ONITA R. KING
Rates & Regulatory Affairs
Tel: 503.721.2452
Fax: 503.721.2516
email: ork@nwnatural.com

NW Natural
220 NW 2ND AVENUE
PORTLAND, OR 97209
TEL 503.226.4211
www.nwnatural.com

September 28, 2018

VIA ELECTRONIC FILING

Public Utility Commission of Oregon
Attention: Filing Center
201 High Street SE Suite 100
Post Office Box 1088
Salem, Oregon 97308-1088

Re: UM 1900: NW Natural's Annual Oregon Safety Project Plan in Compliance with OPUC Order No. 17-084

Northwest Natural Gas Company, dba NW Natural ("NW Natural" or the "Company"), hereby submits its annual 'Safety Project Plan' in compliance with Commission Order 17-084 entered March 6, 2017.

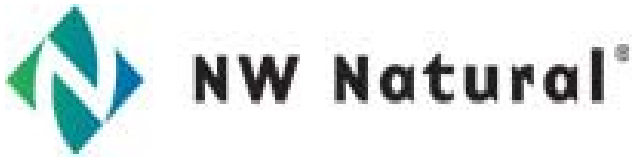
If you have any questions, please contact me at (503) 721-2452 or Jose Gonzalez at (503) 226-4211, extension 4431.

Sincerely,

/s/ Onita R. King

Onita R. King
NW Natural

Enclosure



2018 SAFETY PROJECT PLAN

OREGON

September 28, 2018

Contents

I. Introduction

In compliance with the Oregon Public Utility Commission ("Commission" or "OPUC") Order No 17-084 ("Order") in Docket UM 1722, this 2018 Safety Project Plan (SPP) ("2018 SPP") outlines NW Natural's safety project investments for the calendar year 2019. The 2018 SPP follows the same format presented in the 2017 Plan, and includes new capital safety projects and O&M safety projects, together with some of the projects from the 2017 SPP that will continue into 2019. The 2018 SPP includes a new section (Section XII) that captures the Completed Projects from the 2017 SPP. The 2018 SPP also includes a new section (Section XIII) to introduce future safety programs. However, because the Transmission Mega Rule and the Plastic Pipe Rule publication planned for October 2018, have not yet been released, subsequent revisions to Section XIII in this 2018 SPP may be warranted.

The purpose of the annual SPP is to demonstrate NW Natural's commitment to safety, to identify insight into NW Natural's safety activities, and to identify when major regulatory changes may drive new safety program priorities or modify existing safety programs. In the event that NW Natural seeks approval for a Safety Cost Recovery Mechanism (SCRM), the annual SPP is intended to expedite the review process of safety investments. Safety is a core value at NW Natural and is critically important in all aspects of the Company's pipeline and storage operations. The Company appreciates the opportunity to present this information to the Commission and looks forward to continued engagement with our stakeholders on these important issues.

II. Background Information

NW Natural is a regulated utility doing business in Oregon and southwest Washington. NW Natural serves approximately 740,000 total customers and owns and operates 654 miles of transmission pipelines, 13,722 miles of distribution pipelines, and three energy storage facilities in Oregon – Portland and Newport LNG Plants and Mist Underground Storage.

NW Natural's pipelines and Oregon storage facilities are governed by:

- 49 CFR Part 192 – Minimum Safety Standard – Transmission & Distribution Systems
- 49 CFR Part 193 – LNG Safety Standards
- 49 CFR Part 196 – Protection of Underground Pipelines from Excavations Activity
- Additional OARs (OAR 860-024 – Safety, OAR 860-031 – Pipeline Inspections), and ORSs such as ORS 757.039 – Regulation of hazardous substance distribution and storage operations, and ORS 757.542-993 – One call notification.

In addition to the federal and state regulations identified above, NW Natural's safety program gives consideration to the findings of Oregon House Resolution 3 (HR 3, 2011) which directed the Oregon Seismic Safety Policy Advisory Commission to prepare the Oregon Resiliency Plan with the purpose of identifying recommendations for how Oregon's critical energy infrastructures could be made seismically resilient against a Cascadia subduction zone earthquake. Upon completion of that work on February 28, 2013, the Oregon Senate passed Senate Bill 33 (SB 33, 2013), which recommends that LDCs conduct seismic assessments of their regulated facilities.

III. The Greatest Safety Threats for NW Natural

NW Natural's three greatest threats, as identified in the DIMP Plan are:

A. Excavation Damage

Excavation damage continues to be the largest threat to NW Natural's gas distribution system, comprising approximately 60 percent of all recorded leak repairs. Excavation damage is a system-wide threat brought on predominantly by insufficient excavator practices. NW Natural is proactive in its efforts to attempt to reduce these insufficiencies, as described below.

