrastructure replacement factor ("TIRF") programs for several gas distribution companies to accelerate the replacement of leak-prone infrastructure. Similarly, pursuant to G.L. c. 164, § 145 (added by St. 2014, c. 149, § 2; amended by St. 2021, c. 8, §§ 87-89, St. 2022, c. 179, § 58, and St. 2024, c. 239, § 81) ("GSEP Statute"), gas distribution companies have submitted to the Department accelerated infrastructure replacement plans to replace aging or leaking natural gas pipeline infrastructure, in the interest of public safety and to reduce LAUF. On October 31, 2014, seven of the Commonwealth's gas distribution companies submitted to the Department their first annual accelerated infrastructure replacement plans,

referred to as gas system enhancement plans ("GSEPs").[6] The Department approved the first GSEPs (for 2015) on April 30, 2015. The Department has since approved the gas distribution companies' 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, and 2024 GSEPs, on or about April 30 of those years.[7] Because the intent of the pipeline replacement programs is to reduce the number of natural gas leaks in the natural gas system, as well as to reduce LAUF and methane emissions, we discuss the GSEPs in more detail in Section III, below.[8]

Further, G.L. c. 164, § 144 prescribes a uniform gas leak classification (Grade 1, Grade 2, or Grade 3) based on the hazard presented by a gas leak and a timeline in which distribution companies must repair or monitor each leak depending on its grade. Additionally, G.L. c. 164, § 144(d) prioritizes the repair of gas leaks detected within a school zone, and G.L. c. 164,

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6 The original seven gas distribution companies were: The Berkshire Gas Company; Bay State Gas Company d/b/a Columbia Gas of Massachusetts; Liberty Utilities (New England Natural Gas Company) Corp. d/b/a Liberty Utilities; Boston Gas Company and Colonial Gas Company each d/b/a National Grid; NSTAR Gas Company d/b/a Eversource Energy; and Fitchburg Gas and Electric Light Company d/b/a Unitil. As noted below, there have been some recent organizational changes to these seven companies. The eighth gas distribution company in Massachusetts as of 2014, Blackstone Gas Company, did not submit a GSEP because its gas distribution system contained no leak-prone infrastructure.

Under their GSEPs, the gas distribution companies plan to replace a total of approximately 6,023 miles of aging infrastructure in Massachusetts over 20 years (beginning in 2015), with the exception that Colonial Gas Company intends to complete replacement of its aging infrastructure within eleven years, and NSTAR Gas Company and Boston Gas Company plan to complete their replacements within 25 years.

7 The Department is currently reviewing the gas distribution companies' 2025 GSEPs, filed on October 31, 2024, and will issue final Orders on them no later than April 30, 2025.

8 Section III also provides information on the amount of leak-prone infrastructure within each gas distribution company's system.

§ 144(e) requires gas distribution companies to provide in their annual service quality reports the location, classification date, and repair dates of each leak existing as of the date of the report. On March 8, 2019, the Department promulgated final regulations regarding these requirements and established specific criteria to identify and repair or eliminate environmentally significant Grade 3 leaks ("SEI"). Uniform Natural Gas Leaks Classification Rulemaking, D.P.U. 16-31-C (2019); see 220 CMR 114.00, Uniform Natural Gas Leaks Classification.

Finally, on December 12, 2019, pursuant to St. 2018, c. 227, §§ 19 and 23, the Department promulgated final regulations and guidelines establishing procedures for all gas distribution companies and municipal gas operators to report LAUF and the components thereof -- including fugitive emissions from leaks -- annually to the Department in a uniform manner. LAUF Rulemaking, D.P.U. 19-44-A (2019); see 220 CMR 115.00. The companies filed their first LAUF reports pursuant to the new regulations and guidelines on or about March 15, 2020, and have filed their annual LAUF reports on or about March 15 each year thereafter.

II. PREVALENCE OF NATURAL GAS LEAKS IN THE NATURAL GAS SYSTEM

A. Introduction

General Laws c. 164, § 144, requires the gas distribution companies and municipal gas operators to grade all reported natural gas leaks based on the hazard posed by the leak, and it prescribes a timeline for the companies/operators to repair or monitor natural gas leaks depending on the hazard posed by the leak, as follows:

- A Grade 1 leak represents an existing or probable hazard to persons or property, and requires repair "as immediately as possible," continuous action until the conditions are no longer hazardous, and continuous surveillance until the hazard or source of the leak is eliminated. G.L. c. 164, § 144(b)(2).

- A Grade 2 leak is recognized as non-hazardous to persons or property at the time of detection, but justifies scheduled repair based on probable future hazard. This grade of leak must be repaired, or the main replaced, within twelve months from the date of classification, and must be re-evaluated at least once every six months until eliminated. G.L. c. 164, § 144(b)(3).

- A Grade 3 leak is recognized as non-hazardous to persons or property at the time of detection and can be reasonably expected to remain non-hazardous. This grade of leak must be re-evaluated during the next scheduled survey or within twelve months from the date last evaluated, whichever occurs first, until the leak is eliminated or the main replaced. G.L. c. 164, § 144(b)(4).

