NW Natural

Distribution Integrity Management

Program Plan

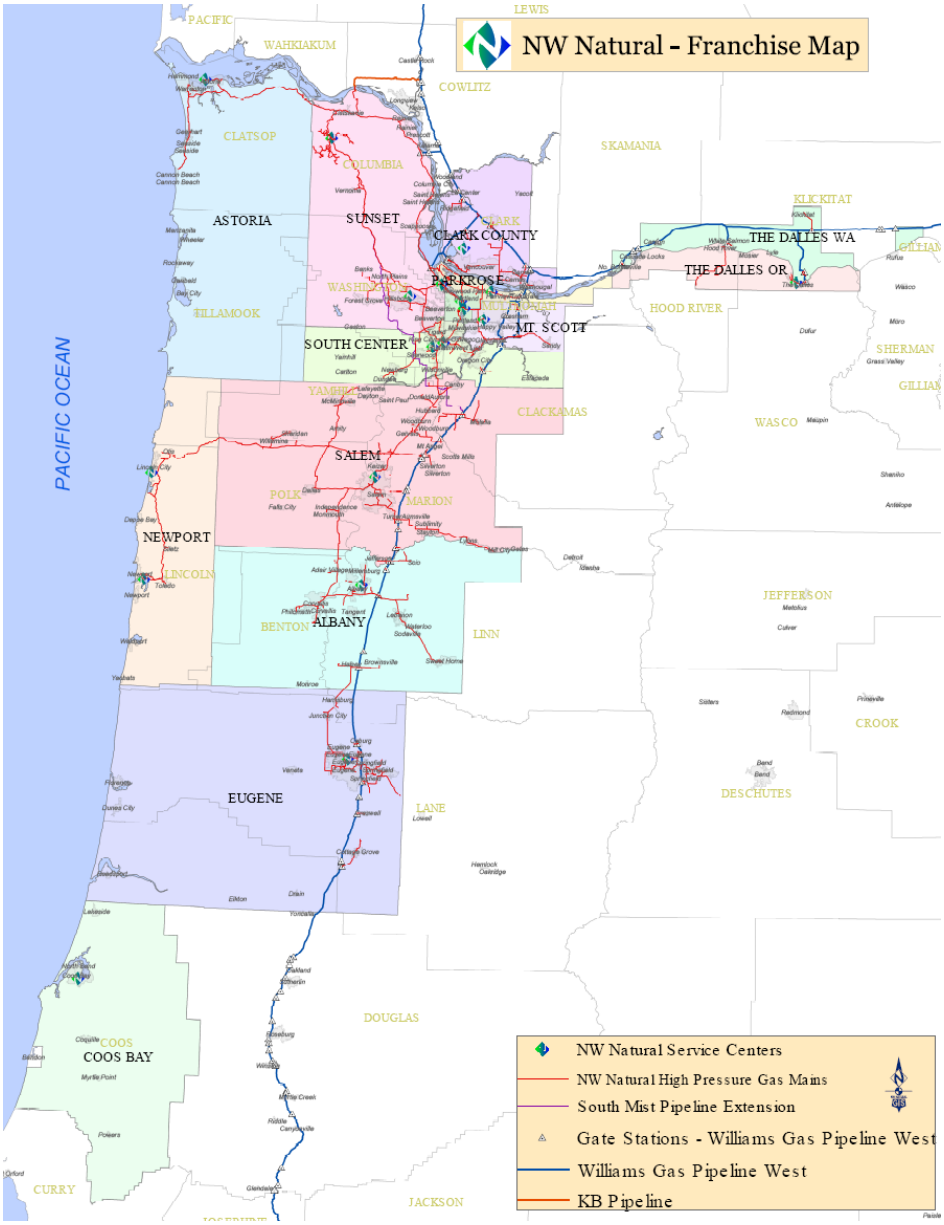
August 1, 2011

220 NW Second Avenue
Portland, Oregon 97209
503-226-4211

Contents

1.0 COMPANY OVERVIEW

Headquartered in Portland, Oregon, NW Natural delivers natural gas to more than 600,000 residential, commercial and industrial customers. The service territory is depicted in Figure 1-0 below.



2.0 SCOPE

This document is the Distribution Integrity Management Program Plan for NW Natural and is intended to meet the requirements of CFR 49, Part 192, Subpart P, Distribution Integrity Management Programs (DIMP). This written plan addresses the seven following required elements of DIMP:

- Knowledge
- Identify Threats
- Evaluate and Rank Risk
- Identify and Implement Measures to Address Risks
- Measure Performance, Monitor Results, and Evaluate Effectiveness
- Periodic Evaluation and Improvement
- Report Results

This written plan applies to gas distribution facilities operated by NW Natural in Oregon and Washington and was initially implemented on August 1, 2011. Gas distribution facilities include the associated mains, services and other appurtenances not meeting the definition of gathering line or transmission line and under jurisdiction of CFR 49, Part 192.

This plan does not cover:

Gathering lines – pipelines and associated facilities that transport gas from a current production facility to a transmission line or main. (NW Natural does not currently have any gathering lines).

Transmission lines – as defined by SPO/SPW 001. Although the processes and procedures defined in this written plan may be used on transmission pipelines outside an HCA.

LNG Facilities – as defined by SPO/SPW 001 and covered under the jurisdiction of CFR 49, Part 193.

2.1 Correlation with Other NW Natural Programs and Documentation

This IMP plan describes the processes of NW Natural's program for distribution integrity management but does not repeat elements of the program that are already in place as existing documented procedures. Sections of the following NW Natural manuals are relevant to some of the processes and procedures of the Integrity Management Program.

- Standard Practices—includes written policies for conducting pipeline operations and maintenance activities and handling abnormal operations and emergencies. The policies are in accordance with 49 CFR 192. A committee reviews the Standard Practices manual once each calendar year and updates it as necessary.
- Field Construction and Maintenance Manual (FCMM)—include written procedures for conducting pipeline construction, operations, and maintenance activities. The procedures are in accordance with 49 CFR 192. A committee reviews the FCMM once each calendar year and updates it as necessary.
- Operator Qualifications (OQ) Procedures and AOCs—include procedures for performing all OQ covered tasks in accordance with 49 CFR 192, subpart M.

3.0 PURPOSE AND OBJECTIVES

The purpose of the DIMP is to enhance safety by identifying and reducing gas distribution integrity risks. Managing the integrity and reliability of the gas distribution pipeline has always been a primary goal for NW Natural; with design, construction, operations and maintenance activities performed in compliance with CFR 49, Part 192 requirements. The objective of this written DIMP Plan is to establish the minimum requirements to comply with the Code of Federal Regulations (CFR 49) § 192.1005, 192.1007, 192.1009 and 192.1011, pertaining to integrity management for gas distribution pipelines.

This written plan does not address how NW Natural may deviate from the required periodic inspections as provided for in §192.1013.

3.1 Company Roles

Integrity management is a company-wide program that involves the entire NW Natural organization. The Integrity Management Group (IMG) is charged with the development of the IMP Plan and for the accomplishment of its processes. The key team members involved in the development and distribution of this program are listed in Table 1.

Table 1. IMP Organization Chart

Name	Title	Function
Gregg Kantor	President and CEO	Chief Executive
Grant Yoshihara	Vice President, Utility Operations	Project Sponsor & Chief Engineer
Jon Huddleston	Process Leader Gas Operations	Steering Committee Member

Steve Nelson	Manager, Engineering	Steering Committee Member
Joe Karney	Integrity Management Supervisor	Project Manager, Steering Committee Member
Roy Rogers	Integrity Management Engineer	Integrity Management Engineer
Scott Lundgren	Integrity Management Engineer	Integrity Management Engineer
Chris Wiles	Integrity Management Specialist	Integrity Management Specialist
Michael Linch	GIS Specialist	GIS Specialist
Kerry Shampine	Manager, Compliance	Steering Committee Member
Bruce Paskett	Principle Compliance Engineer	Steering Committee Member

3.1.1 Vice President, Utility Operations

The Vice President, Utility Operations has overall responsibility to assure that the DIMP Plan processes are implemented by the organization in accordance with this DIMP Plan and associated regulatory requirements. The Vice President, Utility Operations, may delegate some or all of these responsibilities to others within the organization.

3.1.2 Integrity Management Supervisor

The Integrity Management Supervisor has the responsibility for day-to-day program oversight and responsibility to assure that the plan is implemented effectively. This Plan assigns authority to the Integrity Management Supervisor for approval of documents and plans. The Integrity Management Supervisor may delegate some or all of these responsibilities. Roles for this position include:

- Monitors and controls costs and scheduling
- Determines DIMP budget requirements and makes associated Capital and O&M budget requests
- Assures effective implementation of the seven steps of the DIMP process
- Authorizes and approves changes and revisions to the DIMP Plan
- Initiates communication with other departments within the Company
- Participates in annual effectiveness reviews and complete plan re-evaluations
- Gathers data for annual reports to PHMSA and State Safety Regulators
- Reviews and approves Exception Requests

3.2 Personnel Qualifications

The IMG (Integrity Management Group) is charged with development and implementation of the DIMP Plan. The authority for this charge is imparted with the acceptance of a candidate for the described job. NW Natural maintains specific job descriptions and organizational charts for integrity management positions that outline the specific responsibilities and lines of reporting for personnel that perform integrity management activities.

4.0 DEFINITIONS

The following definitions and acronyms shall apply to this DIMP Plan. This section supplements SPO/SPW 001 – Definitions, as found in the Standard Practice Manual.

COF: Consequence of Failure

Damage: as defined in SPO 001

DIRT (Damage Information Reporting Tool): More information on D.I.R.T. may be found at www.cga-dirt.com

DIMP (Distribution Integrity Management Program): an overall approach used by NW Natural to ensure the integrity of its gas distribution system (reference §192.1001)

DIMP Files: NW Natural's records, databases, and/or files that contain either material incorporated by reference in the Appendices of the DIMP Plan or outdated material that was once contained in the DIMP Plan Appendices but is being retained in order to comply with record keeping requirements.

DIMP Plan (Distribution Integrity Management Program Plan): a written explanation of the mechanisms or procedures NW Natural will use to implement its integrity management program and to ensure compliance with subpart P of CFR 49, Part 192(reference §192.1001)

DIMP Rule: CFR 49, Part 192, Subpart P

Distribution Line: as defined in SPO 001

Excavation Damage: as defined in DIRT

EFV (Excess Flow Valve): as defined in SPO 001

FOF (Frequency of Failure): synonymous with Likelihood of Failure

Hazardous Leak: a leak that represents an existing or probable hazard to persons or property, and requires immediate repair or continuous action until the conditions are no longer hazardous (reference §192.1001)

Main: as defined in SPO 001

MDPE: Medium Density Polyethylene

NTSB: The National Transportation Safety Board

PHMSA: The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration

Pipeline: as defined in SPO 001

Region: areas within a distribution system consisting of mains, services, and other appurtenances with similar characteristics and reasonably consistent risk.

Risk: a relative measure of the likelihood of a failure associated with a threat and the potential consequences of such a failure

Risk Model: the integration of facility data, operational data, SME input, and established algorithms to estimate the relative risk associated with a gas distribution system threat

Service Line: as defined in SPO 001

SME (Subject Matter Expert): A SME is an individual who is judged by NW Natural to have specialized knowledge based on their expertise or training.

Sub-Threat: a threat type within one of the primary threat categories specified in §192.1007(b)

Ticket: a notification from the one-call notification center to NW Natural, providing information of pending excavation activity for which NW Natural is to locate and mark its facilities.