- Excavation Practices:

  NW Natural actively engages in educating the general public, customers, employees, other utilities, and contractors about safe excavation procedures and practices using state dig laws and industry best practices.

- One-Call Notification Practices:

  NW Natural is active in local and state-level Utility Coordinating Councils as well as the One Call Utility Notification board work. One of the primary functions of all of these entities is increasing public awareness around the use and laws of Oregon's one call system. NW Natural also maintains a robust Public Awareness Program which includes advertising, direct mailings and public event outreach to increase this awareness.

- Contractor Locating Practices:

  NW Natural is an active member of Oregon's one call system and responds to all locate requests. Due to the high volume of locate requests, NW Natural contracts a portion of those locates. Insufficient locating practices are the result of a contract locator mismarking a natural gas facility or failing to complete a locate request on time. NW Natural maintains routine communication with contractors and has implemented a Quality Assurance

program that includes locating contractors in an effort to minimize the incidences of mismarks and missed due dates.

- Incorrect Facility Marking:

  Incorrectly marked facilities may be due to underground interference, equipment issues, inaccurate facility maps, or procedural issues. If a NW Natural employee is responsible for a mismark, their direct supervisor and the Damage Prevention Department are notified. An investigation by the Damage Prevention Department and a Quality Assurance review are completed and the results are shared with the supervisor for further follow up and training as needed. Additionally the results are reviewed for training improvements, procedural deficiencies, and facility mapping updates. NW Natural follows the same procedure for its locating contractors.

B. Material, Weld or Joint Failure

Material, weld, or joint failure is the second largest threat to the NW Natural gas distribution system, comprising approximately 15 percent of all recorded leak repairs NW Natural is proactive in its efforts to attempt to reduce these occurrences, as described below.

- Plastic Pipe Installed from 1960s to 1980s:

  NW Natural makes every effort to identify all pre-1982 plastic pipe installations, analyze leak histories, evaluate any conditions that may threaten integrity of the pipe, and take appropriate remedial action, including replacement, to mitigate risks to public safety.

- ABS (Acrylonitrile-Butadiene-Styrene):

  NW Natural used ABS in the 1960s to reline existing steel services. These services have been identified for replacement. NW Natural's use of ABS was limited to ½" pipe inserted into existing steel service lines mitigating the risk of rock impingement and slow crack growth related to backfill and construction practices.

- Plexco Service Tee Celcon Caps:

  NW Natural is aware of industry issues regarding Plexco Service Tee Celcon Caps possibly leaking when over-tightened during installation. These caps exist within the NW Natural system and are replaced as found and scheduled for replacement if leaks are identified.

- Polyethylene (PE) Fusion Failure:

  NW Natural has a robust training and Quality Assurance/Quality Control program in place to ensure proper PE fusion quality. This program includes

annual testing, qualification, and ongoing training. All PE fusions are visually inspected and pressure tested prior to being placed in service.

- Flat Back Risers:

  NW Natural discovered in 2012 that a certain type of riser stop valves known as “Flat Back Risers” were prone to severe atmospheric corrosion in the coastal areas of NW Natural’s service territory. The atmospheric corrosion at these locations was such that the Flat Back Risers could become inoperable and subject to leakage. NW Natural found that the atmospheric corrosion was such that the pin on these stops could sever during operation of the stop and cause a hazardous leak. NW Natural developed an Accelerated Action Plan to remediate and remove these stops in the impacted areas.

C. Equipment Failure

Equipment Failure is the third largest threat to the NW Natural gas distribution system, comprising approximately 13 percent of all recorded leak repairs. NW Natural’s efforts to reduce these occurrences are described below.

- Valves:

  Many valves are vital to the safe operation of a gas distribution system. NW Natural has in place a key operating valve inspection and maintenance program to ensure these valves are operable and available for use. Valves that are found to be inoperable, inaccessible, and/or paved over are identified and maintained or remediated as necessary.

- Pressure Control / Relief Equipment:

  NW Natural has an established inspection and maintenance program in place for pressure control/relief equipment to ensure reliable and safe operation.

- Mechanical Couplings:

  Pipe may pull out from compression couplings due to pullout forces that could include excavation damages, cyclic fatigue from changes in the temperature of the natural gas as a result of the Joule-Thomson effect, ground movement from earthquakes or after heavy rains. Failure of mechanical fittings may be classified as “natural forces” or “excavation damage” depending on the root cause of the failure.

  Mechanical couplings may leak through the seal between the coupling and the pipe. Contributing factors may include a degradation of the seal material over time, improper installation, or a change in gas quality.

Other:

Other types of equipment failure may occur in the gas distribution system. Failure reports are reviewed to detect trends or patterns of equipment failure occurring within the distribution system.