For the purposes of this report, the Department gathered gas leak data from the following local gas distribution companies and municipal gas operators in the Commonwealth: The Berkshire Gas Company ("Berkshire"); Eversource Gas of Massachusetts d/b/a Eversource Energy ("EGMA"); Liberty Utilities (New England Natural Gas Company) Corp. d/b/a Liberty Utilities ("Liberty"); Boston Gas Company and Colonial Gas Company d/b/a National Grid ("National Grid");[9] NSTAR Gas Company d/b/a Eversource Energy ("NSTAR Gas"); Fitchburg Gas and Electric Light Company d/b/a Unitil ("Unitil"); Holyoke Gas & Electric Department ("Holyoke"); Middleborough Gas & Electric Department ("Middleborough"); Wakefield Municipal Gas and Light Department ("Wakefield"); and Westfield Gas & Electric Light Department ("Westfield"). Section II.B, below, presents a summary of the gas leak data, as follows: (1) the number of Grade 1, Grade 2, and Grade 3 gas leaks classified pursuant to

[9] On December 16, 2019, the Department approved the merger of Boston Gas Company and Colonial Gas Company with and into Boston Gas Company, within the National Grid USA holding company system. Boston Gas Company and Colonial Gas Company, D.P.U. 19-69 (2019). The merger took effect on March 15, 2020.

G.L. c. 164, § 144 and reported to the Department in 2023;[10] (2) estimates of LAUF and methane emissions from such leaks for 2023; and (3) time and cost estimates for eliminating the backlog of Grade 1, Grade 2, and Grade 3 leaks that existed at the end of 2023. Appendix A, attached to this report, sets forth the company/operator-specific information regarding gas leaks, LAUF, methane emissions, and time/cost estimates.

The Department notes three significant aspects of this report. First, while this report provides the number of Grade 1, Grade 2, and Grade 3 leaks identified and existing during 2023, these data do not represent the number of ongoing, unrepaired leaks as of the date of this report. Rather, the actual number of natural gas leaks on the gas distribution system may fluctuate daily for a number of reasons, including the following: (1) gas distribution companies and municipal gas operators are required to repair Grade 1 leaks "as immediately as possible"; (2) gas distribution companies and municipal gas operators engage in ongoing repair of Grade 2 and Grade 3 leaks; and (3) new Grade 1, Grade 2, and Grade 3 leaks generally occur as a result of encroachment or certain aging infrastructure. Accordingly, the data provided in this report should be viewed as a cumulative total of Grade 1, Grade 2, and Grade 3 leaks as reported in calendar year 2023, along with the associated cost estimates to fix the unrepaired leaks that

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[10] In late 2016 and early 2017, the Department's Pipeline Safety Division ("Division") directed the gas distribution companies and municipal gas operators to begin providing quarterly reports of gas leak information, including total numbers of leaks by grade. In addition, pursuant to G.L. c. 164, § 144, the gas companies are required to report in their annual service quality reports the location of each Grade 1, Grade 2, and Grade 3 leak existing as of the date of the report, the date each leak was classified, and the dates of repairs performed on each Grade 1, Grade 2, and Grade 3 leak. In 2019, the Division began requesting more specific quarterly data pursuant to the new regulations, 220 CMR 114.00.

existed on each reporting entity's gas distribution system as of the end of calendar year 2023. The report also identifies the number of unrepaired leaks, by grade, existing as of the end of calendar year 2023.

Second, the LAUF and methane values contained in this report are not categorized by leak grade, as there is no standard industry approach for calculating LAUF or methane emissions by leak grade (i.e., LAUF or methane emissions associated only with Grade 1, Grade 2, or Grade 3 leaks that exclude other causes). Further, the Department has determined that the LAUF value associated with leakage, as reported to the Department annually by each gas distribution company and municipal gas operator, is the appropriate measurement to include in this report.[11]

Third, all gas distribution companies and municipal gas operators report methane emissions in accordance with the Department of Environmental Protection's 310 CMR 7.71, Reporting of Greenhouse Gas Emissions.[12] The gas distribution companies and municipal gas operators have stated that it is the most widely accepted method used by the natural gas industry to estimate methane emissions from natural gas facilities and, therefore, all leakage on the natural gas system. See Gas Leaks Report, D.P.U. 15-GLR-01, at 10 (2015). Finally, to present

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11 The Department reviewed the LAUF and methane emission estimates that each operator submitted in the Massachusetts addendum to its Form PHMSA F 7100.1 1, which each operator files annually with the Pipeline and Hazardous Materials Safety Administration ("PHMSA") of the U.S. Department of Transportation, pursuant to 49 C.F.R. Part 191. In some cases, the Department also reviewed the LAUF reports.

12 Where applicable, this regulation requires gas distribution companies and municipal gas operators to estimate the average volume of methane emissions by applying the leak factors identified in the Greenhouse Gas regulations, 40 C.F.R. Part 98, subpart W, Table W-7, to various types of pipe material.

the data in a consistent manner, the Department reports LAUF in million British Thermal Units ("MMBTU") and methane emissions in metric tons ("MT").

B. Gas Leaks on Gas Distribution System

Collectively, the gas distribution companies and municipal gas operators reported a total of 22,531 leaks on the gas distribution system in 2023 (including leaks carried over from the prior year and newly identified leaks), classified as follows: (1) 5,033 Grade 1 leaks; (2) 3,960 Grade 2 leaks; and (3) 13,538 Grade 3 leaks (see Appendix A). As of the end of 2023, the gas distribution companies and municipal gas operators reported a total of 10,652 gas leaks remaining on the gas distribution system, classified as follows: (1) 37 Grade 1 leaks; (2) 593 Grade 2 leaks; and (3) 10,022 Grade 3 leaks (550 SEI and 9,472 non-SEI). The gas distribution companies and municipal gas operators estimate that it will cost approximately $17,971,180 to repair the remaining backlog.[13] As calculated and described above, the gas distribution companies and municipal gas operators estimate a total of 341,185.0 MMBTU of LAUF related to leakage and a total of 16,232.7 MT of methane emissions in 2023.[14]

Below is a table displaying leak trends categorized by grade since 2014:

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[13] The time estimates, reported in various ways by each company/operator, are contained in Appendix A. While there were 10,652 leaks remaining on the distribution system as of the end of 2023, the companies/operators have already repaired or eliminated a portion of those leaks during 2024; thus, the repair costs may reflect only part of the backlog that existed as of the end of 2023.

