07-31-15 10:34 RCVD

CITY OF LONG BEACH
Gas & Oil
DEPARTMENT

CHRISTOPHER J. GARNER
DIRECTOR

2400 EAST SPRING STREET · LONG BEACH, CA 90806
(562) 570-2000 · FAX (562) 570-2050

www.lbgo.org

July 30, 2015

VIA UPS

Mr. Chris Hoidel
Director, Western Region
Pipeline and Hazardous Materials Safety Administration
12300 W. Dakota Ave., Suite 110
Lakewood, CO 80228

Re: CPF 5-2015-0009M

Dear Mr. Hoidel:

Long Beach Gas & Oil (LBGO) received your July 1, 2015 letter regarding a Notice of Amendment (NOA) resulting from the April 9-12, 2012 Pipeline and Hazardous Materials Safety Administration (PHMSA) Inspection of LBGO's Distribution Integrity Management Plan (DIMP). In accordance with Title 49 Code of Federal Regulations (CFR) 190.237 [Amendment of plans or procedures], LBGO is providing the following response.

LBGO has completed a comprehensive restructure of its DIMP in order to fully and completely respond to PHMSA's allegations of apparent inadequacy in procedural specificity, risk ranking and evaluation, and performance measures. The result is the broadly revised and improved DIMP enclosed with this letter.

LBGO will not restate the allegations in this letter. Instead, LBGO will reference the relevant sections of the attached amended LBGO DIMP and the relevant CFR as cited in the NOA.

Response to PHMSA Allegation 1; §192.1007 (a) ["...procedural specificity..."]:

LBGO has improved and expanded the identification of data sources and how they were used to develop and implement the Plan and provided a more thorough explanation of the process for information gathering. Please see the following DIMP Sections:

2.4 Plan Development
2.5 Execution Plan for DIMP

2.6 Records
4.4 New Threats and Additional Information

Response to PHMSA Allegation 2; §192.1007(c) ["...evaluation and ranking of risks..."]:

LBGO has elected to group the Age of Infrastructure threat. This grouping allows for a comprehensive evaluation of risks associated with multiple generations of materials selection, and construction methods. Please see the following DIMP Sections:

4.3.1 Age of Infrastructure
4.3.2 Early Construction Practices and Materials
5.2.5 Threat: Other – Age of Infrastructure

Failure to Follow Procedure has been ranked relative to other threats. Please see the following DIMP Section:

5.2.4 Low Likelihood of Occurrence – High Consequence as a Result

Response to PHMSA Allegation 3; §192.1007(d) ["..."Age of Infrastructure..."]:

LBGO has grouped ten individual threats that have common design and construction characteristics from common installation eras in to the grouped Age of Infrastructure threat. In addition to being collectively risk ranked as an Age of Infrastructure group risk, these threats are now also evaluated and risk ranked independently. Please see the following DIMP sections:

5.2.5 Medium Likelihood of Occurrence - Medium Consequence as a Result
6.3 Pipe Replacement Program
7.2 Performance Measures

Response to PHMSA Allegation 4 §192.1007(e) ["...procedural specificity for collecting information for leak(s)...(and) performance measures...."]:

LBGO has amended the DIMP to include specificity regarding existing methods used in collecting information of performance measures for leaks eliminated and or repaired categorized by material. Also amended are the performance measures to track effectiveness. Please see the following DIMP Section:

2.4 Plan Development
2.6.1 Records & Table 1
4.4.2 Additional Information
7.2 Performance Measures

Response to PHMSA Allegation 5 §192.1007(f) ["...periodic evaluation(s)..."]:

LBGO has amended the Plan to provide additional specificity to the procedures required for annual and 5 year reviews of DIMP. Please see the following DIMP Section:

7.2 Performance Measures
8.1 Annual Review
8.2 Periodic (5 Year) Plan Review

LBGO respectfully submits this response and amended DIMP for your consideration in relation to the issues identified in the Notice of Amendment.

We look forward to further discussion with PHMSA of LBGO's restructured DIMP and other Plans and Programs at the upcoming Integrated Inspection this coming September.

Should you have any questions on this matter, please do not hesitate to contact me at (562) 570-2034.

Sincerely,

Steve Bateman
Manager of Engineering and Construction
Long Beach Gas & Oil Department
2400 E Spring St
Long Beach, California 90806

Enclosure(s)
CC: Christopher J. Garner, Director – Long Beach Gas & Oil
Phillip Carroll, Principal Construction Inspector

U.S. Department
of Transportation

Pipeline and Hazardous Materials
Safety Administration

12300 W. Dakota Ave., Suite 110
Lakewood, CO 80228

NOTICE OF AMENDMENT

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

July 1, 2015

Mr. Stephen Bateman
DOT Compliance Primary Manager
City of Long Beach Gas & Oil
2400 East Spring Street
Long Beach, CA 90806-2285

CPF 5-2015-0009M

Dear Mr. Bateman:

PHMSA conducted an internal audit of its past regulatory inspections and noted that this previously prepared enforcement letter from a 2012 audit of your pipeline facilities was not issued. While we apologize for the tardiness of this letter, PHMSA must still ensure any past regulatory violations have been addressed.

From April 9-12 of 2012, a representative of the Pipeline and Hazardous Materials Safety Administration (PHMSA), pursuant to Chapter 601 of 49 United States Code, inspected your Long Beach Gas and Oil (LBGO) procedures and records for Distribution Integrity Management Program (DIMP), as of 2012, in your Long Beach, CA offices.

On the basis of the inspection, PHMSA has identified the apparent inadequacies found within LBGO's plans or procedures, as described below:

1. **§192.1007 What are the required elements of an integrity management plan?**

   A written integrity management plan must contain procedures for developing and implementing the following elements:
   (a) Knowledge. An operator must demonstrate an understanding of its gas

distribution system developed from reasonably available information.
(1) Identify the characteristics of the pipeline's design and operations and the environmental factors that are necessary to assess the applicable threats and risks to its gas distribution pipeline.
(2) Consider the information gained from past design, operations, and maintenance.
(3) 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).
(4) Develop and implement a process by which the IM program will be reviewed periodically and refined and improved as needed.
(5) Provide for the capture and retention of data on any new 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.

LBGO's DIMP did not provide sufficient procedural specificity to describe how the identified data sources were used to develop and are to be used for implementation for the gathering of information and knowledge of its gas distribution system.

LBGO's DIMP did not provide sufficient procedural specificity for identifying, listing, and collecting (as appropriate) additional data and information that is needed to fill gaps in knowledge and information due to missing, inaccurate, or incomplete records. If LBGO has determined there are no information gaps, the DIMP is required to clearly state this determination.

2. **§192.1007 What are the required elements of an integrity management plan?**

A written integrity management plan must contain procedures for developing and implementing the following elements:
(c) Evaluate and rank risk. An operator must evaluate the risks associated with its distribution pipeline. In this evaluation, the operator must determine the relative importance of each threat and estimate and rank the risks posed to its pipeline. This evaluation must consider each applicable current and potential threat, the likelihood of failure associated with each threat, and the potential consequences of such a failure. An operator may subdivide its pipeline into regions with similar characteristics (e.g., contiguous areas within a distribution pipeline consisting of mains, services and other appurtenances; areas with common materials or environmental factors), and for which similar actions likely would be effective in reducing risk.

LBGO's DIMP did not adequately account for the evaluation and ranking of risks that are typically associated with pipeline installations installed prior to the 1950's. While LBGO's DIMP identifies, discusses, and analyzes the threats and the higher leak rates associated with pre-1950's pipeline (e.g., Table 8, Section 4.2.13, Section 4.2.5.3, Section 5.2), the relative importance of this combination of threats (or system vulnerability) is not determined and estimated, and the risks posed to the pipeline system is not ranked against other threats.

The threat of "Failure to follow Procedure" discussed in LBGO's DIMP Section 4.2.5.4 is not adequately accounted for in the evaluation and ranking of risks and this threat must be evaluated and ranked. Our inspectors believe the various threats, e.g., employee's failure to follow procedures due to any number issues, that are combined in the threat of "Failure to follow Procedure" as low probability / high consequence risks that must be accounted for and analyzed.

3. **§192.1007 What are the required elements of an integrity management plan?**

A written integrity management plan must contain procedures for developing and implementing the following elements:
(d) Identify and implement measures to address risks. Determine and implement measures designed to reduce the risks from failure of its gas distribution pipeline. These measures must include an effective leak management program (unless all leaks are repaired when found).

LBGO's DIMP did not adequately address the risk posed to the integrity of their pipelines system by the threat of the "Age of Infrastructure". This threat is not adequately evaluated and ranked in the LBGO DIMP (see Item 2); LBGO has failed to identify measures to address risks for implementation. LBGO did not identify measures to reduce risk posed by this threat that adequately account for the low probability / low consequence risks posed by existing threats from pre-1950's pipeline installations.

4. **§192.1007 What are the required elements of an integrity management plan?**

A written integrity management plan must contain procedures for developing and implementing the following elements:
(e) Measure performance, monitor results, and evaluate effectiveness.
(1) Develop and monitor performance measures from an established baseline to evaluate the effectiveness of its IM program. An operator must consider the results of its performance monitoring in periodically re-evaluating the threats and risks. These performance measures must include the following:
(i) Number of hazardous leaks either eliminated or repaired as required by §192.703(c) of this subchapter (or total number of leaks if all leaks are repaired when found), categorized by cause;
(ii) Number of excavation damages;
(iii) Number of excavation tickets (receipt of information by the underground facility operator from the notification center);
(iv) Total number of leaks either eliminated or repaired, categorized by cause;
(v) Number of hazardous leaks either eliminated or repaired as required by §192.703(c) (or total number of leaks if all leaks are repaired when found), categorized by material; and
(vi) Any additional measures the operator determines are needed to evaluate the effectiveness of the operator's IM program in controlling each identified threat.

LBGO's DIMP lacked procedural specificity for collecting information for performance measures for leak eliminated or repaired categorized by material (§192.1007(e)(1)(v)) as well as those performance measures used to track the effectiveness of measures implemented to reduce risk (§192.1007(e)(1)(vi)).

5. **§192.1007 What are the required elements of an integrity management plan?**

A written integrity management plan must contain procedures for developing and implementing the following elements:
(f) Periodic Evaluation and Improvement. An operator must re-evaluate threats and risks on its entire pipe-line and consider the relevance of threats in one location to other areas. Each operator must determine the appropriate period for conducting complete program evaluations based on the complexity of its system and changes in factors affecting the risk of failure. An operator must conduct a complete program re-evaluation at least every five years. The operator must consider the results of the performance monitoring in these evaluations.

LBGO's DIMP lacked procedural specificity to detail how LBGO conducts a periodic evaluation. The delineation between the annual review and periodic evaluation (not to exceed 5 years) is not clear in the DIMP. These tasks appear to either need to be merged together (until the time a periodic evaluation is conducted on a longer interval) or the steps and actions to perform a periodic evaluation must be clearly described in the required procedural format.

Response to this Notice

This Notice is provided pursuant to 49 U.S.C. § 60108(a) and 49 C.F.R. § 190.237. Enclosed as part of this Notice is a document entitled *Response Options for Pipeline Operators in Compliance Proceedings*. Please refer to this document and note the response options. Be advised that all material you submit in response to this enforcement action is subject to being made publicly available. If you believe that any portion of your responsive material qualifies for confidential treatment under 5 U.S.C. 552(b), along with the complete original document you must provide a second copy of the document with the portions you believe qualify for confidential treatment redacted and an explanation of why you believe the redacted information qualifies for confidential treatment under 5 U.S.C. 552(b). If you do not respond within 30 days of receipt of this Notice, this constitutes a waiver of your right to contest the allegations in this Notice and authorizes the Associate Administrator for Pipeline Safety to find facts as alleged in this Notice without further notice to you and to issue a Final Order.

If, after opportunity for a hearing, your plans or procedures are found inadequate as alleged in this Notice, you may be ordered to amend your plans or procedures to correct the inadequacies (49 C.F.R. § 190.237). If you are not contesting this Notice, we propose that you submit your amended procedures to my office within 60 days of receipt of this Notice. This period may be extended by written request for good cause. Once the inadequacies identified herein have been addressed in your amended procedures, this enforcement action will be closed.

It is requested (not mandated) that Long Beach Gas and Oil maintain documentation of the safety improvement costs associated with fulfilling this Notice of Amendment (preparation/revision of plans, procedures) and submit the total to Chris Hoidal, Director, Western Region, Pipeline and Hazardous Materials Safety Administration. In correspondence concerning this matter, please refer to **CPF 5-2015-0009M** and, for each document you submit, please provide a copy in electronic format whenever possible.

PHMSA does apologize for any inconvenience or confusion that this delayed enforcement let might cause. If there are any questions concerning this letter, please do not hesitate to contact me at (720) 963-3160. Thank you for your cooperation in this matter.

Sincerely,

Chris Hoidal
Director, Western Region
Pipeline and Hazardous Materials Safety Administration

cc: PHP-60 Compliance Registry
PHP-500 H. Monfared (#139063)

Enclosure: *Response Options for Pipeline Operators in Compliance Proceedings*

Response Options for Pipeline Operators in Enforcement Proceedings

The provisions of 49 C.F.R. Part 190, Subpart B (§§ 190.201–190.243) govern response options to enforcement actions initiated by a Regional Director, Pipeline and Hazardous Materials Safety Administration (PHMSA). You are advised to consult Subpart B for further information regarding your rights and responsibilities in such proceedings.

Be advised that all material submitted by a respondent in response to an enforcement action is subject to being made publicly available. If you believe that any portion of your responsive material qualifies for confidential treatment under 5 U.S.C. 552(b), along with the complete original document you must provide a second copy of the document with the portions you believe qualify for confidential treatment redacted and an explanation of why you believe the redacted information qualifies for confidential treatment under 5 U.S.C. 552(b).

I. Procedures for Responding to a NOTICE OF PROBABLE VIOLATION:

Within 30 days of receipt of a Notice of Probable Violation, the respondent shall respond to the Regional Director who issued the Notice in the following way:

a. When the Notice contains a **PROPOSED CIVIL PENALTY*** --

1. If you are not contesting any violations alleged in the Notice, pay the proposed civil penalty and advise the Regional Director of the payment. This authorizes PHMSA to issue an order making findings of violation and upon confirmation that the payment has been received PHMSA will close the case (subject to any outstanding compliance order). Payment terms are outlined below;

2. If you are not contesting any violations alleged in the Notice but wish to submit written explanations, information, or other materials you believe warrant mitigation of the civil penalty, you may submit such materials. This authorizes PHMSA to make findings and to issue a Final Order. PHMSA will consider your submission in deciding whether to reduce or eliminate the penalty amount proposed in the Notice. Under 49 United States Code, § 60122, you are subject to a civil penalty not to exceed $200,000 per violation per day the violation persists up to a maximum of $2,000,000 for a related series of violations. For violations occurring prior to January 4, 2012, the maximum civil penalty may not exceed $100,000 per violation per day, with a maximum penalty not to exceed $1,000,000 for a related series of violations. Refer to 49 C.F.R. § 190.225 for assessment considerations upon which civil penalties are based;

3. If you are contesting one or more of the items in the Notice but are not requesting an oral hearing, submit a written response to the allegations and/or seek elimination or mitigation of the proposed civil penalty; or

4. Request a hearing as described below to contest the allegations and/or proposed assessment of a civil penalty.

b. When the Notice contains a **PROPOSED COMPLIANCE ORDER*** --

1. If you are not contesting the proposed compliance order and the alleged violations associated with it, notify the Regional Director that you intend to take the actions in the proposed compliance order;

2. If you are not contesting the compliance order but wish to submit written explanations, information, or other materials you believe warrant modification of the proposed compliance order in whole or in part, or you seek clarification of the terms of the proposed compliance order, you may submit such materials. This authorizes PHMSA to make findings and issue a compliance order;

3. If you are contesting the proposed compliance order but are not requesting an oral hearing, submit written explanations, information, or other materials in answer to the allegations in the Notice and stating your reasons for objecting to the proposed compliance order items in whole or in part; or

4. Request a hearing as described below to contest the allegations and/or proposed compliance order items.

c. When the Notice contains a **WARNING ITEM** --

No written response is required. The respondent is warned that if it does not take appropriate action to correct these items, enforcement action will be taken if a subsequent inspection reveals a violation.

* Failure of the respondent to respond to the Notice within 30 days of receipt constitutes a waiver of the right to contest the allegations in the Notice and authorizes the Associate Administrator for Pipeline Safety to find facts as alleged in the Notice without further notice to the respondent and to issue a Final Order.

II. **Procedures for Responding to a NOTICE OF AMENDMENT*--**

Within 30 days of receipt of a Notice of Amendment, the respondent shall respond to the Regional Director who issued the Notice in the following way:

a. If you are not contesting the Notice, notify the Regional Director of your plans to address the inadequacies identified in the Notice and/or submit copies of your amended procedures;

b. If you are not contesting the Notice but wish to submit written explanations, information, or other materials you believe warrant modification of the Notice of Amendment in whole or in part, or you seek clarification of the terms of the Notice of Amendment, you may submit such materials. This authorizes PHMSA to make findings and issue an Order Directing Amendment;

c. If you are contesting the Notice of Amendment but are not requesting an oral hearing, submit written explanations, information, or other materials in answer to the allegations in the Notice and stating your reasons for objecting to the Notice of Amendment items in whole or in part; or

d. Request a hearing as described below to contest the allegations in the Notice.

* Failure of the respondent to respond to the Notice within 30 days of receipt constitutes a waiver of the right to contest the allegations in the Notice and authorizes the Associate Administrator for Pipeline Safety to find facts as alleged in the Notice without further notice to the respondent and to issue a Final Order.

III. **Procedure for Requesting a Hearing**

A request for a hearing must be in writing and accompanied by a statement of the issues that the respondent intends to raise at the hearing. The issues may relate to the regulatory requirement or factual basis for the allegations, to the proposed compliance order, or to the proposed civil penalty amount. Refer to 49 C.F.R. § 190.225 for assessment considerations upon which civil penalties are based. A respondent's failure to specify an issue may result in waiver of the right to raise that issue at the hearing. The respondent's request must also indicate whether or not respondent will be represented by counsel at the hearing. Failure to request a hearing in writing within 30 days of receipt of a Notice waives the right to a hearing. In addition, if the amount of the proposed civil penalty or the proposed corrective action is less than $25,000, the hearing will be held by telephone, unless the respondent submits a written request for an in-person hearing. Complete hearing procedures can be found at 49 C.F.R. § 190.211.

IV. **Extensions of Time**

An extension of time to prepare an appropriate response to a Notice may be granted, at the agency's discretion, following submittal of a written request to the Regional Director. The request must indicate the amount of time needed and the reasons for the extension. The request must be submitted within 30 days of receipt of the Notice.

V. **Case File**

Case_file documents are available to the respondent of enforcement proceedings per 49 C.F.R. § 190.209. Documents in the case file are provided upon request, if prepared.

VI. **Freedom of Information Act**

Any material provided to PHMSA by the respondent, and materials prepared by PHMSA including the Notice and any order issued in this case, may be considered public information and subject to disclosure under the Freedom of Information Act (FOIA). If you believe the information you are providing is security sensitive, privileged, confidential or may cause your company competitive disadvantages, please clearly identify the material and provide justification why you believe the documents, or portions of a document, qualify for confidential treatment under 5 U.S.C. 552(b). If we receive a request for your material, we will notify you if PHMSA, after reviewing the materials and your provided justification, determines that withholding the materials does not meet any exemption provided under the FOIA. You may appeal the agency's decision to release material under the FOIA at that time. Your appeal will stay the release of those materials until a final decision is made.

VII. **The Rights of Small Entities to Enforcement Fairness and Policy Against Retaliation**

The Department of Transportation has a policy regarding the rights of small entities to regulatory enforcement fairness and an explicit policy against retaliation for exercising these rights. Our objective is to ensure a fair regulatory enforcement environment. If you feel you have been treated unfairly or unprofessionally, you may contact the PHMSA Office of Chief Counsel. You also have the right to contact the Small Business Administration's National Ombudsman at 1-888-REGFAIR or www.sba.gov/ombudsman regarding the fairness of the compliance and enforcement activities of this agency.

