JACOBS CONSULTANCY

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JACOBS CONSULTANCY

Appendix A

Section	Subsection	No	Recommendation	People		Process		System		Score	Priority
				pts	score	pts	score	pts	score		
Safety Compliance Culture	System Safety Compliance Goals and Accountabilities	4.2.5.1	Develop and implement a Corporate Goal concerning gas system safety. Goal should include supporting objectives, actions and measures to fully communicate and demonstrate senior management's gas system safety intent. Implementation of this goal should result in cascading a gas system safety proactive approach throughout the organization.	5	2.5	3	0.9	1	0.2	3.6	High
		4.2.5.2	Establish stretch goal targets seeking 100% compliance with the natural gas state and federal regulations and no fines. Setting high targets helps to demonstrate PSE wants to achieve full gas safety compliance.	4	2	4	1.2	0	0	3.2	Medium
		4.2.5.3	Modify the Operations Metrics Report developed by Performance Excellence by creating a separate category for Gas Safety Compliance. This will help to create a higher profile and visibility for compliance related metrics.	4	2	1	0.3	1	0.2	2.5	Medium
		4.2.5.4	Develop for each position with gas safety compliance responsibilities a complete and up- to date position description. Position descriptions should clearly convey compliance- related responsibilities as well as other organizational accountabilities.	4	2	4	1.2	1	0.2	3.4	Medium
	Organizational Safety	4.4.3.1	Identify safety systems or processes that would benefit from a Benchmarking/Best Practice Study. Develop and implement a plan to conduct a specific number of Benchmarking/Best Practice Studies over a given period of time.	3	1.5	3	0.9	0	0	2.4	Medium
		4.4.3.2	Introduce a series of gas system metrics-measures that are leading indicators and permit root-cause analysis. Rigorous use of these metrics will help to anticipate and prevent safety incidents or the degradation of safety performance.	3	1.5	4	1.2	2	0.4	3.1	Medium
		4.4.3.3	Review the safety goal setting process and where appropriate introduce more aggressive goal-setting practices.	3	1.5	4	1.2	0	0	2.7	Medium
Training		5.4.1	Institute a centralized administrative system to enable effective communication of information by decentralized training teams.	3	1.5	3	0.9	5	1	3.4	Medium
		5.4.2	Identify training systems or processes that would be benefit from a benchmarking/best practice study. Introduce and incorporate accepted methodologies or the results of such studies into the work environment.	3	1.5	4	1.2	2	0.4	3.1	Medium
		5.4.3	Establish a common, uniform process to assess and assure training programs among PSE and the Service Providers can be evaluated and measured in an objective, consistent manner.	3	1.5	4	1.2	3	0.6	3.3	Medium
Contracts	PSE Outsourcing	6.2.4.1	Redirect management of the service provider model to ensure outsourcing activities reflect sufficient communication, logistics, and oversight that will result in fulfillment of PSE's responsibilities for system safety.	4	2	5	1.5	1	0.2	3.7	High
		6.2.4.2	Update the Outsourcing Contract by clearly describing that PSE takes direct responsibility for matters involving System Safety.	3	1.5	5	1.5	3	0.6	3.6	High
		6.2.4.3	Update the outsourcing contract by defining the relationship PSE intends to have and maintain with the service provider.	3	1.5	5	1.5	3	0.6	3.6	High
		6.2.4.4	PSE and the SPs should establish a Joint Task Force to consider Utility contractor management and SP management processes, such as Billing, to assess System Safety impacts and to look to redesign processes to reduce or remove the System Safety risks.	3	1.5	5	1.5	1	0.2	3.2	Medium
	Construction Service Provider Contracts	6.3.4.1	To properly allocate responsibilities and understanding, redraft the contract to clearly articulate the Utility/SP relationship to better define the liabilities as reflected in the requirements of the Washington Administrative Code.	5	2.5	3	0.9	0	0	3.4	Medium
		6.3.4.2	Prepare guidelines for the operation and management of the contract so it can be used as an operations manual for Contractor Management. The goal of the guidelines should be to maintain the partnering relationship between PSE and the SP while reinforcing system safety and the decisions that can impact it.	4	2	4	1.2	0	0	3.2	Medium
		6.3.4.3	To allocate greater representation to PSE, redraft the contract terms concerning the contract committees. This change will reflect current practice.	2	1	3	0.9	0	0	1.9	Low
		6.3.4.4	Contract metrics need to be expanded to include measures such as conformance to PSE procedures as a result of actual observations. In order to meet the first requirement of the QC/QA Programs, which is to confirm and document work, material and services comply with the contract, the requirements of the published Standards, Plans, Specifications and Pipeline Safety Regulations.	4	2	5	1.5	3	0.6	4.1	High
		6.3.4.5	The QC/QA Programs need to be refocused to enable more site visits to observe procedures during Construction and Operations and Maintenance Procedures. Post-Construction Inspections of connections made under hard surface are a last resort which would only become necessary if critical procedures inspections are not completed.	5	2.5	5	1.5	1	0.2	4.2	High
		6.3.4.6	The scope of the QC/QA metrics should be expanded to include site and public safety, paperwork accuracy, units completed, and more on-site crew work inspections. The existing check list used should be amended so that deviations are not the main focus.	5	2.5	3	0.9	0	0	3.4	Medium