Many of the safety projects identified in this plan are in response to these threats, as well as to comply with safety codes and regulations.

IV. Categories of Safety Activities Performed by NW Natural

Safety Activities at NW Natural are separated into three categories:

A. Prescriptive Regulatory Actions – those which must be performed to meet federal minimum safety standards;
B. Proactive, Performance-Based Actions – those which must be performed to meet federal minimum safety standards based on risk analysis; and
C. Safety Policies – Company-imposed programs established to address areas where NW Natural has identified additional prudent risk reduction actions not currently required by code. These programs include, but may not be limited to: seismic vulnerability assessments, pipeline safety management systems, proactive excess flow valve installation, damage prevention's predictive risk Model. These plans and programs exceed code requirements and were adopted by NW Natural specifically to improve public safety and meet the intent of Oregon's Legislature Policy (SB 33, 2013).

A. Prescriptive Regulatory Actions

CFR 192 includes multiple prescriptive activities that ensure public safety, and that fall into broad categories such as "operations" (Subpart L) and "maintenance" (Subpart M). Most of these activities require an inspection at prescribed intervals to confirm that a facility or asset is meeting the normal operational requirements established in federal code. These activities provide the baseline data for other performance-based activities. These minimum safety requirements include, but are not limited to:

- Atmospheric corrosion surveys
- Leakage surveys
- Cathodic protection surveys
- Right of way patrols
- Valve maintenance
- Water crossing inspections
- Odorization
- Odorometer Reads
- Line Marking

- Pressure Regulation Inspection
- Large Meter Inspections
- Record Keeping
- Control Room Management
- Bridgeline Inspections
- Equipment Calibration
- Houseboat Inspections

The safety activities from this category are prescriptive in nature and not driven by risk analysis alone. Because these activities are required, they are not discussed further in this 2018 SPP, which instead focuses on measures that relate to NW Natural's risk analysis for safety projects.

B. Proactive, Performance-Based Actions

Other sections of CFR 192 include more proactive performance-based risk reduction activities, such as Subpart O – Transmission Integrity Management Program (TIMP), Subpart P – Distribution Integrity Management Program (DIMP), Damage Prevention, and Public Awareness. These programs focus on activities to mitigate pipeline safety risk. Specifically, these programs include:

i. Transmission Integrity (TIMP)

Transmission Integrity refers to 49 CFR 192 Subpart O-Gas Transmission Pipeline Integrity Management. This federally mandated program covers natural gas transmission pipelines located in High Consequence Areas (HCAs).

Activities in this category include baseline assessments and reassessments of transmission lines using in-line inspections and other direct assessment methods. They also include pipeline replacements and modifications in compliance with integrity management rules, MAOP validation agreements with the OPUC, and the relocation of pipelines and transmission facilities to mitigate threats posed by natural forces such as flooding, land movement, and erosion.

ii. Distribution Integrity (DIMP)

Distribution Integrity is outlined in 49 CFR 192 Subpart P- Gas Distribution Pipeline Integrity Management. This federally mandated program requires operators to create a written Integrity Management Program that takes into consideration: system knowledge, threat identification, evaluation and risk ranking, identification and implementation of measures to address risk, measurement of results, and reporting.

Activities in this category include risk-based projects warranting Accelerated Action (AA) to address system integrity risks. These AA's are made up of projects that have been identified through risk modeling, industry identified threats, and by subject matter experts within the Company. Projects include:

- Replacement of vintage plastic services,
- Relocation of facilities under structures,
- Replacement of valves and fittings susceptible to leakage,
- Protection of above grade gas facilities,
- Crossbore investigation, and
- Relocation of distribution gas lines to mitigate threats posed by natural forces such as;
    - Flooding
    - Land movement, and
    - Erosion.

C. Safety Policy – (additional prudent risk reduction actions)

Additional active risk reduction activities are not explicitly required by federal code, nor expected under engineering prudent safety practices, but increase public safety, safety for the operations of the network systems, safety for the LNG Plants, and safety for the UG Storage facilities. These risk reduction actions include:

- Seismic vulnerability assessments of LNG Plants, the Mist Underground Storage Facility, and Transmission Pipeline System as recommended by SB 33 (2013).
- Accelerated additional replacement of vintage materials
- Pipeline modification to permit inline inspection (ILI)
- Pipeline Safety Management System
- Proactive Excess Flow Valve Installation
- Damage Prevention's Predictive Risk Model Program
- Natural Forces Assessment of NW Natural Transmission System.