The Department of Transportation strictly forbids retaliatory acts by its employees. As such, you should feel confident that you will not be penalized for expressing your concerns about compliance and enforcement activities.

VIII. Small Business Regulatory Enforcement Fairness Act Information

The Small Business and Agricultural Regulatory Enforcement Ombudsman and 10 Regional Fairness Boards were established to receive comments from small businesses about federal agency enforcement actions. The Ombudsman will annually evaluate the enforcement activities and rate each agency's responsiveness to small business. If you wish to comment on the enforcement actions of the Pipeline and Hazardous Materials Safety Administration, call 1-888-REG-FAIR (1-888-734-3247) or go to http://www.sba.gov/ombudsman/dsp_faq.html.

IX. Payment Instructions

Civil Penalty Payments of Less Than $10,000

Payment of a civil penalty of less than $10,000 proposed or assessed, under Subpart B of Part 190 of the Pipeline Safety Regulations can be made by certified check, money order or wire transfer. Payment by certified check or money order (containing the CPF Number for this case) should be made payable to the "Department of Transportation" and should be sent to:

Federal Aviation Administration
Mike Monroney Aeronautical Center
Financial Operations Division (AMK-325) P.O. Box 269039
Oklahoma City, OK 73125-4915

Wire transfer payments of less than $10,000 may be made through the Federal Reserve Communications System (Fedwire) to the account of the U.S. Treasury. Detailed instructions are provided below. Questions concerning wire transfer should be directed to the Financial Operations Division at (405) 954-8845, or at the above address.

Civil Penalty Payments of $10,000 or more

Payment of a civil penalty of $10,000 or more proposed or assessed under Subpart B of Part 190 of the Pipeline Safety Regulations must be made wire transfer (49 C.F.R. § 89.21 (b)(3)), through the Federal Reserve Communications System (Fedwire) to the account of the U.S. Treasury. Detailed instructions are provided below. Questions concerning wire transfers should be directed to the Financial Operations Division at (405) 954-8845, or at the above address.

INSTRUCTIONS FOR ELECTRONIC FUND TRANSFERS

(1) RECEIVER ABA NO. 021030004	(2) TYPE/SUB-TYPE (Provided by sending bank)
(3) SENDING BANK ABA NO. (Provided by sending bank)	(4) SENDING BANK REF NO. (Provided by sending bank)
(5) AMOUNT	(6) SENDING BANK NAME (Provided by sending bank)
(7) RECEIVER NAME TREAS NYC	(8) PRODUCT CODE (Normally CTR, or as provided by sending bank)
(9) BENEFICIAL (BNF) = AGENCY LOCATION CODE 69140001	(10) REASONS FOR PAYMENT Example: PHMSA - CPF # / Ticket Number/Pipeline Assessment number

INSTRUCTIONS: You, as sender of the wire transfer, must provide the sending bank with the information for blocks (1), (5), (7), (9), and (10). The information provided in Blocks (1), (7), and (9) are constant and remain the same for all wire transfers to the Pipeline and Hazardous Materials Safety Administration, Department of Transportation.

Block #1 - RECEIVER ABA NO. - "021030004". Ensure the sending bank enters this 9-digit identification number; it represents the routing symbol for the U.S. Treasury at the Federal Reserve Bank in New York.

Block #5 - AMOUNT - You as the sender provide the amount of the transfer. Please be sure the transfer amount is punctuated with commas and a decimal point. **EXAMPLE: $10,000.00**

Block #7 - RECEIVER NAME - "TREAS NYC". Ensure the sending bank enters this abbreviation. It must be used for all wire transfers to the Treasury Department.

Block #9 - BENEFICIAL - AGENCY LOCATION CODE - "**69140001**". Ensure the sending bank enters this information. This is the Agency Location Code for the Pipeline and Hazardous Materials Safety Administration, Department of Transportation.

Block #10 - REASON FOR PAYMENT - **"AC-payment for PHMSA Case # /** To ensure your wire transfer is credited properly, enter the case number/ticket number or Pipeline Assessment number, and country."

NOTE: A wire transfer must comply with the format and instructions or the Department cannot accept the wire transfer. You as the sender can assist this process by notifying the Financial Operations Division (405) 954-8845 at the time you send the wire transfer.

DISTRIBUTION INTEGRITY MANAGEMENT PLAN (DIMP)

LONG BEACH GAS & OIL DEPARTMENT
CITY OF LONG BEACH

2400 E Spring Street
Long Beach, California 90806

Initial Date: August 2, 2011
Updated: July 15, 2015

Rev 1: 11 16, 2011 Include execution plan
Rev 2: 1 5, 2012 Updated execution plan
Rev 3: 3 27 2012 SME, Seismic plans

Table of Contents

Section 1. Scope

This document is the distribution integrity management plan for Long Beach Gas and Oil Department (LBGO). It is intended to meet the requirements of 49 CFR Part 192, Subpart P Distribution Integrity Management Programs (DIMP).

The processes used are based upon the Simple, Handy, Risk-based Integrity Management Plan™ (SHRIMP) software package developed by the APGA Security and Integrity Foundation (SIF). However, it is modified to meet the specific needs of LBGO.

This Plan will be reviewed annually and periodically by a group of subject matter experts (SME) who have knowledge of the Long Beach system.

The distribution system has not been divided up into segments but has been evaluated as one complete system. The reason for this approach is predicated upon a survey of leaks that showed that they are "uniformly" spread around the City with no particular concentration in one geographic area or correlation with any other specific factor.

Section 2. Definitions, Acronyms and Procedures

2.1 Definitions

Excavation damage: Any impact that results in the need to repair or replace an underground facility.
Hazardous Leak: 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.
Baseline Year: The baseline year is considered to be 2011 for identifying threats.
Baseline Foundation for the baseline year use historical information extracted from annual reports, and other sources. This historical data will be used for comparative purposes to determine the effectiveness of any remedial measures. This baseline data will be updated annually during plan review.

2.2 Acronyms

AOC	Abnormal Operating Condition
AMI	Advanced Meter Interface
CIP	Capital Improvement Project
CP	Cathodic Protection
CFR	Code of Federal Regulations
DOT	Department of Transportation
GIS	Geographic Information System
LBGO	Long Beach Gas and Oil Department
LBPW	Long Beach Public Works Department
mV	millivolt
MSA	Meter Set Assembly
MOP	Maximum Operating Pressure
MAOP	Maximum Allowable Operation Pressure
O & M Plan	Operations and Maintenance Plan
PE	Polyethylene
ppm	parts per million
SCADA	Supervisory Control and Data Acquisition
SME	Subject Matter Expert
SMYS	Specified Minimum Yield Strength

2.3 Procedures

All procedures are in the O & M manual and are incorporated by reference into DIMP.

2.4 Plan Development

This Plan was developed using pipeline design, construction, operations and maintenance records. Other records including leak history, corrosion control, continuing surveillance patrols, excavation damage, as well as the judgment and knowledge of LBGO personnel were also used in Plan development. The specific elements of knowledge of the infrastructure used to assess each threat and prioritize risks are listed in the Threat Assessment and Risk Evaluation sections of the Plan.

The DIMP organization shown in Section 10.1 will compile the data extracted from all reasonably available source documents identified in Section 10.3 and evaluate that data to obtain relevant knowledge of the system to be used for the purposes of this plan.

The plan was developed and is maintained using following information:

- Annual analysis of leaks repaired during previous calendar year combined with those of previous years, looking for patterns.
- Data gathered from the SME group.
- Pipe and construction condition information found during construction and leak repair excavation activities over the six years prior to implementation of DIMP.
- SME knowledge of specific construction techniques used in previous years/decades.
- Review of Essentials data gathered during the following inspections (specific inspection forms for each inspection type are stored in Essentials).
  - Corrosion
  - Vaults
  - emergency valves
  - regulator station
  - bridge crossings
- Information about previous meter set installation practices and locations.
- Gas quality and system pressure information.
- Review of pipe and fitting data from Work Orders and GIS.
- Contemporaneous reports of anomalies from field personnel as defined below.

LBGO pipeline records are stored in a Geographical Information System (GIS). This system is maintained and updated by Engineering Division personnel and depicts relevant pipeline data in the distribution system and is one of the primary sources of information and a basis for system analysis.

Due to the nature of construction and repair work on the distribution system, an SME group consisting of corrosion, telemetry, regulator station maintenance and valve maintenance personnel, gas field service representatives, pipeline maintenance supervisors and construction inspectors was empowered to report anomalies as much as six years before the implementation of DIMP. As a result, many of the threats were identified and made known at the time DIMP was developed.

The following list identifies focus areas of responsibility for each SME group (in no particular order):

- Corrosion – maintains CP and reports anomalies related to cathodic protection of the steel pipeline system to Engineering.

- Regulator Station & Valve Maintenance – maintains District and City Gate regulator stations and Emergency valves and reports anomalies related to the operation of regulator stations and emergency valves to Engineering.
- Dispatch – monitors system pressures and reports anomalies to Regulator Station & Valve Maintenance, Telemetry, or Engineering.
- Telemetry – maintains system pressure equipment and reports anomalies to Engineering.
- Gas Field Service Representatives – first response to reported leaks, set meters and repair aboveground customer sets, report anomalies to Dispatch or Construction Inspection.
- Leak Survey – conducts leak and atmospheric corrosion surveys at aboveground meter sets and reports leaks to Pipeline Maintenance Supervisor II, evidence of corrosion to Gas Services Supervisors and other anomalies to Construction Inspection.
- Pipeline Maintenance Supervisor I's – supervises leak repair and construction crews, witnesses existing pipe (main and service) conditions and reports anomalies to Construction Inspection and Engineering.
- Construction Inspection – performs 100% inspection on all pipeline construction activities performed by contractors, evaluates reports from Pipeline Maintenance Supervisors, Gas Field Service Representatives and Leak Survey, conducts bridge crossing inspections, and reports anomalies to Engineering.
- Engineering – conducts evaluations of reported anomalies, complies information from field observations, update information in GIS.

As previously defined, during normal operations and maintenance activities LBGO field personnel report anomalies and Abnormal Operating Conditions (AOC) for evaluation and incorporation in this Plan as appropriate.

2.5 Execution Plan for DIMP

A GIS "snapshot" of the Long Beach natural gas distribution system has been taken in December 2011. This data base "snap shot" will be used as a base line for establishing many of the metrics to be used to demonstrate the effectiveness of the Long Beach DIMP in reducing vulnerabilities to the system. Using this "snap shot" a count will be made using GIS data of the possible threats to the system. In some cases, an engineering estimate will be made using base line GIS data. An example is the number of possible service swing tees, which were installed in the years 1943 to 1952. An estimate of swing tees will be made using the footage of main installed in this time frame divided by the average distance between services less any services replaced after that time frame on those segments of main.

Based upon the base line data, a count will be made at the end of each calendar year of how many threats have been eliminated or reduced in magnitude from the system. This information can be presented graphically or in tabular format.

A DIMP attribute table will be set up in GIS for mains, risers and services. Attributes applicable to each will be added to facilitate the count. Examples include, for risers: Amp fittings, Dresser couplings, Kerotest couplings, threaded mains: service swing tees, bell and spigot pipe, shallow services.

Each vulnerability will have a "record keeping" file that will be part of this plan. Each file will document the process by how the data has been gathered. The files will contain pertinent information such as photographs; PDF pictures of for example map products, and lists where necessary. The file will also contain any special methodology used to develop the metric, for example how many swing tees on a segment of main.

These "record keeping" files are part of the O & M plan and are kept in Appendix J (DIMP). LBGO converted from paper exclusive records to digital systems in 2008 with the conversion and implementation of a geographical information system (GIS) and a compliance scheduling and tracking system (Essentials). All pipeline assets are stored in GIS. All compliance related records are stored in Essentials. GIS and Essentials are linked to facilitate the compliance scheduling of newly installed pipeline facilities. Both GIS and Essentials are expandable and adaptable, meaning the systems can be changed or adjusted as needs arise. As additional data is gathered and collated, the information can be entered into GIS for future evaluation. Hard copies of all pipeline records are maintained in the Engineering archives. Many of the hardcopy records have been scanned and are available either directly through GIS or on the City server network.

2.6 Records

LBGO's pipeline records were extensively reviewed during the GIS conversion process. At the end of each calendar year LBGO captures the existing GIS data of the system in a "snapshot". This snapshot is archived, is a primary source for ongoing analysis, performance measurement, DIMP adjustment, discovery of unknowns and potential patterns of system performance.

LBGO recognizes that additional data needs to be incorporated in to GIS. For example, pipe condition information is gathered and recorded on work, repair, retirement and service orders each time the pipeline is exposed for work. This data will be digitized at some point and imported into GIS.

For a full listing of GIS data and pipeline facility attributes, see Geodatabase Designer, which is incorporated by reference.

2.6.1 Leak Survey and Leak Repair Records

LBGO collects the following information annually as part of data collection for reporting leaks on the Distribution Annual Report Form 7100.1-1. This data is collected and maintained throughout the year as a tracking mechanism for leaks found and repaired. At the middle and end of each calendar year, this data is correlated with each individual leak report to ensure that all discovered leaks have been addressed, all temporary repairs are permanently repaired and ensure that leaks are categorized consistently for reporting. Each leak report is filed in the permanent record archive. This summary information is also kept on file with the Distribution Annual Report. Permanent repairs listed are incorporated into GIS at the end of each year for further analysis of leak patterns.

Table 1: Leak Repair Records

AFTER REPAIR IS MADE	REPAIR TYPE	Type of repair initially performed (Temporary or Permanent), changed to Permanent when permanent repair is complete
BEFORE REPAIR IS MADE	DATE	Date the indication of the leak was discovered
	PREMISE #	Nearest house number
	STREET	Street
	MISC/ SURVEY	Whether leak was discovered on a survey or called in
	GRADE CATEGORY	Grade of Leak at time of discovery
AFTER REPAIR IS MADE	MAIN/ SERVICE	Whether the leak was discovered on the main or service
	SIZE	Size of pipeline that leak was located on
	MATERIAL	Material of pipeline that leak was located on
	CAUSE	Cause of Leak
	DATE	Date Repaired
	CORRECTIVE ACTION	Corrective Action taken during Investigation
	RECOMMEND RENEWAL	Whether the Supervisor performing repairs recommends that the pipe be replaced
	PERMANENT REPAIR ORDER	Order Number of permanent repair
	COMMENTS	General detail about leak cause
	PERMANENT REPAIR METHOD	If Temporary repair was performed, what Permanent repair was subsequently performed
	YEAR INSTALLED	The year that the pipeline facility was originally installed
	MISCELLANEOUS LEAKS FOUND IN SURVEY AREAS	Follow-up analysis to determine effectiveness of the survey

Section 3. Knowledge of the Distribution System

3.1 System Description

The LBGO system is comprised of about 915 miles of main pipeline and approximately 86,500 services (1016 miles) and 150,000 meters. The service territory encompasses nearly all of the City of Long Beach, all of the City of Signal Hill and two pockets of unincorporated areas of the County of Los Angeles.

System throughput is about ten billion cubic feet of natural gas annually. Approximately 85% of the natural gas is supplied through the four city gate interconnects with Southern California Gas Company. The remaining 15% is supplied by local gas and oil producers through six metering stations. The Gas Dispatch function monitors system pressures, gas throughput and gas quality 24 hours per day via a supervisory control and data acquisition (SCADA) system.

The system is split into several pressure districts with different maximum operating pressures. A backbone system consisting mainly of large diameter pipelines operating at 40 psig, distributes natural gas to the various pressure districts through district regulator stations. Current pressure districts operate at 40 psig, 15 psig, 10 psig, and 7 psig. LBGO does not operate any natural gas transmission pipelines.

The Long Beach Gas Department was established as a municipal utility in 1924, purchasing the Southern Counties Gas Company properties within the City boundaries. The original gas system or "Old System," the predecessor of the current distribution system, began distribution of manufactured gas to customers in 1900 and the pipeline system consisted of cast iron, bare steel and wrapped steel. Natural gas was introduced in 1915. Throughout the 1950's and early 1960's, as the City grew, the Gas Department purchased assets within the City boundaries from Southern Counties Gas Company and Southern California Gas Company.

The LBGO service territory is completely developed as class three or four locations. There are no class one or two locations within the service territory.

3.1.1 Main Pipelines

Main pipelines are of steel or plastic material and range in size from 1-1/4" through 20" nominal diameters. Of the 915 miles of main pipelines, 79% or 722 miles of main pipeline is steel. Records indicate that all steel main construction, occurring after the establishment of the municipal utility, used coated or wrapped pipe. All "Old System" main pipelines have been replaced. The oldest main pipeline in the system dates from 1924. There is no evidence of bare steel main remaining in the system and the last remaining section of the original cast iron pipe was replaced in 1966. Records and excavations indicate that all steel mains in the pipelines purchased after 1950 were wrapped.

The remaining 21% or 193 miles are polyethylene (PE) plastic. Records and excavations indicate all PE material used in main pipeline installation is either PE2406 or PE2708 and all early PE was manufactured by Plexco. Polyethylene was first used as main pipeline material in 1975. There are no records of other exotic or questionable plastics in the system.

3.1.2 Service Pipelines

All service pipelines are of steel or plastic material. Of the 1016 miles of service pipelines, 58% or 588 miles of service pipeline is steel. All steel service pipelines were originally installed with wrap or coating. The oldest steel service pipeline in the system was installed in 1920.

The remaining 42% or 427 miles are polyethylene (PE) plastic. Records indicate all PE material used in service pipeline installation is either PE2406 or PE2708 and all early PE was manufactured by Plexco (orange pipe). Polyethylene was first used as service pipeline material in 1973. There are no records of other exotic or questionable plastics in the system.

At one point in time, LBGO installed services made of copper material. Those services were installed in one particular area of the system and all have since been replaced. The method of replacement left small pieces (less than 1 foot) of copper attached to the service tee at each service/main connection.

The service pipelines in the Southern Counties Gas purchase area are all wrapped steel. The service pipelines in the Southern California Gas purchase areas were wrapped steel, copper and tenite (an exotic plastic). All copper and tenite services have been replaced since the purchase. The method of replacement of the copper services left small pieces (less than 1 foot) of copper attached to the service tee at each service/main connection, with the exception of four stubs of 7 feet each.

3.1.2.1 Fittings

A common practice during service installation to connect PE to steel was to use a compression-stab type fitting called an "amp fitting." These fittings were used primarily at the service/main connection and at the riser/service connection. The fitting was also used at branch service connections. Use of this type of fitting was discontinued for stab-type compression fittings and pre-manufactured transition fittings in the late 1980's, however many amp fittings still exist on the system.

3.1.2.2 Main/Service Connections

Several types of main/service connections exist on the system, depending on the installation practices at the time of install. The prevalent method pre 1947 was directly welding a steel stub to the main. Between 1947 and 1952, an in-house fabricated fitting called a swing tee was used. Only some of the swing tees were wrapped when installed. This was followed by another in-house fabricated fitting, known as a "Long Beach Tee," installed up to the late 1950's. None of the earlier fittings had the ability to control the flow of gas without venting gas to the atmosphere. Starting in the late 1950's, controllable Mueller service connection tees were used and are still in use today.

For PE main/service connections, all connections were made using Plexco or Performance Pipe fittings with the exception of the late 2000's when some JM Eagle fittings were used. Early Plexco fittings had Celcon polyacetyl caps.

3.1.2.3 Risers

Of the 91,164 risers in the system, 56,257 are of steel material. The remaining risers are pre-manufactured (Perfection or Lyall) PE Anodeless, Flex or Inserted risers. Risers installed before 1953 may have threaded fittings connecting the riser to the service pipe. Until approximately 1956, risers and service pipelines to most customers was 1-1.4" and required a threaded bell reducer to connect the riser to the meter stop valve (flathead), due to the difference in pipe size. Generally, after 1957, service pipe size was standardized at ¾", the same size as the meter stop valve.

Upon the introduction of PE as service pipe material in the system, steel continued to be used for riser material. Tracer wire brazed to both the main and the riser provide the ability to locate the service line and also provide cathodic protection to the steel riser, which has been verified through a survey of the risers.