5.0 KNOWLEDGE OF FACILITIES

This section describes NW Natural's methodology for demonstrating an understanding of its gas distribution system. NW Natural uses reasonably available information as the foundation for DIMP. This section will include, at minimum, the following:

- NW Natural will identify the characteristics of the distribution pipeline's design and operations and the environmental factors that are necessary to assess the applicable threats and risks to its gas distribution pipeline.
- NW Natural will consider the information gained from past designs, operations and maintenance.
- NW Natural will identify additional information needed and provide a plan for gaining that information over time through normal activities conducted on the pipeline (for example, design, construction, operations or maintenance activities).
- NW Natural will develop and implement a process by which the DIMP will be reviewed periodically and refined and improved as needed.
- NW Natural will provide for the capture and retention of data on any new distribution pipeline installed. The data must include, at a minimum, the location where the new pipeline is installed and the material of which it is constructed.

The requirements of this section will be met using the design and construction records stored in GIS (Geographic Information System) and compliance inspection records including leak history, corrosion control records and continuing surveillance records stored in the Asset Register. When applicable, NW Natural will utilize the collective judgment of SMEs to fill in gaps for missing and inaccurate or incomplete records. NW Natural will also use available external data sets to identify the characteristics of the distribution system's environmental factors (for example, census data, FEMA flood

plain, DOGAMI SLIDO, etc). NW Natural will continually evaluate and may gather additional information as appropriate to improve system knowledge.

The knowledge of the distribution system will be used to evaluate each threat and prioritize risks as listed in Section 6.0 (Threat Identification) and Section 7.0 (Evaluation and Ranking of Risk) in this plan.

Figure 5-0 illustrates the procedure to confirm Knowledge of the System.

Process to Confirm Knowledge of the System

The purpose of this process is to verify complete and current knowledge of the gas distribution system, to identify gaps in knowledge and to fill those gaps to meet the requirements of "Know Your System". This process can be initiated by any member of the Integrity Management Group at any time.

1. The Integrity Management Group identifies the records necessary to "Know Your System", and demonstrate an understanding of its gas distribution system developed from reasonably available information.

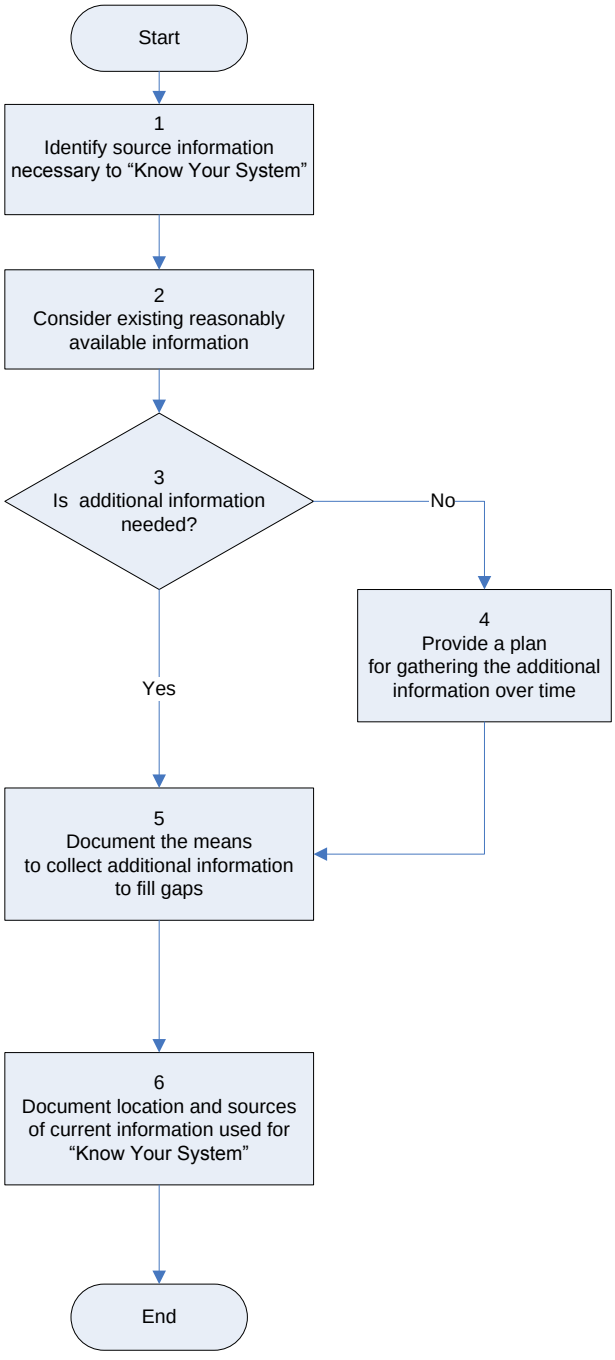
2. Consider existing reasonably available information including data contained in GIS, Asset Register, Sharepoint/FileNet, SQL/ PragmaCAD, Annual Report and SME knowledge. Data considered will include information gained from past design, operations and maintenance activities.

3. Determine if records provide the most current data and information available. Also, does the information identify the characteristics of the distribution pipeline's design and operations and the environmental factors that are necessary to assess the applicable threats and risks to its gas distribution pipeline? Is the information gained from past designs, operations and maintenance considered? Is information needed to fill gaps?

4. Provide a plan for gaining information over time through normal activities conducted on the pipeline (for example, design, construction, operations or maintenance activities).

5. Document location and sources of existing records, including electronic (FileNet, GIS), paper and subject matter experts.

6. Gather new information to fill gaps in knowledge due to missing, inaccurate or incomplete records.



5.1 Type and Location of Records

5.1.1 GIS (Geographic Information System)

- The primary record of NW Natural's distribution system resides in the GIS, which is a map of the entire NW Natural system, covering 2,000 sq. miles of above ground and underground facilities. It includes specific records of pipe size, material, installation date, location, MAOP (Maximum Allowable Operating Pressure), business district and other information as available. The platform allows for external records to be overlaid, such as census data, FEMA flood plain, DOGAMI SLIDO, etc. A summary of the data sets used to demonstrating an understanding of its gas distribution system is found in Appendix A.

- In some cases, NW Natural may be unable to determine the materials or characteristics of some of the components of the system. This is due to earlier practices not capturing this information or inaccurate, incomplete or missing records. NW Natural SMEs will use the year of installation as guidance to make such decisions about piping material, joint type, coating type or repair methods used. These decisions will be documented in DIMP files plan and will be uploaded into the GIS.

- Information about an existing system will be updated when new or better information becomes available. NW Natural will not dig up its facilities for the purpose of gathering data. This information will be gathered during existing operating or maintenance activities and installation of new facilities on an existing infrastructure. NW Natural will rely on existing processes to accomplish this, such as the data gathered by the Pipe Inspection Report (PIR).

- NW Natural will continue to re-evaluate data captured and stored and may start gathering additional information in the future.

- NW Natural's continual improvement efforts may include capturing facility information and the development of a process for notating "assumed values", based on information provided by SMEs.

5.1.2 Asset Register (Essentials by Advantica/GL)

- NW Natural uses the electronic database Asset Register to schedule, track and record compliance programs for leakage, corrosion, valve maintenance, district regulators, service regulators, meter sets, odorometer sites, long couplings, flex lines for houseboats, water crossings and bridge line inspections.

- The Asset Register data is imported into the GIS to overlay on the existing system data.

- The corrosion module of the electronic Asset Register database was implemented in 2005 and leakage was implemented in 2006.

5.1.3 Sharepoint/FileNet

- NW Natural uses Sharepoint/FileNet, a digital record database, to store procedures, pressure test documents and as-builts. This information is archived from paper and electronic records created at the time of installation. These files contain additional information that may be used in the future. Remaining microfilm or original paper records will be archived in Sharepoint or FileNet. The pertinent information for identifying the characteristics of the pipeline's design is stored in the GIS.

5.1.4 SQL /RLMAN

- NW Natural stores historical information related to damages in RLMAN, accessed through the SQL server. This information includes the date, location, responsible party and reason for the damage. Reports related to damages

including locates received, locates completed and third party damages are created from SQL information and are used to determine a damage ratio, damages per 1000 locates.

5.1.5 PragmaCAD

- PragmaCAD is a dispatch tool, used to gather information and manage field construction and compliance activities. The PragmaCAD data is currently accessible through the SQL server. PragmaCAD will gather data from the Pipe Inspection Report to better define system characteristics.

5.1.6 Annual Report

- The annual report to DOT summarizes the basic knowledge of what is in NW Natural's distribution system, including a breakdown of the mains and service lines by material, diameter and installation decade. This report is electronically filed for Oregon and Washington annually with PHMSA and is stored with Compliance Management. The information contained in this report is used to complement the understanding and knowledge of the system. Beginning in 2010, the report includes the following sections:
    - Part A- Operator Information.
    - Part B - System Description, which reports the miles and number of services in the NW Natural system at the end of the year.
    - Part C - Total Leaks Eliminated/Repaired During Year provides a breakdown of eliminated/repaired leaks by leak cause for mains and for service lines, and the number of known system leaks scheduled for repair.
    - Part D - Excavation Damage reports the total number of excavation damages and the total number of locate tickets.

- Part E - Excess Flow Valve (EFV) Data reports the total number of EFV's installed in reporting year, system wide, and the cumulative total.
- Part F - Total Number of Leaks on Federal Lands Repaired or Scheduled for Repair
- Part G - Percent of Unaccounted for Gas as a percent of total input for the 12 months ending June 30 of the reporting year.
- Part H - Additional Information
- Part I - Preparer and Authorized Signature
- Fitting Failure Report, separate but associated report data for each failure of a mechanical fitting that results in a hazardous leak during the calendar year.

5.2 Review

This plan will be reviewed periodically as necessary, not to exceed 5 years, for continual updating, refinement and to assure it reflects current operational policy.

Figure 5-1 illustrates the procedure to review DIMP Operations.

Process for Comprehensive Review of DIMP Operations

The purpose of this process is to maintain the DIMP Plan, which will be updated when new regulations are published, continual improvements are identified or when other issues arise. This process allows for both minor and major changes to be addressed. and can be initiated by any member of the Integrity Group. The review process will be completed as necessary, not to exceed 5 years.

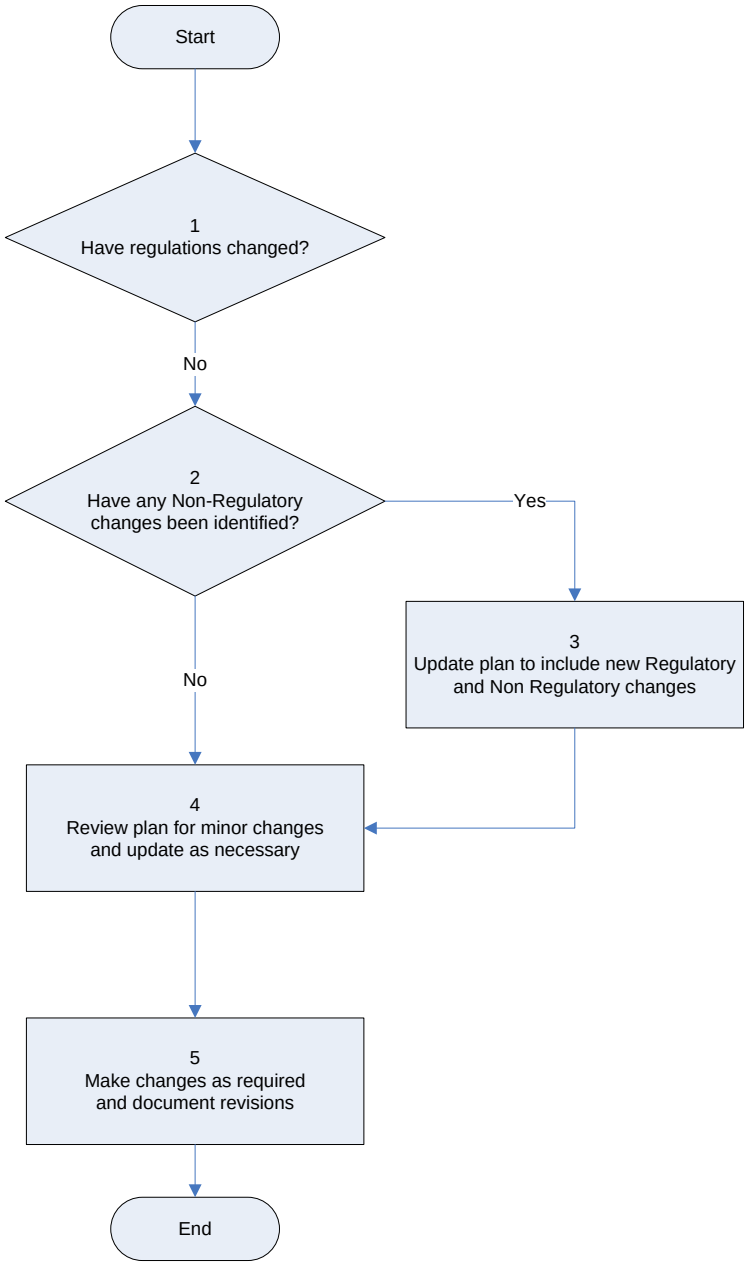
1. Determine if there are new federal regulations, state enforcement, FAQ's or other guidelines provided by regulatory bodies in effect which will impact the plan.