Section	Subsection	No	Recommendation	People		Process		System		Score	Priority
				pts	score	pts	score	pts	score		
		6.3.4.7	Currently when the PSE QA Inspector is attempting to locate and SP crew significant time is lost, and if dispatch is contacted the element of surprise, useful in discovering disorderly jobsite conditions, is lost. Consequently consideration should be given towards GPS equipment to assist in locating the Service Provider crews or some other method that accomplishes the above need.	4	2	2	0.6	4	0.8	3.4	Medium
		6.3.4.8	The SP should explore the possibility of fielding QC staff from supervision as opposed to using bargaining unit employees as QC Inspectors. This change would the overall integrity of the QC process.	3	1.5	2	0.6	0	0	2.1	Medium
		6.3.4.9	PSE and the SP's should take the opportunity to educate QC and QA staff on public communication and mark their vehicles as each respective company's Quality Control/Quality Assurance Inspection Team.	3	1.5	1	0.3	0	0	1.8	Low
		6.3.4.10	PSE should develop a training program to pass knowledge to contract managers about system safety and the kinds of decisions that can impact it. Training sessions should begin with the history of code violations and settlements to instill a sense of urgency for the importance of doing jobs in conformance to the gas operating standards. There should also be training on business drivers and the kinds of reactions that will arise from management decisions and demands that might impact safety.	4	2	4	1.2	0	0	3.2	Medium
		6.3.4.11	PSE should review its system-facing metrics to identify new metrics that deliver a measure of assurance of system safety. These will likely not involve easy counting measures as they will be focused on assurance and validation rather than deviations or failures.	5	2.5	4	1.2	1	0.2	3.9	High
		6.3.4.12	PSE should introduce the incentive scheme after all proposed changes are made to the contract and metrics, and then only if it is convinced the need is still there. A lot of what is required for a successful Outsourcing Contract can be delivered via focused and effective management, once the recommended changes have been made.	3	1.5	4	1.2	0	0	2.7	Medium
		6.3.4.13	PSE should strive to meet the AGA 60-day average reported in the best practices study. Reviewing the billing process to enable the removal of the as-built and D-4 documents from the billing package as soon as they are received will ensure the updated maps are expedited. A copy should be kept in the invoice folder for reference and completeness. The accuracy of the information on the as-built and D-4, aside from issues surrounding amounts of materials used, etc. should be dealt with through the QC/QA process.	1	0.5	3	0.9	0	0	1.4	Low
		6.3.4.14	Enhance the Paperwork Correction Process utilizing a cross functional PSE SP team. The goal would be to eliminate sending needed corrections back to the field by developing parameters for corrections and establishing a basis for recording corrections. The veracity of the process developed could be assessed by periodic audits.	3	1.5	3	0.9	5	1	3.4	Medium
		6.3.4.15	Review the field paperwork process and make a recommendation for reducing volume and streamlining the information captured. This recommendation scope could also include assessing electronic capture of data.	4	2	5	1.5	0	0	3.5	Medium
		6.3.4.16	Assess the benefits and costs associated with using a roving inspector to visit larger job sites to QA and complete as-built drawings and D-4 Forms to Mapping as is done on large scale pipeline jobs.	1	0.5	3	0.9	3	0.6	2.0	Low
	Facility Locating Service Provider Contracts	6.4.4.1	Consider developing a leading type metric to measure miss-locates. A possible surrogate for this measure could be the number of downtime claims from a third-party contractor from attempting to find the main themselves or waiting for the Locator to return to site.	1	0.5	4	1.2	2	0.4	2.1	Medium
		6.4.4.2	Create a contractual basis for the Locating SP Probation Concept and establish objective rules as to its application.	1	0.5	5	1.5	1	0.2	2.2	Medium
		6.4.4.3	Establish and continue a QA Program to audit the Locators' QC Programs.	1	0.5	5	1.5	3	0.6	2.6	Medium
	Leak Survey Service Provider Contracts	6.5.4.1	PSE should develop a consistent system for the collection of data/map errors found in the field by perhaps capturing these corrections directly from maps/as-built drawings or D-4 Forms used in the field.	3	1.5	5	1.5	1	0.2	3.2	Medium
		6.5.4.2	PSE should establish a continuing program to QA audit the Leak Survey QC Programs.	3	1.5	5	1.5	2	0.4	3.4	Medium
Auditability of Records	PSE Records Management Practice	7.2.4.1	Convert Procedures and Standard manuals to an electronic field format, or collect and redistribute manuals with current information and standardized bindings. Develop employee accountability and audit process for Procedures and Standards revision accuracy.	3	1.5	3	0.9	3	0.6	3.0	Medium
		7.2.4.2	Create a Records section in every Gas Operating Standard. If no records are required for the operating standard, clearly indicate no records required.	3	1.5	5	1.5	0	0	3.0	Medium
	Service Providers Records	7.3.4.1	Review construction service provider foreman generated paperwork for streamlining opportunities and implement recommendations.	3	1.5	3	0.9	5	1	3.4	Medium