3.1.3 Pressure Control

Generally, natural gas service to customers is provided via the lower pressure, smaller diameter pipelines within the pressure districts. LBGO operates 47 district regulator stations throughout the system. Each district regulator station has two regulators, a primary regulator, set at the district MOP and a monitor regulator set at a higher pressure, within the limits of 49 CFR 192.201, for overpressure protection. The SCADA system collects real-time system pressures at the 43 cathodic protection rectifier sites and is monitored by the Gas Dispatch function. The SCADA system has alarms to notify the dispatcher if pressure anomalies occur on the system.

3.1.4 Cathodic Protection

Cathodic Protection procedures are in the O & M plan section 451.

In December 2005, the OPS issued a proposed compliance order and notice of amendment for work associated with external corrosion control (CPF No 5-2005-0029, concerned with CFR 192.605b, 192.465d, and 192.467 a.). In June of 2010, OPS issued a letter stating that all requirements for the compliance order had been met.

All of the steel pipelines in the system are under cathodic protection, meeting either the negative 850 mV or negative polarization voltage shift of 100 mV criteria. In February 2004, it was estimated that only 30% of the system was under adequate cathodic protection. During routine operation, new electrical shorts are discovered which will disrupt cathodic protection of an area. These electrical shorts are corrected when found.
As of June 2010, 671 shorts have been cleared since 2004.

In 2009 and 2010, LBGO conducted baseline tests and 100 mV depolarization tests in each CP area , so as to take into consideration IR drop in every area, whether the area met 850 mV criteria or not.

Steel risers on PE services connected to steel mains have been checked for isolation and those found deficient in CP have either been replaced with anode-less risers or had an anode installed. Other steel risers on PE services connected to PE mains are currently either being replaced programmatically or having an anode installed. Those with installed anodes are monitored as required by 49 CFR, Part 192.463.

Work has been done to mitigate stray currents from the Metro Light rail system by installing 50-pound magnesium anodes at eighteen pipeline locations perpendicular to the rail line. LBGO is proposing to replace pipelines parallel to the rail line with P.E. pipe.

The SCADA system monitors the performance of each CP rectifier system.

3.2 Environmental Conditions

3.2.1 Atmospheric Conditions

Long Beach and Signal Hill are not routinely subject to frost, icing or snow conditions. Long Beach borders the ocean and aboveground pipe can be subjected to salty atmospheric conditions. Aboveground pipe patrols and inspections have not shown an indication that the atmospheric conditions produce a level of corrosion in any one area of the system.

3.2.2 Soil Conditions

Multiple soil conditions exist in the LBGO service area including, cohesive, granular, plastic, moist, saturated and submerged soils (OSHA Safety & Health Regulations for Construction Subpart P1926 Subpart P App A)

All known LBGO facilities are of wrapped steel or PE material and therefore not in direct contact with soil conditions. There is no evidence of corrosive soils having an effect on the pipeline and LBGO has performed no testing of soils for that purpose.

3.2.3 Other Phenomenon

Long Beach and Signal Hill lie in an Earthquake zone, with the Newport-Inglewood Fault bisecting the system and the San Andreas Fault approximately 75 miles to the northeast. Each of these systems are capable of a M7.0 earthquake which would cause catastrophic damage, not just to Long Beach, but across the Los Angeles Basin. With a seismic event, the system would be exposed to soil liquefaction, depending on the ground shaking intensity, in the shore and port areas, along with the northern, eastern and western areas of the system. There is a slight chance of a landslide occurring along the southern section of Signal Hill. In addition to the major faults, there are numerous smaller faults capable of generating smaller earthquakes that could also cause damage to the system. The last major earthquake, which produced significant damage to infrastructure on the Newport Inglewood Fault occurred in 1933.

Another potential large scale event would be a tsunami. The National Oceanic and Atmospheric Administration maintains the Pacific Tsunami Warning Center covering coastal California. An event in the western Pacific Ocean or Alaska could cause a tsunami event in Long Beach, but generally, there would be several hours of warning, allowing for some preparation. An underwater landslide along Catalina Island, 22 miles to the south, would pose a more immediate threat, with little time to prepare.

While the climate in Long Beach is relatively mild, severe weather events occasionally occur causing localized flooding and lightning strikes.

Appendix 2 contains maps of seismic activity and floodplains.

3.3 Design Factors

Design procedures are given in the O & M manual and incorporated by reference. In particular, the following criteria are general to piping design in the Long Beach natural gas distribution system. The most conservative approach is used, using DOT default values to calculate the percent of SMYS and calculating MAOP. The calculation follows the formula shown in CFR 192.105 (Design formula for steel pipe) and CFR192.121 (Design of plastic pipe). The formula develops the design pressure for the steel pipeline segment at 100% SMYS with design factor from CFR 192.111 and a longitudinal joint factor from CFR 192.113.

For early origin pipe, factors assumed are a class 4 location of 0.4, longitudinal joint of 0.6, temperature derating of 1, and a yield strength of 24,000 psi.

3.4 Operating Conditions

Gas pressure and quality are monitored continuously using a SCADA system in Gas Control/Dispatch. The system is automated to cut off supply of natural gas from a supplier who does not meet LBGO pipeline natural gas quality standards. The system will automatically alarm if MAOP of the pipeline is exceeded.

Residential areas are leak surveyed every five years and business districts are leak surveyed annually. There do not appear to be apparent leak patters associated with any one specific geographical area. Pipeline under paved areas that go from "wall to wall," generally located in alleys and streets, have not shown signs of leakage greater than that observed in other parts of the system.

3.5 Summary of System Data

Table 2: Summary of All Leaks from 2008 to 2014

Year	Total Leaks on Main Pipelines	Total miles of main pipeline	Total Leaks per Mile of Main Pipeline		Total Leaks on Service Pipelines	Miles of Service Pipelines	Total Leaks per Mile of Service Pipeline
2008	49	921	0.053		303	1026.2	0.295
2009	32	918	0.035		303	1026.4	0.295
2010	38	913	0.042		232	1025.1	0.226
2011	31	916	0.034		299	1023.7	0.292
2012	15	916	0.016		215	1022.7	0.21
2013	26	918	0.028		324	1021.8	0.317
2014	11	915	0.012		185	1021.6	0.181

Table 3: Corrosion Leaks per Mile of Steel Pipe

Year	Miles of Steel Main from Prev Year Annual Report	Number of Corrosion Leaks on Mains	Leaks/Mile of Steel Main		Miles of Steel Service Pipe from Prev Year Annual Report	Number of Corrosion Leaks on Services	Leaks/Mile of Steel Service Pipe
2008	831	33	0.04		760.13	83	0.109
2009	815	20	0.025		713.5	52	0.073
2010	800	20	0.025		699	62	0.089
2011	782	16	0.02		681	74	0.109
2012	769	11	0.014		663	49	0.074
2013	750	12	0.016		644	54	0.084
2014	736	3	0.004		613	26	0.042

Figure 1: Corrosion Leaks per Mile of Pipe

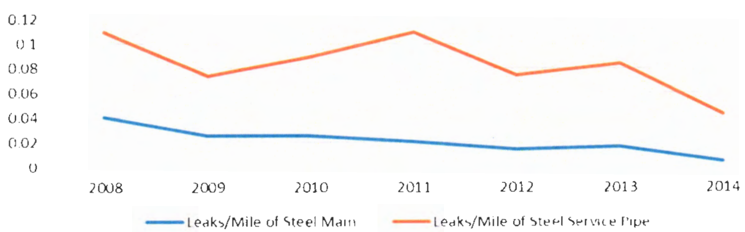


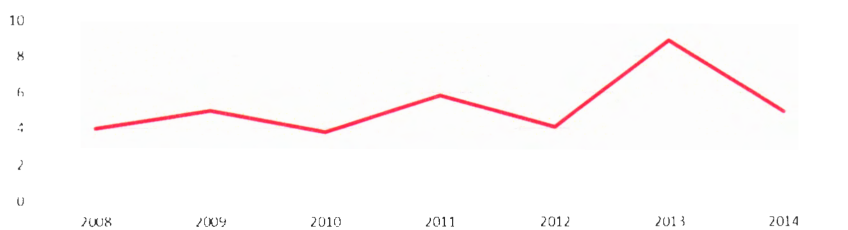
Table 4: Summary of Excavation Leaks from 2008 to 2014

Year	Total Excavation Leaks on Main Pipelines	Total miles of main pipeline	Total Excavation Leaks per Mile of Main Pipeline	Total Excavation Leaks on Service Pipelines	Miles of Service Pipelines	Total Excavation Leaks per Mile of Service Pipeline
2008	4	921	0.004	60	1026.2	0.058
2009	5	918	0.005	48	1026.4	0.047
2010	7	913	0.008	44	1025.1	0.043
2011	4	916	0.004	64	1023.7	0.063
2012	2	916	0.002	41	1022.7	0.04
2013	3	918	0.003	50	1021.8	0.049
2014	1	915	0.001	37	1021.6	0.036

Table 5: Summary of Excavation Damage Data

Year	Number Tickets	Total Excavation Damages (Hits)	Hits/1000 Tickets	Hits w/ no Tickets	% Of Hits W/no USA	Miss Mark	Mismark/ Total Tickets	Home owner (HO)	% HO to Total Hits
2008	11470	46	4.01	23	50%	1	0.01%	9	20%
2009	10086	50	4.96	25	50%	2	0.02%	7	14%
2010	11070	42	3.79	21	50%	3	0.03%	10	24%
2011	10963	64	5.84	28	44%	3	0.03%	14	22%
2012	10547	43	4.08	22	51%	2	0.02%	10	23%
2013	10039	89	8.87	39	44%	4	0.04%	13	15%
2014	13424	66	4.92	23	35%	0	0.00%	16	24%

Figure 2: Excavation Damages/1000 Tickets



Note: Starting in 2013, all damages were recorded whether or not there was a release of gas.

Table 6: Detailed Summary of Leaks from Various Causes

Leak Issue	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Corrosion - Mains	33	20	20	16	11	12	3
Corrosion - Services	83	52	62	74	49	54	26
Excavation – 3rd Party	47	49	39	58	36	46	36
Excavation – 3rd Party – Shallow Pipe	1	3	1	5	3	1	5
Excavation – 1st & 2nd Party	0	1	3	6	4	7	2
Threaded risers:	139	153	70	99	86	139	72
Joint Failures	5	16	9	6	1	5	
LBGO Swing Tees	9	5	7	7	1	4	1
Amp Fittings	7	2	9	9	5	3	5
Pipe Repairs:	3	12	5	6	5	0	0
Other Outside Force - Vehicle hit Riser	7	2	4	5	3	3	4
Previous excavations by others:	-	-	8	8	4	0	0
Below Ground Flanges:	2	0	3	2	1	1	0
Celcon (polyacetal) caps on Plexco service tees	3	0	2	1	1	1	0
Other Outside Forces - other than vehicle damage	**3**	**1**	**2**	**1**	**5**	**4**	**7**
Dresser/Dayton Couplings	1	0	0	1	0	4	3
Threaded main:	2	3	0	0	0	0	0
Threaded Plug Valves (2, 3 and 4 Inch):	2	0	0	0	0	0	0
Mastic coatings on service tees:	0	0	2	0	0	0	0
Larger than 8 inch Diameter Plug Valves:	0	0	0	1	0	0	0
Pressure tees:	0	0	1	0	0	0	0
Natural forces	1	0	0	0	4	1	0
Incorrect Operations	0	0	0	0	4	4	0
Inadequate Procedures	0	0	0	0	0	0	0
Inadequate Safety Practices	0	0	0	0	0	0	0
Failure To Follow Procedures	0	0	0	0	0	0	0
Regulators	0	0	0	0	0	0	0
Saddle Weld Tees	0	0	0	0	0	0	0
Bell & Spigot Pipe:	0	0	0	0	0	0	0
Inserted services:	0	0	0	0	0	0	
Copper service main to service connections:	0	0	0	0	1	0	3
MSAs Kerotest insulators:	0	0	0	0	0	0	0
Shallow Mains & Services	-	-	-	0	0	1	

Section 4. Threat Assessment

4.1 Overview

The distribution system pipeline was evaluated for threats based on the following factors relative to leak history: corrosion; natural forces; excavation damage; other outside force damage; material or weld failure; equipment malfunction; incorrect operation. Other factors that could be classified as integrity threats to the pipeline were also considered and included in the evaluation: corrosion control records (external and internal); valve maintenance records; visual inspection following any exposure of the pipeline; bridge patrols; excavation damage reports; past and present construction methods; year of pipeline installation.

LBGO identified three significant risks to the City's gas distribution pipeline system: excavation damage caused by third parties; past pipeline installation practices; and susceptibility of major pipeline damage in the event of a localized earthquake.

The results of these threat assessments are discussed in the following sections.

Time Dependent Threats: Threat Level Accelerates Over Time

<table>
<tr><td></td><td>External Corrosion</td><td>Internal Corrosion</td><td>Atmospheric Corrosion</td></tr>
<tr><td>Primary Cause</td><td>Poor Coating & Inadequate Cathodic Protection</td><td>Low Gas Quality</td><td>Poor Coating
Facility Location</td></tr>
<tr><td>Primary Prevention</td><td>Cathodic Protection
Proper Coating Application</td><td>Gas Quality Monitoring</td><td>Proper Coating Application
Proper Facility Location</td></tr>
<tr><td>Practices</td><td>Pipe to Soil reads</td><td>Shut Down City Gate When Gas Quality Specs are exceeded</td><td>Patrolling
AOC recognition</td></tr>
<tr><td rowspan="2">Mitigation Practice</td><td>Visual Assessment
Coating Inspection</td><td>Visual Assessment
Internal Pipe Inspections (Coupons)</td><td>Visual Assessment</td></tr>
<tr><td colspan="2">Selective Pipeline Replacement</td><td>Recoat or Replace</td></tr>
</table>

Resident Threats: Threat Is Inherent but Does Not Grow Over Time

<table>
<tr><th></th><th>Past Manufacturing</th><th>Construction / Fabrication Related</th><th>Equipment Related</th></tr>
<tr><td>Primary Cause</td><td>Longitudinal Seam, bell & spigot Pipe/Fitting</td><td>Girth Welds, Branch Connections, Mitered Joints</td><td>Valves, Regulators, Mechanical Couplings</td></tr>
<tr><td>Primary Prevention</td><td>Pipe/Fitting Specification</td><td>Construction Procedures and Practices</td><td>Preventative Maintenance</td></tr>
<tr><td>Practices</td><td>Pipe/Fitting Inspection Receiving Materials</td><td>Inspection during Construction</td><td>Inspection during Maintenance</td></tr>
<tr><td rowspan="3">Mitigation Practice</td><td>Mill Pressure Test
Pressure Test Fitting</td><td>Pressure Test
Design Practices</td><td>Scheduled Patrolling</td></tr>
<tr><td colspan="3">Monitoring Pressure & External Loads</td></tr>
<tr><td colspan="3">Selective Pipeline/Fitting Replacement</td></tr>
</table>

Threats Independent of Time

<table>
<tr><th></th><th>Excavation Damage</th><th>Incorrect Operations</th><th>Outside Forces</th></tr>
<tr><td>Primary Cause</td><td>Human Error, inadequate training, failure to follow procedures</td><td>Human Error, inadequate training, failure to follow procedures</td><td>Ground Movement</td></tr>
<tr><td>Primary Prevention</td><td>Hand Excavation Surveillance, Patrolling and Marking</td><td>Operating and maintenance Procedures</td><td>Design Practices</td></tr>
<tr><td>Practices</td><td>One Call System, Public Awareness</td><td>Training and Development
Incident Investigation</td><td>Patrols & Surveillance</td></tr>
<tr><td rowspan="3">Mitigation Practice</td><td>Locating & Marking</td><td>Audits</td><td>Design Practice
Emergency Preparedness</td></tr>
<tr><td>Excavation Monitoring</td><td colspan="2" rowspan="2">Training</td></tr>
<tr><td>Public Awareness</td></tr>
</table>

4.2 Primary Threat Assessment

4.2.1 Corrosion

4.2.1.1 Atmospheric Corrosion

- The system has aboveground steel piping exposed to the atmosphere.
- Metal loss has been detected during atmospheric inspections.
- Records indicate that no leakage due to atmospheric corrosion has been found on aboveground piping.
- There has been no indication of localized atmospheric corrosion on the system.

4.2.1.2 External Corrosion on Buried Pipelines

- The system contains steel mains and services.
- All steel main and services are under impressed or galvanic CP.
- CP test readings have not indicated general or localized areas that indicate inadequate protection.
- Exposed pipe records do not indicate general or localized deterioration of the pipe.
- Exposed pipe records occasionally indicate deteriorated wrap.
- Corrosion leaks per mile of steel main is decreasing.
- Corrosion leaks per mile of service pipe is steady.
- There is an indication of stray current along the MTA Blue Line, but no deterioration of the pipe has been observed during excavations.
- There has been no indication of localized external corrosion on the system.

4.2.1.3 Steel risers on PE Services:

- The system contains steel risers installed on plastic PE services.
- Typical installation includes a tracer wire for locating the PE Steel risers attached to both the steel main and the riser tail.
- Other installations where PE main was installed have the service tracer wire connected to the main tracer wire network, in this case the riser was remote from cathodic protection.
- There have been no leaks observed due to corrosion on the riser specific to these installations.
- Prior to 1985, there is usually an AMP fitting at the PE/Steel connection.
- There has been no indication of localized corrosion of steel risers on the system.

4.2.1.4 Mastic coating on service tees or no wrap on swing tees:

- Service tees exist on the system with mastic coating through the mid- 1990's.
- Swing tees have been discovered with no wrap.
- The time weighted effectiveness of mastic coatings is uncertain.
- All steel pipes are under C.P.
- There has been no indication of localized corrosion of service or swing tees on the system.

4.2.1.5 Other Metal

- Copper stubs (6" length and shorter) exist on the system in localized areas.
- Through excavation records, copper stubs appear to be adequately wrapped.
- Records indicate that no leakage due to corrosion has been found on these stubs.
- Copper stubs are localized in several distinct areas.

4.2.1.6 Internal Corrosion

- The system contains steel mains and services.
- Corrosion on internal areas of the pipe have not been found during examination of tapping coupons or pipe removed for other reasons.
- Drip run records through 2004 until 2011 have not indicated that liquids have been found in the system.
- Gas from local production is monitored for moisture content, H2S concentration and CO2 concentration at Local producer City Gate stations. Alarms are set in the SCADA system to alert personnel if gas quality standards are exceeded.
- There has been no indication of localized internal corrosion on the system.

4.2.2 Natural Forces

4.2.2.1 Vegetation

- Leaks have been attributed to damage from vegetation (i.e. tree roots) at a rate of about 1 per year.
- Leaks found have been at isolated locations.

4.2.2.2 Weather

- Extreme weather events due to snow and ice are uncommon occurrences (the last reported snow fall was 1949).
- Extreme weather events due to rain are more common:
  - Several localized areas of the system are prone to flooding during extreme precipitation;
  - Lightning is not a common phenomenon in the area, however lightning damage has occurred.
- Areas prone to flooding are localized.

4.2.2.3 Earth Movement (Earthquakes)

- The system is bisected by the Newport Inglewood Fault, capable of producing an earthquake of greater than M6.0.
- The major Southern California Fault is the San Andreas which is located approximately 75 miles inland, but capable of producing an earthquake that could affect the system.
- The Newport Inglewood Fault runs along a path from the southeast shore area, passing just north of downtown and exiting long beach on the west at I-710 and I-405.
- Approximately ¾ of the system lies north of the fault along with 3 of the 4 major city gate receipt points.

- Nine major system pipelines cross the Newport Inglewood Fault.
- Liquefaction due to earth movement while not a separate threat, could occur in the eastern, northern and western sections of the system, including the Port area and the shore.
- There are common experiences of small earthquakes, <M5.0 in the area of the system, none have resulted in failure of system components.
- This threat may affect the entire system in general.

4.2.2.4 Tsunami

- Tsunamis can be generated in remote locations and still affect the system.
- Tsunami prone areas are confined to the Port area, the area along 2nd Street and Studebaker Road, the Naples/Belmont Shore area and the area south of Ocean Boulevard (See California Emergency Management Agency Tsunami Inundation Map for Emergency Planning Los Alamitos Quadrangle/Seal Beach Quadrangle and Long Beach Quadrangle – March 2009).

4.2.3 Excavation Damage

4.2.3.1 First & Second Party (Operator or Operator's Contractor Damages)

- Pipeline damage and leaks have occurred due to excavation damage by operator personnel and operator's contractor personnel at the rate of one or two per year.
- Damages are not confined to specific personnel or crews.