[14] See Appendix A for company/operator-specific information.

	Gas Leaks by Grade 2014-2023									
	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014
Grade 1	37	24	21	26	41	41	30	19	23	86
Grade 2	593	709	638	1,277	1,743	2,346	1,148	902	1,184	1,230
Grade 3	10,022	11,444	12,789	13,509	14,260	15,146	15,587	16,889	16,864	19,459
Total	**10,652**	**12,177**	**13,448**	**14,812**	**16,044**	**17,533**	**16,765**	**17,810**	**18,071**	**20,775**

Comparing 2023 to 2022, these numbers reflect a 54.17 percent increase in Grade 1 leaks, a 16.36 percent decrease in Grade 2 leaks, a 12.43 percent decrease in Grade 3 leaks, and a 12.52 percent decrease in total leaks. Since 2014, there has been a 56.98 percent decrease in Grade 1 leaks, a 51.79 percent decrease in Grade 2 leaks, a 48.50 percent decrease in Grade 3 leaks, and a 48.73 percent decrease in total leaks on the system.

The data demonstrate that while the gas distribution companies and municipal gas operators reported numerous Grade 1, Grade 2, and Grade 3 leaks during calendar year 2023, gas distribution companies and municipal gas operators also continuously engaged in the ongoing repair of these leaks, specifically prioritizing Grade 1 leaks, but also repairing significant numbers of outstanding Grade 2 leaks and Grade 3 leaks. The vast majority of unrepaired leaks as of the end of calendar year 2023 are those specifically classified as non-hazardous. Additionally, except for National Grid, all the gas distribution companies and municipal gas operators repaired their 2023 Grade 1 leaks by the end of 2023.

As discussed above, a significant reason that Grade 1, Grade 2, and Grade 3 gas leaks continue to be identified and reported is that large portions of the gas distribution system are

composed of certain aging infrastructure. We turn now to a discussion of pipeline replacement programs that are designed to accelerate the repair or replacement of leak-prone pipe and will, accordingly, result in the elimination of many natural gas leaks.

III. PIPELINE REPLACEMENT PROGRAMS

A. Introduction

The Department has recognized that there may be public safety, service reliability, and environmental issues associated with the continued existence and aging of leak-prone facilities in gas companies' distribution systems. New England Gas Company, D.P.U. 10-114, at 56 (2011); Bay State Gas Company, D.P.U. 09-30, at 133 (2009). The Department has historically concluded that a sustained replacement of leak-prone facilities is appropriate and desirable from a public policy perspective given the potential benefits to public safety, service reliability, and the environment. D.P.U. 10-114, at 56; Boston Gas Company/Colonial Gas Company/Essex Gas Company, D.P.U. 10-55, at 121 (2010); D.P.U. 09-30, at 133-134. In the early 1990s, the Department promulgated regulations (220 CMR 113.00) that prohibited the installation of cast-iron pipe for gas distribution after April 12, 1991. These regulations required that each gas distribution company develop and implement cast-iron replacement programs. The regulations also included a mandatory provision requiring gas distribution companies to immediately replace cast-iron pipe that has been encroached upon.

Beginning in 2009, the Department approved TIRF programs by which gas distribution companies could accelerate the repair or replacement of certain types of aging infrastructure. Specifically, the Department approved proposals to implement TIRF programs for Bay State in 2009, National Grid in 2010, and Liberty in 2010. D.P.U. 10-55, at 122; D.P.U. 09-30, at 134;

D.P.U. 10-114, at 56, 76-77. The TIRF programs allowed these companies to recover the revenue requirement (including depreciation, return on investment, and property taxes) on investments made to replace leak-prone mains, services, and other facilities through a reconciling mechanism outside of base rates. D.P.U. 10-55, at 137-138, 145; D.P.U. 10-114, at 35; Bay State Gas Company, D.P.U. 13-75, at 21 (2014). Through the TIRFs, National Grid, Bay State, and Liberty Utilities replaced significant amounts of leak-prone infrastructure.[15] The TIRF programs were phased out as the gas distribution companies transitioned to GSEPs for accelerated pipe replacement. As demonstrated by the TIRFs and now the GSEPs, and as discussed in greater detail below, Massachusetts has set a course to eliminate leak-prone infrastructure on an accelerated basis.

B. GSEPs

1. Overview

For those gas distribution companies operating with TIRF programs, the GSEP Statute replaced the TIRF program for replacement of eligible infrastructure as of January 1, 2015. See

[15] Specifically, between 2010 and 2013, Boston Gas eliminated 335 miles of cast iron and non-cathodically protected steel mains, along with 8,000 services, and Colonial Gas eliminated 154 miles of cast-iron and non-cathodically protected steel mains, along with 969 services. Boston Gas Company/Colonial Gas Company, D.P.U. 14-132, at 10 n.14 (2015). Between 2010 and 2013, Bay State eliminated 177 miles of cast-iron and non-cathodically protected steel mains, along with 10,079 services. Bay State Gas Company d/b/a Columbia Gas of Massachusetts, D.P.U. 14-134, at 9 n.13 (2015). Finally, between 2010 and 2013, Liberty Utilities eliminated approximately 25 miles of non-cathodically protected steel or cast-iron/wrought iron mains, along with replacement of 1,994 services. Liberty Utilities (New England Natural Gas Company) Corp., D.P.U. 14-133, Exh. LU-1, at 4 (2015).