V. Projected and Preliminary Costs Presented in this Plan

The 2018 Capital and O&M costs presented in this plan are projected costs based on current expenditures for each of the identified projects through the end of the year. Costs for the significant safety initiatives planned for 2019 are preliminary or expected costs, for planning purposes. Costs for other safety projects under consideration will be presented in future SPP.

VI. 2019 Capital Safety Investment

In 2019, NW Natural estimates it will invest $6.7MM in capital to comply with DIMP and TIMP. Significant projects in this category include:

Central Coast Inline Inspection (ILI) (Estimate $2.5 MM):

This project is the completion of 2018 work which involves transitioning the central coast feeder from direct assessment to ILI. The central coast feeder will be NW Natural's longest and most complicated inline inspection to date. The portion of the central coast feeder that has a diameter of 10" which runs from Salem to Perrydale was completed in 2018. The 12" portion which runs from Perrydale along Hwy 18 and Hwy 101 to Toledo will be completed in 2019.

Eugene Transmission (ILI) (Estimate $2.0 MM):

This project involves transition of the Eugene transmission line from direct assessment to ILI. The Eugene transmission line is the primary feed to downtown Eugene and the University of Oregon. This pipeline is approximately 4 miles and is routed along Coburg Road which is a major thoroughfare in the City of Eugene.

Other safety projects and programs (Estimate $2.2 MM):

- **Pipeline Replacement due to Natural Forces**
  Portions of the NW Natural distribution and transmission system cross landslide faults and under water crossings. Due to single weather events or the passage of time it may be identified that pipelines at these locations are at risk or may be discovered as exposed during patrols. The Integrity Team develops plans to remediate these at-risk pipelines as they are discovered throughout the year.
- **Vintage Plastic**
  NW Natural installed Acrylonitrile-Butadiene-Styrene (ABS) services from the late 1950s to 1970s. All known ABS services have been replaced. However undocumented vintage plastic services are removed as found.
- **Meter Protection Installation**
  NW Natural continues a program to install guard posts adjacent to meter sets that are determined to be at risk of damage due to vehicle or equipment contact.
- **Pipeline Modification due to ROW Encroachment**
  Patrols on NW Natural Transmission Pipelines discover structures or other encroachments built adjacent to pipelines that impact the safe operation of the pipeline. This program works with landowners to remediate these encroachments.
- **Automatic/Remote Controlled Shut off Valve Installation**
  In order to efficiently close line valves on the transmission system in case of an incident, NW Natural is continually identifying key areas where Automatic/Remote Control valves can be installed in order to efficiently isolate sections of the transmission system in case of an incident.

Historical Capital Expenditure - Safety Project Plan (System Integrity)

The Historical Capital Expenditures are actual expenditures for each of the presented year.

Year	Expenditure
2015	$17,190,356*
2016	$ 7,772,763
2017	$ 5,925,409

*Final year of known bare steel main replacement

Historical capital expenditures included:

- Work to modify pipelines to accept inline inspection devices. This work includes removal of non-piggable fittings and facilities required to launch and receive inline inspection devices.
- Pipeline relocations to mitigate threats including outside forces and natural forces. This work does not include relocations due to utility conflicts, or third party improvement projects.
- Pipeline replacements due to bare steel main replacements.
- Pipe replacements and testing in compliance with federal and state regulations.

VII. 2019 O&M Expenditures

In 2019 NW Natural expects to spend $5.7MM in O&M to address and comply with DIMP, TIMP, damage prevention, and public awareness.

Activities that reflect expenditures in this category include costs for supplies (office/field), reference materials, education (conferences/workshops), vendor and contract costs associated with transmission assessments, sewer crossbore investigations and remediation, public awareness program materials, advertisements and mailings, and natural forces investigation and remediation. Included is the development of a Damage Prevention Risk Model to risk rank locate tickets based on the work performance of the excavator, the location of the excavation, the digging method and the pipeline pressure. The predictive rules will allow NW Natural to engage the excavator via the locating tickets before they commence their work to mitigate potential damages to our facilities. It also covers the development, initiation, and execution of studies and consulting fees related to integrity requirements, such as class location studies and third party geotechnical site evaluations to address and mitigate risk.

In addition, O&M includes some non-capital internal labor in support of NW Natural's system integrity program (SIP). These costs include the Integrity Management staff (7 FTEs), damage prevention specialists (3.5 FTEs plus proposed additional term limited additional FTEs to support the pilot project) involved in damage prevention/investigation, and a public information officer (1 FTE) for safety outreach, training and program administration. The Integrity Management group may also utilize other internal resources in support of SIP activities which includes GIS analysts, Customer Service, Construction, and other subject matter experts. Significant O&M projects include:

Sewer Crossbore Inspections ($1,900,000):

The sewer crossbore program involves the visual inspection of sanitary sewers for incidences of gas line crossbores. In installations where trenchless technology was used to install polyethylene pipe, there exists the possibility the gas line was bored through a sewer main or lateral. NW Natural's policy is to expose all foreign line crossings when performing trenchless work. Sewer crossbores typically occur when facility owners fail to locate their pipe, creating a situation where NW Natural is unable to expose their facilities during construction. This is an industry-wide threat. Although sewer crossbores are not isolated to gas operators, the consequence when gas lines are involved can be high. This program identifies trenchless polyethylene installations and inspects the sewers in the vicinity to identify crossbores.