Section	Subsection	No	Recommendation	People		Process		System		Score	Priority
				pts	score	pts	score	pts	score		
		7.3.4.2	Review all paper forms used by PSE field operations staff and the service providers to determine if they are still relevant and reduce the amount of manual record keeping.	3	1.5	2	0.6	5	1	3.1	Medium
	Records Management Systems	7.4.4.1	Utilizing the IT business case justification process, elevate the priority of the initiative to move Compliance Maintenance Programs managed in Access, such as H2RL, Atmospheric Corrosion Inspections, and Valve Inspections, to SAP.	4	2	4	1.2	5	1	4.2	High
		7.4.4.2	Increase awareness of Map Revision Request form for both PSE and service provider employees and establish metrics to hold employees accountable for compliance.	3	1.5	5	1.5	1	0.2	3.2	Medium
		7.4.4.3	Commit to establishing a firm target date to conclude evaluating the cost benefits associated with an enterprise-wide GIS. Assuming positive evaluation results, further commit to establishing an aggressive implementation plan with appropriate funding.	4	2	5	1.5	3	0.6	4.1	High
	Internal Audits of Records	7.5.5.1	In order to support the efficient use of QA&I staff, develop an improved tracking system that will aid in locating service provider crews.	4	2	1	0.3	4	0.8	3.1	Medium
		7.5.5.2	Move the quarterly Leak Audits and D-4 Audits from the Target Audit List to the Routine Audit List to continue to randomly inspect records for Compliance.	1	0.5	5	1.5	1	0.2	2.2	Medium
	Service Providers QC of Records	7.6.7.1	Initiate PSE QA Audits on Locating Service Providers to minimize the likelihood of non-compliance. Include in the audits, metrics that measure near-miss as well as inaccurate locates.	1	0.5	5	1.5	1	0.2	2.2	Medium
	Industry Comparison	7.7.4.1	Commit to establishing a firm target date to conclude evaluating the cost benefits associated with an enterprise-wide GIS. Assuming positive evaluation results, further commit to establishing an aggressive implementation plan with appropriate funding.	3	1.5	4	1.2	5	1	3.7	High
Continuing Surveillance	Current PSE Continuing Surveillance	8.2.8.1	In order to enable a more robust Continuing Surveillance Program, improve communications between System Control and Protection, and System Maintenance Planning. If significant improvements in communication are not achievable, conduct an Organizational Assessment to fully evaluate the benefits of both organizations reporting to the same SVP or Director.	5	2.5	3	0.9	1	0.2	3.6	High
		8.2.8.2	System Maintenance Planning and System Control and Protection should work together to minimize the documentation required when a corrosion order exceeds the 90 day requirement, but is completed within the 120 days allowed by UTC and PSE standards.	3	1.5	3	0.9	1	0.2	2.6	Medium
		8.2.8.3	PSE should revise the System Condition Reporting Programs for its employees and SPs in a manner that is useful for reporting a variety of conditions; with all parties' responsibilities well known, and with clear communication to all parties of the program's usefulness in promoting System Safety. Recommended improvements to consider should include: a single form, comprehensive training, clear responsibilities, increased use of Information Technology, established a prioritization procedure and updated Gas Operating Standards.	4	2	4	1.2	1	0.2	3.4	Medium
		8.2.8.4	Continue to aggressively evaluate the cost-benefit of investing in a GIS system to Aggregate System Information for analysis. Implementation will also better enable compliance with DIMP Regulations.	4	2	5	1.5	1	0.2	3.7	High
	Continuing Surveillance Trends	8.3.5.1	In order to play a greater role in identifying trends and enabling new programs and program adjustments, and facilitating the evaluation of recent year data, efforts should be made to complete the System Performance Programs Annual Review closer to the beginning of the calendar year than the current June issuance date.	2	1	4	1.2	1	0.2	2.4	Medium
		8.3.5.2	PSE should examine and rectify its process for accounting of eliminated leaks.	0	0	3	0.9	3	0.6	1.5	Low
		8.3.5.3	Continue to aggressively evaluate the cost-benefit of investing in a GIS system to Aggregate System Information for analysis. Implementation will also better enable PSE to determine the root-causes and prevent damages and leaks.	4	2	5	1.5	5	1	4.5	High
		8.3.5.4	Improve coordination or consider reorganization of damage control responsibilities among the several organizations involved to create a more unified management process. A task force similar to the Gas Compliance Steering Committee would provide an effective format for the communication of damage control information and coordination of monitored efforts.	3	1.5	4	1.2	2	0.4	3.1	Medium