G.L. c. 164, § 145 (added by St. 2014, c. 149, § 2; amended by St. 2021, c. 8, §§ 87-89,[16] St. 2022, c. 179, § 58,[17] and St. 2024, c. 239, § 81). There have been several amendments to the GSEP Statute since its enactment, most recently on November 20, 2024.[18] This report addresses the prevalence of leaks in calendar year 2023. Accordingly, where the Department references the GSEP Statute in this section, it is referring to the version that was effective August 11, 2022 to November 19, 2024. Pursuant to the GSEP Statute, each gas distribution company annually submits a plan to accelerate the replacement of leak-prone infrastructure and to address the leak rate on the gas company's natural gas infrastructure. G.L. c. 164, § 145(b) (eff. August 11, 2022). The GSEP Statute also provides as follows:

> Each company's gas infrastructure plan shall include interim targets for the department's review. The department shall review these interim targets to ensure each gas company is meeting the appropriate pace to reduce the leak rate on and to replace the gas company's natural gas infrastructure in a safe and timely manner. The interim targets shall be for periods of not more than 6 years or at the conclusion of 2 complete 3-year walking survey cycles conducted by the gas company. The gas companies shall incorporate these interim targets into timelines for removing all leak-prone infrastructure filed pursuant to

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16 On March 26, 2021, Governor Baker signed An Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy, St. 2021, c. 8, § 87, which amended G.L. c. 164, § 145. Key changes include requirements that (1) companies submit GSEPs annually, (2) companies include interim targets in their GSEPs, and (3) where practical, moving meters currently located inside a structure to outside locations.

17 On August 11, 2022, Governor Baker signed An Act Driving Clean Energy and Offshore Wind, St. 2022, c. 179, § 58, which amended the definition of "eligible infrastructure replacement" under G.L. c. 164, § 145(a) to include the use of advanced leak repair technology approved by the Department to repair an existing leak-prone gas pipe to extend the useful life of the such gas pipe by no less than 10 years; and replacing gas infrastructure with utility-scale non-emitting renewable thermal energy infrastructure.

18 On November 20, 2024, Governor Healey signed An Act Promoting a Clean Energy Grid, Advancing Equity and Protecting Ratepayers, St. 2024, c. 239, § 81, which made several amendments to G.L. c. 164, § 145. For the purposes of this report, references to the GSEP Statute do not reflect the 2024 amendments.

> subsection (c) and may update them based on overall progress. The department may levy a penalty against any gas company that fails to meet its interim target in an amount up to and including the equivalent of 2.5 per cent of such gas company's transmission and distribution service revenues for the previous calendar year.
> G.L. c. 164, § 145(b) (eff. August 11, 2022).

Any plan filed with the Department shall include, but not be limited to the following: (i) eligible infrastructure replacement of mains, services, meter sets and other ancillary facilities composed of non-cathodically protected steel, cast-iron and wrought iron, which are prioritized to implement the federal gas distribution pipeline integrity management plan annually submitted to the Department and consistent with the requirements of 49 C.F.R. § 192.1001 through § 192.1015; (ii) an anticipated timeline for the completion of each project; (iii) the estimated cost of each project; (iv) rate change requests; (v) a description of customer costs and benefits under the plan; (vi) the relocations, where practical, of a meter located inside of a structure to the outside of said structure for the purpose of improving public safety; and (vii) any other information the Department considers necessary to evaluate the plan. G.L. c. 164, § 145(c) (eff. August 11, 2022). Additionally, the GSEP Statute requires that any plan filed include a timeline for removing all leak-prone infrastructure on an accelerated basis specifying an annual replacement pace and program end date with a target end date of either (i) not more than 20 years from the filing of the initial plan or (ii) a reasonable target end date considering the allowable cost recovery cap established pursuant to subsection (f). G.L. c. 164, § 145(c) (eff. August 11, 2022).[19]

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[19] The GSEP Statute further provides that annual changes in the revenue requirement eligible for recovery pursuant to the plan shall not exceed (i) 1.5 percent of the gas company's most recent calendar year total firm revenues, including gas revenues attributable to sales and transportation customers, or (ii) an amount determined by the

If a plan complies with Section 145 and the Department determines that it reasonably accelerates eligible infrastructure replacement and provides benefits to customers, the Department must preliminarily accept the plan either in whole or in part. G.L. c. 164, § 145(e) (eff. August 11, 2022). The gas distribution company may begin recovering the estimated plan revenue requirement on May 1 of the year following submission of the plan. G.L. c. 164, § 145(e) (eff. August 11, 2022). Subsequently, on or before May 1 of each year, the gas distribution company must file final project documentation for construction completed during the previous calendar year to demonstrate substantial compliance with the plan and to demonstrate that the costs were reasonably and prudently incurred. G.L. c. 164, § 145(f) (eff. August 11, 2022).

On October 31, 2014, the seven gas distribution companies noted above (Unitil, Berkshire, Liberty, National Grid,[20] Bay State, and NSTAR Gas) submitted to the Department

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Department that is greater than 1.5 percent of the gas company's most recent calendar year total firm revenues, including gas revenues attributable to sales and transportation customers. G.L. c. 164, § 145(f) (eff. August 11, 2022). In 2019, the Department revised the cap calculation and raised the cap to three percent, stating that this cap would remain in effect until further ordered. See, e.g., Fitchburg Gas and Electric Light Company, D.P.U. 18-GSEP-01, at 30 (2019). The Department may modify a plan prior to approval at the request of a gas company, or it may make other modifications to a plan as a condition of approval. G.L. c. 164, § 145(d) (eff. August 11, 2022). The Department is required to consider the costs and benefits of the plan including, but not limited to, impacts on ratepayers, reductions of LAUF through a reduction in natural gas system leaks, and improvements to public safety. G.L. c. 164, § 145(d) (eff. August 11, 2022). The Department is also required to give priority to plans narrowly tailored to addressing leak-prone infrastructure most immediately in need of replacement. G.L. c. 164, § 145(d) (eff. August 11, 2022).