2. Determine if any continual improvements, best practices or industry driven changes need to be integrated into the DIMP plan.

3. Update plan to include new Regulatory and Non Regulatory changes.

4. Review plan for minor changes.

5. Make changes to plan document revision log.



5.3 Data Capture for New Construction and Ongoing O&M

Records for all piping systems installed after the effective date of this plan will be captured and retained by NW Natural. This will include the location where new piping and appurtenances are installed and the material of which they are constructed. This shall be accomplished as detailed in CFM 403-1, 403-2, 403-3, 405-1, and/or 405-1.

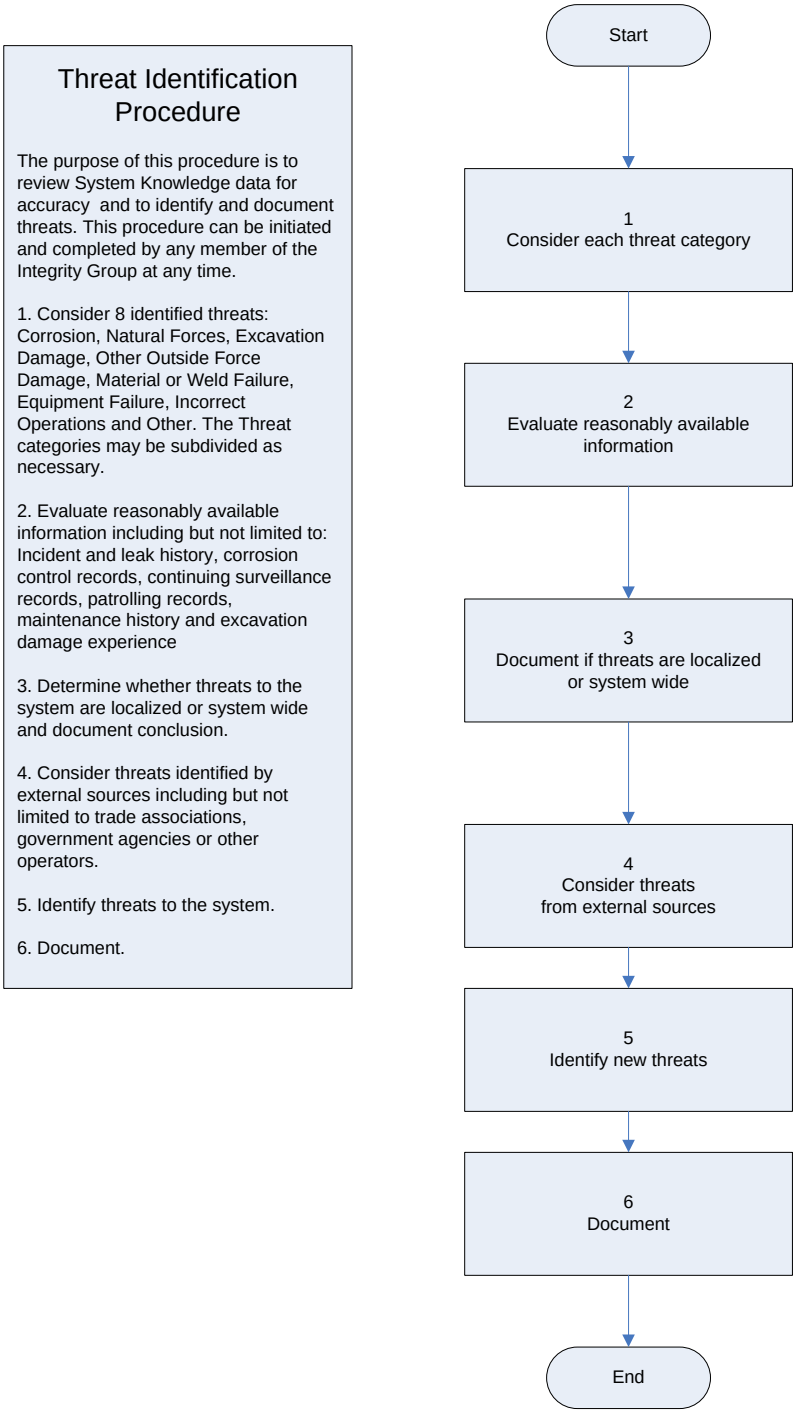
6.0 THREAT IDENTIFICATION

This section describes NW Natural's methodology for identifying existing and potential threats to the gas distribution pipeline. The following categories of threats shall be considered for each gas distribution pipeline:

- Corrosion
- Natural Forces
- Excavation Damage
- Other Outside Force
- Material, Weld or Joint Failure
- Equipment Failure
- Incorrect Operation
- Other concerns that could threaten the integrity of the gas distribution pipeline.

NW Natural will review information gathered for Section 5.0 and reasonably available information to identify existing and potential threats. Sources of data may include, but are not limited to, incident and leak history, corrosion control records, continuing surveillance records, patrolling records, maintenance history, and excavation damage experience. NW Natural will maintain records demonstrating compliance with the requirements of this plan.

Figure 6-0 illustrates the procedure used to identify threats.



6.1 Threat Identification

NW Natural relies on over 150 years of operating experience and actively participates in industry and PHMSA integrity forums. Where possible, NW Natural uses a data centric approach, supplemented with SME and industry data.

6.1.1 Data Centric Approach to Existing Threat Identification

NW Natural will use the best information available in order to understand the system and identify threats. The data centric approach is a Threat Identification methodology that uses available leak repair and incident data to identify threats that have a known history. The results are then reviewed by the SME(s) to make a final conclusion as to which threats are applicable. NW Natural will document the Threat Identification results in this chapter of the written DIMP Plan.

If it is found that the level of detail available from leak repair and incidents does not fully support this approach, NW Natural will consider the SME Centric approach outlined in Section 6.3. NW Natural may also wish to combine the data centric and SME centric approaches in order to have as complete an evaluation as possible.

6.1.2 SME Centric Approach to Threat Identification

NW Natural may not have leak repair or other key data that is detailed enough to support the threat identification approach described in Section 6.1.1 and/or may wish to leverage the knowledge and experience of SMEs to perform threat identification. The available SME centric approach to Threat Identification uses SME input to identify threats that have a known history to NW Natural's personnel.

6.1.3 Threat Identification from External Sources

Additionally, NW Natural may become aware of potential new threats by routinely monitoring information from sources that include:

- National Transportation and Safety Board (NTSB) Reports and Recommendations applicable to Pipeline Accidents. Reports may be found at:

http://www.ntsb.gov/Publictn/P_Acc.htm; Recommendation Letters may be found at: http://www.ntsb.gov/recs/letters/

- Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) Advisory Bulletins: http://phmsa.dot.gov/pipeline/regs/advisory-bulletin

- Membership in American Gas Association, Western Energy Institute, Gas Technology Institute and Northwest Operators Group)

- Involvement in Association workshops and forums that share knowledge regarding distribution pipeline threats

- Review of trade journals and magazines that publish material regarding gas distribution

6.2 Corrosion

Corrosion represents approximately 8% of all recorded leak repairs from 2005 to 2009.

Corrosion is a systematic threat. The Pipeline Integrity Group evaluated the corrosion threat and determined the following sub-threats were applicable for the NW Natural Distribution system. The results of these threat assessments are discussed below. Leak data is used to identify areas where isolated localized issues may occur. Pipe condition gathered during normal system maintenance identifies potential future issues.

6.2.1 Pipe Material

The primary potential driver for external corrosion system-wide is installed pipe material. The NW Natural Distribution system is approximately 45% poly, 55% coated and cathodically protected steel and less than 1% bare and non-cathodically protected steel. There is no corrosion threat associated with poly pipe. A corrosion threat exists for coated and cathodically protected steel, but existing code compliance and current

system practices adequately mitigate the threat system-wide. Isolated localized issues may occur. Bare steel represents the largest corrosion threat to NW Natural's Distribution system. NW Natural has completed a cast iron mitigation program, eliminating all cast iron within the system as of 1998.

6.2.2 Casings

Casings are primarily used to protect or facilitate installation of mains and services. Casings are typically equipped with vents for air circulation, casing spacers to provide isolation between the carrier pipe and casing, test leads for monitoring electrical isolation effectiveness and end seals to prevent water from accumulating in the casing.

NW Natural has coated steel pipe installed in casing system-wide and monitors for the electrical isolation between the distribution main and the casing annually, per the corrosion manual (Engineering Standard Practice 465 and 467). While there have been no corrosion related failures in casing, the threat of corrosion can exist under certain conditions.

Properly installed and maintained steel pipe in steel casing has a slightly higher threat than non-cased pipeline installations. Steel pipe installed in plastic casing has a slightly elevated threat of corrosion than direct buried pipeline installation. Cased crossings that have an identified or confirmed short (electrolytic or contact) are considered to have an elevated threat of corrosion.

NW Natural is aware of one area where coated steel pipe was inserted into abandoned steel pipe without spacers. While no corrosion leaks have been associated with this steel-in-steel installation, NW Natural considers this area to have an elevated threat of corrosion compared to direct buried steel main.

6.2.3 Atmospheric Corrosion

NW Natural's system includes facilities that may be subject to the threat of atmospheric corrosion. Steel pipe with inadequate coating that is exposed to marine atmospheres,

high humidity and atmospheric pollutants may be particularly vulnerable to atmospheric corrosion. These regions are stored in the GIS.

Risers, regulators, station piping, bridge crossings and other above ground facilities are all subject to the threat of atmospheric corrosion. NW Natural's atmospheric corrosion survey frequency is based upon Standard Practice 465.

NW Natural's atmospheric corrosion mitigation plan includes protective coating applications (paint) and the use of corrosion resistant materials (stainless steel and zinc plating) and replacement as required.

6.2.4 Corrosion Factors Discussed But Not Considered a Threat

There is no ductile iron or copper pipe within the NW Natural system and NW Natural has not identified in its operating history the results of internal corrosion in any distribution pipeline. Issues with the cathodic protection system are fixed upon discovery and are not used for threat identification at this time.

6.3 Natural Forces

Damage by Natural Forces is the 6th largest threat to the NW Natural gas distribution system, representing less than 1% of all recorded leak repairs during the five years from 2005 to 2009. Natural Forces is a localized threat.