Section	Subsection	No	Recommendation	People		Process		System		Score	Priority
				pts	score	pts	score	pts	score		
		8.3.5.5	PSE should create a feed back mechanism to capture root analysis on poor or no locates, including tracking "Near-Miss" Data which could also provide important Continuing Surveillance information regarding the accuracy of locates.	4	2	5	1.5	1	0.2	3.7	High
		8.3.5.6	PSE should adopt Common Ground Alliance's Best Practices that will enhance locator accuracy and timeliness, and incorporate them into goals reflected in the Locator Contracts. This includes establishing objective measures for locator accuracy and timeliness and then establishing targets for year-over-year improvement.	4	2	4	1.2	2	0.4	3.6	High
	Continued Surveillance Compliance and Reporting	8.4.7.1	PSE should add clarification to the record regarding certain categories of UTC-reportable incidents as described in Section 4.2 UTC Reportable Incidents for the purpose of Continuing Surveillance.	1	0.5	3	0.9	0	0	1.4	Low
		8.4.7.2	A greater focus on the use of Continuing Surveillance information for internal auditing and a proactive approach to management of the Gas system is needed. PSE should use the annual Continuing Surveillance report to identify trends, initiate proactive measures, and track subsequent progress. The end result would be enhanced system integrity and a reduced need for settlement agreements and settlement-related audits	4	2	4	1.2	3	0.6	3.8	High
		8.4.7.3	In the interest of coordinating all aspects of Continuing Surveillance, PSE should coordinate various departments (if not consolidated in response to Recommendation 8.2.8.1) concerning Continuing Surveillance, and appoint a manager to report on Continuing Surveillance to the Gas Compliance Steering Committee.	2	1	2	0.6	0	0	1.6	Low
		8.4.7.4	Efforts to consolidate information to provide a workable Continuing Surveillance system should receive a higher priority.	1	0.5	3	0.9	5	1	2.4	Medium
		8.4.7.5	The annual Continuing Surveillance Review as specified in the Gas Operating Standards should be performed and become the major indicator of the state of the gas system.	3	1.5	4	1.2	1	0.2	2.9	Medium
Sufficiency of Resources	Gas Safety Compliance Programs	9.2.4.1	Develop and implement a Corporate Goal concerning Gas System Safety. Goal should include supporting objectives, actions and measures to fully communicate and demonstrate senior management's Gas System Safety intent. Implementation of this goal should result in cascading a Gas System Safety proactive approach throughout the organization.	5	2.5	3	0.9	1	0.2	3.6	High
	Adequacy of Resources	9.3.6.1	PSE should expedite the development of a strategic workforce planning study to define the work force required to implement company business strategies and identify actions needed to meet those requirements. The analysis should reveal gaps between the work force needed and the workforce supply forecasted to be available, and identify certain critical positions as well as certain key employees.	5	2.5	3	0.9	0	0	3.4	Medium
		9.3.6.2	The company should initiate vehicle recordkeeping that includes maintaining a history of vehicle breakdowns and repair costs. This history should be periodically reviewed to determine vehicle replacement needs.	2	1	3	0.9	0	0	1.9	Low
		9.3.6.3	The company should initiate recordkeeping of employee double-ups required as a result of a shortage of functional vehicles. These records should be periodically reviewed to determine the appropriate number of spare vehicles in any given location.	3	1.5	3	0.9	0	0	2.4	Medium
	Monitoring Effectiveness	9.4.6.1	Revised the Operating Standards for Continuing Surveillance 2575.2700 to reflect the significant observation role the Manager Quality Assurance and Inspections has in continuing surveillance.	3	1.5	5	1.5	0	0	3.0	Medium
		9.4.6.2	Add clarity in how compliance activity responsibilities are delegated and how individuals are held accountable throughout the organization.	4	2	4	1.2	1	0.2	3.4	Medium
		9.4.6.3	Conduct a study of how and where first-line supervisors spend their time. Determine which existing supervisory and administrative tasks can be reassigned and/or appropriate staffing needs, so that first-line supervisors have the ability to routinely spend 50% of their time with field crews and service personnel. Develop a list of appropriate field related responsibilities along with the means to ensure supervisor accountability.	5	2.5	5	1.5	0	0	4.0	High
		9.4.6.4	Review and communicate the criteria for incident command with all PSE and SP staff so that the PSE leadership role is clearly understood; consider incorporating incident command observations into the quality assurance program.	5	2.5	4	1.2	0	0	3.7	High
		9.4.6.5	Elevate the priority of the initiative to move compliance maintenance programs managed in Access, such as H2RL, atmospheric corrosion inspections, and valve inspections, to SAP.	5	2.5	1	0.3	5	1	3.8	High
	Safety Compliance Program Status	9.5.2.1	Expedite the xEM database under development. This software will provide electronic reminders to designated individuals when compliance reports or actions in response to regulatory requirements are necessary	3	1.5	1	0.3	5	1	2.8	Medium