4.2.3.2 Third Party Damages

- Pipelines on the system have been damaged by third party excavators.
- Third-party excavators have been found not following one-call laws.
- Damages have rarely occurred due to unmarked or inaccurately marked facilities.
- The system is built-out with little major development areas, development is generally confined to individual parcels or groups of parcels.

4.2.3.3 Blasting Damage

- There have been no instances of blasting operations for demolition or construction within the area of the system for the past 10 years.
- Absence of underlying rock mitigates the need for blasting near the surface.

4.2.3.4 Previous Excavations by others:

- Excavation damage from previous excavations have been found on the system.
- Previous excavation damage has been a cause of leaks, due to the compromise of the pipe coating or wrap and in some cases, installation of other utilities and pipelines touch the system pipeline.
- Leaks that have been discovered are generally a combination of the effects of corrosion and the compromise of the pipe coating.
- Previous excavation damages are not localized on the system.

4.2.3.5 Shallow pipe installations:

- There is pipe in the system, both mains and services that was installed at depths not meeting current standards (shallow pipe).
- Pipe that is shallow has a higher potential of excavation damage than pipe installed at current standard depths.
- Shallow pipe installations are not localized on the system.

4.2.3.6 Inserted services:

- From approximately 1974 to 1993 services were inserted as a selective practice during replacement.
- The old service lines were usually shallow on property.
- Sizes of the inserted pipe is generally ½" and ¾" PE.
- The possibility of excavation damage is increased due to concealment of inner plastic piping.
- Inserted services are not localized on the system.

4.2.4 Other Outside Forces

4.2.4.1 Vehicle Damage to MSAs

- The system has aboveground pipeline facilities in the form of valve sets, city gates and meter set assemblies (MSAs).
- MSAs have been damaged by vehicles striking or colliding with the MSA at approximately four per year.
- MSA and risers have been damaged by third party construction equipment.
- Vehicle damage has not been localized on the system.

4.2.4.2 Vehicle Damage to District Regulators Stations and City Gates

- Regulator stations have been damaged by vehicles.
- Damage has been observed to the aboveground facilities such as vent pipes and chart boxes.
- All district regulator stations are located in underground vaults.
- Aboveground city gate stations are protected from general vehicular traffic.
- Local producer sites are located in areas not accessible to general vehicular traffic.

4.2.4.3 Sewer Crossbores

- Services and mains have been installed through sewer mains and laterals.
- Service and main pipelines have been damaged due to snaking of sewer laterals by plumbers.
- Pipeline damage generally confined to PE.
- Sewer crossbores have not been localized on the system, however are more prevalent in areas where large-scale pipe replacement has occurred.

4.2.5 Material, Weld or Joint Failures

4.2.5.1 Material Defect

4.2.5.1.1 Celcon (polyacetal) caps on Plexco service tees

- There are approximately 2490 PE service connection tees manufactured by Plexco installed in the system prior to and including 1996 (the date Plexco discontinued using Celcon polyacetyl caps).
- Leaks have been discovered on Celcon polyacetyl caps at a rate of about 4 per year.
- The PE service connection tees are located in streets and alleys.
- Celcon caps are only found in the system on PE main installations prior to 1996.

4.2.5.1.2 AMP fittings

- A steel to plastic transition known as an AMP fitting was widely used in the system prior to 1985.
- There are approximately 2,800 AMP fittings in the system mostly on one-inch and ¾" diameter services.
- Leaks have been discovered on AMP fittings at a rate of about 6 per year.
- The AMP fittings are located in streets and alleys at the service connection tee and at the riser.
- Most of the leaks found are located in the street.
- AMP fitting installations are only found in the system on PE service installations prior to 1985.
- AMP fittings were occasionally used on leak repairs until approximately 1992. There is no indication of leakage from these fittings.

4.2.5.2 Joint Failures

4.2.5.2.1 Weld Failures

- Weld failures have been observed on the system on both mains and services.
- Leaks were not localized by welder or area.

4.2.5.2.2 Swing Tees:

- Swing tees are in-house fabricated fittings that join the service to the main, consisting of a short section of pipe welded to a short bent section of pipe and a threaded cap.
- Swing tees were generally installed in the system between 1947 and 1953.
- Leaks have been observed on swing tees and usually found at one of the weld joints
- The swing tees may or may not be wrapped.
- Swing tees are located throughout the system and confined to areas where the mains and services were installed by the LB Gas Department during the period

from 1947 to 1953, but not in areas where the mains and services were purchased from another utility.

4.2.5.2.3 Fusion Failures

- Four fusion failures resulting in leaks have been observed in the past 7 years.

4.2.5.3 Bell & Spigot Pipe:

- Bell & Spigot pipe was installed on the system in the mid 1940's through the mid to late 1950's.
- This pipe can be characterized by fillet weld girth joints, and a submerged arc welded longitudinal joint, identified by a weld bead along the length of the pipe that is not flush with the pipe. Grinding away the weld bead on the longitudinal joint may cause a leak, due primarily to inadequate penetration of the weld.
- Through the mid-1950's, this pipe also is characterized by having non-standard dimensions.
- Mid to late 1950's installed pipe has been observed to have standard dimensions.
- Pipe with these characteristics are in 8", 10" and 12" nominal size.
- Bell & spigot pipe installations are found in the system generally on the sections of main designated as backbone.

4.2.5.4 Pipe Joining practices (pre-1960):

- Early pipe joining methods were by welding.
- It has been observed that these welds may not have a root pass.
- Pipe ends may not have been beveled.
- These conditions are found on smaller diameter pipe (6" and less) installed in the 1930's, 1940's and 1950's, but not in areas of mains and services purchased from other utilities.

4.2.6 Equipment Failure

4.2.6.1 Threaded risers:

- The system has threaded service riser connections belowground and has a potential for leakage at the threaded connection.
- Until approximately 1956, services had a bell reducer placed between the service riser and the meter stop valve. These bell reducers are prone to leak at the threaded joint.
- Threaded risers are not localized on the system.

4.2.6.2 Below-ground Flanges:

- Early valves and insulators were joined to the pipe segments by flange.
- Flanges have been observed to leak through the gasket.
- Belowground flanges are not localized on the system.

4.2.6.3 Dresser Couplings:

- Dresser couplings were installed on the main pipelines before 1950 and there are currently 6 known Dresser couplings on mains in the system.
- Dresser/Dayton couplings were installed on service pipelines through 1948, and there is an unknown number of couplings still on service pipelines.
- All of these couplings are four inch and under in diameter.

4.2.6.4 Regulators and other Pipeline Equipment

- There has been no indication of leakage, failure or over-pressurization due to failures of regulators or other pipeline equipment.
- System pressures are monitored 24/7 on SCADA in Gas Dispatch for both over-pressurization and under-pressurization.

4.2.6.5 Larger than 8 inch Diameter Plug Valves:

- 8-inch or larger diameter plug valves were determined to be a threat warranting further consideration for additional action beyond code compliance. Experience has shown that some of these valves may bypass natural gas in a closed position.

4.2.6.7 Convenience Valves (In Line Service Valves)

- Valves have been installed on service lines for certain customers.
- The purpose of the valve is to shut off the service at a remote location to the meter.
- Valves have been discovered to be inoperable.

4.2.7 Incorrect Operations

4.2.7.1 Inadequate Procedures

- The potential exists that inadequate procedures could be a threat to the system.
- General operating and construction procedures may not cover all field conditions encountered.

4.2.7.2 Inadequate Safety Practices

- The potential exists that inadequate safety practices could be a threat to the system.
- General safety procedures may not cover all field conditions encountered.

4.2.7.3 Failure to Follow Procedures

- The potential exists that procedures could not be followed and present a threat to the system.
- General operating and construction procedures may not cover all field conditions encountered.

4.2.7.4 Incorrect Operations due To Drugs or Alcohol

- The potential exists that operator use of drugs or alcohol could present a threat to the system.

4.3 Other Potential Threats

4.3.1 Age of Infrastructure

In over 90 years of operation, LBGO has experienced multiple generations of construction and maintenance practices, materials selection, and surrounding development and excavation. These factors over time can be a threat to the system. Age of infrastructure is not, by itself, a threat.

4.3.2 Early Construction Practices and Materials

Industry standards and construction practices have changed over the past decades and are determined to be a threat warranting further consideration for additional action beyond code compliance or current system practice.

4.3.2.1 Saddle Weld and Pressure Tees:

- Saddle weld tees are in-house fabricated fittings serving the function of a modern standard tee. Typically installed as a main to main or main to service branch tie-in the connection was made by cutting a hole in one pipe and joining, by fillet welding, a branch pipe of the same or smaller pipe over the hole.
- Saddle weld tees were a generally accepted branch fitting up through the late 1950, after which forged bends and tees were used.
- Pressure tees are in-house fabricated pressure control fittings with a threaded cap.
- Pressure tees are generally found on mains installed prior to 1948.

4.3.2.2 Tubing:

- The system has several sections of pipeline constructed of tubing (described as 4 inch at Los Santos, at Willow & Palo Verde and 6 inch along Stearns).
- The tubing is thinner wall thickness and smaller outside diameter than standard pipe.
- All main sections identified as tubing were installed in 1951.

4.3.2.3 Non-standard dimensional pipe:

- The pipeline system has segments of pipe that are "non-standard" diameter - 2-1/2", 5", and 13".
- Fittings do not exist for pressure control on these pipelines.

4.3.2.4 Threaded Mains and Fittings below-ground

- Records and field observation indicate a past practice of main and valve installation using threaded joints and couplings.
- There has been leaks observed at on the threads of a section of main or a valve.
- Threaded main sections (2 inch and less installed in the 50's, 3 inch around Golden Ave, 2nd and Ximeno) have the potential for leakage from the threaded area.
- Threaded fittings are not localized on the system.

4.3.2.5 Gate Valves

- There are 38 gate valves of mainly 3" and 4" sizes remaining in the system on main pipelines.
- Gate valves were in common use until about 1951, LBGO has removed over 300 gate valves since 2001.
- Gate valves may have a tendency to fail at the gate/actuator connection.

4.3.3 Pipe repairs

- LBGO has used canopies (welded cover), half-soles, weld patches, and leak clamps as permanent pipe repairs. Some of these repairs are over 50 years old and have leaked.

4.3.4 Meter Set Assemblies/Services

4.3.4.1 MSAs Dresser Couplings

- Non-restrained Dresser couplings have been installed downstream of the meter at the house line connection. LBGO has not had a failure but a potential for fitting pull out exists. These fittings are on larger MSAs.

4.3.4.2 MSAs Kerotest insulators

- Kerotest fiberglass wrapped insulator has been installed below the meter in a vertical position above ground. The only rigidity provided to the MSA is through the house line. The wrap has also started to deteriorate due to sunlight. It is estimated that there are around 30 to 50 of these fittings in the system installed above ground.

4.3.5 Work Done by Others

4.3.5.1 Pave over Valve & Corrosion Lids

- Valve and CP lids have been paved over during pavement work.

4.3.5.2 Excavation work adjacent to pipeline facilities

- Other construction and/or excavation takes place in close proximity to the pipeline.

4.3.6 Air Traffic

- There is a municipal airport in LBGO service territory. There is a possibility of LBGO facilities being affected by an air disaster.

4.3.7 Cyberterrorism

- The SCADA System controlling LBGO facilities is vulnerable to cyberattack.

4.4 New Threats and Additional Information

The following is the procedure to be followed if a new possible threat is discovered or identified or further information is required about an existing threat.

4.4.1 New Threats

If a new threat is discovered for whatever reason, (examples include, exposure of pipeline during a normal excavation, advisory notice from PHMSA or another technical body), or further information is required about an existing threat then LBGO Engineering will form a team to perform the following functions: gather data from available sources, including GIS, work orders, field books, and service orders. The data will be analyzed to determine whether the threat is viable or not and whether it should be included in the DIMP attribute table in GIS. Based upon the results a course of action will be determined.

4.4.2 Additional Information

While LBGO operates a robust GIS system, gaps in data that is available for analysis continue to exist. LBGO continuously gathers data from field operations on the following forms. These forms and GIS attributes are under continuous review, modification and improvement for the purposes of this Plan.

- Work Orders
- Repair Orders
- Retirement Orders
- Service Orders
- Leak Notices
- Leak Survey Field Reports
- Exposed Pipe Reports
- Crossbore Information Sheets
- Damaged Line Reports
- Essentials Field Inspection and Patrol Reports (Electronic)

Forms are modified as necessary to collect additional information from field construction, operations and maintenance activities. The following are procedures for gathering additional information from field activities.

- Information not currently available is identified by a DIMP Organization team member (See Section 10.1).
- The DIMP team members determine whether the additional necessary information is available on historical records or whether forms should be modified to collect the information.
- If the information is available on historical records, the process in 4.4.1 is followed.
- If additional field information is required, the DIMP team members will identify the appropriate source of the data and recommend a change in an existing form or create a new form, as needed.
- Changes to or additional forms are communicated to supervisory staff for dissemination to field personnel.

Section 5. Risk Evaluation

5.1. Overview

To evaluate risk from the threats identified in Section 4, two factors are used, probability of an event occurring and the consequences if that event occurs. The GPTC Guide defines risk as the product of the likelihood of a problem occurring and the consequences that could be caused by the problem if it occurs.

For the most part, these risk evaluation methods consist of the following elements, performed, more or less, in the following order: assess the vulnerability of critical assets to specific threats and determine the potential consequences of specific types of events to system assets.

5.1.1 Probability of an Event Occurring

The probability of an event occurring is based on several factors including leak history, operating history, past practices and other information. The probabilities factors used are as follows:

5.1.1.1 High Probability of an Occurrence of an Event

These are events that are observed and discovered on a regular basis through normal operating and maintenance processes.

5.1.1.2 Medium Probability of an Occurrence of an Event

These are events that are observed and discovered as found and not routinely observed during normal operating and maintenance processes.

5.1.1.3 Low Probability of an Occurrence of an Event

These are events that are observed and discovered once or twice over an extended time period and rarely observed during normal operating and maintenance processes.

5.1.2 Potential Consequence if the Event Occurs

The consequences caused by an event are evaluated based on factors including hazard or impact to life, property, the environment, a geographic area, customers, employees, or the system in general. The consequence factors used are as follows:

5.1.1.1 High Consequence

These are events with the potential for loss of life, loss of property, an ignition, hazard to the environment, significant personal injury, operation of system outside of design parameters, or major interruption in the provision of gas to customers, need to request outside resources.

5.1.1.2 Medium Consequence

If an event occurs, a medium consequence is the potential for the inability to perform required operations and maintenance activities, a minor outage (less than 100 customers), long term reduction of serviceability of pipe, or a non-hazardous release of natural gas.

5.1.1.3 Low Consequence

If an event occurs, a low consequence is the potential a loss of a few or no customers, a non-hazardous release of natural gas, in the range of 50 ppm or less, or a reduction in pipe wall thickness, not affecting the serviceability of pipe.

No attempt has been made to quantify the actual probability or actual consequence. The ranking procedure has been developed using operator experience to rank each threat according to its probability of occurrence and the severity of the consequence. The individual threats to the pipeline have been grouped into the nine groups shown below. Mitigation of these risks will be dependent upon risk evaluation and resource availability.

The symbology is as follows:
HP = High Probability of Occurrence
MP = Medium Probability of Occurrence
LP = Low Probability of Occurrence
HC = High Consequence as a Result of Occurrence
MC = Medium Consequence as a Result of Occurrence
LC = Low Consequence as a Result of Occurrence

		Low Consequence	Medium Consequence	High Consequence
		LC	MC	HC
High Probability of Occurrence	HP	HP*LC	HP*MC	HP*HC
Medium Probability of Occurrence	MP	MP*LC	MP*MC	MP*HC
Low Probability of Occurrence	LP	LP*LC	LP*MC	LP*HC

The ranking is prioritized beginning with the highest relative risk. Failures that may potentially affect life or property are ranked as a high consequence, irrespective of the actual consequence. A prioritization process is followed whereby the risks with the highest probability of occurring and the greatest consequence are handled first, and risks with lower probability of occurrence and lower consequence are handled in descending order. In practice the process can be very difficult, and balancing between risks with a high probability of occurrence but lower consequence versus a risk with lower probability of occurrence but higher consequence is based upon operator judgement.

Elements identified in the Threat Assessment above requiring further consideration for additional actions, have been ranked as to the overall risk.

All data required for evaluation of the preceding year will be collected by June 30st of the following year. This data will be evaluated for threats and risk evaluation by August 31st. The team referenced in section 10.1 will evaluate the data.

5.2 Risk Ranking

5.2.1 High Likelihood of Occurrence - High Consequence as a Result

Threat: Excavation Damage - Third Party - HP*HC
Detail: Main and service pipelines have been damaged during excavation by third parties.
Probability: Due to the lack of LBGO control and lack of notice of excavations near system pipelines and facilities, the probability of damage by third parties is undetermined. Until 2013, this threat was the third highest cause of leaks, however third party excavation damage is now the second highest cause of leaks.
Consequence/Discussion: Damage to active main and service pipelines due to excavation generally results in blowing gas. Blowing gas in an area where construction or homeowner equipment is operating may create an immediate ignition and safety hazard to persons and property and a methane release hazardous to the environment.
Risk Assessment: Due to the uncertainty in quantifying the likelihood of occurrence and given the known hazard to life and property, this threat is ranked as both high in probability and consequence.

Threat: Other Outside Force - Sewer Crossbores - HP*HC
Detail: The use of trenchless technology (e.g. boring) has created situations where it would be possible to bore/drill through a sewer line during installation of gas pipelines.
Probability: Sewer laterals and mains are not required to be marked in response to an Underground Service Alert request. Until 2011, LBGO did not pre-locate sewer mains and laterals. Approximately 15,000 PE services were installed between 2000 and 2010 and it is undetermined how many crossbores may be in the system related to these installations. Damage from plumber snakes (root cutters) is more prevalent with PE main and service material than with steel.
Consequence/Discussion: Damage to active PE main and service pipelines generally results in blowing gas. In the case of crossbores, the gas would travel into a building through the sewer line and accumulate, creating an immediate ignition and safety hazard to persons and property and a methane release hazardous to the environment.
Risk Assessment: Due to the uncertainty of in quantifying the likelihood of occurrence and given the known hazard to life and property, this threat is ranked as both high in probability and consequence.

5.2.2 High Likelihood of Occurrence - Medium Consequence as a Result

None Identified.

5.2.3 Medium Likelihood of Occurrence - High Consequence as a Result

Threat: Other Outside Force - Vehicle Damage to Meter Set Assemblies - MP*HC
Detail: Aboveground meter seat assemblies have been damaged by vehicles.
Probability: While many meters are located in areas inaccessible to vehicles, an unknown number are located adjacent to driveways and buildings and other places that maybe be

accessible to vehicles. Most MSAs are located at building walls. Due to the human factor, the probability of damage of MSAs by vehicles is undetermined, however LBGO experiences about five of these instances each year.
Consequence/Discussion: Damage to active MSAs sometimes results in blowing gas. Blowing gas near vehicles or close to buildings may create an immediate ignition hazard to persons and equipment or allow gas to enter a building and a methane release hazard to the environment.
Risk Assessment: Due to the number of meters located near vehicular travel zones and the "human factor" and given the known hazard to life and property, this threat is ranked as medium in probability and high in consequence.

Threat: Natural Forces - Natural Forces due to Earth Movement - MP*HC
Detail: The system has not experienced damage due to earth movements within the last 30 years.
Probability: There is uncertainty about when a major earthquake will strike the Newport-Inglewood Fault. In addition, several other fault systems are in areas where an earthquake of significant magnitude could cause damage to the system.
Consequence/Discussion: Damage to the system from an earthquake will depend on a number of factors, including but not limited to proximate location of the epicenter, magnitude, fault system. A major earthquake on the Newport-Inglewood Fault (> 6.0) with an epicenter along the Long Beach section would most likely cause near catastrophic damage. In addition, older large diameter pipelines, as well as small distribution pipelines with early construction practices (girth welds) cross the fault or are in close proximity and may come apart causing a release of gas and widespread service outages. In addition, the added threat of liquefaction could occur during a substantial earthquake.
Risk Assessment: Due to the unpredictable nature of earthquake events, the much used phrase, "it's not if it will happen, but when," applies, therefore, this threat is ranked as a medium likelihood of occurrence. Because of the unpredictability of the magnitude, this threat is ranked high in consequence as life and property hazards and system deliverability issues will most likely arise. Maps showing the location of nearby fault lines are shown in Appendix 2.