Land Base Replacement Project ($700,000):

The purpose of this project is to produce a more spatially accurate gas system and land base model in GIS. NW Natural's current land base data set consists of line segments which provide a visual depiction of property lines and encumbrances for field users but which do not carry any useful information about said property or property rights. These lines have been built over time, starting from pre-digital map sources drafted on hardcopy mediums; these sources are not inherently aligned. Since gas system map features (pipes, fittings, etc.) have traditionally been drawn relative to land base, the spatial inaccuracies introduced by them have been propagated throughout the gas system data set for decades. At the completion of this project a more accurate system will be presented in the NW Natural GIS system which will provide a greater knowledge of the system and allow for better data analysis and integration.

Transmission inline reassessment and remediation ($998,600):

This work includes the prescribed seven year reassessment of transmission pipelines in HCA's and is comprised of both inline inspection and direct assessment of transmission assets and associated repairs.

Natural Forces ($272,000):

Where the threat of natural forces can be mitigated without pipe replacement or rerouting, NW Natural may choose to address the threat through site work. This option can be critical in situations where a reroute is not feasible due to environmental restrictions or where a pipeline serves a critical customer or provides a single feed to a distribution system. Work may include armoring of slopes, re-grading of sites, culvert improvements, and retaining structures to address land movement and drainage issues.

Damage Prevention ($525,000):

In compliance with DIMP regulations, and to address the single largest threat to gas facilities, NW Natural maintains a damage prevention department. The department consist of a supervisor and 2.5 damage prevention specialists whose responsibilities include damage prevention through training, attendance at pre-construction meetings, participation in Utility Coordinating Councils, and support of the 811 One-call system. Damage prevention specialists are also responsible for the investigation, enforcement, and contractor training related to excavation and third party damage.

NW Natural plans to enhance its damage prevention program through development of a Damage Prevention Risk Model. The primary goal of the risk model is to help NW Natural proactively address high risk excavations through active engagement of contractors prior to commencement of excavation work, preventing third party damages. The risk model includes a predictive methodology component with enhanced communication and contractor outreach from NW Natural personnel. NW Natural is proposing a “Pilot Safety Project” in 2019 to learn of its impact in reducing damages to our pipelines and more accurately identify the proper level of resources to support this new damage prevention safety project. NW Natural expects to increase the footprint of the Damage Prevention project in future years with the support the Damage Prevention Risk Model provides.

Public Awareness ($900,000):

This safety project is to meet requirements mandated in API RP 1162, adopted by reference by PHMSA into Part 192.616(a),(b), and (c). The purpose of this project is to promote safety information, reduce damages and educate our customers and the public about natural gas safety. The program includes customer correspondence, mailers, advertisements, community events, mobile phone applications, and brochures to the affected public such as excavators, contractors, public officials, dwellings along pipeline right of way and in high consequence areas, floating homes, un-odorized facilities and schools. Training is offered to the contractor network in an effort to reduce damages, and materials are provided to first responders and contractors within NW Natural's service territory.

Right of Way Encroachments ($175,000):

Part of routine pipeline patrols is to identify changes in site conditions. One such change is the installation of structures over pipelines and inside dedicated pipeline rights-of-way and easements. In some instances the remediation involves relocation of structures and non-gas facilities.

Pipeline Safety Management System (PSMS) ($300,000):

NW Natural hired a program manager to implement PSMS at NW Natural in November 2017. The program manager has been conducting the PSMS gap analysis. NW Natural's goal is to have the gap analysis completed before end of Q4 2018, and begin the PSMS framework formulation and plan development in 2019. This new safety project is ongoing, as once the plan is fully developed and approved, its implementation will commence with proper resources identified and discussed in future SPPs. For the 2018 SPP the identified resource is the program manager position and associated work requirements.

Historical O&M Expenditure - Safety Project Plan (System Integrity):

The historical O&M expenditures are actual expenditures for each of the presented years (does not include historic PSMS or public awareness expenditures).