[20] Boston Gas Company and Colonial Gas Company submitted a joint GSEP under one docket number.

their first annual GSEPs. As part of its proposed GSEP, each company, among other things, (1) submitted a plan to repair or replace eligible leak-prone infrastructure during calendar year 2015, (2) estimated a revenue requirement associated with that replacement, and (3) provided a timeline to repair or replace all leak-prone infrastructure in its gas distribution system. On April 30, 2015, the Department approved each company's initial GSEP. The gas distribution companies have submitted their annual GSEPs on or about each October 31 thereafter, and the Department has approved them, subject to further review and investigation, to become effective May 1 of the following year.[21] The Department is currently reviewing the companies' eleventh annual GSEPs, for calendar year 2025.

Additionally, on or about April 29, 2016, pursuant to G.L. c. 164, § 145(f), these same gas distribution companies submitted to the Department their first annual GSEP reconciliation filings ("GRECs"), wherein each company reconciled its actual investments with its planned investment for calendar year 2015. The Department approved the first GRECs, in substantial part, on October 31, 2016. The gas distribution companies have submitted their annual GRECs on or about each May 1 thereafter, and the Department has approved them, wholly or in substantial part, on or about October 31. The following summarizes the GREC information reported for each GSEP year:

- 2015 GSEPs: $291.6 million expended to replace 221.24 miles of leak-prone mains and 11,119 leak-prone services, plus related work.

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[21] Pursuant to G.L. c. 164, § 145(c), the companies submitted with their 2023 GSEPs a summary of the GSEP replacement progress to date, the work to be completed over the next five years, and a discussion of related issues that the companies identified as impacting the continued effectiveness of the GSEPs.

- 2016 GSEPs: $356 million expended to replace 250 miles of leak-prone mains and 16,804 leak-prone services, plus related work.
- 2017 GSEPs: $416.7 million expended to replace 280.3 miles of leak-prone mains and 18,708 leak-prone services, plus related work.
- 2018 GSEPs: $287.2 million expended to replace 165.4 miles of leak-prone mains and 11,337 leak-prone services, plus related work.
- 2019 GSEPs: $418.5 million to replace 214.89 miles of leak-prone mains and 13,995 leak-prone services, plus related work.
- 2020 GSEPs: $506.6 million expended to replace 213.55 miles of leak prone mains and 14,287 leak-prone services, plus related work.
- 2021 GSEPs: $510.9 million expended to replace 255.3 miles of leak prone mains and 17,619 leak-prone services, plus related work.
- 2022 GSEPs: $561.1 million expended to replace 275.89 miles of leak prone mains and 17,598 leak-prone services, plus related work.
- 2023 GSEPs: $583.7 million expended to replace 268.5 miles of leak prone mains and 16,519 leak-prone services, plus related work.

Based on each gas distribution company's most recently approved GSEP, the following provides a current summary of the amount of leak-prone infrastructure on each company's system, the infrastructure that each company anticipated replacing during calendar year 2024, the revenue requirement associated with the 2024 GSEP, and the company's anticipated timeline to repair or replace all leak-prone infrastructure.

2. Unitil

Unitil distributes natural gas to approximately 16,417 customers in six communities in Massachusetts. Fitchburg Gas and Electric Light Company, D.P.U. 23-GSEP-01, at 9 (April 30, 2024). Unitil owns and operates approximately 271 miles of distribution mains and 11,242 services. D.P.U. 23-GSEP-01, at 9. Unitil states that approximately 2.93 percent of its

distribution mains (7.96 miles) and 9.80 percent (1,102) of its services are composed of unprotected bare or coated steel, 11.21 percent (30.41 miles) of its mains and zero percent of its services are composed of cast-iron or wrought iron, and 0.27 percent of its mains and zero percent of its services are composed of ductile iron. D.P.U. 23-GSEP-01, at 10. This means that approximately 14.41 percent of the distribution mains (39.11 miles) and 9.80 percent (1,102 miles) of the distribution services are composed of leak-prone materials. D.P.U. 23-GSEP-01, at 10.

Historically, beginning in 2000, Unitil replaced a minimum of two miles of leak-prone pipe per year. D.P.U. 23-GSEP-01, at 10. Unitil's initial GSEP established a program to replace all eligible leak-prone infrastructure, including mains, services, meter sets, and other ancillary facilities, over a 20-year period, with an anticipated replacement rate of 3.5 miles per year. D.P.U. 23-GSEP-01, at 10. Unitil estimates retiring 6.00 miles of leak-prone main and replacing 354 associated services in 2024. D.P.U. 23-GSEP-01, at 10. Unitil anticipates that all GSEP-eligible pipe in its service territory will be replaced by the end of 2034. D.P.U. 23-GSEP-01, at 13.

3. Berkshire

Berkshire distributes natural gas to approximately 40,000 customers in Berkshire County and portions of Hampshire and Franklin Counties. The Berkshire Gas Company, D.P.U. 23-GSEP-02, at 8 (April 30, 2024). Berkshire operates a network of approximately 766 miles of natural gas mains and over 32,876 active services. D.P.U. 23-GSEP-02, at 8. Berkshire states that about nine percent of its system mileage consists of leak-prone mains and services comprising cast-iron, bare steel, and non-cathodically protected coated steel pipe.