Threat: Natural Forces – Tsunami - MP*HC
Detail: The system has not experienced damage due to a tsunami within the last 30 years.
Probability: There is uncertainty about when a tsunami will strike the Long Beach coastal areas. Much of the issues of tsunamis are similar to that of earthquakes and are related to earthquake events, a tsunami may not be generated from a local event, but rather from distant events. The most immediate threat would be from an underwater landslide at Catalina Island. This is rated as a medium probability of occurrence due to the unpredictable nature of earthquake events.
Consequence/Discussion: Damage to the system from a tsunami would be likely be localized along the shore and low-lying areas. The result will be realized as flooding and destruction of buildings and homes. Widespread service outages will likely occur, however, unlike an earthquake, however, California has a tsunami warning system that may provide

advance notice before they strike and cause damage. Widespread service outages along the shore area will likely occur.
Risk Assessment: Due to the unpredictability of the timing of tsunamis, this threat is ranked as a medium likelihood of occurrence. Because of the unpredictability of the location of the event causing the tsunami, this threat is ranked high in consequence as life and property hazards and system deliverability issues will most likely arise. Maps showing the location of flood and tsunami prone areas are shown in Appendix 2.

Threat: Excavation Damage – Shallow Pipe - MP*HC
Detail: In some locations the mains and services were installed in the past that now do not have the recommended depth of cover. The shallow location can make the pipeline more prone to excavation damage.
Probability: Due to the lack of LBGO control and notice of excavations near system pipelines and facilities, the probability of damage is undetermined. The depth of the pipe has been only a factor in a small number of excavation damage events.
Consequence/Discussion: Damage to main and service pipelines from excavation generally results in blowing gas. Blowing gas in an area where construction or homeowner equipment is operating may create an immediate ignition and safety hazard to persons and property and a methane release hazardous to the environment.
Risk Assessment: Because excavations occur more frequently in streets, rather than on sidewalks or property, and the amount of shallow pipe in streets is a fraction of all pipe in streets, this threat is ranked as a medium likelihood of occurrence. Due to the known hazard to life and property, this threat is ranked as high in consequence.

Threat: Other - MSA Dresser Couplings - MP*HC
Detail Non-restrained Dresser couplings have been installed downstream of the meter at the house line connection. These fittings are on larger MSAs.
Probability: The probability of a failure occurring involving is directly related to earth movements of significant magnitude, which are uncertain events.
Consequence/Discussion: Failure of this type may allow escaping gas to occur, usually downstream of the meter, which may create a hazardous situation.
Risk Assessment: Due to the uncertainty of an earth movement event and the extent that the earth movement will cause damage to the joint is unknown, the probability of a failure of this joint is ranked as medium. However, the potential exists to create a situation that could threaten life or property, so the consequence could be high.

5.2.4 Low Likelihood of Occurrence – High Consequence as a Result

Threat: Excavation Damage - Inserted services - LP*HC
Detail: PE service lines have been inserted into older abandoned steel services, marked PE services are concealed within the steel pipe. Third parties could mistakenly cut the steel without knowledge of the inserted PE, cutting the PE as well.
Probability: There are approximately 2,070 inserted service lines in a system of 86,755 total services. The possibility that any one service will be cut by a third party is low.

Consequence/Discussion: Damage to active PE main and service pipelines due to excavation generally results in blowing gas. Blowing gas in an area where construction or homeowner equipment is operating may create an immediate ignition and safety hazard to persons and property and a methane release hazardous to the environment.
Risk Assessment: Because the number of inserted services is a fraction of the total number of services and service lines are located and marked when notification is received, the probability of damage is low, however, a cut line is an immediate hazard to life and property representing a high consequence.

Threat: Other Outside Force - Vehicle Damage to District Regulators Stations and City Gates - LP*HC
Detail: District regulator stations and city gates have not been damaged by vehicles.
Probability: Two district regulator stations were aboveground and located in areas where an unlikely occurrence could have put a vehicle in a position to damage an aboveground station. All other stations are located in belowground vaults. Both of the aboveground stations were located at busy intersections and both were somewhat protected by fenced enclosures. The belowground stations are in vaults with H-20 rated covers. The aboveground city gate stations are located on property or in protected enclosures, making the potential for an occurrence unlikely.
Consequence/Discussion: Damage to an active aboveground district regulator station could result in blowing gas. Blowing gas near automobiles may create immediate ignition, hazard to persons and equipment and a methane release hazard to the environment. In addition, unplanned shutdowns to district stations most likely would cause a service outage.
Risk Assessment: Since only two of forty-seven stations were factors and were minimally protected and the 9 city gates are adequately protected, this threat is determined to have a low probability of occurrence. The "human factor," created a known hazard to life and property and outage potential indicated a high consequence.

Threat: Incorrect Operations - Failure To Follow Procedures - LP*HC
Detail: An employee could fail to follow established or written procedures.
Probability: With an ongoing employee training program and the availability of supervisory and support personnel, the likelihood of an employee failing to follow procedures resulting in an incident is relatively small.
Consequence/Discussion: Failure to follow procedures could result in the operation of system outside of design parameters, major interruption in the provision of gas to customers, the potential for loss of life or property or significant personal injury.
Risk Assessment: This is "human factor risk" that always exists with the number of tasks performed by personnel on a daily basis. The probability of any one failure to cause a significant hazard to the system remains small due to training, qualification and supervision. But the potential exists that any one failure could cause hazard to life and property, system operational issues or outage potential, resulting in a high consequence rating.

Threat: Incorrect Operations - Due To Drugs or Alcohol - LP*HC
Detail: Drugs or alcohol could be a factor in an occurrence of an event.

Probability: With the mandated drug and alcohol testing program, the likelihood that the use of drugs or alcohol being a factor in an incident is relatively low.
Consequence/Discussion: An employee on drugs and/or alcohol could cause a lapse in observation, failure to respond properly to an abnormal operating condition or could be a factor in an employee failing to follow procedures. Any one of these factors could result in the operation of the system outside of design parameters, major interruption in the provision of gas to customers, the potential for loss of life or property or significant personal injury.
Risk Assessment: This is "human factor risk" that could exist with personnel, however, with random testing the probability of drugs or alcohol being a factor in an occurrence of an event that could cause a significant hazard to the system remains low. However, the potential exists that any one failure could cause hazard to life and property, system operational issues or outage potential, resulting in a high consequence rating.

Threat: Incorrect Operations - Inadequate Procedures - LP*HC
Detail: General operating and construction procedures may not cover all field conditions encountered.
Probability: LBGO through its ongoing Operator Qualification program provides general knowledge training for covered tasks and field training for specific tasks. In addition, each crew is assigned to an on-site field Supervisor and each work package is assigned to a field Construction Inspector. All contract work is directly observed and inspected by a Construction Inspector. Deviations from established procedures require concurrence between the Supervisor and Inspector, with consultation from Engineering. The potential for an occurrence from procedures that may be inadequate are generally rectified by the availability of qualified supervisory personnel to address issues that may arise.
Consequence/Discussion: Inadequate procedures could result in the operation of system outside of design parameters, major interruption in the provision of gas to customers, the potential for loss of life or property or significant personal injury.
Risk Assessment: Direct field supervision and inspection, job procedure packages, available SMEs, all combine to support field operations and reduce the probability of an occurrence due to inadequate procedures, But the potential exists that any one failure could cause hazard to life and property, system operational issues or outage potential, resulting in a high consequence rating.

Threat: Incorrect Operations - Inadequate Safety Practices - LP*HC
Detail: Inadequate safety procedures could be a factor in an occurrence of an event.
Probability: Safety training is an ongoing function within the department so the potential for safety practices not being followed at worksites is low.
Consequence/Discussion: Lapses in safety practices are difficult to predict and the outcomes from those lapses are equally as difficult to characterize. Therefore the potential consequences from this threat are unknown.
Risk Assessment: Safety training and tailgate meetings heighten employees' awareness to safety, so the probability of occurrence is low. The unpredictable outcome of any occurrence could result consequence that could be hazardous to life or property and system integrity.

Threat: Other – Cyberterrorism - LP*HC
Detail: The SCADA system could be vulnerable to a cyber-attack.
Probability: The SCADA system is a standalone network which minimizes outside intervention. The system is scanned for viruses on a biweekly basis. Therefore, the probability of an occurrence is low.
Consequence/Discussion: The SCADA system only controls system inlet valves. The single consequence would be to cause a complete shutdown of the gas system, which would be a major disruption in the provision of gas to customers.
Risk Assessment: This threat is of low probability of occurrence since the SCADA system is isolated from outsiders. It may be a high consequence due to the potential interruption in service.

Threat: Other – Air Traffic (crash) - LP*HC
Detail: Parts of the system are located in the flight path of LGB (Long Beach Airport). LGB operates both small planes and commercial airliners.
Probability: An occurrence of this type is limited to a plane crash. The likelihood of a crash affecting the system is small, however, a section of backbone crosses the runway at the east end.
Consequence/Discussion: The consequences of a crash affecting the system could be high, due to accessibility issues. A large scale crash in the residential approach or departure zones could limit the ability to shut the system down adequately without affecting delivery to other customers.
Risk Assessment: This threat is of low probability of occurrence since plane crashes are rare occurrences and such an occurrence would need to penetrate the ground or remove structures. It may be a high consequence due to accessibility issues and the unpredictable location of an occurrence.

Threat: Excavation Damage – First or Second Party (Operator or Operator's Contractor) - LP*HC
Detail: Main and service pipelines have been damaged during excavation by Operator or Operator's Contactor.
Probability: It is generally improbable that a main or service line is damaged by Operator or Operator's Contactors, given the fact that the mains and services are marked by LBGO personnel.
Consequence/Discussion: Damage to active main and service pipelines due to excavation generally results in blowing gas. Blowing gas in an area where construction or homeowner equipment is operating may create an immediate ignition and safety hazard to persons and property and a methane release hazardous to the environment.
Risk Assessment: Given that mains and services are excavated by qualified personnel and facilities are located and marked prior to excavation, the probability of an occurrence is low. Due to the uncertainty in quantifying the hazard to life and property, this threat is ranked high in consequence.

Threat: Joint Failure - Bell & Spigot Pipe - LP*HC
Detail: Installed in the mid to late 40s and the early 1950s, this type of pipe also has longitudinal joints that have protruding welds (submerged arc welded or furnace butt welded longitudinal seams).
Probability: Failure of this pipe without an intervening outside force has a low probability of occurrence.
Consequence/Discussion: These joints are found on large diameter backbone pipelines. These weld joints (fillet weld) may be susceptible to failure in the event of earth movement both vertically and laterally, subjecting the weld to bending forces. These pipelines are located along arterial streets, a break at a joint or joints, coupled with an emergency situation could cause accessibility problems for emergency personnel. Another potential problem is the difficulty of fit up and installation of pressure control (PC) fittings due to the protruding longitudinal weld. This pipe is usually of a non-standard outside diameter adding to pressure control fit challenges. A break on one of these pipelines would also allow gas to escape creating a hazard to life and property.
Risk Assessment: There have been no observed leaks at joints on these pipelines. The potential for an occurrence is low due to the unpredictability of earthquake occurrences. However, based upon the location, sizes and given the known hazard to life and property, this threat is ranked high in consequence.

5.2.5 Medium Likelihood of Occurrence - Medium Consequence as a Result

Threat: Other – Age of Infrastructure - MP*MC
Detail: By itself, the age of infrastructure risk is the cumulative effect of practices and procedures that occurred in the past. This is not a singular risk, but a collection of legacy conditions related to the period (decade) of installation. Each of the threats below are evaluated individually, however for this evaluation, the threats are taken as a whole.
5.2.5 High Likelihood of Occurrence - Low Consequence as a Result
Threat: Equipment Failure – Threaded risers
Threat: Joint Failure – Swing Tees
5.2.6 Low Likelihood of Occurrence – High Consequence as a Result
Threat: Joint Failure - Bell & Spigot Pipe
5.2.8 Medium Likelihood of Occurrence – Low Consequence as a Result
Threat: Other - Early Construction Practices and Materials, including Saddle Weld and Pressure Tees, Tubing, Non-standard dimensional pipe, Threaded Main and Fittings Below-ground Plug Valves (2, 3 and 4 Inch) and Gate Valves
Threat: Corrosion – External Corrosion on Buried Pipelines
Threat: Corrosion – Other Metal
Threat: Excavation Damage - Previous Excavations by others
Threat: Joint Failure - Pipe Joining practices (pre-1960)
5.2.9 Low Likelihood of Occurrence - Low Consequence as a Result
Threat: Equipment Failure – Below Ground Flanges
Threat: Equipment Failure - Dresser Couplings

Probability: Taken together and reviewing the leak and maintenance history, the numbers of leaks associated with these threats are relatively high. The probability of an occurrence are different for each individually, but the potential for an occurrence collectively is medium.
Consequence/Discussion: Leaks associated with these types of threats are generally do not create a hazard to life and property and can generally be repaired within applicable timeframes.
Risk Assessment: Each threat will be analyzed individually and have its own risk ranking. The cumulative effects of these may have a medium probability, however the chances of many of these occurring simultaneously is small. The consequence of any one event is different for each type of event, but collectively, the consequences of the group as a whole is medium.

5.2.6 Low Likelihood of Occurrence - Medium Consequence as a Result

Threat: Other – Work Done by Others – Pave-overs – LP*MC
Detail Valve and insulator lids have been found to be paved over during street reconstruction.
Probability: Experience has shown that there is a small chance that a valve lid will be paved over during a street repaving project. In addition, the relationship between City departments keep the chances of pave-overs low.
Consequence/Discussion Valves and corrosion test points become inaccessible which will hamper valve inspection, corrosion work and valve closure in an emergency response.
Risk Assessment: Because the LBPW standard specifications include provisions to protect LBGO facilities in place, this threat is a low probability. Because LBGO conducts annual inspections on emergency valves and corrosion test points, pave-overs are promptly discovered. Also, in an emergency situation, alternative methods can be used to shut down the flow of gas. This threat is ranked as a medium consequence.

Threat: Other – Work done by Others - Excavation work adjacent to pipeline facilities – LP*MC
Detail: The wrap or coating on main and service pipelines have been damaged during excavation adjacent to pipelines by third parties that have not resulted in a leak but has caused external corrosion.
Probability: Due to the lack of LBGO control and lack of notice of excavations near system pipelines and facilities, the probability of damage by third parties is undetermined.
Consequence/Discussion: Damage to active main and service pipelines due to adjacent excavation generally results in gouges and wrap damage. If LBGO personnel are promptly notified, repairs can be made in a timely manner. If LBGO is not notified, damage may result in a future leak.
Risk Assessment: Due to the uncertainty in quantifying the likelihood of occurrence and given the superficial damage to pipeline facilities and the length of time for an occurrence to manifest into a problem, this threat is ranked as low in probability and medium in consequence.

5.2.7 High Likelihood of Occurrence - Low Consequence as a Result

Threat: Equipment Failure – Threaded risers – HP*LC
Detail: Threaded risers are a threat because of the potential for leakage below ground at the threaded connection or at the aboveground bell reducer below the meter stop valve.
Probability: This represents the highest number of leaks on the system, but the probably of any one failure of the approximately 35,000 in the system is small.
Consequence/Discussion: The leaks are through the threaded area and can be considered to be fizzer or weeper type leaks, in the range of 50 ppm. While the leak may be located adjacent to a building, it is generally undetectable at a range of about 1 foot. Migration of gas from a leak of this type has not been observed.
Risk Assessment: Because of the numbers of these in the system, the collective probability of an occurrence is high, but the consequences resulting from the occurrence is near minimal due to the minimal amount of escaping gas that has been observed over the past 10 years.

Threat: Joint Failure – Swing Tees – HP*LC
Detail: LBGO Swing Tees are an in-house fabricated fitting that has a tendency to leak at a weld joint.
Probability: The probably of any one failure of the approximately 8,000 in the system is small, however collectively the probability of an occurrence is high.
Consequence/Discussion: Generally a leak at one of these locations is in the street and away from buildings. These leaks are usually fizzers or weepers and gas migration from an occurrence has not been observed.
Risk Assessment: The number of swing tees in the system are relatively large and leaks have a high probability of occurrence. The leaks are located in streets and alleys away from buildings, are generally small in nature, usually fizzer or weeper types and are of low consequence.

5.2.8 Medium Likelihood of Occurrence – Low Consequence as a Result

Threat: Corrosion - Mastic coating on service tees or no wrap on swing tees - MP-LC
Detail: Mastic coatings were applied on girth weld joints and service tees during some construction time periods on steel main and service installations. Swing tees have been found with no wrap. Girth welds, service and swing tees are located in streets and alleys away from buildings.
Probability: It is unknown how many mastic coated girth welds or service tees or unwrapped swing tees are in the system. The probability of any one failure is small, however collectively the probability of an occurrence is medium.
Consequence/Discussion: Corrosion could compromise the steel, eventually causing a leak. However a leak at one of these locations, being in the street and away from buildings is a low consequence. These leaks are usually fizzers and gas migration from an occurrence has not been observed.
Risk Assessment: While it is unknown how many instances there are, the practices are confined to certain eras of construction and would result in a standard repair. Therefore this threat is rated as medium in probability and low in consequence.

Threat: Corrosion - Atmospheric Corrosion - MP-LC
Detail: Inspections have found metal loss on MSAs due to atmospheric corrosion.
Probability: There are approximately 153,000 MSAs in the system and an ocean nearby. The probability of any one failure is small primarily due to the minimum number of actual observations, however, collectively the probability of an occurrence is medium.
Consequence/Discussion: At most, corrosion would produce a small fizzer-type leak that would allow leaking gas to dissipate. A small leak and subsequent repair would likely be confined to a single customer.
Risk Assessment: This threat was rated as a medium probability due to field observations and a nearby ocean, but low consequence due to the low number of actual observances and resulting non-hazardous leak.

Threat: Equipment Failure – Larger than 8 inch Diameter Plug Valves - MP-LC
Detail: There is the possibility of large diameter plug valves not fully sealing when closed.
Probability: Large diameter plug valves were commonly installed on pipelines constructed from the 1930's though the 1990's. It is possible that a large diameter plug valve will not seal fully.
Consequence/Discussion: There is the possibility of some "blow by" as the valve may not seal properly, that may affect a complete shutdown of a pipeline. Mitigative measures include double block and bleed methods and the use of stopper fittings which will limit the consequence.
Risk Assessment: This threat was rated as a medium probability due to field experience with large diameter plug valves, but low in consequence because other methods of shutting down pipelines are available.

Threat: Equipment Failure – Convenience Valves (In-line Service Valves) - MP-LC
Detail: Convenience valves (in-line service valves) have been installed throughout the system during different eras of construction. These valves are difficult to maintain due to the potential of shutting off gas to customers. Many of these valves are gate or plug valves. These valves act a backup to the meter stop valve located at each service riser.
Probability: Convenience valves were commonly installed on some service pipelines in accessible locations. It is possible that a convenience valve will not operate and seal fully.
Consequence/Discussion: There is the possibility that a valve may not operate or seal if needed, resulting in the use of different methods to shutdown a service line. However, each service riser is equipped with a meter stop valve, which is the primary method to stop the flow of gas to an MSA.
Risk Assessment: This threat was rated as a medium probability due to field experience, but low consequences because other methods of shutting down pipelines are available.
Threat: Corrosion – External Corrosion on Buried Pipelines - MP-LC
Detail: Approximately 70 percent of existing mains and 55 percent of existing services are steel material. All steel mains and services are protected by corrosion control systems including both galvanic and impressed current systems. A subset of external corrosion on steel pipelines is due to previous excavation damage that manifests into a corrosion leak.