Year	Expenditure
2015	$4,034,218
2016	$4,889,618
2017	$4,771,267

Historic O&M expenditure included:

- Regulatory transmission assessments including the investigation and remediation of identified anomalies resulting from inline inspection and external corrosion direct assessment (ECDA).
- Sewer crossbore inspection program.
- Investigation and remediation of natural forces including landslides, flooding, erosion, etc.
- Buildover remediation where structures encroach into pipeline right-of-way.
- Digital conversion of historical facility records to facilitate system knowledge.
- Remediation of difficult to operate valves.
- Work to reduce the number of operating pressures in the distribution system (MAOP normalization).

These costs do not reflect costs related to ongoing maintenance of facilities including right-of-way clearing, patrols, leakage, cathodic protection, and other ongoing routine O&M work.

VIII. 2019 Significant Safety Initiatives

Pro-active Excess Flow Valve (EFV) Installations ($500,000):

On October 14, 2016 PHMSA adopted code requiring the installation of EFVs or shut-off valves on all new or replaced branched service lines (Docket No. PHMSA-2011-009). While the code requires EFV installations be installed in all new or replaced branched service lines, it did not require retrofitting installation of EFVs at existing services. NW Natural believes a proactive EFV installation program is a prudent effort that can mitigate the consequence of a gas release resulting from a damage to a gas service line. In 2018 a pilot project to retrofit existing services with EFVs was conducted to measure the effort and identify costs for a proactive EFV installation program. These learnings will be used to develop an ongoing Safety Program that can be presented in future Safety Project Plans. The proposed program would be risk based initially focused on high consequence and densely populated areas such as business districts and special buildings, or identified sites.

Seismic Vulnerability Assessment of NW Natural's Transmission Line System ($500,000):

The performance of this assessment and study is in compliance with the recommendations of SB 33 (2013) published on October 1, 2014. SB 33 (2013), recommends all LDCs to conduct seismic vulnerability assessment of their critical energy infrastructures.

NW Natural plans to perform a seismic vulnerability assessment and study of all high pressure and transmission pipelines (operating above 60 psig). The intent of the study is to identify vulnerable pipeline segments and recommend mitigation and hardening measures to address those vulnerabilities. The recommendations and resulting projects from the seismic assessment will be presented in future SPPs.

The proposed seismic vulnerability assessment will complement existing TIMP mitigation programs, including but not limited to; installation of ASVs or RCVs, elimination of bridge crossings, natural forces mitigation work, system reinforcement, and valve installation.

IX. Other Safety Projects/Programs Being Evaluated at this Time include:

Tracking and Traceability

In compliance with PHMSA's Plastic Pipe Rule, expected to be published in October 2018, NW Natural will begin to assess and implement actions to meet the proposed requirements of the rule. Once the assessment is completed, a Safety Project will be developed and proposed in future SPPs. To provide a better understanding of the plastic pipe rule, some of the key requirements are presented below, for reference.

It is PHMSA's intent that all operators have methods to identify the location of pipe, the person who joined the pipe, and components within the pipeline (i.e., tracking) to help identify systemic issues involving plastic pipe. PHMSA also proposes that operators be required to identify and document the location of pipe manufacture, production, lot information, size, material, pressure rating, temperature rating, and, as appropriate, other information such as type, grade, and model (i.e. traceability). In order to facilitate compliance, PHMSA proposes to revise § 192.63 to require operators to adopt the tracking and traceability requirements in ASTM F2897‑11a, "Standard Specification for Tracking and Traceability Encoding System of Natural Gas Distribution Components (Pipe, Tubing, Fittings, Valves, and appurtenances)".

Note: The safety project to accomplish the above requirements will be multiyear.

Pilot Risk Model Project for 2019 ‑ As outlined in Section VII - 2019 O&M Expenditures Safety Projects, under the damage prevention safety project, the risk model is a new safety project to help drive the behavioral change component of excavation, by engaging excavators on site for the excavation work that is identified as very high risk in both severity and probability of occurring. In 2019 NW Natural is engaging a pilot program, employing the Damage Prevention Risk Model to measure the success of this new safety effort and properly identify the required level of resources to manage the safety project ongoing. The findings of the pilot in resources level and success rate will be presented in the 2019 SPP. It is envisioned the 2019 pilot safety project will require three additional FTEs to the damage prevention team, which will be revisited after the pilot period.

X. Cost Benefit Analysis & Alternative Analysis

As stated in the 2017 SPP, the performance of a cost benefit analysis and alternatives analysis is sometimes difficult in the context of regulated safety programs. Such an analysis has not been of major consideration in this report because the majority of the safety projects are mandated by CFR and regulatory

requirements, dictated by industry best practices, or driven by operational requirements. The assigned risk and prioritization for implementing these projects are based on in-depth studies and analysis of NW Natural's transmission and distribution systems as well as plant and storage assets. Studies are performed on a regular basis as part of normal operations. The benefit of this regular analysis process allows limiting the number of studies needed to perform safety related work for which there are few practicable alternatives.