D.P.U. 23-GSEP-02, at 9. Berkshire further states that these cast-iron and unprotected steel facilities accounted for approximately 66 percent of all leaks that occurred on its system as of the end of 2022. D.P.U. 23-GSEP-02, at 9.

Berkshire developed its GSEP to replace 109 miles of leak-prone cast-iron and bare steel infrastructure on an accelerated basis over 20 years, beginning January 1, 2015, and ending December 31, 2034. D.P.U. 23-GSEP-02, at 9. Under its approved GSEP, Berkshire intends to replace approximately 11.73 miles of main and 482 services in 2024. D.P.U. 23-GSEP-02, at 9.

4. National Grid

In Massachusetts, National Grid distributes natural gas to approximately 950,000 customers in 144 cities and towns. Boston Gas Company d/b/a National Grid, D.P.U. 23-GSEP-03, at 10 (April 30, 2024). As of December 31, 2022, National Grid owns and operates 7,273 miles of distribution mains and 568,168 services. D.P.U. 23-GSEP-03, at 10. For Boston Gas, National Grid states that approximately 13.7 percent (996 miles) of the distribution system mains consist of non-cathodically protected steel, 19.6 percent (1,425 miles) consist of cast-iron and wrought iron, and 2.5 percent (182 miles) consist of pre-1985 Aldyl-A plastic; thus, approximately 36 percent of the distribution system mains consist of leak-prone pipe. D.P.U. 23-GSEP-03, at 10. For Colonial Gas, National Grid states that approximately 1.6 percent (62 miles) of the distribution system mains consist of non-cathodically protected steel, approximately 1.5 percent (60 miles) consist of cast-iron and wrought iron, and approximately 4.7 percent (186 miles) consist of pre-1985 Aldyl-A plastic; thus, approximately nine percent of the distribution system mains consist of leak-prone pipe. D.P.U. 23-GSEP-03, at 10.

Pursuant to the approved National Grid GSEP, Boston Gas anticipates replacing all eligible leak-prone facilities by 2039, and Colonial Gas anticipates replacing all eligible leak-prone facilities by 2034. D.P.U. 23-GSEP-03, at 11. Under the approved GSEP, Boston Gas anticipates replacing 120 miles of leak-prone mains and associated services in 2024, and Colonial Gas anticipates replacing 14 miles of leak-prone mains and associated services in 2024. D.P.U. 23-GSEP-03, at 11.

5. Liberty

Liberty distributes natural gas to approximately 58,582 customers in the Fall River, North Attleboro, Plainville, Swansea, Somerset, and Westport communities of Massachusetts. Liberty Utilities (New England Natural Gas Company) Corp., D.P.U. 23-GSEP-04, at 8 (April 30, 2024). As of December 31, 2022, Liberty's distribution system consisted of 628.543 miles of main and 37,097 services. D.P.U. 23-GSEP-04, at 9. Approximately 6.92 percent (43.5 miles) of Liberty's distribution system mains were composed of non-cathodically protected steel, approximately 10.42 percent (65.5 miles) were composed of smaller diameter cast-iron and wrought iron, and approximately 0.473 percent (3.0 miles) were composed of large diameter cast-iron and wrought iron, which means that approximately 17.8 percent of the system was composed of relatively higher risk materials. D.P.U. 23-GSEP-04, at 9. Additionally, approximately 17.35 percent, or 6,437, of the services were composed of non-cathodically protected steel, and approximately 0.06 percent, or 21, of the services were composed of copper. D.P.U. 23-GSEP-04, at 9. Liberty reported no services composed of cast-iron or wrought iron. D.P.U. 23-GSEP-04, at 9.

Under the initial GSEP, Liberty anticipated replacing approximately 230 miles of leak-prone main and 13,711 leak-prone services on its system over a 20-year period. D.P.U. 23-GSEP-04, at 9. Liberty anticipates replacing approximately 15 miles of leak-prone main and 793 leak-prone services in 2024. D.P.U. 23-GSEP-04, at 10. Liberty projects a completed replacement of its eligible leak-prone main infrastructure pursuant to the GSEP in or near 2031. D.P.U. 23-GSEP-04, at 15.

6. EGMA

EGMA distributes natural gas to approximately 330,000 customers in 61 communities in three operating areas in Massachusetts: Brockton, Springfield, and Lawrence. Eversource Gas Company of Massachusetts, D.P.U. 23-GSEP-05, at 8 (April 30, 2024). As of December 31, 2022, EGMA's distribution system consisted of 5,020 miles of mains and 282,309 services. D.P.U. 23-GSEP-05, at 9. Approximately 3.17 percent (159 miles) of EGMA's distribution system mains were composed of non-cathodically protected steel and approximately 7.37 percent (370 miles) were composed of cast-iron or wrought iron, which means that approximately 10.54 percent (529 miles) of the distribution system mains were composed of relatively higher risk materials. D.P.U. 23-GSEP-05, at 9. Additionally, approximately 10.9 percent, or 30,738, of its distribution system services were composed of non-cathodically protected steel, and 506 services (0.18 percent) were composed of copper. D.P.U. 23-GSEP-05, at 9.

Pursuant to its initial GSEP, EGMA anticipated replacing an average of 50.89 miles per year of eligible aging infrastructure over a 20-year period, from 2015 through 2033. D.P.U. 23-GSEP-05, at 9. In 2024, EGMA anticipates replacing approximately 45 miles of leak-prone mains and 2,400 leak-prone services. D.P.U. 23-GSEP-05, at 9. Based on the information

currently available, EGMA anticipates it could complete its GSEP earlier than the 20-year timeframe approved in D.P.U. 14-134. D.P.U. 23-GSEP-05, at 10.