Threat: Excavation Damage - Previous Excavations by others:
Detail: Previous excavation damage to pipelines has been observed to have occurred in the past and been unreported to LBGO. The risk analysis for this threat will be combined with the external corrosion threat since the result of a leak due to previous coating damage is generally external corrosion.
Probability: On average over the past 7 years, approximately 16 leaks per year are found per year due to corrosion on main pipelines, with that number decreasing. Corrosion leaks found on services are more commonplace. Due to the lack of LBGO knowledge of past excavations near system pipelines and facilities, the probability of previous damage by third parties is undetermined. Combined, there is a medium probability of a corrosion leak occurring on the system.
Consequence/Discussion: Generally the leaks found on mains are located in streets and alleys, with no observed evidence of gas migration. Leaks due to previously unreported excavation damage is generally limited to damage to the pipe coating. Corrosion leaks found on services are generally small, fizzer or weeper type leaks.
Risk Assessment: There does not appear to be a localized indication of corrosion leaks on the system. However, corrosion is the second leading cause of leaks, which makes corrosion a medium probability. The leaks found are generally non-hazardous in nature with virtually no observed migration, indicating a low consequence.

Threat: Equipment Failure – Below Ground Flanges - MP-LC
Detail: Flanged valves and insulators were typically used on small diameter pipelines through the mid 1990's and large diameter pipelines through the late 1990's. The flanges are buried and have leaked through the gasket.
Probability: There are approximately 1500 flanged plug and gate valves and approximately 100 flanged insulators below ground and leaks are found at a rate of about 4 per year.
Consequence/Discussion: Valves and insulators are located in streets and alleys, away from buildings. Each has a casing that will allow gas to escape directly to the surface minimizing the potential for migration. Leaks on these flanges are usually fizzer-type leaks.
Risk Assessment: The percentage of flanges found leaking compared to the total in the system represents a medium probability of occurrence. The location and venting capabilities couples with the small amount of escaping gas, represents a low consequence in the event of a leak.

Threat: Other - Early Construction Practices and Materials, including Saddle Weld and Pressure Tees, Tubing, Non-standard dimensional pipe, Threaded Main and Fittings Below-ground (Plug Valves (2, 3 and 4 Inch) and Gate Valves - MP-LC
Detail: The pipeline system was constructed over a period of time starting in 1924 through today. There have been various types of materials used, depending on the technology and material availability at the time, to construct parts of the pipeline. In addition, several sections of the system were acquired from other entities using different materials. As a result, the pipeline has segments of pipe that are "non-standard" diameter such as 2-1/2, 10, 13, 14 inch, tubing (4 inch along Los Santos and at Willow & Palo Verde and 6 inch along Stearns) and field fabricated fittings such as bends and tees. In addition, pipe joints and joining of materials were done with threaded connections. Standardization of materials

started occurring in the late 1950's. Various problems can be encountered when working on this pipe including single pass welds, fit-up problems during hot taps and tie-ins. There are no specific links to suggest that these items are more prone to leakage that those installed after 1960. However, leaks have occurred at threaded fittings.
Probability: Given the fact that 38 percent of the main and 26 percent of the services were installed prior to standardization, there is a potential that problems could occur.
Consequence/Discussion: Because the occurrence of issues are minimally leak related and leaks that are found are of the fizzer-type, located in streets and alleys and away from buildings, the hazard to life or property is low.
Risk Assessment: There is a medium probability of an issue arising due to these installed items, but a low consequence since alternatives can accommodate the issues.

Threat: Joint Failure - Pipe Joining practices (pre-1960) - MP-LC
Detail: The welding processes used to join steel pipe prior to 1960 are characterized by being a single pass weld with no root pass and no beveling of the pipe.
Probability: Given the fact that 41 percent of the steel main in the system was installed prior to the implementation of modern weld standards, there is a likelihood of encountering a weld joint of this type.
Consequence/Discussion: Other than the weld being not as strong as welds made using modern weld standards, there is low consequence with these welds. These welds are not prone to leak.
Risk Assessment: There is a medium probability of encountering a weld of this type, but a low consequence result.

5.2.9 Low Likelihood of Occurrence - Low Consequence as a Result

Threat: Corrosion – Internal Corrosion – LP*LC
Detail: Evidence of internal corrosion has been observed, however, only once or twice within the last 10 years (H_2S, Moisture Content and inerts at local producer sites are continuously monitored on the SCADA system).
Probability: Because of the lack of observable internal corrosion, the likelihood of future occurrences are low.
Consequence/Discussion: Internal corrosion would not cause hazards to life or property nor widespread outages.
Risk Assessment: There is little evidence of internal corrosion and an occurrence would affect few customers with no identifiable hazard to life or property, therefore the probably of occurrence and consequence are low.

Threat: Corrosion – Other Metal – LP*LC
Detail: There are short copper stubs attached to service tees left over from previously abandoned copper services. Records indicate that there may be as many as 300 on the system. These copper segments are generally no longer than three inches in length. Corrosion of the steel tee has not been observed.
Probability: Leaks have not been found on the connections so the probability of an occurrence is low.

Consequence/Discussion: Generally a leak at one of these locations, being in the street away from buildings, is a low consequence.
Risk Assessment: The number of stubs is unknown, but are localized to certain areas of the system. With no leak history and locations in streets, these are classified as low probability and low consequence.

Threat: Corrosion – Steel risers on PE Services – LP*LC
Detail: Steel risers on PE services may be "remote" from the CP system. Cathodic protection of the riser is conducted through the PE tracer wire. This has been observed as an effective means of providing CP to the steel riser.
Probability: CP inspections have indicated that only a handful of these risers lack CP, indicating low chance of occurrence.
Consequence/Discussion: There is a possibility of the tracer wire being broken, which will result in the riser not being under CP. Corrosion leaks are time-dependent and rarely become hazardous prior to discovery during the course of regular operations and maintenance activities.
Risk Assessment: The probability of corrosion occurring on a riser of this type is low. Due to the type of leak being non-spontaneous and slow to manifest, a hazard associated with a leak on a riser of this type is low in consequence.

Threat: Natural Forces – Vegetation – LP*LC
Detail: Leaks due to vegetation have been observed.
Probability: Leaks have been observed at a rate of less than one per year indicating the probability of an occurrence is low.
Consequence/Discussion: Leaks of this type generally are time dependent allowing ample time for discovery. While a leak may occur close to a building, indication of leakage will typically occur long before the leak becomes hazardous.
Risk Assessment: Leaks due to vegetation have been rarely observed. The probability of damage of this type occurring is low. Due to the type of leak being non-spontaneous and slow to manifest, a hazard associated with a leak of this type is low in consequence.

Threat: Natural Forces – Weather – LP*LC
Detail: Leaks or damage due to weather related causes have rarely occurred on the system.
Probability: There does exist a possibility of localized flooding and lightning strikes, however, the chances of damage or leakage is low.
Consequence/Discussion: Due to the unpredictability of weather conditions, classification of consequences due to weather related sources is unknown, however, the local climate generally does not include severe weather conditions.
Risk Assessment: This is classified as low probability of occurrence and low consequence due to local climate conditions.

Threat: Excavation Damage - Blasting Damage – LP*LC
Detail: Blasting could cause incidental damage to pipelines or pipeline facilities.
Probability: Due to the absence of underlying rock, the use of blasting during any type of construction is virtually nonexistent.

Consequence/Discussion: Since blasting is a localized controlled process, LBGO would receive prior notification of any such activities through its membership in the local one-call system, therefore, potential hazards would be identified and addressed prior to the activity.
Risk Assessment: There has been no occurrence of blasting in proximity to the system so the probably of an occurrence is low. The effects if blasting were to occur, would be localized affecting few customers with little hazard to life or property, so the consequences would be low.

Threat: Material Defect - AMP fittings – LP*LC
Detail: There are approximately 2,800 AMP fittings in the system generally located on services at either the riser or at the service connection tee.
Probability: Leaks are found on an average of five per year, indicating that only a small number of the total actually fail.
Consequence/Discussion: Most of the leaks that have been observed have been located at the service connection tee. These leaks, being in the street and away from buildings, are a low consequence. These leaks are usually fizzers and gas migration from an occurrence has not been observed.
Risk Assessment: The number of amp fittings used in relation to the total number of PE to steel connections in the system is fractional. Substantial numbers of leaks have not been found indicating that the probability of an event occurring is low. The leaks found are generally small in nature, usually fizzer type leaks with virtually no danger to life or property, so the consequences would be low.

Threat: Material Defect - Celcon (polyacetal) caps on Plexco service tees – LP*LC
Detail: Of the 22,680 PE service connection tees in the system, 2,490 manufactured by Plexco with Celcon caps were installed in the system prior to 1997. LBGO only used Plexco PE service tees prior to 1997.
Probability: Leaks are found on an average of four per year, indicating that only a small number of the total actually fail.
Consequence/Discussion: Leaks found are usually fizzer type leaks and gas migration from an occurrence has not been observed.
Risk Assessment: The number of PE service tees installed prior to 1997 in relation to the total number of PE service tees in the system is fractional. Substantial numbers of leaks have not been found indicating that the probability of an event occurring is low. The leaks found are located in streets and alleys away from buildings, with virtually no danger to life or property, so the consequences would be low.

Threat: Joint Failure - Fusion – LP*LC
Detail: Leaks due to a fusion failure have been observed.
Probability: Due to inspection, training and testing, the potential for a failed fusion to remain in the system is remote.
Consequence/Discussion: Leaks from failures of this type are not spontaneous, allowing ample time for discovery and have been observed as fizzer type leaks.

Risk Assessment: The probability of leakage occurring at a fusion joint is low. Due to the type of leak being non-spontaneous and slow to manifest, a hazard associated with a leak of this type is low in consequence.

Threat: Joint Failure - Welds – LP*LC
Detail: Leaks due to a weld failure has been observed.
Probability: Due to inspection, training and testing, the potential for a failed weld to remain in the system is remote.
Consequence/Discussion: The leaks found are located in streets and alleys away from buildings, with virtually no danger to life or property, are not spontaneous, allowing ample time for discovery and have been observed as fizzer type leaks.
Risk Assessment: The probability of leakage occurring at a weld is low. Due to the type of leak being non-spontaneous and slow to manifest, and the typical location, a hazard associated with a leak of this type is low in consequence.

Threat: Equipment Failure – Regulators and other Pipeline Equipment – LP*LC
Detail: There have been no observed failures of pressure regulating or control equipment.
Probability: District regulators are operationally checked annually and rebuilt periodically. Customer MSAs each have a filter installed upstream of the regulator. The potential of a failure of this equipment is low.
Consequence/Discussion: The consequences of failure of a district regulator on the system are small as the system pressures are monitored 24 hours a day via SCADA, and each station is equipped with a monitor regulator for overpressure protection. The monitor regulators are set within allowable buildup and the SCADA system has alarm set points below the allowable buildup. MSA regulators each have an internal relief or are constructed with a monitor regulator for overpressure protection to protect customer house lines within operational limits.
Risk Assessment: The probability of any regulator on the system catastrophically failing is low and the consequence of a failure is low.

Threat: Equipment Failure - Dresser Couplings – LP*LC
Detail: Dresser couplings were sporadically used prior to the mid-1950's for pipe joints on smaller diameter pipe. There are 6 known couplings left in the system. In the mid 2000's two were removed due to leakage around the sealing area.
Probability: With only 6 known couplings in the system and all being on small diameter pipe, the probability of leakage causing a system problem is low.
Consequence/Discussion: These fittings are located on mains in residential streets. There is little potential for spontaneous catastrophic failure, as the previous leaks found were fizzer-type.
Risk Assessment: Due to the small number remaining in the system, type of failure previously observed and locations, this threat is low probability and low consequence.

Threat: Other - MSAs Kerotest insulators – LP*LC
Detail The Kerotest fiberglass wrapped insulator has been installed below the MSA in a vertical position above ground. It is estimated that there are around 30 to 50 of these fittings

in the system installed above ground. They were installed in conjunction with a ball valve on the larger MSAs.
Probability: There has been no evidence of failure or damage to these insulators being installed aboveground.
Consequence/Discussion: Damage to the fiberglass wrap could occur due to exposure to sunlight. A consequence could be a weakening of the fitting which could lead to a leak.
Risk Assessment: This is a low probability, low consequence risk.

Threat: Other - Pipe repairs – LP*LC
Detail: Historically LBGO system had used canopies (welded cover), weld patches, and leak clamps as permanent pipe repairs. The principal cause of leakage is the deterioration of the rubber associated with the clamp; or over time the clamp bolts have become loose.
Probability: The number of these repairs remaining in the system have been significantly reduced due to the amount of pipe that has been replaced in recent history.
Consequence/Discussion: While some of these repairs are over 50 years old and have leaked, observed leaks are not of the spontaneous catastrophic type and have been observed as fizzer-type leaks. Most of these repairs are located in streets and alleys, away from buildings.
Risk Assessment: Due to the low number of repairs left in the system and the type of leaks found, this threat is low probability and low consequence.

Section 6 – Additional and Accelerated Actions

6.1 General Additional and Accelerated Actions

6.1.1 Leak Repairs

- All Grade 1 leaks are promptly and permanently repaired.
- Grade 2 and Grade 3 leaks are temporarily repaired promptly during the leak investigation and permanently repaired within the specified time period depending on the grade unless mitigating circumstances such as a known future abandonment is planned to occur within a reasonable time period, all leaks not repaired within the specified time period for the grade of leak are monitored.

6.1.2 Excess Flow Valves

- Excess flow valves are installed on all single family residential services, all branched single family residential services and all residential services up to 3 meters on a single property regardless of system pressure.
- Approximately 60 percent of LBGO's system operates at 10 psig or less.

6.2 Specific Additional and Accelerated Actions

6.2.1 High Likelihood of Occurrence - High Consequence as a Result

Risk: Excavation Damage - Third Party Damage - HP*HC
Additional & Accelerated Action:

- Provide additional in-house excavation damage prevention training.
- Discuss and request regulatory intervention from the appropriate agency to address specific violations by a third party (e.g., excavators, property owners, other facility operators) of state damage prevention laws.
- As part of the LBGO stand-by program, Construction Inspection will provide on-call coverage and availability for USA line marking and line identification.
- Also part of the LBGO stand-by program, established active call in program with Long Beach Water Department (LBWD) for line marking and identification.
- Installation of Excess Flow Valves on all residential single family residential dwelling services including those that are branched, regardless of operating pressure.

Risk: Other Outside Force - Sewer Crossbores - HP*HC
Additional & Accelerated Action:

- A program has been initiated to systematically check all sewer laterals where PE pipe has been installed starting with the recent large scale replacement projects.
- Annual Repair Orders will be issued to document discovery and repair of sewer crossbores.
- Engineering will initiate visual inspection (camera) of selected replacement areas.
- Video evidence of each sewer line inspection will be retained.
- GIS documentation of sewer inspections is being developed.

- Enhanced public awareness information to customers is in distribution.

Effective in 2010, each new or replacement service order package issued has any available sewer record information included to assist in evaluation of potential conflicts. In 2013, LBGO obtained all on-property sewer cards from LBWD for its own use.

Effective in 2013, for large scale service line replacement, whether contracted or in-house, sewer lines are located and marked prior to work beginning.

Effective in 2015, contract service replacement work shall require post installation sewer line inspection prior to completion of work.

6.2.2 Medium Likelihood of Occurrence - High Consequence as a Result

Risk: Other Outside Force - Vehicle Damage to Meter Set Assemblies - MP*HC
Additional & Accelerated Action:

- Further assessment of this threat in consultation with SME's in the Gas Services and Engineering & Construction Bureaus has resulted in an evaluation of risk program. The Engineering Division devised a process and procedure to document the potential for external damage of existing meter locations in the entire service area based on input from field personnel whose knowledge of the system identified areas of vulnerability.
- The assessment is focused on meter location and protection. Correction includes bollard or other suitable protection systems and/or service line and meter relocation.
- High risk locations are referred to the Engineering Division for evaluation and correction as needed. The assessment is on-going.
- Location of meters at locations - 110 Pine Ave and at Ocean, Renaissance Hotel- are in the process of being reviewed for possible redesign.

Risk: Natural Forces - Natural Forces due to Earth Movement - MP*HC
Additional & Accelerated Action:

- As a municipally owned utility, LBGO actively participates in quarterly drills with other City departments related to disaster management, with a high focus on earthquake preparedness. In addition to City departments such as Fire and Police, other participants include local community partners, hospitals, American Red Cross and City of Signal Hill.
- Through Emergency Management, all gas supervisors and above are National Incident Management System (NIMS) certified at level 1 and 7.
- LBGO operates in an area subject to earthquakes and invests approximately $7 million annually in pipe replacement generally targeting pipelines that could be susceptible to earthquake damage, installing and replacing isolation valves, upgrading buildings and other facilities critical to providing service and improving communication systems.

6.2.3 Low Likelihood of Occurrence – High Consequence as a Result

Risk: Excavation Damage - Inserted services - LP*HC
Additional & Accelerated Action:

- Inserted services are regularly replaced when other work on that service pipeline is scheduled.

6.2.4 Medium Likelihood of Occurrence - Medium Consequence as a Result

Risk: Other – Age of Infrastructure – MP*MC
Additional & Accelerated Actions:

- See Pipe Replacement Program in Section 6.3.

6.2.5 Low Likelihood of Occurrence - Medium Consequence as a Result

Risk: Other – Work Done by Others – Pave-overs – LP*MC
Additional & Accelerated Actions:

- By agreement the City of Long Beach Public Works Department (LBPW) advises LBGO of completed street improvement projects. LBGO then initiates a field survey of valve lids and manhole covers to ensure operation and access. Any pave overs or damage is immediately reported to LBPW for repair.

6.2.6 High Likelihood of Occurrence - Low Consequence as a Result

Risk: Equipment Failure – Threaded Risers – HP*LC
Additional & Accelerated Actions:

- LBGO has an ongoing service replacement program for service line leaks.
- Generally, the causes of most service line leaks are corrosion or a threaded fitting below the meter stop valve. The threaded fitting leaks are in the range of 50 to 100 ppm.
- Any leak on a service pipeline or riser installed before about 1960 with a cause of corrosion or threaded fittings results in a complete replacement of that service pipeline.
- In addition, any service that is requested to be altered due to a customer requested meter relocation before about 1960 is also programmatically replaced.

6.2.7 Medium Likelihood of Occurrence – Low Consequence as a Result

Risk: Equipment Failure – Larger than 8-inch Diameter Plug Valves – MP*LC
Additional & Accelerated Actions:

- LBGO has an ongoing vault removal project that targets older valve vaults with assess issues and deterioration.
- This project began in 2010 and has eliminated 14 of the 28 vaults with large diameter plug valves.
- This project along with other pipeline replacement projects has removed 60 of 166 large diameter plug valves and installed 38 new large diameter ball valves.
- This project also includes requalification of pipeline MAOP to current standards.

Risk: Corrosion – Atmospheric Corrosion – MP*LC
Additional & Accelerated Actions:

- LBGO has initiated an AMI Project. As part of the 2 year project, all meters in the system will be upgraded to automated reading. The upgrade process will include a survey for atmospheric corrosion and remediation as needed.
- Approximately 53,000 of the older meters and 4,000 older regulators are scheduled for replacement. The regulator replacement will include all associated piping.

Risk: Equipment Failure – Convenience Valves (In-line Service Valves) - MP*LC
Additional & Accelerated Action:

- Further assessment of this threat in consultation with SME's in the Engineering & Construction Bureau has resulted in an evaluation of risk program. The Engineering Division devised a process and procedure to document the location, condition and serviceability of in-line service valves (convenience valves) in the entire service area.
- The assessment is focused on schools, hospitals and other high occupancy structures.
- High risk locations are referred to the Engineering Division for evaluation and correction as needed. The assessment is on-going.
- LBGO shall issue an annual Repair Order to identify and repair or replace convenience valves at the above described locations.

6.2.8 Low Likelihood of Occurrence - Low Consequence as a Result

Risk: Corrosion – Steel Risers on PE Services – LP*LC
Additional & Accelerated Actions:

- LBGO has an ongoing program to replace steel risers on PE service lines.

6.3 Pipe Replacement Program

In 2004, LBGO recognized the need to develop a long-term strategy to reduce the cumulative risks of the older pipelines as represented by the recorded leaks. Because older pipelines were of various construction methods, contained multiple types of in-house fabricated fittings and obsolete facilities and pipe materials may not have been consistent with current standards, a pipeline replacement program was initiated. The pipeline replacement program was part of a capital investment plan to concentrate on the removal of pipeline installed prior to 1950.