Appendix B
Field Observations

Field Observations

1.0 Introduction

1.1 Objective and Scope

The objective of this task was to conduct a series of field observations of Puget Sound Energy's (PSE) service providers and employees performing a large variety of work. The types of work to be observed varied from new and replacement construction to various operations, inspections and maintenance activities performed on the distribution gas system. The field observations in effect are a collection of observation data gathered by skilled and knowledgeable auditors of field crews executing gas facility construction and procedures. These observations reflect both PSE and its service provider's attitude towards maintaining a safe and compliant culture, demonstrate the effectiveness of standards, procedures and OQ training, provide a perspective on how negotiated contracts are interpreted and complied with, reveal how field records are originated, and provide an insight as to the adequacy of gas safety compliance program resources. Our findings are listed under the following headings:

Service Providers-Construction

- Labor pool
- Field Observation Form and data collected
- Pre-Operational Field Procedure
- Operational Field Procedures-Construction
- Post-Operational Field Procedures

Quality Control-Service Provider Construction

- Labor pool
- Types of work covered
- Field Observation Form and data collected
- Results of field observation

Quality Assurance- Service Provider Construction (PSE)

- Labor pool
- Types of work covered
- Field Observation Form and data collected
- Results of field observation

Service Provider- Locating

- Training
- QC

- Safety
- Results of field observation

Service Provider- Leakage Survey

- Training
- QC
- Safety
- Results of field observation

Puget Sound Energy Activities

- Labor pool
- Types of work covered
- Field Observation Form and data collected
- Results of field observation

1.2 Background

Our approach to this task was based on an analysis of the results of interviews and documents provided at the outset of the project. Based on the importance of individual crew leader roles in achieving performance, Jacobs chose to focus its observations on seeing all service provider field crews and broad number of PSE's workforce, rather than on work activities. Our approach was then divided into subtasks, as described below:

- **Data Collection** - Data collected from direct field observations and field interviews with PSE employees, service providers, and Potelco's subcontractor, Pipeline Construction, Inc.

- **Field Observers Role** - The PSE service territory was divided into four territories with a Jacobs field observer assigned to each area. The field observers were instructed to watch a complete field project from start to finish and document their findings utilizing the Field Observation form.