To expand a bit further on the above, the in-depth studies and analysis of the transmission and distribution networks and storage facilities identify potential threats and risks that can then be mitigated or eliminated by the application of best engineering practices, operational knowledge/experience along with the experience of subject matter experts. Briefly stated, the in-depth study analysis is used to identify and implement measures and plans to address potential threats and risks, which are then prioritized by projects or included in programs to most efficiently and effectively mitigate or eliminate the threat(s)/risk(s). The exception to this process are programs and mandates prescribed in federal code such as TIMP and DIMP, where are prioritized based on the results of an analysis of NW Natural's systems and the studies described above combined with operational experience and engineering judgement. When the CFRs mandate safety projects and/or program completion within a prescribed timeline they are moved in the prioritization list according to the requirements of the mandate.

In addition, safety projects may not always provide for alternatives. In the event a safety project requires an independent study or a vulnerability assessment study, an RFI/RFQ will be prepared and issued. As necessary NW Natural will interview and select the most qualified subject matter experts (SME) to participate and provide input for the studies. Once the required studies are completed, the recommendations are fully vetted against system threats and presented in future SSPs, with appropriate alternative analysis presented for their implementation.

XI. Pending Legislation Update

Pending legislation is presented below for the Commission's review. The impact on safety programs, once finalized, will be fully assessed and as appropriate will be presented to the Commission in future annual SPPs.

Docket No. PHMSA-2011-0023 - the Safety of Gas Transmission and Gathering Lines (Transmission Mega Rule), was separated into three rulemakings. They are;

- Rulemaking No. 1 – Regulatory Mandate – involves MAOP reconfirmation, expansion of assessment requirements, material verification, definition of traceable verifiable complete (TVC), seismicity, fracture mechanics, MAOP

exceedance reporting, moderate consequence areas (MCA), and other related rules. This rulemaking is currently under review by the OMB and is expected to be published Q1 2019.

- Rulemaking No. 2 – Non-Regulatory Mandate – involves repair criteria, integrity management improvements, cathodic protection, management of change, risk modeling requirements, external corrosion, internal corrosion, risk assessment requirements, safety of launchers and receivers, surveillance after weather events, and other related rules. This rulemaking is expected to be published Q2 2019.
- Rulemaking No. 3 – Safety of Gas Gathering Pipelines – involves gathering lines and is expected to be published Q3 2019.

NW Natural will assess the full impact of the new or amended rules once published to ascertain its full impact on normal operations and engineering practices. NW Natural envisions modification to existing safety projects and the possible development of additional safety projects may be needed to address the new mandated requirements.

Docket No. PHMSA-2014-0098 – Plastic Pipe Rule is expected to be published in October 2018. Within the rule is a tracking and traceability requirement that extends the level of data collected beyond current code requirements to include attributes such as the location of manufacture, lot number, date of manufacture, and part/model number. The Plastic Pipe rule has been designated a "significant rulemaking" due to economic impact; compliance with the plastic pipe rule will require new equipment, software, and process changes by NW Natural to meet the tracking and traceability requirements of the rule.

Docket No. PHMSA-2016-0016 – Underground Storage Facilities for Natural Gas - The current Interim Final Rule incorporates API Recommended Practice 1171 referred to as the Functional Integrity of Natural Gas Storage in Depleted Hydrocarbon Reservoirs and Aquifer Reservoirs by reference. NW Natural is in the process of developing a storage well integrity program in compliance with API 1171 incorporating all required provisions into operations at Mist.

Notes:
1) The final rule is expected to be published November 2018
2) Audits of Underground Storage Facilities have begun
3) User fees have been assessed.

XII. Completed Projects (projects completed or scheduled to be completed in 2018):

North Coast ILI ($4,500,000):

This project is part of NW Natural's continuing commitment to inspect transmission lines using inline inspection. The north coast feeder consists of 16-inch and 10-inch transmission pipeline installed in 1965. The pipeline begins at Deer Island in Rainier, Oregon and traverses the Columbia River and north coast, where it terminates and feeds smaller diameter pipelines to the north, serving Astoria/Warrenton, and the south, serving Seaside/Cannon Beach. The work involves installation of launchers and receivers as well as retrofitting the pipeline to permit the passage of inline inspection tools.

Salem Feeder MAOP Validation ($347,000 - Actual):

This project relates to the agreement between the OPUC and NW Natural to address missing pressure test documentation. The work includes the replacement of pipe at Salem Parkway and pressure test of 269 feet of 8-inch pipe under the paved portion of the roadway.