The decision to concentrate on pre-1950 pipe was based on factors discovered during leak repair processes. Older pipelines have been observed to be more susceptible to external corrosion, although it has been subsequently found that pipelines installed through approximately 1958 may have a higher risk of external corrosion due to lower grade materials. Early construction practices, such as pipe joining (welding, threaded and mechanical couplings) and available materials (gate valves, plug valves, tubing, bell & spigot pipe joints and non-standard dimensioned pipe) have all been a source of leaks, requiring that much needed resources be devoted to repairs. It has also been observed that older pipelines have been damaged by excavations (damaged wrap, nicks and gouges) that have gone unreported to LBGO and later manifesting into leaks. By concentrating on replacing older pipelines, LBGO has reduced pipeline vulnerabilities related to time dependent and early construction risks. So far, LBGO has spent about $50 million on this program and continues to invest approximately $7 million annually. Much of the early part of the program was concentrating on older, small diameter pipelines, primarily in residential areas, with the replacement pipe being PE material. Concentrating on these pipelines eliminated high leak probability facilities. Currently about 21 % of main pipeline and about 42% of the service pipelines in the system consist of plastic pipe.

Larger diameter, older pipelines are now being considered due to other vulnerabilities such as earth movements. In addition to pipe replacement, capital investments have also been made in pressure regulating stations, system pressure monitoring and large diameter valve replacements. With the large diameter valve replacements, LBGO has also incorporated a pipeline MAOP requalification process for those large pipelines installed prior to the pressure testing requirements in 1965 and all connected pipelines regardless of installation date.

Section 7. Performance Measures

7.1 Responsibility

The Manager of Engineering and Construction is responsible for ensuring that the actions and performance measures are collected and acted upon. If the possible actions cannot be acted upon, then an explanation will be given for non-action. LBGO will use historical data to establish baseline measures (see section 2 for definitions).

7.2 Performance Measures

Risk: Excavation Damage - Third Party Damage - HP*HC
Performance Measure:
- Track the frequency and cause of these incidents per 1000 tickets: see Table 5 and Figure 2 above.
- The effectiveness of preventative measures will be reviewed annually.

Risk: Other Outside Force - Sewer Crossbores - HP*HC
Performance Measure:
- Number of sewer lines inspected will be tracked.
- Number of discovered and repaired crossbores by Work Order details (number of services installed, year, by LBGO or others).
- The effectiveness of preventative measures will be reviewed annually.

Risk: Other Outside Force - Vehicle Damage to Meter Set Assemblies - MP*HC
Performance Measure:
- Track the number of vehicle damage incidents annually.
- The effectiveness of preventative measures will be reviewed every 5 years.

Risk: Natural Forces - Natural Forces due to Earth Movement - MP*HC
Performance Measure:
- Track the number of times yearly that it meets with emergency response entities.
- In the event that an earth movement occurs that affects the pipeline, LBGO response and any systemic vulnerability revealed by the occurrence will be reviewed and incorporated in this and other Plans or Programs as deemed appropriate.

Risk: Excavation Damage - Inserted services - LP*HC
Performance Measure:
- Track the number of inserted service damaged by excavation annually.
- The effectiveness of preventative measures will be reviewed every 5 years.

Risk: Equipment Failure – Threaded risers – HP*LC
Performance Measure:
- Track the number of leaks discovered on threaded risers annually.
- Compare annual totals of threaded risers remaining in the system.

- The effectiveness of preventative measures will be reviewed every 5 years.

Risk: Equipment Failure – Larger than 8 inch Diameter Plug Valves - MP*LC
Performance Measure:
- Track the number of 8 inch diameter plug valves in the system annually.
- Track the number of any operational impacts due to the existence of these valves annually.
- The effectiveness of preventative measures will be reviewed every 5 years.

Risk: Other – Age of Infrastructure - MP*MC
Performance Measure:
- Track the amount of pre-1950 pipe in the system annually.
- Track the number, material type and cause of leaks on pre-1950 pipe annually.
- The effectiveness of preventative measures will be reviewed every 5 years.

Risk: Corrosion - Atmospheric Corrosion- MP*LC
Performance Measure:
- Track the number of paint orders or replace meter orders due to corrosion each year.
- The effectiveness of preventative measures will be reviewed every 5 years.

Risk: Equipment Failure – Convenience Valves (In-line Service Valves) - MP*LC
Performance Measure:
- Annually track the number of convenience valves identified as needing repair and the number replaced
- The effectiveness of preventative measures will be reviewed every 5 years.

Risk: Corrosion – Steel risers on PE Services - LP*LC
Performance Measure:
- Track the number of steel risers on PE services in the system.
- The effectiveness of preventative measures will be reviewed every 5 years.

Risk: Material Defect - Celcon (polyacetal) caps on Plexco service tees– LP*LC
Performance Measure:
- Track the number of these failures annually.
- A plan of action will be developed if a pattern of accelerated failures occur.

Threat: Material Defect - AMP fittings - LP*LC
Performance Measure:
- Track the number of these failures annually.
- The effectiveness of preventative measures will be reviewed every 5 years.

Threat: Equipment Failure - Dresser Couplings - LP*LC
Performance Measure:
- Monitor the number of Dresser couplings removed due to leakage or failure.
- The effectiveness of preventative measures will be reviewed every 5 years.

Table 7: Metrics and Data Sources

Number	Risk	Jan 2015 Snapshot" (total in system)	Feb 2014 "Snapshot" (total in system)	Feb 2013 "Snapshot" (total in system)
1	**Potential Sewer Crossbores that have not been checked**	8407	9918	
2	**Number of Service lines in Sewer lines (Crossbores) discovered prior to damage**	21	8	1
3	**Number of Service lines in Sewers (Crossbores) damaged prior to discovery**	2	4	5
4	**Shallow Pipe (ft. of main)** **ADJUSTED TO ELIMINATE NULL VALUES** **GIS Query** (SELECT * FROM DistributionMain WHERE "ORIGINALCOVERDEPTH" > 0 AND "ORIGINALCOVERDEPTH" < 30)	164205	791555	830593
5	**MSA Dresser Couplings** **Evaluation of Meter Sets with Dresser Couplings ongoing**			
6	**Inserted services** **GIS Query** (Select * FROM Riser WHERE INSERTINDICATOR = 'Y')	1896	1926	2066
7	**Bell & Spigot Pipe (ft. of main) - Age of Infrastructure** **GIS Query** (SELECT * FROM DistributionMain WHERE "DIMP" = 'BLSP')	163488	163586	164458
8	**Threaded risers - Age of Infrastructure** **GIS Query** (Select * FROM Riser WHERE INSTALLYEAR <= 1954)	14555	14956	16327
9	**LBGO Swing Tees (ft. of main) - Age of Infrastructure** **GIS Query** (Select * FROM DistributionMain WHERE "DIMP" = 'SWING')	267262	290377	342001

Number	Risk and Data Source	Jan-15	Feb-14	Feb-13
10	**Large Diameter Plug Valves (greater than 8 inch)** **GIS Query** (SELECT * FROM GasValve WHERE "SUBTYPECD" = 1 AND "EMERGENCYVALVE" = 'Y' AND ("VALVESIZE" = 8 OR "VALVESIZE" = 10 OR "VALVESIZE" = 12 OR "VALVESIZE" = 14 OR "VALVESIZE" = 16 OR "VALVESIZE" = 20))	200/160 Inspected	213	232
11	**Convenience Valves** **GIS Query (SELECT * FROM GasValve WHERE "SUBTYPECD" = 4)**	344		
12	**Below Ground Flanges - Age of Infrastructure** **ELIMINATED DUPLICATE INSULATOR VALVE COMBINATIONS** **GIS Query** (SUBTYPECD = 7 AND (VALVEENDCONNECTIONTYPE = 'FL' AND "VAULT" = 'N' AND "STATION" = 'N') OR SUBTYPECD = 1 AND (VALVEENDCONNECTIONTYPE = 'FL' AND "VAULT" = 'N' AND "STATION" = 'N') THEN REMOVE GIS Query (Select by location (Target) NonControllableFitting WHERE "SubtypeCD" = "6" Select by location (Source) GasValve WHERE Distance = 10.000 feet)	3383	4,459	4,653
13	**Non-standard dimensional pipe (ft. of main) - Age of InfrastructureTOTAL FOOTAGE REDUCED - QUERY updated to reflect actual)GIS Query** (Select * FROM DistributionMain WHERE "NOMINALSIZE" = 5 OR "NOMINALSIZE" = 13 OR "NOMINALSIZE" = 2.5 OR "INSTALLYEAR" < 1958 AND ("NOMINALSIZE" = 10 OR "NOMINALSIZE" = 14))	82624	276265	281113
14	**Saddle Weld Tees - Age of Infrastructure** **GIS Query** (SELECT * FROM NonControllableFitting WHERE "SUBTYPECD" = 2 OR ("SUBTYPECD" = 9 AND "STYLE" = 'SDW') OR ("SUBTYPECD" = 10 AND "STYLE" = 'SDW'))	3248	3339	3446

Number	Risk and Data Source	Jan 2015	Feb 2014	Feb 2013
15	**Threaded Main - Age of Infrastructure** Unknown method to determine location	Unknown	Unknown	Unknown
16	**Tubing (ft. of main) - Age of Infrastructure** **GIS Query** (SELECT * FROM DistributionMain WHERE "PIPESCHEDULE" = 'TUBING')	3378	3384	3384
17	**Threaded plug valves (2 inch, 3 inch and 4 inch) - Age of Infrastructure** **REMOVED THREADED VALVES WITH NEARBY INSULATORS** **GIS Query** (SELECT * FROM GasValve WHERE SUBTYPECD = 1 AND VALVEENDCONNECTIONTYPE = 'T' AND (VALVESIZE = 2 OR VALVESIZE = 3 OR VALVESIZE = 4)) THEN REMOVE GIS Query (Select by location (Target) GasValve WHERE "SubtypeCD" = "1" Select by location (Source) NonControllableFitting WHERE "SubtypeCD" - "6" AND Distance = 10.000 feet)	364	441	455
18	**Pressure tee - can with threaded caps** **GIS Query** (SELECT * FROM NonControllableFitting WHERE "SUBTYPECD" = 12)	40	50	54
19	**Manufacturing processes – gas welding practice on (40s, 50s, 60s) Large Diameter pipe - Age of Infrastructure** **ADJUSTED UPWARD FOR SMALLER PIPE SIZES** **GIS Query** (SELECT * FROM DistributionMain WHERE "INSTALLYEAR" < 1957 AND ("NOMINALSIZE" = 8 OR "NOMINALSIZE" = 10 OR "NOMINALSIZE" = 12 OR "NOMINALSIZE" = 14 OR "NOMINALSIZE" = 16 OR "NOMINALSIZE" = 18))	247515	2121424	2208070
20	**Copper service main to service connections (Svc. Tees) - Age of Infrastructure** **GIS Query** (SELECT * FROM ServiceConnectionTee WHERE SERVICECONNECTIONTYPE = 'CTS')	545	545	545

Number	Risk and Data Source	Jan 2015	Feb 2014	Feb 2013
21	**Dresser Couplings - Age of Infrastructure** Completed survey for 600 series meter sets; 30 out of 250 surveyed had DCs; 2 more found since last snapshot	32	32	30
22	**MSA Kerotest insulators installed insulators above ground** Currently gathering data from field surveys.4 have been found; 2 @ Convention Center, 1 @ Shoreline Dr Bridge, 1 @ Miller Children's Hospital	4	4	4
23	**Steel Risers on PE services** **ADJUSTED TO CAPTURE ALL STEEL RISERS ON PE SERVICES** **GIS Query (Select by location (Target) Riser WHERE "Material" = "STL" Select by location (Source) Service WHERE "Material" = "PL" Distance = 5.000 feet)**	4231	1030	1080
24	**Amp Fittings (Svc. Tees)** **(need to pinpoint but generally between used 1980 and 1985) Number is approximate** **GIS Query** (SELECT * FROM ServiceConnectionTee WHERE SERVICECONNECTIONTYPE = 'AF' AND "INSTALLYEAR" > 1980 AND "INSTALLYEAR" < 1986)	1800	3364	3489
25	**Celcon Caps (Svc. Tees)** **ADJUSTED DATES CELCON CAPS USED UNTIL 1996** **GIS Query** (SELECT * FROM ServiceConnectionTee WHERE "MATERIAL" = 'P' AND "INSTALLYEAR" < 1996)	2473	1797	1797
26	**Pipe Repairs** **ELIMINATED PERMASERT PE REPAIRS** **GIS Query** (SELECT * FROM LeakRepair WHERE "REPAIRMETHOD" <> 'Permasert' OR "REPAIRMETHOD" IS NULL)	359	509	542
27	**Pre-1930 Main (ft. of main)** **GIS Query** (SELECT * FROM DistributionMain WHERE "INSTALLYEAR" < 1931)	411	411	411

Number	Risk and Data Source	Jan 2015	Feb 2014	Feb 2013
28	**1930 - 1939 Main (ft. of main)** **GIS Query** (SELECT * FROM DistributionMain WHERE "INSTALLYEAR" > 1929 AND "INSTALLYEAR" < 1940)	28916	35597	38816
29	**1940 - 1949 Main (ft. of main)** **GIS Query** (SELECT * FROM DistributionMain WHERE "INSTALLYEAR" > 1939 AND "INSTALLYEAR" < 1950)	281573	331302	401238

Section 8. Periodic Evaluation and Improvement

8.1 Annual Review

Annually, the DIMP organization, identified in Section 10.1, will conduct a review of the DIMP program.

The Manager of Engineering & Construction will be responsible for initiating the Review and will approve all amendments resulting from that review.

The Engineering Division will update the data for the DIMP tables in Section 3 and the Performance Measures in Section 7.

The annual review will include the following sections:

Section 4 - Threat Assessment
Section 6 - Additional and Accelerated Actions
Section 7 - Performance Measures

Threats identified in Section 4 will be reviewed to ensure that all Threats continue to be actual Threats to the system. Any additional Threats that are identified from the previous year and not listed in Section 4 will be added to Section 4. A Risk Assessment will be added to Section 5 for any added Threat in Section 4. A determination will be made whether to add Additional and Accelerated Actions to Section 6 that may be necessary to reduce the Risk or whether newly identified Threats can be monitored. If any Additional and Accelerated Actions are added to Section 6, a corresponding Performance Measure will be added to Section 7. Threats that are no longer present in the system will be noted in Section 5 and any Additional and Accelerated Action in Section 6 and Performance Measure in Section 7 will be discontinued.

Each of the Section 7 Performance Measures will be reviewed for trends indicating that any of the Section 6 Additional and Accelerated Actions is ineffective in reducing the associated risk. If any Additional and Accelerated Action is found to be less effective than intended, consideration will be given to implementing other Additional Actions to address that risk.

Appendix 1 will be updated to list current SMEs.

8.2 Periodic (5 Year) Plan Review

A review of this Plan will occur every 5 years. The DIMP organization, identified in Section 10.1, in conjunction with various SMEs, will convene and conduct a comprehensive review of the Plan.

The Manager of Engineering & Construction will be responsible for initiating the Review and will approve all amendments resulting from that review.

The Engineering Division will update the data for the DIMP tables in Section 3 and the Performance Measures in Section 7.

The comprehensive review will include the following sections:

- Section 4 – Threat Assessment
- Section 5 - Risk Evaluation
- Section 6 - Additional and Accelerated Actions
- Section 7 - Performance Measures
- Section 10 – DIMP Organization and Data Sources

Threats identified in Section 4 will be reviewed to ensure that all Threats continue to be actual Threats to the system. Any additions or deletions to Threats will be identified and documented as to the reason for the addition or deletion. Deleted Threats will still be listed in Section 4 and a disposition and reason the Threat is no longer valid will be documented until the next comprehensive review, at which time the Threat can be removed from DIMP.

Each current Risk Evaluations in Section 5 will be reviewed for accuracy. Any reason for changing the current Risk ranking will be identified and reasons documented. Additional Threats added to the Risk Evaluation will be identified and ranked in accordance with Section 5.1 Threats listed in Section 4 that are no longer valid will be removed from the Section 5 Risk Evaluation. Changes to Risk Ranking protocols will be identified and documented.

Each of the Section 6 Additional and Accelerated Actions will be reviewed for effectiveness using the Performance Measures in Section 7. Additional and Accelerated Actions may be adjusted to reflect updated Risk ranking and current resource requirements. New Additional and Accelerated Actions and associated Performance Measures may be added to reflect changes to Threats and Risk rankings.

New data sources will be evaluated for identification of Threats and tracking purposes. Those new data sources will be incorporated in Section 10.3. Missing data will also be identified and documented. Methods to obtain missing data will be reviewed for process changes. GIS attributes will be reviewed and changed for tracking purposes.

The DIMP organization in Section 10.1 and the SMEs in Appendix 1 will be updated.

Changes to DIMP will be communicated to the appropriate personnel in the LBGO organization.

Section 9. Reporting

LBGO will continue to report to the appropriate authority and/or make available for the purposes of the DIMP all required information including:

- Number of hazardous leaks either eliminated or repaired as required by 192.703(c).
- Number of excavation damages.
- Number of excavation tickets received.
- Total number of leaks either eliminated or repaired, categorized by cause and material.

Section 10. Organization, Responsibilities, Subject Matter Experts, Data Sources

10.1 DIMP Organization Team

The DIMP organization is made up of representatives of the following Bureaus within the department:

- Engineering & Construction Bureau
  - Manager – Engineering & Construction
- Engineering & Construction Bureau – Engineering Division
  - Principal Construction Inspector
  - Engineering Staff (2)
- Engineering & Construction Bureau – Pipeline Maintenance Division
  - Gas Maintenance Supervisor II (2)
  - Gas Maintenance Supervisor I (2)
- Gas Services Bureau
  - Gas Distribution Supervisor I (2)

Additional Subject Matter Experts are consulted from the following responsibility areas:

- Valve and Regulator Maintenance
- Corrosion Control
- Weld Shop
- Leak Survey
- Meter Shop
- Dispatch
- Construction Inspection

10.1.1 Qualifications of Subject Matter Experts

SME's from all Bureaus are included as part of the DIMP organization in order to effectively identify and respond to the nature of each identified threat. The organization uses field reports, GIS, Essentials Code Compliance software, and other source documents to accomplish these tasks.

SMEs may be personnel identified in 10.1 or an Operator Qualified individual with direct field knowledge or knowledge in a specific topic. These individuals are responsible for documenting field conditions and reporting those conditions to Engineering & Construction Bureau management. SMEs can also be personnel responsible for evaluating records as well as conducting interviews with field personnel. These SMEs are selected based upon knowledge and experience of the overall system behavior.

A statement of qualification of these individuals currently selected to form this team is shown in Appendix 1.

10.2 Responsibilities

The Engineering & Construction Bureau Manager is responsible to ensure that both the DIMP organization and the LBGO Gas organization stays actively engaged in DIMP.

The DIMP organization is responsible for carrying out the annual and periodic reviews listed in Section 8. The organization is also responsible for gathering, communicating, and responding to known, perceived and discovered threats throughout the system.

10.3 Data Sources

Records associated with demonstrating compliance for DIMP must be maintained for ten years. Copies of previous written DIMP will also be retained to meet 192.1011. Detailed data is retained in GIS as well as electronically, currently at T:\EngrConstr|Engineering\OM Manual\App_J DIMP\Record Keeping

The list below provides source record documents and where necessary are incorporated by reference. Not all records listed below are required for compliance.