- **Data Capture** - The Field Observation form was developed to collect data on the observations made of the field crews. The Field Observation form consists of three primary sections: pre-field operational field procedures; operational field procedures; and post-operational field procedures. By using the form, a consistent method was employed promoting efficiency and objectivity. In addition, the data collected can be readily aggregated to generate useful observation information.

- **Data Analysis** - In this subtask, the observation data was consolidated and analyzed and combined with the collective knowledge gained through field interviews.

Due to the seasonality of some work activities and logistical limitations, it was not possible to observe all work activities. However with the keen focus of observing 100% of the service provider field crews and a broad number of PSE's workforce, Jacobs feels confident that the audit results of observed activities directly correlate with those activities which were not observed. We base this belief on our experience with previous similar studies, where issues with conformance to standards and procedures are generally indicative of individual's training, knowledge and attitude rather than an inability to properly complete a specific activity.

Construction Service Providers and PSE Employees:

The Field Observation form was designed to capture complete empirical data for each field project represented by a unique SAP generated work order number.

For each work order project, the Jacobs field observation team was able to observe locates; standards and procedures, safety; paperwork completeness and accuracy; public awareness; employee qualifications; tools and equipment; and restoration. To help capture this broad variety of observations, a scoring system was designed to notate compliance with superior practices being assigned a higher value and sub-par deviations a lower value. The deviations were further notated with written documentation and photos for future reference.

The field observers received the construction service providers' electronic crew work assignment list, which make available daily location information for approximately seventy Pilchuck crews and five Potelco crews. Based on this information, the field observers planned their schedules. However, the field observers reported many inaccuracies in the crew work location assignment; these were due to last minute changes associated with many contributing factors. Some of the field observers remedied this by calling the service providers' general foreman or crew foreman directly to find exact locations, but this approach negated the surprise inspection. The field observations took place in almost every city and town served by PSE (refer to the Appendix 1 – Item 1). Also, every attempt was made to audit at least each crew foreman once. Item 2 in Appendix 1 provides specific names of the crew foreman observed and the number of audits each crew foreman experienced.

PSE employees, service providers and their subcontractors were well informed about the impartial audit to be conducted by Jacobs and were forthright with their perspectives on work activities. Along with direct observation, we interviewed the employees and crews for work experience and challenges that they see currently or in the future. The observation methodology called for the field observers to observe a various PSE employees from different locations performing a variety of work, every service provider construction crew and document all the work functions associated with a work order. This approach necessitated typically spending the entire day with one PSE employee or staying on a project worksite from start to finish, and sometimes required returning the following day.

Service Providers- Facility Locates:

There are two service providers used for locating underground substructures (gas and power), Locating Inc., and Central Locating Services. These locating service providers are assigned geographic areas by counties. The Jacobs observer spent a day with each provider in the field documenting locating practices, safety, quality control, and training.

Service Providers-Leak Survey:

The leakage survey provider is Heath Consultants. Heath Consultants dispatches crews from three geographic areas within the PSE service area. The Jacobs field observer spent two days walking gas survey routes noting survey practices, safety, quality control and leakage notification and documentation.

2.0 Service Provider-Construction

2.1 Labor Pool

All the construction service providers draw from the same labor pool. The crews are comprised of organized labor from three major crafts: pipe fitters/welders; operators; and laborers. The crew structure is designed as a composite crew with the service provider company having the ability to assign the best qualified person as foreman no matter their craft or seniority in that craft. There is no line of progression and most of the operators started as laborers and transfer unions after five years due to the retirement investment benefit. Pipe fitters typically started as helpers before acquiring journeyman status.

For the most part, the work forces interviewed are in their late thirties and early forties with an average of ten to fifteen years field work knowledge. Many of the older experienced workers complained about the toll that the field work has on their body even with the advent of better equipment and tools. The existing aging work force are also concerned about the next generation gas construction employees because their work ethic and values are different than those they experienced when starting in the field.

2.2 Field Observation Form and Data Collected

The Field Observation form was designed to capture measurable unbiased data points for analysis. A blank Field Observation form, complete with description and scoring guidelines, which can be found in Appendix 3 - Item 1. Each section of the form is designed to help group work activities so that granulated data could be collected and categorized within the large scope of work activities. The form went through considerable field beta testing before finalization and application.