7. NSTAR Gas

NSTAR Gas distributes natural gas to approximately 300,000 customers in 52 communities in central and eastern Massachusetts. NSTAR Gas Company d/b/a Eversource Energy, D.P.U. 23-GSEP-06, at 9 (April 30, 2024). NSTAR Gas owns and operates approximately 3,315 miles of distribution mains and 210,012 services. D.P.U. 23-GSEP-06, at 9. NSTAR Gas states that, as of December 31, 2022, approximately 15.5 percent of its distribution system mains are composed of non-cathodically protected steel and approximately 7.5 percent of its distribution system is composed of cast-iron, which means that approximately 23 percent of the distribution system mains are composed of leak-prone materials. D.P.U. 23-GSEP-06, at 9.

Historically, NSTAR Gas replaced an average of 25 miles of leak-prone pipe per year. D.P.U. 23-GSEP-06, at 9. Pursuant to its initial GSEP, NSTAR Gas estimated that it would replace all eligible aging infrastructure over a 25-year period, with an anticipated replacement rate of 50 miles per year following an initial five-year ramp-up period. D.P.U. 23-GSEP-06, at 9. In its 2021 GSEP, NSTAR Gas extended the ramp-up period by two years to reach a replacement rate of 60 miles per year and to reduce the overall GSEP program to less than 25 years. D.P.U. 23-GSEP-06, at 9. NSTAR Gas states that because of a ten-mile shortfall in 2020 due to the COVID-19 pandemic, it will increase its replacement rate by two miles per year for the five-year period beginning in 2022. D.P.U. 23-GSEP-06, at 9. In 2024, NSTAR Gas

anticipates replacing 62 miles of leak-prone main and 3,000 associated services. D.P.U. 23-GSEP-06, at 10.

IV. CONCLUSION

Pursuant to Section 9 of the Act, the Department has gathered data from gas distribution companies and municipal gas operators regarding the prevalence of natural gas leaks on the natural gas system. As indicated above, that data represent the total, cumulative leaks by grade during calendar year 2023, as well as system-wide LAUF and methane emissions. The data demonstrate that while the gas distribution companies and municipal gas operators identified numerous Grade 1, Grade 2, and Grade 3 leaks during calendar year 2023, the gas distribution companies and municipal gas operators have also continuously engaged in the ongoing repair of these leaks. More specifically, the gas distribution companies and municipal gas operators have specifically prioritized repair of Grade 1 leaks, which are defined as hazardous leaks, but have also repaired significant numbers of outstanding Grade 2 leaks as well as Grade 3 leaks, both of which are defined as nonhazardous leaks. With the exception of National Grid's Grade 1 leaks, all other Grade 1 leaks that occurred on the gas distribution systems during calendar year 2023 had been repaired by the end of 2023.

As discussed above, a major reason that natural gas leaks occur on Massachusetts' natural gas distribution system is the presence of certain types of older infrastructure, including non-cathodically protected steel, cast-iron pipe, and wrought iron pipe, on significant portions of the system. The Department has historically recognized public safety and environmental issues posed by natural gas leaks, and it is confident that those issues are being addressed in several ways, including through implementation of a cast-iron replacement program and the accelerated

replacement of aging infrastructure under the GSEPs submitted by the gas distribution companies with leak-prone pipes. The Department will continue to monitor the progress of the gas distribution companies in replacing aging infrastructure through review of the gas distribution companies' annual GSEP filings, which detail plans to repair or replace aging or leak-prone infrastructure the following calendar year, and through review of the companies' annual GREC filings, which detail the repair or replacement work performed in the previous calendar year.

On December 6, 2023, the Department issued its Order on Regulatory Principles and Framework in D.P.U. 20-80, the Department's investigation into the role of gas companies in achieving the Commonwealth's 2050 climate goals. In D.P.U. 20-80-B, the Department adopted policies designed geared generally "toward minimizing additional investment in pipeline and distribution mains and achieving decarbonization in the residential, commercial, and industrial sectors." D.P.U. 20-80-B at 13. According to the Department's Order, gas companies must "move beyond 'business as usual' in their gas system planning, whether involving proposed expansion of service to new areas or investments necessary to maintain the safety of existing natural gas infrastructure." D.P.U. 20-80-B at 13-14. A gas company's GSEP represents its plan for such investments, and the "different lens [to be] applied to gas infrastructure investments going forward" that the Department described in D.P.U. 20-80-B at 13 is applicable to our review of GSEP filings. A related requirement from D.P.U. 20-80-B is the obligation imposed on LDCs to demonstrate that they considered non-gas pipeline alternatives ("NPAs") as a condition of recovering additional investment in pipeline and distribution mains. In its Order on Joint Motion for Clarification Filed by the Gas Local Distribution Companies, the Department

clarified that it "did not carve out GSEP or any other project category as exempt from the NPA analysis requirement in its Order." D.P.U. 20-80-C at 21.

Further, the 2024 Amendments to the GSEP Statute modify the definition of "eligible infrastructure investment" to "eligible infrastructure measure," and thereby include "retirement or improvement" in addition to "replacement." Other sections of the 2024 Amendments refer to "remediating" or "remediation" as a response to leak-prone infrastructure. These amendments give the Department more authority to require measures other than replacement to address leak-prone pipe, and the Department intends to enforce these provisions going forward.

The Department thanks the Joint Committee on Telecommunications, Utilities and Energy and the Joint Committee on Public Safety and Homeland Security for the opportunity to present this report addressing gas leaks in the natural gas distribution system. As discussed above, the Department will continue to monitor and work with the gas distribution companies to ensure that gas leaks are repaired in a timely and cost-efficient manner and to ensure continued public safety in the Commonwealth of Massachusetts. The Department remains engaged and encouraged by the continuing discussion around the future of natural gas infrastructure.