6.3.1 Seismically Active Zones

NW Natural's system is in a seismically active zone and the threat exists evenly throughout the system.

6.3.2 Areas Susceptible to Earth Movement/Landslide

Earth movement due to landslides may damage gas distribution facilities and result in gas leaks. The NW Natural system exists in areas known to be susceptible to earth movement as identified by state, local and federal agencies, patrolling and NW Natural's

historical records. These areas may warrant mitigative measures such as increased monitoring and valve installation.

6.3.3 Heavy Rains / Floods/Water Crossings

Areas of NW Natural's system are susceptible to flooding. NW Natural has identified flood zones throughout the system using FEMA Flood Plain maps. Water crossings have an increased risk of failure due to washouts. Water crossings are identified in the GIS system.

6.3.4 Natural Forces Discussed But Not Considered a Threat

Frost line, frost heave and ice blockage of pressure control equipment vents are not threats within the NW Natural system.

6.4 Excavation Damage

Excavation damage is the largest threat to the NW Natural gas distribution system, representing approximately 55% of all recorded leak repairs during the five years from 2005 to 2009. Excavation damage is a system wide threat. The most significant root-cause factors are discussed below.

6.4.1 Improper Excavation Practice

NW Natural actively engages in educating employees and contractors about excavation procedures, using state dig laws and industry best practices. NW Natural employees are trained per OP-C-101-01. Contractors and third party excavators are monitored per the requirements of OP-C-101-01.

6.4.2 Facility Not Located or Marked

NW Natural is a participating member in the one call state system and responds to all one call tickets received. NW Natural experiences a low volume of this type of incident, which is due to a failure to request locates, locates requested in the wrong location or locates not completed on time.

6.4.3 One Call Notification Center Error

Locates may not be completed due to errors that occur at the one call notification center. NW Natural tracks one call activity and there have been no damages caused by one call notification center error in the past 14 years.

6.4.4 Mis-marked Facilities

Mis-marked facilities may be due to deficiencies in training, job execution, or equipment. NW Natural investigates every mis-mark.

If a NW Natural employee is responsible for a mis-mark, 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 if needed. NW Natural follows the same procedure for a contracted locating company.

6.4.5 Incorrect Facility Records

Gas Distribution facilities may be mis-marked or left unmarked due to inaccurate facility maps. NW Natural has a process in place for correcting and updating facility maps as any inaccuracies are identified.

6.4.6 Other

Other root causes include difficult to locate facilities (e.g. broken wire on plastic main or interference due to congested Right-of-Ways).

6.5 Other Outside Force Damage

Other Outside Force Damage is the 8th largest threat to the NW Natural gas distribution system, representing less than 1% of all recorded leak repairs during the five years from 2005 to 2009. Other Outside Force Damage is a localized threat.

6.5.1 Vehicle Damage to Risers and Meters

When installing new services or relocating service facilities, NW Natural employs protective measures on new construction to protect the gas riser and gas meter from vehicular damage. NW Natural retroactively employs protective measures to protect or to relocate the riser/meter when changes made by the property owner or historic design requirements do not sufficiently protect the meter/riser.

6.5.2 Vehicle Damage to Above-Ground Equipment / Stations

NW Natural employs protective measures to protect above-ground sections of gas mains, gas services, and regulator station piping which may be subject to damage by vehicular traffic. NW Natural employs additional protection or relocation to mitigate the risk of damage that could result in a gas leak or damage.

6.5.3 Vandalism

NW Natural employs protective measures to protect gas valves and station equipment from vandalism that could result in the unsafe operation of a gas distribution system and measures to prevent or reduce the likelihood of such vandalism.

6.5.4 Fire or Explosion

NW Natural employs scenario-based and classroom training to educate internal and external first responders to mitigate this risk.

6.6 Material, Weld or Joint Failure

Material, weld, or joint failure is the 3rd largest threat to the Northwest Natural gas distribution system, representing approximately 10% of all recorded leak repairs during the five years from 2005 to 2009. Material, Weld or Joint Failure is a system wide threat.

6.6.1 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 impose high stresses on the pipe, and take appropriate remedial action, including replacement, to mitigate any risks to public safety.

6.6.2 PVC

Polyvinylchloride (PVC) plastic pipe has not been installed for transportation of natural gas by NW Natural. PVC is used as a sleeve and conduit by NW Natural.

6.6.3 ABS

NW Natural installed Acrylonitrile-Butadiene-Styrene (ABS) services from the late 1950s through the early 1970s. All known ABS has been removed and replaced and if an ABS service is identified, it is scheduled for replacement.

6.6.4 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 scheduled for replacement if leaks are identified. There is no formal monitoring program in place at this time.

6.6.5 PE Fusion Failure

NW Natural has a robust training and QA/QC program in place to ensure proper poly fusion quality. This is achieved by annual testing, qualification and ongoing training. Poly fusions are visually inspected and pressure tested per Engineering Standard Practice 511, and installed per OP-C-130-01.

6.6.6 Material, Weld or Joint Discussed But Not Considered a Threat

Century Products MDPE 2306, Aldyl A pipe, HDPE pipe and Delrin Insert Tap Tees are not used within the NW Natural system.

6.7 Equipment Failure

Equipment Failure is the 2nd largest threat to the Northwest Natural gas distribution system, representing approximately 23% of all recorded leak repairs during the five years from 2005 to 2009. Equipment Failure is a system wide threat,

6.7.1 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, per SP 405 and OP-C-831-01. Key valves that are inoperable, inaccessible, and/or paved over are identified and maintained as needed.

6.7.2 Pressure Control / Relief Equipment

NW Natural has an established inspection and maintenance program in place for Pressure Control/Relief Equipment, per SP 743 and OP-M-800-01.

6.7.3 Mechanical Couplings

1. Pipe may pull out from compression couplings due to pullout forces that could include cyclic fatigue from seasonal temperature changes (e.g. frost heave), ground movement from earthquakes or after heavy rains, improper installation, and deterioration of the coupling.
2. Mechanical couplings may leak through the seal between the coupling and the pipe. Contributing factors may include a degradation of the seal over time or a change in the gas quality in the distribution system.
3. Leaks resulting from the pullout of a mechanical fitting due to the repeated action of freezing are classified as leaks due to Natural Forces.

6.7.4 Other

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

6.8 Incorrect Operation

Incorrect operation is the 7th largest threat to the NW Natural gas distribution system, representing less than 1% of all recorded leak repairs during the five years from 2005 to 2009. Incorrect Operations is a system wide threat.

6.8.1 Operating Errors

NW Natural has qualification and training programs in place to prevent operating errors, found in the Operator Qualifications manual, established in 2004. The procedures and AOCs are part of NW Natural's O&M Manual.

6.8.2 Gas lines cross-bored through Sewer Laterals

NW Natural recognizes the industry issue associated with cross-boring through sewer pipelines and takes immediate action upon discovery. NW Natural interacts with sewer municipalities within its region to minimize the incidents of boring through sewers. No historical incidents from this issue have been identified, but NW Natural recognizes the threat to its system.

6.9 Other

Leaks classified as Other represent 3% of total reported leaks, the 5th largest amount within the NW Natural Distribution system.

Pending a full investigation of an incident or leak, NW Natural may initially classify an incident as "other" until an actual cause can be determined.

7.0 EVALUATION AND RANKING OF RISK

Objective

This section describes NW Natural's methodology for evaluating and ranking the risks associated with its distribution pipelines. In this evaluation, NW Natural will determine the relative importance of each threat and estimate and rank the risks posed to its distribution pipeline. To complete this evaluation, NW Natural will:

- Consider each applicable current and potential threat
- Consider the likelihood of failure associated with each threat
- Consider the potential consequences of such a failure
- Estimate and rank the risks (i.e. determine the relative importance) posed to the distribution pipeline
- Consider the relevance of threats in one location to other areas

7.1 Risk Assessment Process

Information from the GIS, Annual Reports and other electronic data, written documentation and SME knowledge are used to populate NW Natural's DIMP risk model. The foundation is a mathematical or algorithm model with SME data added as appropriate. The data used includes pipe diameter, material and coating, installation date, MAOP, leak data, scheduled inspections, presence of EFVs, geographical area and population density/business districts.

NW Natural groups facilities by common traits and problems, which allows each group to be risk-ranked as a unit. The process is an analysis that assigns a relative risk value and may result in recommendation for action. "Relative risk" does not indicate an absolute measure of risk; it only indicates a comparative value relative to other NW

Natural facilities. It may be determined that facilities or groups of facilities that do not experience problems can be removed from the risk evaluation and no further action necessary.

The risk model assigns values to each facility or group of facilities based on the data gathered by threat and considers two factors to determine risk: Likelihood and Consequence

7.1.1 Likelihood

Likelihood refers to the possibility of an issue occurring within NW Natural's Distribution system and is modeled using data from three sources: Past incidents or failures, near-misses or partial failures and facilities susceptible to failure. Past incidents or failure data is gathered typically from leak data, near misses are gathered from normal maintenance activities and facilities susceptible to failure data is based on industry knowledge.

In this risk evaluation system, the likelihood of an event occurring is addressed by the relative scoring of the items within each index. The score of each item reflects the importance of that item relative to the other items in the index. This importance is based upon NW Natural's experience and general industry knowledge.

NW Natural created a likelihood of failure risk value for each of the eight threats.

The foundation for this risk assessment was the DIMP Tool Set, developed by ESRI, using the ArcGIS ModelBuilder environment. Using the GIS environment allows NW Natural to overlay internal and external data sets on the distribution system. This is accomplished by segmenting the service territory into user defined grids or rasters, which facilitate linking internal and external data to distribution facilities. NW Natural uses a 50'x 50' raster size, which is common practice for ESRI users.

Adequate information was readily available for this process, and as applicable in the future, NW Natural will capture additional relevant information during routine operations and maintenance activities.

The current algorithm used for Risk Assessment (the evaluation and ranking of risk) shall be documented and included by reference in Appendix C. Prior risk assessment algorithms shall be retained and stored in the DIMP files.

7.2.1 Consequence

Consequence refers to the potential impact an incident or failure may have on the area surrounding a pipeline facility. Consequence is modeled using data from two primary sources: Number of people impacted and the amount of gas that could potentially escape as the result of a failure.

NW Natural created one consequence score, which is used system wide to evaluate each of the eight likelihood threats.

To determine Consequence, census data (representative of where people live and work) and business districts (representative of where people work) were used to evaluate the number of people impacted, which is then combined with MAOP, pipe diameter and the presence of EFVs to determine the amount of gas that could escape. The value created represents the relative consequence score if failure occurs.

7.3 Total Relative Risk

Total relative risk is equal to the weighted average of the likelihoods multiplied by the consequence. Risk can be analyzed by total relative risk or by individual threat risk or by sub-threat risk.

The current risk assessment (likelihood, consequence, and resultant risk ranking) shall be stored in the GIS. Prior risk assessment results shall be retained and stored in the DIMP files.

7.4 Risk Assessment Validation

The Integrity Management team determined that the results of the risk assessment are valid and accurately represent the NW Natural distribution system. The results of the risk assessment and the operations and maintenance records focus on the same facilities or groups of facilities, and the results agree with the experiences of NW Natural's SMEs and if they are reasonable in comparison to historical leak repair data for the threat type.

7.7 Risk Assessment Process Improvement

Risk Evaluation and Ranking is an ongoing process that responds to changes in the distribution system and continuous improvements in risk evaluation and ranking methodology will be necessary. NW Natural's Integrity team will periodically evaluate the Risk Model and as new threats arise, system knowledge evolves, or as potential improvements are identified, the Risk Model will be updated. Changes to the Risk Model will be documented in Appendix C.