Eugene Industrial Feeder MAOP Validation ($500,000 - Actual):

This project relates to the agreement between the OPUC and NW Natural to address missing pressure test documentation. The work includes the replacement and relocation of a blowdown/bridle and associated 10-inch and 6-inch pipe at the intersection of Coburg Road and Crescent Avenue in Eugene, Oregon.

CZ (Crown Zellerbach) West Linn MAOP Validation ($546,000 - Actual):

This project relates to the agreement between the OPUC and NW Natural to address missing pressure test documentation. The work included the replacement and relocation of 10-inch, 8-inch, and 6-inch pipe as well as the reconstruction of a district regulator station on the west side of the Oregon City – West Linn Bridge.

Dethman Ridge ($ 356,000 - Actual):

Replacement of 187 feet of 4-inch pipe exposed in Odell Creek in Hood River. A temporary bypass was needed because the 4-inch was a one-way feed into the distribution system. The work includes extensive coordination and environmental permitting with Hood River and the Army Corp of Engineers because of the in-water work required.

Santiam River Pipe Replacement (Estimate $950,000):

During an underwater patrol, an 8-inch line was identified as having shallow to no cover in the Santiam River. This pipeline will be replaced by the end of 2018.

Mill Creek Pipe Replacement (Estimate $950,000):

During an underwater patrol, a 12-inch line was identified as having shallow to no cover in Mill Creek. This pipe will be replaced by the end of 2018.

Underground Storage Integrity (Estimate $300,000):

As part of a mist reliability study and in anticipation of PHMSA's adoption of RP 1171, NW Natural performed inline inspection of four transmission pipelines that transport natural gas between storage wells at Mist into the NW Natural transmission system.

MAOP validation ($1,000,000 - Actual):

This work includes the O&M components of the agreement between the OPUC and NW Natural to address missing pressure test documentation. The O&M portion of this work involves the process, procedures, labor, and equipment that do not involve the installation of new assets.

XIII. Introducing Future Safety Programs

NW Natural plans to change the format of future annual Safety Project Plans to incorporate all safety programs in which the Company is engaged. In the past, the annual SPP aligned more with engineering and operations project areas and did not address other pertinent safety and prudency areas, such as security, fixed networks, environmental, and others. The intended purpose of this new section is to inform the Commission about NW Natural's future safety project plans, both capital and O&M projects, which will be presented in the form of seven primary categories. A preview of the future format is shown below:

New Regulatory Requirements – (e.g. TIMP 2.0, Tracking and Traceability)
NW Natural, through its involvement with industry peers, regulatory entities, and trade associations will assess the full impact of new or amended rules once published to ascertain its full impact into our normal operations and engineering practices. With the impact assessment completed, NW Natural envisions modification of existing and possible development of additional safety projects to address the new mandated requirements.

Seismic
Projects under the seismic safety program follow SB 33 (2013) recommendations, published on October 1, 2014, recommending all LDCs to conduct seismic vulnerability assessments of their critical energy infrastructures. The identified safety projects will help harden the resiliency of NW Natural's

pipeline and storage infrastructure systems against major seismic events, and will provide for safety and security for our customers, employees and citizens of our state. One example is application of earthquake valves.

Damage Prevention

Projects under the damage prevention safety program are projects that will reduce the first, second and third party damages to our pipeline network systems. One example is applying a risk model to underground line locates for determining risk of excavation and prudent actions to prevent damages during excavation.

Distribution Integrity Management Program - Accelerated Actions (DIMP AA)

Projects under this safety program are projects designed to reduce the risks from failures of gas distribution pipeline systems. In addition, where existing compliance activities and procedures need to be supplemented to address risks, an additional and accelerated action (A/A) will be identified to mitigate the risk, by eliminating or reducing the likelihood, or by lessening the consequence of a potential issue.

Security

Projects under the security safety program are safety projects that will identify, protect, detect, and respond/recover to help ensure NW Natural's natural gas pipeline infrastructure and energy storage facilities are fully safe and operational when under security threats. These programs will enhance the resilience of NW Natural's gas operations to the security threats. NW Natural will evaluate and implement, as appropriate, actions taking into account individual environments, identified risks, and what has been deemed reasonable and prudent to implement.

Fixed Network

Projects under the fixed Network safety programs are safety projects that provide for prudent command and control technologies to help manage the daily operations, maintenance, and monitoring of our pipeline systems safely and prudently. The application of prudent technologies allow for more expeditious information exchanges and decision making when responding to anomalies, once discovered. One example is the remote pressure monitoring of pipeline systems.

Possible Other

Projects under other safety programs are those projects that are not called for by code, which are outside the normal or conventional operations of pipeline systems, but are prudent safe courses of actions. One example is the implementation of pipeline safety management systems.