File Name	Record Location	Retention Time	Comments
O & M plan and Gas Standards	T drive Engineering O & M manual	Lifetime	Updated annually and as needed
Operator Qualification credentials	Individual Bureau or Division Files	5 years	Old versions not retained
Drug and Alcohol program,	Business Operations - Safety	Lifetime	
Mechanical Fitting Failure Report	See Leak notice records		Submitted with Annual report to DOT
Work Orders	GIS – Engineering Files	Lifetime of pipe	w/GIS application
Service Orders	GIS – Engineering Files	Lifetime of pipe	w/application
Repair orders	GIS - Engineering File	Lifetime of pipe	w/GIS application
Retirement orders,	GIS -Engineering Files		
Corrosion control records - Coupons - internal corrosion.	Corrosion control storage area	Lifetime of pipe	
Corrosion control records-pipe to soil	Code Compliance - ADVANTICA	Lifetime of pipe	Kept w/CC application
Corrosion control records-rectifier inspection reports	Code Compliance - ADVANTICA	Lifetime of rectifier	Kept w/CC application
Corrosion control records - casing inspections	Code Compliance - ADVANTICA	Lifetime of pipe	Kept w/CC application

File Name	Record Location	Retention Time	Comments
Corrosion control records - bonds	Code Compliance - ADVANTICA	Lifetime of bond	Kept w/CC application
Gas Quality	SCADA Records		
PHMSA annual reports 7100.1-1	Engineering Files		
Southern California Under Ground Service Alert	w/annual report		Annual Ticket count from USA
Excavation Damage Report	T drive Inspection pipeline damage		
Bridge inspection reports,	Code Compliance - ADVANTICA	Lifetime	Kept w/application
Pressure regulator station inspection report	Code Compliance - ADVANTICA	Lifetime	Kept w/application
Vault inspection report.	Code Compliance - ADVANTICA	Lifetime	Kept w/application
Pipe inspection reports			
Valve maintenance records	Code Compliance - ADVANTICA	Lifetime	Kept w/in application

Appendix 1: Subject Matter Expert (SME) – Statement of Qualifications

Name: Stephen C. Bateman, PE
Title: Manager – Engineering & Construction Bureau
Relevant Education: BSME, MBA
Licensed Mechanical Engineer, California, Georgia
Relevant Experience:
Atlanta Gas Light Co., Atlanta GA, 8 Years
    LNG Plant Engineer
    Gas Distribution Engineer
    NGV Operations Engineer
    Manager, Pressure Control
    Manager, Gas Control
Marmac Engineering, Tustin, CA 1 Year
    Consulting Engineer, assigned to Pacific Gas & Electric Co., California Gas Transmission, Walnut Creek, CA
City of Long Beach, Gas & Oil Department 11 years
    Mechanical Engineer
    Senior Mechanical Engineer

Name: Phillip Carroll
Title: Principal Construction Inspector
Education: B.S. Organizational Behavior
    Master of Arts in Management
Professional Licenses: Certified Pipeline Welding Inspector
Relevant Experience: 27 years at LBGO; 7 years Utility Man; 5 years Construction Foreman; 7 years Inspector I & II; 8 years Principal Construction Inspector (Supervisor); Department representative at PHMSA Inspections 10 years.

Name: Michael Ulichney
Title: Gas Maintenance Supervisor II
Education:
    NACE – National Association of Corrosion Engineers
    Southern Cal Gas – Large Pressure Control
    Cerritos College – Oxy/Acetylene and Arc Welding/Pipe
Professional Licenses:
    NACE Cathodic Protection Tester I
Years of Pipeline Related Experience:
    27 Yrs. at LBGO involving various aspects of:

Maintenance	Pressure Control
Repair	Cathodic Protection
Replacement	Leak Locating

Positions Held:
    Gas Maintenance Supervisor II – 1 Yr.
    Gas Maintenance Supervisor I - 19 Yrs.

Gas Construction Worker II – 4 Yrs.
Gas Construction Worker I – 3 Yrs.

Name: Rudy Chavez
Title: Gas Maintenance Supervisor II
Education: Harbor College, General Education
Cerritos College, Pipeline Welding/Pipe Fitting/Metallurgy.
Professional License: Certified Pipeline Welding Inspector
Work Experience: 26 Years with the City of Long Beach Gas Department. Began career in February 1988 as a Gas Construction Worker, promoted in 1990 to the Position of Pipeline Welder/Fitter, promoted in 1995 to Gas Construction Foreman, and promoted in 2001 to Gas Maintenance Supervisor II
Responsibilities: Accountable for the more technical aspects of gas system construction and natural gas distribution, including but not limited to: welding operations, corrosion control, leak survey, valve and regulator stations, training and staff development, infrastructure management, data base management, safety and safety training.

Name: Aaron Perkins
Title: Mechanical Engineering Associate
Education: Associated of Science: Long Beach City College
BSCE: California State University Long Beach
Professional Licenses: Engineer in Training: EIT 147501
Years of Pipeline Related Experience:
Engineering Technician: 8 years
AutoCAD drafter
GIS technician
Creating gas handling procedures for senior mechanical engineer
Mechanical Engineering Associate: 2 years
Creating pipeline designs
Creating gas handling procedures for pipeline projects
GIS database analysis
SynerGee Gas Modeling
Pipeline sizing and customer gas load review
Project management of multiple pipeline replacement projects
Creating pipeline replacement specifications
Assisting corrosion group with repairs to CP system
Assisting regulator group with design and reconstruction of regulator stations

Name: Chuck Querido
Title: Mechanical Engineering Associate
Education: BSEE - University of California, Los Angeles
Professional Licenses/Certificates:
Engineer in Training - EIT 124129
PE in Mechanical Engineering - M36277
Years of Pipeline Related Experience:
Engineering Technician - 5 years

AutoCAD drafting
GIS editing
Mechanical Engineering Associate - 2 years
Creating pipeline designs
Creating gas handling procedures for pipeline projects
GIS database analysis
SynerGEE Gas Modeling
Pipeline sizing and customer gas load review

Name: Dave Vasquez
Title: Associate Civil Engineer
Education: Manufacturing Engineering Major; Vocational Teaching Credential
Professional Licenses: State of California: Engineering-in-Training

Name: Paul A Lange
Title: Construction Inspector II
Education:
College Business Administration / Math / Blueprint / Drafting.
Certifications:
Pipeline Welding Inspector CPWI, National Welding Inspection School
Welding Inspection, American Society for Non Destructive Testing
Fusion Inspection Qualification, McELROY University
Small & Mid-Range Diameter Fusion Qualification, McELROY University
Basic Corrosion, NACE International
Corrosion Fundamentals, Western States Corrosion / NACE
Large Pressure Control, Southern California Gas Company
NIMS IS-0070, Emergency Management Institute FEMA
Operator Qualification, DOT Title 49 CFR 192, Subpart N, LBGO
Underground Utility Locating, Pres-Tech, Inc
Years of Pipeline Related Experience:
18 Years with LBGO (1997 to 2015)

- <u>Gas Utility Worker I & II, 1997 to 2002</u>: Installed, Replaced and Repaired gas services and gas mains while working on Service, Main and Leak Crew's. Pressure Control for 2" thru 12"on mains, train and coordinate GUW I'& II's.
- <u>Construction Inspector I & II 2002 to 2015 (Present)</u> Developed and implemented the administrative processes for the tracking and processing of Investigations. Developed and implemented LBGO's Bridge Patrol. Developed and implemented LBGO's Pipeline Damage Program. Draw / Provide AS Built drawings for LBGO records. Train and coordinate and Mentor the activities of Construction Inspector I's and II's. Monitor the activities for compliance to LBGO and Federal Code DOT Title 49 requirements, on In House and Contracted work on gas services and mains.

Name: Anthony Smith
Title: Construction Inspector I
Training:

Metro Tech Locating Training
Fire Extinguisher Training
Asbestos Awareness
Person Protective Equipment

Professional Licenses:
Pipe Line Welding Inspector (CPWI)
Fusion Inspector Training & Qualification

Years of Pipeline Related Experience:
Gas Construction Worker -16 years
Construction Supervisor I -13 years
Corrosion - 2 years
Construction Inspector I – 4 years

Name: David Bates
Title: Gas Maintenance Supervisor I
Education:
Long Beach City College, 1993-1995
McElroy University, 2002- Present

Professional Licenses:
McElroy University, Small – Mid Diameter PE Fusion, Inspection Certification.
NACE, Corrosion Basic and Fundamentals

Years of Pipeline Related Experience:
Signal Hill Petroleum: Roughneck/ Roustabout -3 years
Technical Service Co.: Fluid Level Technician/ Down Hole Chemical Installer – 1 year
THUMS: Pier J Island Freeman – 1 year
Long Beach Gas & Oil: Gas Construction Worker I-III, Leak Survey, Pressure Control, PE Fusion Trainer, Gas Maintenance Supervisor I – 16 years

Name: Paul DeYoung
Title: Gas Maintenance Supervisor I
Education:
B.A. California State University Long Beach
A.A. Long Beach City College

Professional Licenses:
Large Pressure Control, Southern California Gas Company
McElroy University, Large Diameter PE Fusion Certification

Years of Pipeline Related Experience:
Most recent, Ten Years-LBGO,
Four Years-Tidelands Oil (Roustabout)
Two Years-Beayco Pipeline (General Laborer/Welding Assistant)

Name: Robert Coffey
Title: Gas Maintenance Supervisor I
Education: Harbor College
Years of Pipeline Related Experience:

26 years with Long Beach Gas & Oil. Gas Construction Worker I – III, Installation and maintenance of the natural gas pipeline system, leak detection, Gas Maintenance Supervisor I

Name: Christopher McLinden
Title: Gas Distribution Supervisor I
Certification:
Carrhill Company, fusion of polyethylene (PE) piping.
Ward Manufacturing, installation of corrugated stainless steel tubing fuel gas piping. (CSST).
Years of Pipeline Related Experience:
23 years, installation, maintenance, repair, troubleshooting of gas meters, regulators, district regulators, and gas appliances. Field proofing of industrial gas meters.
7 years, Gas Distribution Supervisor I - Gas Services Bureau, supervising field personnel.

Name: Fermin Gracian
Title: Gas Pipeline Welder/ Layout Fitter
Education:
Cerritos College, Pipeline Welder
El Camino College, Layout Fitter
Professional Licenses:
Certified Plant and Pipeline Welding Inspector (CPWI)
Years of Pipeline Related Experience:
26 years' experience in the gas industry.

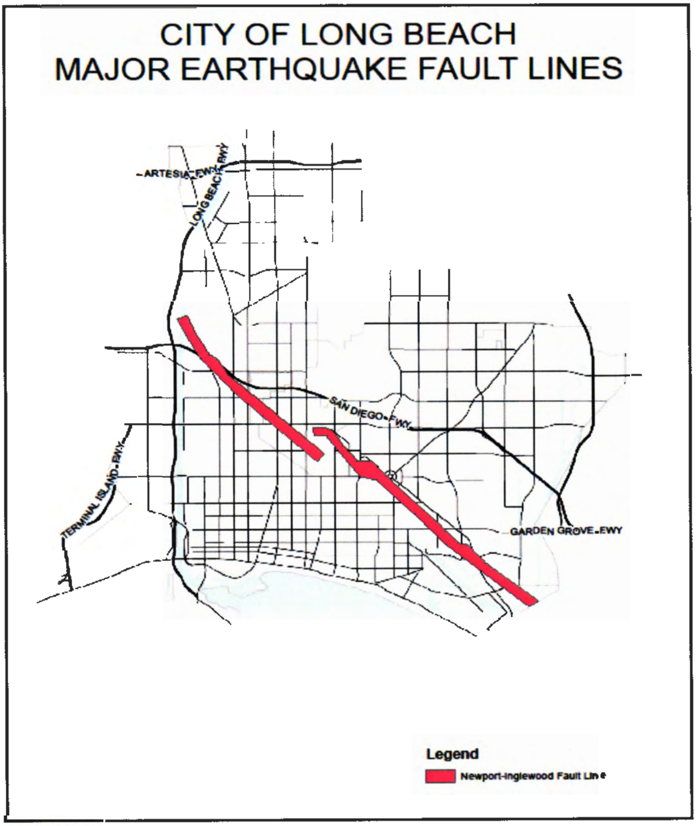
Name: Lovell Williams
Title: Gas Construction Worker III, Leak Survey
Professional Licenses:
Certified to operate the following equipment:
Remote Methane Leak Detector (RMLD)
Detecto Pak III
Gas Ranger
GIS
First Aid/CPR
Years of Pipeline Related Experience:
20+ years' experience

Name: Virjo (Mike) Conner
Title: Gas Construction Worker III – Cathodic Protection
Education: Long Beach City College
Harbor Occupational Center
Professional License: Certified NACE Technician II, Rectifier Certification
Work Experience: I have been with the City of Long Beach Gas & Oil Department for 11 years. In 2003 I was hired as a Gas Construction Worker I. In 2008 I was promoted to the

Corrosion Division working with Cathodic Protection. My responsibilities include that the Cathodic Protection systems is operating utilizing our Code Compliance.

Appendix 2: Maps Of Major Earthquake Faults, Flood Planes

City of Long Beach Major Fault Lines



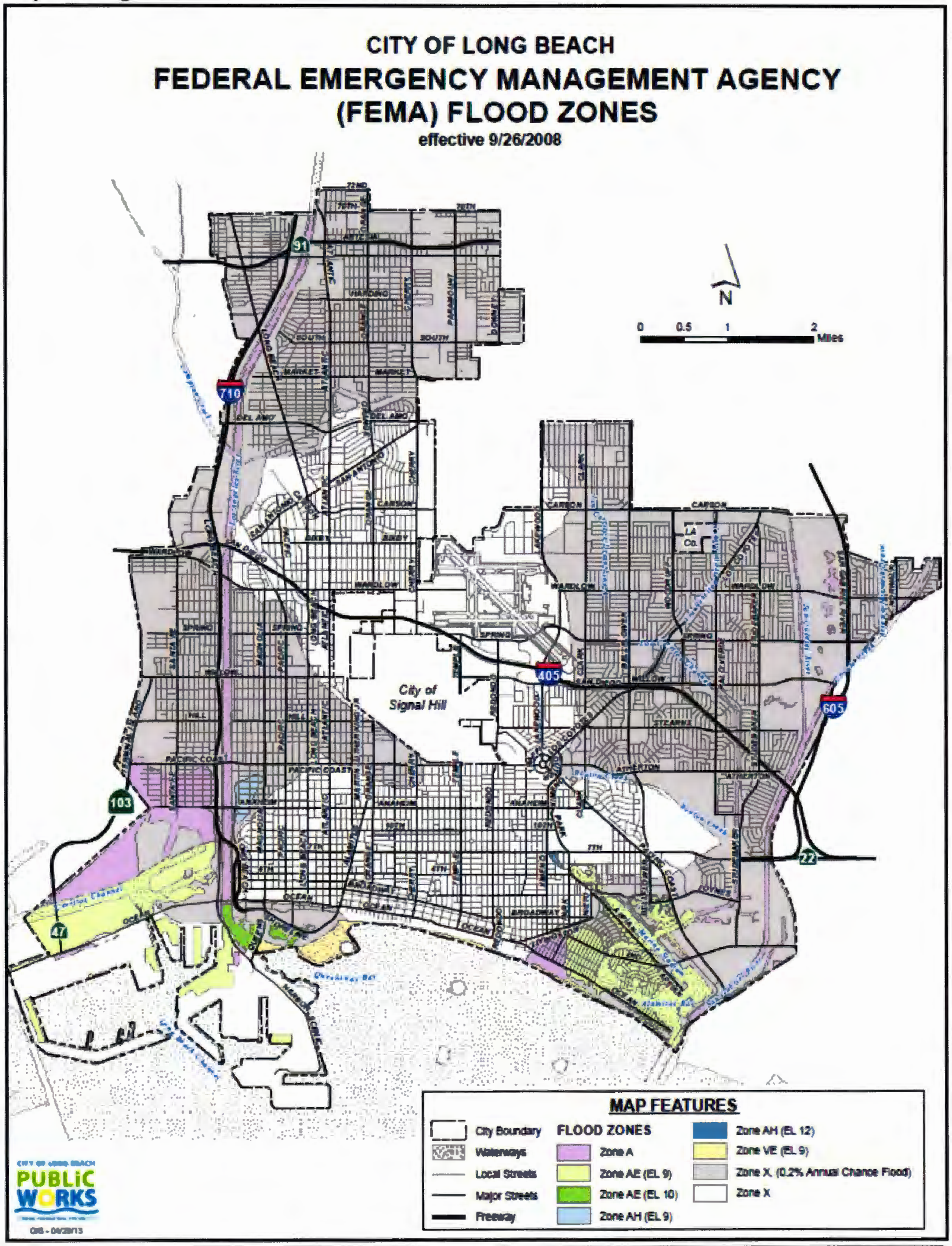
Printed on 1/27/12

Southern California Major Fault Lines

The region's most populous areas are crisscrossed by faults capable of delivering jolts of magnitudes equal to or greater than the 1994 Northridge earthquake, which measured 6.7. Below, the latest fault map released by the California Geological Survey is coupled with earthquake scientists' estimates of the maximum magnitude of potential quakes on those faults.

Less than 6.7 or unrated — **6.7 to 7.5** — **7.5 to 8.0** — **8.0+**

City of Long Beach Flood Zones



Moderate to Low Risk Areas

In communities that participate in the NFIP, flood insurance is available to all property owners and renters in these zones:

ZONE	DESCRIPTION
B and X (shaded)	Area of moderate flood hazard, usually the area between the limits of the 100-year and 500-year floods. Are also used to designate base floodplains of lesser hazards. Such as areas protected by levees from 100-year flood, or shallow flooding areas with average depths of less than one foot or drainage areas less than 1 square mile.
C and X (unshaded)	Area of minimal flood hazard, usually depicted on FIRMs as above the 500-year flood level.

High Risk Area

In communities that participate in the NFIP, mandatory flood insurance purchase requirements apply to all of these zones.

ZONE	DESCRIPTION
A	Areas with a 1% annual chance of flooding and a 20% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones.
AE	The base floodplain where base flood elevations are provided. AE Zones are now used on new format FIRMs instead of A1-A30 Zones.
A1-30	These are known as numbered A Zones (e.g., A7 or A14). This is the base floodplain where the FIRM shows a BFE (old format).
AH	Areas with 1% annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
AO	River or stream flood hazard areas, and areas with a 1% or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Average flood depths derived from detailed analyses are shown within these zones.
AR	Areas with a temporarily increased flood risk die to the building or restoration of a flood control system (such as a levee or a dam). Mandatory flood insurance purchase requirements will apply, but rates will not exceed the rates for unnumbered A zones if the structure is built or restored in compliance with Zone AR floodplain management regulations.
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones.

High Risk - Coastal Areas

In communities that participate in the NFIP, mandatory flood insurance purchase requirements apply to all of these zones.

ZONE	DESCRIPTION
V	Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26% chance of flooding over the life of a 30-year mortgage. No base flood elevations are shown within these zones.
VE, V1 - 30	Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.

Undetermined Risk Areas

ZONE	DESCRIPTION
D	Areas with possible but undetermined flood hazards. No flood hazard analysis has been conducted. Flood insurance rates are commensurate with the uncertainty of the flood risk.

Appendix 3: Revision and Review Dates

This plan will be reviewed at least annually. However updates may occur at any time.

Revision or Review Date	Author(s)	Comment
August 2, 2011	S Bateman, P Carroll, A Winter	Initial Plan
November 16, 2011	S Bateman, P Carroll, A Winter	Execution plan
January 2012	A Winter, D Vasquez	Appendix 2
March 28, 2012	A Winter,	High level threat assessment & Appendix 3
April 10,11 2012	A Winter	Chapter 3 Introduction to System Knowledge: 4.2.10.1 Age of Infrastructure: 4.2.13 Discussion on Threats: 10.1 List of Responsibilities: 4.2.4 Internal Corrosion 4.1 High Level Summary of Threats 4.1 Coordination with other agencies 4.2.5 added statement on OQ 4.2.10 cross reference to Appendix 5 Table 2 eliminated "e= estimated" Table 4 added column for 2011 and row for "shallow main" Section 5 added data collection schedule 5.3.1.1 added actions on yearly totals and availability of C. Inspectors 5.3.2.1 added collection of exc hits, recording in GIS and coordination with others 10.1 added formal review to responsibilities Table 9 updated data for Copper stubs
August 2, 2012	A Winter	Added Appendix 5 review team formed for annual evaluation of DIMP Appendix 4 leak repair updated to reflect data as of January 2012 Table 9a Summary of age dependent vulnerabilities updated Table 4 Summary of leaks Added Appendix 6 Sewer Cross Bore Plan
May 2013	S. Bateman/P. Carroll/G.Moral	Updated tables to reflect data through 2012.

August 2014	S. Bateman/P. Carroll/G.Moral	Updated tables to reflect data through 2013.
July 2015	S. Bateman/P. Carroll/M. Ulichney	Reformatted entire Plan; tables updated; specificity in processes and procedures improved; relative risk rankings clarified; review process clarified; responsibilities clarified