8.0 IDENTIFICATION AND IMPLEMENTATION OF MEASURES TO ADDRESS RISKS

This section describes NW Natural's existing and proposed measures to address the risks that have been evaluated and prioritized in Section 7.0.

The general purpose of this section is to determine and implement measures designed to reduce the risks from failures of its gas distribution pipeline. NW Natural uses this process to identify facilities where existing safety related compliance activities need to be supplemented with an A/A (Additional and Accelerated) Action to mitigate the risk. The risk can be managed by eliminating or reducing the likelihood or by lessening the consequence of a potential issue. A/A Actions may address one or more identified threats. Analysis of the risk data may be by total risk or by individual threats within the risk model.

Figure 8-0 illustrates the procedure to address risks.

Process to Identify and Implement Measures to Address Risk

The purpose of this process is to identify high risk areas evaluated for Accelerated Actions. This process is typically completed annually or as necessary and can be initiated by any member of the Integrity Management Group. High risk areas are selected according to the Risk Model or as identified by SMEs.

1. The Integrity Management Group identifies high risk facilities using the Risk Model and SME input.

2. Identify and document the compliance activities currently performed at high risk facilities. (leakage, corrosion, water crossing surveys, etc).

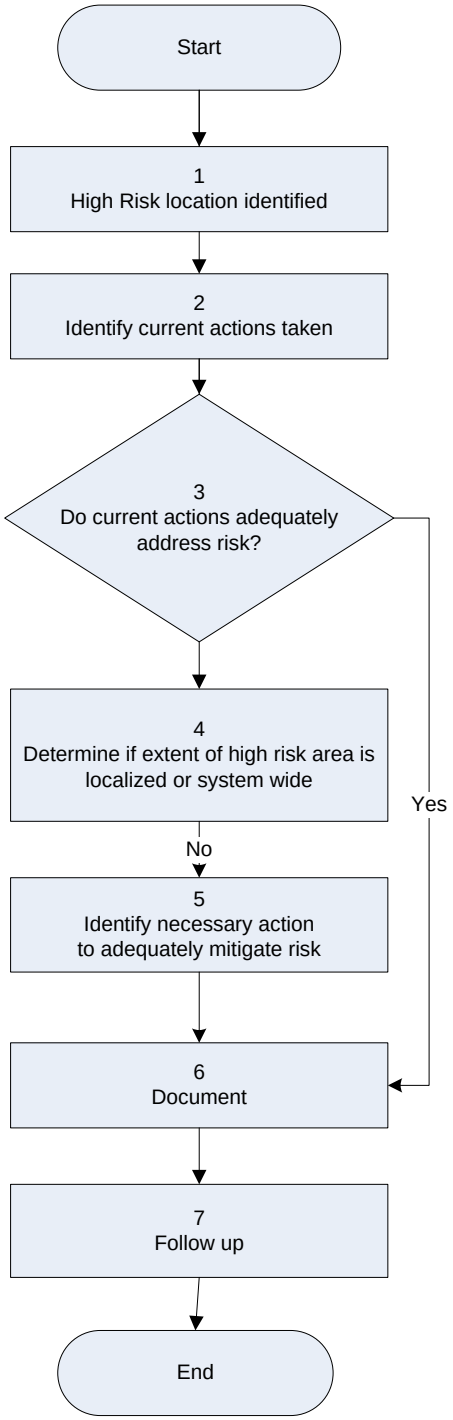
3. Determine if extent of high risk area is localized or system wide.

4. Determine if implementation of Accelerated Actions should be isolated or system wide

5. Identify the necessary Accelerated Actions to adequately mitigate risk (gather more information, schedule more frequent inspections, replace pipe, etc). Identify risk reduction score.

6. Document A/A Action including analysis of high risk area measure selected, how it will be implemented, and risk it is addressing.

7. Six month review to determine that Accelerated Actions have been completed.



8.1 Additional or Accelerated Actions

Using the process shown in Figure 8-0, the following A/A actions have been identified. The A/A actions are documented in Appendix D.

8.1.1 Corrosion Threat

Additional or Accelerated Actions that are currently scheduled or in place in order to reduce the risks associated with corrosion are:

- Bare steel replacement

8.1.2 Natural Forces

Additional or Accelerated Actions that are currently scheduled or in place in order to reduce the risks associated with natural forces are:

- Create specific mitigation plans for identified high risk active landslide areas

8.1.3 Excavation Damage

Additional or Accelerated Actions that are currently scheduled or in place in order to reduce the risks associated with excavation damage are:

- Actively reduce damages through training, education and enforcement as implemented by Damage Prevention Team

8.1.4 Other Outside Force

Additional or Accelerated Actions that are currently scheduled or in place in order to reduce the risks associated with other outside forces are:

- Install guard posts on new installations per company procedures. Continue program to identify areas of inadequate installation and bring to current standards

8.1.5 Material, Weld or Joint Failure

Additional or Accelerated Actions that are currently scheduled or in place in order to reduce the risks associated with material, weld or joint failure are:

- Replace ABS services

8.1.6 Equipment Failure

Additional or Accelerated Actions that are currently scheduled or in place in order to reduce the risks associated with equipment failure are:

- Investigate Service Tee Cap failures. Identify areas of increased risk and take appropriate action.

8.1.7 Incorrect Operation

Additional or Accelerated Actions that are currently scheduled or in place in order to reduce the risks associated with incorrect operation are:

- Evaluate potential exposure of sewer cross bores and develop a plan to address risk.

8.2 Leak Management Program

The Leak Management program is established in Engineering Standard Practice 707 and 709. Additionally, the OQ Manual, Part J-Compliance: Leakage, outlines the procedures of the existing program.

NW Natural uses this program to maintain the integrity of its distribution system. Many factors specific to NW Natural's geographic location and Distribution system are

considered to evaluate the severity of leaks and determine the appropriate actions to mitigate the risk associated with the leaks.

NW Natural's program contains the following basic elements:

Locate the leaks in the distribution system;

Evaluate the actual or potential hazards associated with these leaks;

Act appropriately to mitigate these hazards;

Keep records; and

Self-assess to determine if additional actions are necessary to keep people and property safe.

8.2.1 Locate the Leaks

NW Natural detects and locates leaks through the use of leak detection equipment when conducting leak surveys and investigating notifications of gas odors. Leak surveys are performed per SP 707.

8.2.2 Evaluate Leaks

When located, the hazards associated with the leaks are evaluated according to established classification criteria, per SP 709. These classification criteria take into consideration the safety risk posed by each leak:

- Class A – A leak that represents an existing or probable hazard to persons or property and requires immediate repair or continuous action until safe conditions are restored.
- Class B – A leak that is non-hazardous but justifies scheduled repair.
- Class C – A leak that is non-hazardous and can reasonably be expected to remain unchanged until the next scheduled check.

8.2.3 Act Appropriately

Once a leak has been located and classified, NW Natural takes actions that are consistent with the classification of that leak, per SP 709. This may include temporary or permanent repair of non-hazardous leaks. NW Natural takes immediate action to repair hazardous leaks.

8.2.4 Keep Records

NW Natural collects and records data to evaluate the effectiveness of the leak management program, per SP 709. These records provide sufficient data to allow all regulatory reports to be filed and to allow for continual leakage program improvements. NW Natural uses historical leak data as an indicator of potential future hazards. These records are stored in Advantica.

8.2.5 Self-Assess Key Performance Metrics & Analysis of Effectiveness

The Leak Management Program key performance metrics (those that establish program effectiveness) shall be documented, or included by reference, in Appendix D. Prior documentation shall be retained and stored in the DIMP files. The current performance metric evaluates the number of overall leaks as reported on PHMSA Annual Distribution Report.

9.0 MEASUREMENT OF PERFORMANCE, MONITORING RESULTS, AND EVALUATING EFFECTIVENESS

The section of the plan establishes performance measures that NW Natural will monitor from an established baseline in order to evaluate the effectiveness of the DIMP. The performance measures detailed in Sections 9.1 through 9.6 have been established in order to monitor performance and assist in the ongoing evaluation of threats.

- Number of hazardous leaks either eliminated or repaired (or total number of leaks if all leaks are repaired when found), categorized by cause;
- Number of excavation damages;
- Number of excavation tickets (receipt of information by NW Natural from the notification center);
- Total number of leaks either eliminated or repaired, categorized by cause;
- Number of hazardous leaks either eliminated or repaired (or total number of leaks if all leaks are repaired when found); categorized by material and;
- Any additional measures to evaluate the effectiveness of NW Natural's DIMP in controlling each identified threat.

9.1 Number of Hazardous Leaks either Eliminated or Repaired, per §192.703(c), Categorized by Cause

The baseline and ongoing performance of the number of hazardous leaks either eliminated or repaired, per §192.703(c), categorized by cause, shall be documented in the Distribution Annual Report.

9.2 Number of Excavation Damages

The baseline and ongoing performance of the number of excavation damages shall be documented in the Distribution Annual Report.

9.3 Number of Excavation Tickets (received from the notification center)

The baseline and ongoing performance of the number of excavation tickets received from the notification center(s) shall be documented in the Distribution Annual Report.

9.4 Total Number of Leaks either Eliminated or Repaired, Categorized by Cause

The baseline and ongoing performance of the total number of leaks either eliminated or repaired, categorized by cause, shall be documented in the Distribution Annual Report.

9.5 Number of Hazardous Leaks Either Eliminated or Repaired, per §192.703(c), Categorized by Material

The baseline and ongoing performance of the number of hazardous leaks either eliminated or repaired, per §192.703(c), categorized by material, shall be documented in the Distribution Annual Report.

9.6 Additional Performance Measures

If it is determined that additional performance measures are needed to evaluate the effectiveness of the DIMP in controlling an identified threat, the performance measures shall be documented, or included by reference in Appendix E.

10.0 PERIODIC EVALUATION AND IMPROVEMENT

This section describes NW Natural's periodic re-evaluation of threats and risks on the entire pipeline and the effectiveness of its program.

10.1 Plan Updating, Review Frequency and Documentation

- The plan will be reviewed periodically, with the interval not exceeding five years, and updated on an as-needed basis.
- The review will include verifying, and updating as needed, content such as any contact information contained in the plan, names or numbers of designated forms, information storage locations, action schedules, etc. NW Natural will also review experience with the plan and consider revising any parts that users have found confusing or difficult to implement.
- NW Natural will modify the plan to reflect completed DIMP work, then determine whether other risks should be given higher priority based in that completed work.
- If the review of performance measures concludes that a change of approach is warranted, such as selection of a different performance measure, or of a different risk management technique or practice, NW Natural will make appropriate revisions to the plan.
- NW Natural will maintain a record demonstrating that the plan review was performed even if no changes were made.

This written integrity management plan will be reviewed periodically and updated as required to reflect changes and improvements that have occurred in process, procedures and analysis for each element of the program. A complete program re-evaluation will be completed every five years. All changes to the written plan, inclusive

of material from the appendices, shall be recorded on the Revision Log in Appendix F. However, changes to material in the appendices that is included by reference need not be recorded on the Revision Log.

10.2 Effectiveness Review

- The data collected for a performance measure will be periodically reviewed by NW Natural to determine if the risk management technique or practice (A/A action) implemented is effective.
- During review, the data that supports the performance measure for a risk management technique or practice (A/A action) will be collected and analyzed. The analysis will examine whether the evidence indicates the practice or action is or is not managing the targeted task. NW Natural will then decide whether to continue or discontinue with the action, accelerate or decelerate its pace, modify how it is being implemented, or choose another action. NW Natural may conclude that it is too early to tell or that currently there is insufficient data to tell how well an action is working.
- Through analysis, NW Natural will examine if the performance measure selected is providing information useful in analyzing the impact of the practice or action. If the impact is unclear, NW Natural will include other data in the review or select a different performance measure.
- The frequency of review will depend on the time frame within which NW Natural anticipates that the A/A action will produce meaningful results. NW Natural will establish a review period appropriate for the performance measures and the interval will not exceed five years for any particular performance measure for consistency with the maximum allowed interval for complete program re-evaluation.