By Order of the Department,

James M. Van Nostrand, Chair

Cecile M. Fraser, Commissioner

Staci Rubin, Commissioner

V. APPENDIX A: 2023 GAS LEAKS INFORMATION

	Leaks Carried Forward from CY2022	New Leaks Identified	Total Leaks on System (A + B)	Leaks Repaired or Eliminated	Leaks Pending At End of CY2023 (C - D)	Leaks Pending At End of CY2023 (Reported)	LAUF (MMBTU)	Total Methane Emissions (MT)	Backlog Repair Estimates	
									Time to Complete	Cost to Complete
The Berkshire Gas Company										
Grade 1	0	35	35	35	0	0	6,205.0	116.00	96 months	$262,400
Grade 2	28	32	60	53	7	9				
Grade 3 SEI	0	1	1	1	0	0				
Grade 3 nonSEI	77	31	108	42	66	64				
Totals	**105**	**99**	**204**	**131**	**73**	**73**				
Eversource Gas of Massachusetts d/b/a Eversource Energy										
Grade 1	0	497	497	483	14	0	49,961.1	10,432.2	90 months	$8,000,000
Grade 2	70	657	727	553	174	41				
Grade 3 SEI	38	47	85	20	65	24				
Grade 3 nonSEI	1,386	538	1,924	72	1,852	1,587				
Totals	**1,494**	**1,739**	**3,233**	**1,128**	**2,105**	**1,652**				
NSTAR Gas Company d/b/a Eversource Energy										
Grade 1	0	661	661	650	11	0	45,962.4	860.94	109 months	$3,600,000
Grade 2	49	611	660	491	169	41				
Grade 3 SEI	45	61	106	6	100	62				
Grade 3 nonSEI	1,672	532	2,204	60	2,144	1,176				
Totals	**1,766**	**1,865**	**3,631**	**1,207**	**2,424**	**1,279**				
Holyoke Gas & Electric Dept.										
Grade 1	0	30	30	27	3	0	3,436.0	63.40	n/a	$0
Grade 2	0	29	29	34	-5	0				
Grade 3 SEI	0	0	0	3	-3	0				
Grade 3 nonSEI	0	15	15	10	5	0				
Totals	**0**	**74**	**74**	**74**	**0**	**0**				
Liberty Utilities (New England Natural Gas Company) Corp. d/b/a Liberty Utilities										
Grade 1	0	79	79	79	0	0	8,426.0	161.80	12 months (G2); per 220 CMR 114.00 timelines (G3)	$1,638,382.20
Grade 2	5	35	40	31	9	10				
Grade 3 SEI	0	0	0	0	0	0				
Grade 3 nonSEI	244	41	285	34	251	248				
Totals	**249**	**155**	**404**	**144**	**260**	**258**				
Middleborough Gas & Electric Dept.										
Grade 1	0	6	6	6	0	0	3,023.7	0.027	n/a	$0
Grade 2	0	5	5	5	0	0				
Grade 3 SEI	0	0	0	0	0	0				
Grade 3 nonSEI	0	4	4	4	0	0				
Totals	**0**	**15**	**15**	**15**	**0**	**0**				
Boston Gas Company and Colonial Gas Company, each d/b/a National Grid										
Grade 1	20	3,571	3,591	3,554	37	37	215,688.0	4,036.00	12 months	$3,808,398
Grade 2	886	1,472	2,358	1,873	485	485				
Grade 3 SEI	527	109	636	173	463	463				
Grade 3 nonSEI	7,005	1,080	8,085	1,722	6,363	6,363				
Totals	**8,438**	**6,232**	**14,670**	**7,322**	**7,348**	**7,348**				
Fitchburg Gas and Electric Light Company d/b/a Unitil										
Grade 1	0	116	116	116	0	0	3,095.0	57.60	n/a	$0
Grade 2	0	43	43	43	0	0				
Grade 3 SEI	0	5	5	5	0	0				
Grade 3 nonSEI	0	9	9	9	0	0				
Totals	**0**	**173**	**173**	**173**	**0**	**0**				
Wakefield Municipal Gas & Electric Light Dept.										
Grade 1	0	5	5	7	-2	0	5,273.0	503.00	App. 15 repaired in 12 months, remaining 21 within 24-36	$650,000
Grade 2	1	3	4	3	1	1				
Grade 3 SEI	8	2	10	9	1	1				
Grade 3 nonSEI	45	9	54	18	36	34				
Totals	**54**	**19**	**73**	**37**	**36**	**36**				
Westfield Gas & Electric Light Dept.										
Grade 1	0	13	13	13	0	0	114.8	1.70	6 months	$12,000
Grade 2	3	31	34	28	6	6				
Grade 3 SEI	0	0	0	0	0	0				
Grade 3 nonSEI	1	6	7	6	1	0				
Totals	**4**	**50**	**54**	**47**	**7**	**6**				
TOTALS										
Grade 1	**20**	**5,013**	**5,033**	**4,970**	**63**	**37**	**341,185.0**	**16,232.7**	**n/a**	**$17,971,180**
Grade 2	**1,042**	**2,918**	**3,960**	**3,114**	**846**	**593**				
Grade 3 SEI	**618**	**225**	**843**	**217**	**626**	**550**				
Grade 3 nonSEI	**10,430**	**2,265**	**12,695**	**1,977**	**10,718**	**9,472**				
Totals	**12,110**	**10,421**	**22,531**	**10,278**	**12,253**	**10,652**				