An assessment of the performance measures described in Sections 9.1 through 9.6 shall be performed. In cases where the re-evaluation criteria specified is met or exceeded, a re-evaluation of the associated threats and risks shall be completed. An emerging threat in one or more location shall be evaluated for relevance to other areas. The re-evaluation of threats and risks shall be documented in Appendix F and the results of the re-evaluation shall be documented in Appendices F. The review shall also establish whether a complete program re-evaluation shall be completed in a shorter timeframe than five years; this decision shall also be documented. Past effectiveness reviews that are no longer current shall be retained and stored in the DIMP files.

11.0 REPORTING RESULTS

11.1 State & Federal Annual Reporting Requirements

The following four measures shall be reported, annually by March 15, to PHMSA as part of the annual report required by CFR 49, § 191.11:

- Number of hazardous leaks either eliminated or repaired (or total number of leaks if all leaks are repaired when found), per § 192.703(c), categorized by cause
- Number of excavation damages
- Number of excavation tickets (receipt of information by NW Natural from the notification center)
- Total number of leaks either eliminated or repaired, categorized by cause
- NW Natural will report information related to failure of compression couplings, excluding those that result only in non-hazardous leaks, to PHMSA as part of the annual report required by §191.11 beginning with the report submitted March 15, 2011. This information will include, as available, location of the failure in the pipeline, nominal pipe size, material type, nature of failure including any contribution of local pipeline environment, coupling manufacturer, lot number and date of manufacture, and other information that can be found in markings on the failed coupling.

If a State exercises jurisdiction over the pipeline, these five measures shall also be reported to the State Pipeline Safety Authority in the State where the gas distribution pipeline is located. A copy of the reports shall be maintained in the DIMP files.

12.0 DOCUMENT AND RECORD RETENTION

The following records shall be retained in the DIMP files.

- The most current as well as prior versions of this written DIMP Plan
- Documents supporting Knowledge of Facilities (material supporting Appendix A of the DIMP Plan)
- Documents supporting threat identification (material supporting Appendix B of the DIMP Plan)
- Documents supporting risk evaluation and ranking (material supporting Appendix C of the DIMP Plan)
- Documents supporting the identification and implementation of measures to address risks (material supporting Appendix D of the DIMP Plan)
- Documents supporting measurement of performance, monitoring results and evaluating effectiveness (material supporting Appendix E of the DIMP Plan)
- Effectiveness Reviews (material supporting Appendix F of the DIMP Plan)
- Annual Reports to PHMSA (as required by §191.11) and State pipeline safety authorities
- Compression Coupling Failure Reports

Documentation demonstrating compliance with the requirements of CFR 49, Part 192, Subpart P shall be retained for at least 10 years or longer per NW Natural's Document Retention Schedule.

APPENDIX A

Chapter 5.0

Knowledge of Facilities

Appendix A-1. A summary of the data sets used to demonstrating an understanding of the gas distribution system

Input Data	Data Source	Collection Method	Data Type	GIS Type
3rd Party Damage	RL Man	Risk Agent	Table	Point
Atmospheric Corrosion Buffer	NWN GIS	GIS Buffer from State Boundary Line	Feature Layer	Polygon
Business Districts	NWN GIS	GIS Creation with Leakage Group Validation	Feature Layer	Polygon
Casings	NWN GIS	Construction AsBuilt	Feature Layer	
Census Blockgroups	US Census Bureau	Internet Download	Feature Layer	Polygon
Census Employment Data	US Census Bureau	Internet Download	Feature Layer	Polygon

Input Data	Data Source	Collection Method	Data Type	GIS Type
District Regulators	NWN GIS	Construction AsBuilt	Feature Layer	Point
Exposed Pipe Inspection	PCAD Data	PCAD Data point	Table or Raster Layer	Line
FEMA Floodplain	FEMA	Internet Download	Feature Layer	Polygon
Gas Distribution Mains	NWN GIS	Construction AsBuilt	Feature Layer	Line
Gas Distribution Mains	NWN GIS	Construction AsBuilt	Feature Layer	Line
Gas High Pressure Mains	NWN GIS	Construction AsBuilt	Feature Layer	Line
Gas Services	NWN GIS	Construction AsBuilt	Feature Layer	Line
Gas Valve	NWN GIS	Construction AsBuilt	Feature Layer	Point

Input Data	Data Source	Collection Method	Data Type	GIS Type
Gas Valve Inspections	Asset Register		Table	Point
Leak Data	Asset Register	Leakage Crew	Table or Raster Layer	Point
Non-Controllable Fitting	NWN GIS	Construction AsBuilt	Feature Layer	Point
OneCallTickets	Locates Database	One Call Center, Inc.	Table	Point
RailRoads	Oregon GEO	Internet Download	Feature Layer	Line
Risers	NWN GIS	Construction AsBuilt	Feature Layer	Point
Roads	Federal TIGER Data	Internet Download	Feature Layer	Line
Service Regulators	NWN GIS	Construction AsBuilt	Feature Layer	Point
Water	Oregon GEO/ WAGIC	Internet Download	Feature Layer	Line
Slope	USGS DEM (10M)	Internet	Raster	Raster

Input Data	Data Source	Collection Method	Data Type	GIS Type
		Download		
Landslide SLIDO v1-Oregon	DOGAMI	Internet Download	Feature Layer	Polygon
Landslide Washington	WA. Dept. of Natural Resources	Internet Download	Feature Layer	Polygon
Landslide NWN	NWN / GeoEngineer Reports			
Fittings	NWN GIS	Construction AsBuilt/ Auto-Populate During Data Model Migration	Feature Layer	Point
Gas Lamp	NWN GIS	Construction AsBuilt	Feature Layer	Point

APPENDIX B

Chapter 6.0

Threat Identification

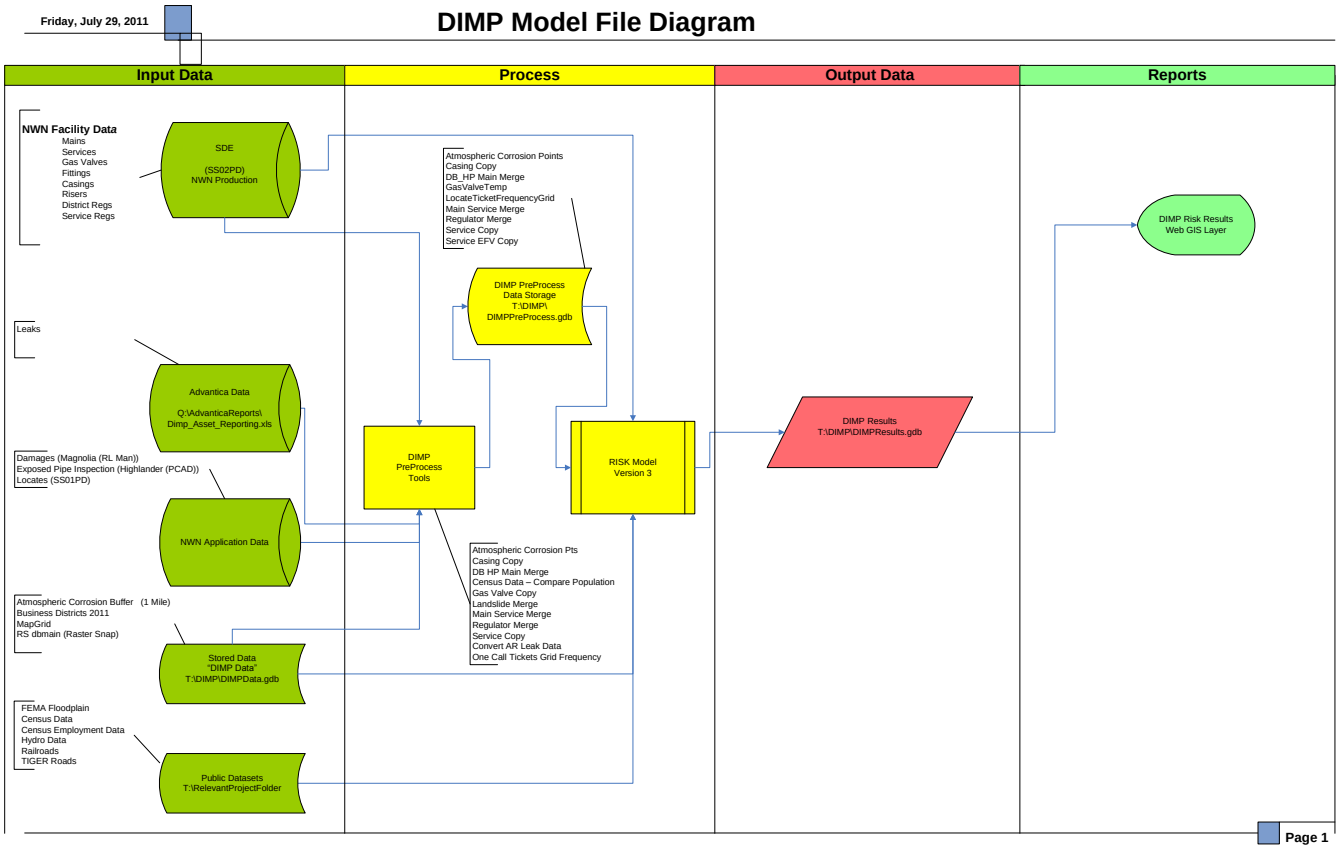
Appendix B is reserved for future supporting documents related to Threat Identification.

APPENDIX C

Chapter 7.0

Evaluation and Ranking of Risk

Appendix C-1. DIMP Risk Model Architecture.



Appendix C-2. Risk Algorithm

Threat Category	Sub-Threat (Input)	Score	Total Score
Consequences	**Population**		
	< 100	0	**0 to 18**
	>= 100 AND < 500	2	**0 to 18**
	>= 500 AND < 1000	4	
	>= 1000 AND < 2000	6	
	>= 2000 AND < 5000	8	
	>= 5000 AND < 5000	9	
	Business Districts		
	NWN Business Districts	1	
	Gas Main-Service		
	Nominal Diameter *.25 + Operating Pressure Integer	2 - 8	
	EFV Protected		
	(Nominal Diameter *.25 + Operating Pressure Integer) * 0.50	2 - 4	

Threat Category	Sub-Threat (Input)	Score	Total Score
Corrosion	**Leaks**		**0 to 24**
	Repaired Leaks caused by Corrosion Active Mains	8	**0 to 24**
	Repaired Leaks caused by Corrosion Active Services	8	
	Casing		
	Steel Casing with Steel Pipe	1	
	Atmospheric Corrosion Points		
	Service Risers, Service Regulators & Districts Regulators within 1 mile form Coast Line	1	
	Material		
	Wrapped Service/ Main	3	
	Bare Service/ Main	9	
	Exposed Pipe Inspections		
	CorrosionType		
	Major	5	
	Minor	2	

Threat Category	Sub-Threat (Input)	Score	Total Score
	Rust	1	
	Erosion		
Other	**Leaks**		
	Repaired Leaks caused by other Active Mains	8	**0 to 16**
Leaks < 10 Years	Repaired Leaks caused by other Active Services	8	**0 to 16**
	Active Leaks on Active Mains		
	"A" Leak - Becomes a Repaired Leak	0	
	"B" Leak	4	
	"C" Leak	1	
	Active Leaks on Active Services		
	"A" Leak - Becomes a Repaired Leak	0	
	"B" Leak	4	
	"C" Leak	1	
Incorrect Operations	**Leaks**		

Threat Category	Sub-Threat (Input)	Score	Total Score
	Leaks caused by incorrect Operations on Active Mains	8	**0 to 8**
Leaks < 10 Years	Leaks caused by incorrect Operations on Active Services	8	**0 to 8**
	Sewer Cross Bores		
	Poly Services Where Installation Method (Incompete)	0	
Natural Forces	**Leaks**		
	Repaired Leaks Caused by Natural Forces - Active Mains	8	**0 to 35**
Leaks < 10 Years	Repaired Leaks Caused by Natural Forces - Active Services	8	**0 to 35**
	Water Crossings		
	Service Water Crossings		
	-Exposed Pipe (Bridge Xing)	6	
	-Non-HDD	2	
	-HDD	0	
	Main Water Crossings		
	-Exposed Pipe (Bridge Xing)	6	

Threat Category	Sub-Threat (Input)	Score	Total Score
	-Non-HDD	2	
	-HDD	0	
	GeoHazards		
	Slope (Slope DEM)		
	-Mains on Slopes < 20%	2	
	-Services on Slopes < 20%	2	
	Landslide (GeoEngineer Reports)		
	-Mains in Active Landslide Areas	7	
	-Services in Active Landslide Areas	7	
	Landslide (SLIDO/ DNR Data)		
	-Mains in Historic Landslides	1	
	-Services in Historic Landslides	1	
	Flooding		
	Regulator Stations		
	-Zone 'A' - 100 Year Floodplain, no elevations provided	5	
	-Zone 'AE' - 100 Year Floodplain, base flood elevations provided	5	
	-Zone 'AH' - 100 Year Floodplain, pond, average depth = 1 to 3 ft.	2	

Threat Category	Sub-Threat (Input)	Score	Total Score
	-Zone 'AO' - 100 Year Floodplain, near River or Stream, average depth = 1 to 3 ft.	2	
	-Zone 'AR' - Areas w/ Temporary increased riskdue to building/ restoration of flood control system	2	
	-Zone 'A99' - Areas w/ Historical 100 year floodplain, yet protected by flood control system.	0	
	-Zone 'X' - Upland, not in floodplain	0	
	-Zone 'B' - Between Areas of 100 year and 500 year old floodplains	2	
	-Zone 'V' - 100 Year Coastal Floodplain, no elevations	5	
	-Zone 'D' - Areas w/ possible but undetermined flood hazards	5	
	-Zone 'X500' - 500 Year Floodplain	1	
	- ELSE - Legacy Codes	5	
Outside Force	**Leaks**		
	Leaks caused by Outside Forces on Active Mains	8	**0 to 30**
Leaks < 10 Years	Leaks caused by Outside Forces on Active Services	8	**0 to 30**
	Railroad Crossings		

Threat Category	Sub-Threat (Input)	Score	Total Score
	Gas Mains Crossing Railroads	1	
	Gas Services Crossing Railroads	1	
	Risers	3	
	Regulators: Distirct & Service	3	
	Reliefs	3	
	Major Road Crossings		
	Gas Mains Crossing Major Roads	1	
	Gas Services Crossing Major Roads	1	
	Risers	3	
	Regulators	3	
	Reliefs	3	
	Casings		
	Gas Pipe Casing Crossing Major Roads/ Railroads	-1	
Material	**Leaks**		
	Leaks caused by Material on Active Mains	8	**0 to 20**
Leaks < 10 Years	Leaks caused by Material on Active Services	8	**0 to 20**
	Material		

Threat Category	Sub-Threat (Input)	Score	Total Score
	Services		
	Poly Material on Service older than 1983	6	
	ABS Material on Services	6	
	Poly Material on Service with Null Install Date	6	
	Bare Material on Services	4	
	Mains		
	Poly Material on Main older than 1983	6	
	Bare Material on Mains	4	
Excavation	**Leaks**		
Leaks < 10 Years	Leaks caused by Excavation on Active Mains	8	**0 to 19**
	Leaks caused by Excavation on Active Services	8	**0 to 19**
Damages < 10 Years	**Damages**		
	Type of Damage		
	Bent	8	
	Broken	8	

Threat Category	Sub-Threat (Input)	Score	Total Score
	Coating Damage	4	
	Scratch	4	
	Null	6	
Locates < 3 Years	**Locates Frequency Grid**		
	Low (1 - 35)	1	
	Medium (35 - 70)	2	
	High (>70)	3	
Dependent on Incomplete/ Inaccurate PCAD EPI Data	**Depth OF Cover (EPI Data incomplete - No Risk Score Assessed)**		
	Standard Depth	1	
	Shallow	3	
	Deep 10' or greater	0	
Equipment Failure	**Leaks**		

Threat Category	Sub-Threat (Input)	Score	Total Score
	Leaks caused by Equipment Failure on Active Mains	8	**0 to 28**
Leaks < 10 Years	Leaks caused by Equipment Failure on Active Services	8	**0 to 28**
	Gas Equipment		
	Valves		
	Steel Valves on Mains & Services	3	
	Poly Valves on Mains & Services	1	
	EFV	1	
	Regulator: District & Service	3	
	Reliefs	3	
	Risers	1	
	Gas Lamp	1	
	Fittings		
	Coupling	1	
	Curb Service	1	
	Cut Service	1	
	End of Main	1	
	End OF Service	1	
	Insulated Flange	1	

Threat Category	Sub-Threat (Input)	Score	Total Score
	Insulated Coupling	1	
	Tees - Service	1	
	Tees - Main	1	
Joint Failure	**Leaks**		
	Leaks caused by Faulty Material or Welds on Active Mains - **Accounted for in Material Model**	0	**0 to 6**
Leaks < 10 Years	Leaks caused by Faulty Material or Welds on Active Services - **Accounted for in Material Model**	0	**0 to 6**
	Mains		
	Pre 1970 Steel Pipe (Double Submerged Arc Weld DSAW Pipe)		
	< 4"	1	
	> 4"	3	
	Operator Qualifications		
	Mains & Services		
	Pipe Installed after OQ Practises (>10/28/2002)	0	
	Pipe Installed before OQ Practises (<10/28/2002)	3	

Threat Category	Sub-Threat (Input)	Score	Total Score

APPENDIX D

Chapter 8.0

Identification and Implementation of Measures to Address Risks

Table D-1: DIMP A/A Actions

Proposed DIMP A/A Actions			
Threat	**A/A Action**	**Implementation Schedule**	**Performance Measure**
Corrosion	Replace Bare Steel	Replace all Bare Steel mains and services by 2021	A reduction in the number of open leaks reported annually. Also given the industry accepted best practice to remove bare steel from the system a measurement of miles of main and a count of services in service at year end with a goal of zero by 2021.
Natural Forces	Specific mitigation plans for identified high risk active areas on land movement	Create and implement mitigation plan within one year of identifying high risk area	Maintain low (near zero) leak rate for natural force leaks as reported on PHMSA Annual Report.

Excavation Damage	Actively reduce damages through training, education, and enforcement as implemented by Damage Prevention Team.	Continuous improvement	Measure of damages per 1000 locates.
Other Outside Force Damage	Guard Posts	Install guard posts on new installations per company procedures. Continue program to identify areas of poor installation and bring to current standards.	Maintain low (near zero) leak rate for other outside force damage leaks as reported on PHMSA Annual Report.
Material, Weld or Joint Failure	Replace ABS services	Identify all likely locations by the end of 2011. Create replacement schedule by end of 2012.	A count of ABS services in service at years end as reported on Annual Report with a goal of zero.

Equipment Failure	Service Tee caps	Identify areas of increased service tee cap failure by end of 2012. Create monitoring and replacement program by end of 2013	A decrease in the number of Hazardous leaks associated with Equipment Failure.
Incorrect Operations	Sewer Cross Bores	Evaluate potential exposure of sewer cross bores and develop a plan to address risk by end of 2012.	Maintain low (near zero) leak rate associated with sewer cross bores.

Appendix D-2: Leak Management Program Key Performance Metrics

	OR- Number of Main Leaks Repaired	OR- Number of Service Leaks Repaired	OR - Number of Leaks scheduled for repair at end of year	WA- Number of Main Leaks Repaired	WA- Number of Service Leaks Repaired	WA - Number of Leaks scheduled for repair at end of year
2005	328	700	80	29	66	4
2006	218	461	67	23	65	6
2007	360	691	39	77	55	2
2008	327	599	63	63	46	2
2009	287	474	49	36	39	0
2010	263	453	35	19	43	2

APPENDIX E

Chapter 9.0

Measure Performance, Monitor Results, and Evaluate Effectiveness

Appendix E-1, PHMSA Distribution Annual Report – Oregon, 2010

NOTICE: This report is required by 49 CFR Part 191. Failure to report can result in a civil penalty not to exceed 100,000 for each violation for each day that such violation persists except that the maximum civil penalty shall not exceed $1,000,000 as provided in 49 USC 60122.		OMB NO: 2137-0522 EXPIRATION DATE: 01/31/2014
U.S Department of Transportation Pipeline and Hazardous Materials Safety Administration	Form Type:	ORIGINAL
	ID:	3011
	(DOT use only)	

ANNUAL REPORT FOR
CALENDAR YEAR 2010
GAS DISTRIBUTION SYSTEM

A federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act unless that collection of information displays a current valid OMB Control Number. The OMB Control Number for this information collection is 2137-0522. Public reporting for this collection of information is estimated to be approximately 16 hours per response, including the time for reviewing instructions, gathering the data needed, and completing and reviewing the collection of information. All responses to this collection of information are mandatory. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to: Information Collection Clearance Officer, PHMSA, Office of Pipeline Safety (PHP-30) 1200 New Jersey Avenue, SE, Washington, D.C. 20590.

PART A - OPERATOR INFORMATION

1. Name of Operator	NORTHWEST NATURAL GAS CO
2. LOCATION OF OFFICE (WHERE ADDITIONAL INFORMATION MAY BE OBTAINED)	
2a. Street Address	220 NW 2nd Ave
2b. City and County	Portland,Multnomah
2c. State	OR
2d. Zip Code	97209
3. OPERATOR'S 5 DIGIT IDENTIFICATION NUMBER	13840
4. HEADQUARTERS NAME & ADDRESS	
4a. Street Address	220 N.W. SECOND AVENUE
4b. City and County	PORTLAND
4c. State	OR
4d. Zip Code	97209
5. STATE IN WHICH SYSTEM OPERATES	OR

PART B - SYSTEM DESCRIPTION

1.GENERAL

	STEEL									
	UNPROTECTED		CATHODICALLY PROTECTED							
	BARE	COATED	BARE	COATED	PLASTIC	CAST/ WROUGHT IRON	DUCTILE IRON	COPPER	OTHER	TOTAL
MILES OF MAIN	21.000	0.000	1.000	6249.000	5298.000	0.000	0.000	0.000	0.000	11569.000
NO. OF SERVICES	52.000	0.000	115.000	193417.000	398452.000	0.000	0.000	0.000	0.000	592036.000

2.MILES OF MAINS IN SYSTEM AT END OF YEAR

MATERIAL	UNKNOWN	2" OR LESS	OVER 2" THRU 4"	OVER 4" THRU 8"	OVER 8" THRU 12"	OVER 12"	TOTAL
STEEL	0.000	4850.000	886.000	479.000	49.000	7.000	6271.000
DUCTILE IRON	0.000	0.000	0.000	0.000	0.000	0.000	0.000
COPPER	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CAST/WROUGHT IRON	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PLASTIC PVC	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PLASTIC PE	0.000	4479.000	705.000	114.000	0.000	0.000	5298.000
PLASTIC ABS	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER PLASTIC	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	9329.000	1591.000	593.000	49.000	7.000	11569.000

3.NUMBER OF SERVICES IN SYSTEM AT END OF YEAR — **AVERAGE SERVICE LENGTH: 77**

MATERIAL	UNKNOWN	1" OR LESS	OVER 1" THRU 2"	OVER 2" THRU 4"	OVER 4" THRU 8"	OVER 8"	TOTAL
STEEL	0.000	192583.000	824.000	152.000	23.000	2.000	193584.000
DUCTILE IRON	0.000	0.000	0.000	0.000	0.000	0.000	0.000
COPPER	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CAST/WROUGHT IRON	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PLASTIC PVC	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PLASTIC PE	8.000	396579.000	1559.000	144.000	8.000	0.000	398298.000
PLASTIC ABS	0.000	154.000	0.000	0.000	0.000	0.000	154.000
OTHER PLASTIC	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	8.000	589316.000	2383.000	296.000	31.000	2.000	592036.000

4.MILES OF MAIN AND NUMBER OF SERVICES BY DECADE OF INSTALLATION

	UNKNOWN	PRE-1940	1940-1949	1950-1959	1960-1969	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019	TOTAL
MILES OF MAIN	3.000	11.000	1.000	279.000	2826.000	1970.000	1646.000	2874.000	1932.000	27.000	11569.000
NUMBER OF SERVICES	169679.000	7.000	7.000	318.000	5130.000	16009.000	55800.000	191088.000	148567.000	5431.000	592036.000

PART C - TOTAL LEAKS AND HAZARDOUS LEAKS ELIMINATED/REPAIRED DURING THE YEAR

CAUSE OF LEAK	MAINS		SERVICES	
	TOTAL	HAZARDOUS	TOTAL	HAZARDOUS
CORROSION	17	1	5	5
NATURAL FORCES	0	0	0	0
EXCAVATION DAMAGE	80	2	322	1
OTHER OUTSIDE FORCE DAMAGE	0	0	0	0
MATERIAL OR WELDS	131	25	89	26
EQUIPMENT	0	0	0	0
INCORRECT OPERATIONS	0	0	0	0
OTHER	7	0	4	1

NUMBER OF KNOWN SYSTEM LEAKS AT END OF YEAR SCHEDULED FOR REPAIR : 35

PART D - EXCAVATION DAMAGE

NUMBER OF EXCAVATION DAMAGES: 499

NUMBER OF EXCAVATION TICKETS : 159342

PART E-EXCESS FLOW VALUE(EFV) DATA

NUMBER OF EFV'S INSTALLED THIS CALENDER YEAR ON SINGLE FAMILY RESIDENTIAL SERVICES: 4445

ESTIMATED NUMBER OF EFV'S IN SYSTEM AT THE END OF YEAR: 152449

PART F - LEAKS ON FEDERAL LAND

TOTAL NUMBER OF LEAKS ON FEDERAL LAND REPAIRED OR SCHEDULED TO REPAIR: 0

PART G-PERCENT OF UNACCOUNTED FOR GAS

UNACCOUUNTED FOR GAS AS A PERCENT OF TOTAL INPUT FOR THE 12 MONTHS ENDING JUNE 30 OF THE REPORTING YEAR.

INPUT FOR YEAR ENDING 6/30: 46%

PART H - ADDITIONAL INFORMATION

PART I - PREPARER AND AUTHORIZED SIGNATURE

Kerry Shampine,Compliance Manager (Preparer's Name and Title)	(503) 226-4211 (Area Code and Telephone Number)
kfs@nwnatural.com (Preparer's email address)	(Area Code and Facsimile Number)

Appendix E-1, PHMSA Distribution Annual Report – Washington, 2010

NOTICE: This report is required by 49 CFR Part 191. Failure to report can result in a civil penalty not to exceed 100,000 for each violation for each day that such violation persists except that the maximum civil penalty shall not exceed $1,000,000 as provided in 49 USC 60122.		OMB NO: 2137-0522 EXPIRATION DATE: 01/31/2014
U.S Department of Transportation Pipeline and Hazardous Materials Safety Administration	**Form Type:**	ORIGINAL
	ID:	3025
	(DOT use only)	

ANNUAL REPORT FOR
CALENDAR YEAR 2010
GAS DISTRIBUTION SYSTEM

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2b. City and County	PORTLAND,MULTNOMAH
2c. State	OR
2d. Zip Code	97209
3. OPERATOR'S 5 DIGIT IDENTIFICATION NUMBER	13840
4. HEADQUARTERS NAME & ADDRESS	
4a. Street Address	220 N. W. SECOND AVENUE
4b. City and County	PORTLAND,MULTNOMAH
4c. State	OR
4d. Zip Code	97209
5. STATE IN WHICH SYSTEM OPERATES	WA

PART B - SYSTEM DESCRIPTION

1.GENERAL

	STEEL									
	UNPROTECTED		CATHODICALLY PROTECTED							
	BARE	COATED	BARE	COATED	PLASTIC	CAST/ WROUGHT IRON	DUCTILE IRON	COPPER	OTHER	TOTAL
MILES OF MAIN	3.000	0.000	1.000	368.000	1317.000	0.000	0.000	0.000	0.000	1689.000
NO. OF SERVICES	5.000	0.000	0.000	4275.000	61541.000	0.000	0.000	0.000	0.000	65821.000

2.MILES OF MAINS IN SYSTEM AT END OF YEAR

MATERIAL	UNKNOWN	2" OR LESS	OVER 2" THRU 4"	OVER 4" THRU 8"	OVER 8" THRU 12"	OVER 12"	TOTAL
STEEL	0.000	222.000	86.000	61.000	3.000	0.000	372.000
DUCTILE IRON	0.000	0.000	0.000	0.000	0.000	0.000	0.000
COPPER	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CAST/WROUGHT IRON	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PLASTIC PVC	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PLASTIC PE	0.000	1095.000	189.000	33.000	0.000	0.000	1317.000
PLASTIC ABS	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER PLASTIC	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	1317.000	275.000	94.000	3.000	0.000	1689.000

3.NUMBER OF SERVICES IN SYSTEM AT END OF YEAR | **AVERAGE SERVICE LENGTH: 62**

MATERIAL	UNKNOWN	1" OR LESS	OVER 1" THRU 2"	OVER 2" THRU 4"	OVER 4" THRU 8"	OVER 8"	TOTAL
STEEL	0.000	4225.000	43.000	10.000	2.000	0.000	4280.000
DUCTILE IRON	0.000	0.000	0.000	0.000	0.000	0.000	0.000
COPPER	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CAST/WROUGHT IRON	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PLASTIC PVC	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PLASTIC PE	1.000	61321.000	200.000	9.000	5.000	0.000	61536.000
PLASTIC ABS	0.000	5.000	0.000	0.000	0.000	0.000	5.000
OTHER PLASTIC	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	1.000	65551.000	243.000	19.000	7.000	0.000	65821.000

4.MILES OF MAIN AND NUMBER OF SERVICES BY DECADE OF INSTALLATION

	UNKNOWN	PRE-1940	1940-1949	1950-1959	1960-1969	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019	TOTAL
MILES OF MAIN	0.000	0.000	0.000	27.000	127.000	104.000	191.000	719.000	516.000	5.000	1689.000
NUMBER OF SERVICES	3770.000	0.000	0.000	12.000	217.000	505.000	2951.000	29463.000	27920.000	983.000	65821.000

PART C - TOTAL LEAKS AND HAZARDOUS LEAKS ELIMINATED/REPAIRED DURING THE YEAR				
CAUSE OF LEAK	MAINS		SERVICES	
	TOTAL	HAZARDOUS	TOTAL	HAZARDOUS
CORROSION	1		0	
NATURAL FORCES	0		0	
EXCAVATION DAMAGE	10	1	37	1
OTHER OUTSIDE FORCE DAMAGE	0		0	
MATERIAL OR WELDS	5	2	3	2
EQUIPMENT	0		0	
INCORRECT OPERATIONS	0		0	
OTHER	0			
NUMBER OF KNOWN SYSTEM LEAKS AT END OF YEAR SCHEDULED FOR REPAIR : 2				

PART D - EXCAVATION DAMAGE	PART E-EXCESS FLOW VALUE(EFV) DATA
NUMBER OF EXCAVATION DAMAGES: 55	NUMBER OF EFV'S INSTALLED THIS CALENDER YEAR ON SINGLE FAMILY RESIDENTIAL SERVICES: 985
NUMBER OF EXCAVATION TICKETS : 17370	ESTIMATED NUMBER OF EFV'S IN SYSTEM AT THE END OF YEAR: 29670
PART F - LEAKS ON FEDERAL LAND	**PART G-PERCENT OF UNACCOUNTED FOR GAS**
TOTAL NUMBER OF LEAKS ON FEDERAL LAND REPAIRED OR SCHEDULED TO REPAIR: 0	UNACCOUUNTED FOR GAS AS A PERCENT OF TOTAL INPUT FOR THE 12 MONTHS ENDING JUNE 30 OF THE REPORTING YEAR. INPUT FOR YEAR ENDING 6/30: 46%

PART H - ADDITIONAL INFORMATION

PART I - PREPARER AND AUTHORIZED SIGNATURE	
Kerry Shampine (Preparer's Name and Title)	(503) 226-4211 (Area Code and Telephone Number)
kfs@nwnatural.com (Preparer's email address)	(Area Code and Facsimile Number)

Appendix E-3. Additional Performance Measures for A/A Actions.

A/A Action	Performance Measure	Baseline Measurements (Per 2010 PHMSA annual report unless noted otherwise)
Replace Bare Steel	A reduction in the number of open leaks reported annually. Also given the industry accepted best practice to remove bare steel from the system a measurement of miles of main and a count of services in service at year end with a goal of zero by 2021.	• OR - Bare Steel Main - 22 miles • OR - Bare Services - 167 • OR - Leaks Scheduled for Repair - 35 • WA - Bare Steel Main - 4 miles • WA - Bare Steel Services – 5 • WA - Leaks Scheduled for Repair - 2
Specific mitigation plans for identified high risk active areas on land movement	Maintain low (near zero) leak rate for natural force leaks as reported on PHMSA Annual Report.	• OR – Natural Forces Leaks – 0 • WA – Natural Forces Leaks - 0
Actively reduce damages through training, education, and enforcement as implemented by Damage Prevention Team.	Measure of damages per 1000 locates.	• OR – 499 damages on 159,342 locates = 3.1 damages/1000 locates • WA – 55 damages on 17,370 locates = 3.2 damages/1000 locates
Guard Posts	Maintain low (near zero) leak rate for other outside force damage leaks as reported on PHMSA Annual Report.	• OR – Other Outside Force Leaks – 0 • WA – Other Outside Force Leaks - 0
Replace ABS services	A count of ABS services in service at years end as reported on Annual Report with a goal of zero.	• OR – 154 ABS services • WA – 5 ABS services

Service Tee caps	A decrease in the number of Hazardous leaks associated with Equipment Failure.	• OR – Hazardous Equipment Failure Leaks – 0 • WA – Hazardous Equipment Failure Leaks – 0
Sewer Cross Bores	Maintain low (near zero) leak rate associated with sewer cross bores.	• OR- Incorrect Operations Leaks – 0 • WA – Incorrect Operations Leaks - 0

APPENDIX F

Chapter 10.0

Periodic Evaluation and Improvement

Appendix F-1. Revision Log Distribution Integrity Management Program Plan

Date	Section/Pages	Rev	Primary Change	Approved
7/1/2011		**00**	Initial Document	

Date	Section/Pages	Rev	Primary Change	Approved