The form has three broad sections of operational functions: 1. Pre-Operational Field Procedures; 2. Operational Field Procedures; and 3. Post Operational Field Procedures. Each of these sections is further divided into subsections for data aggregation and reflection of the work functions. In total there are 66 line items that are aggregated within the various subcategories.

There are four columns of expression in the Compliance Levels Scoring Section, each with a numeric value (Highest *Above Standards*-3, Neutral *Meets Compliance Standards*-2, Lowest *Not Compliant*-1, and NA-0 *Not Applicable*). The Field Observation form's design is an enhancement over a typical pass or fail grade in that it gives a value to efforts that Exceed (Highest) or Fail (Lowest). It should be noted that the Jacobs field observers were directed to make written comments and/or take photos for all observations receiving a numeric value of 1 or 3.

In order to ensure high confidence in the observation findings, a broad and adequate number of audits needed to be conducted and a sufficient number of line items needed to be observed and evaluated. In total 156 service provider-construction audits were conducted. These audits resulted in 2257 line items being evaluated. Figure 1 Service Providers-Construction highlights the overall expectation percentage evaluated. Between Pilchuck, Potelco, and their subcontractor, Pipeline Construction, 2241 out of 2257 line items observed met or exceeded expectations. This equates to the Service Providers-Construction, as a group, achieving a met or exceeded expectation percentage of 99.3%.

Figure 1 – Service Provider Construction

Service Providers:	Rank 3 Above Expectation	Rank 2 Expectation Met	Rank 1 Below Expectation	Total Field Observations
Pilchuck	2	1822	12	119
Potelco/Pipeline Construction	11	406	4	37
TOTAL:	**13**	**2228**	**16**	**156**

2.3 Pre-Operational Field Procedure

The Pre-Operational Field Procedure contains two subsections: A. Worker and Site Safety; and B. Procedural Checklist.

2.3.1 Worker and Site Safety

The Worker and Site Safety subsection was of the utmost importance in recording how well the crew leader regarded the public and service provider's employee's safety during construction activities. This section also captured how the job site leadership views procedures and attitudes towards safety. As shown in Figure 2, in total there were 287 observations in this category with 7 receiving a score of 1 - the "Lowest" and 3 receiving a score of 3 - the "Highest."

Figure 2 - Worker & Site Safety

I. PRE-OPERATIONAL FIELD PROCEDURES	Highest	Neutral	Lowest
A. Worker and Site Safety	3	2	1
1. Located Facilities – paint, signs, markers	1	97	3
2. Located Potential Ignition Sources	0	40	0
3. Implemented Emergency Conditions	0	3	0
4. Accidental Release of Gas Controlled	0	5	0
5. Ground Movement (subsidence, erosion, slides) Controlled	1	22	0
6. Review Worker Safety Equipment	1	110	4

1. Located Facilities – paint, signs, markers: *Locate refers to the process of determining the existence and location of an underground facility and indicating that location through the use of stakes, flags, paint or some other customary manner. Such markings identify the location of the underground facility so that excavators can avoid damage to the facility when digging.*

This item received the second lowest ranking score in comparison to all other work functions observed (refer to Appendix 4A – Item 1). The observations highlight the challenges faced in the congested underground environment for both the excavators and the locators. Every crew leader has a lot at stake to ensure the underground facilities identified are accurate. Consequently, it is customary to recheck and verify the locate company's markings to confirm the location of underground facilities before starting to excavate. There are 101 observations with 3 low-ranking scores; they can be summarized as 2 missed locates and 1 missing or not located. Two of the missed locates are due to mapping inaccuracies. There is 1 scored as "Highest" and it is a result of the extra care that the crew leader took when locates were discovered to be inaccurate.

Examples of field observers locating comments include:

"Locators failed to locate buried TV cables. The crew, while trenching, broke one. Foreman called locators back out to locate the remaining cable left in the ground."

"As-built gas map indicated gas line at curb; actual gas line location is approximately 6' from curb. First locate indicated gas line as per as-built. Secondary locate by PSE identified actual gas line location. Seattle City Light locator did not complete area locate properly. Pilchuck dug into electric line due to inadequate locate."

2. Located Potential Ignition Sources: *Refers to sources of ignition: static discharge, high temperatures, open flames, electrical devices and outlets.*

This category had 40 observations and all met with 100% compliance.

3. Implemented Emergency Conditions: *This refers to keeping the public and employees safe while mediating an emergency; this includes pre-determined notification sequence*.

There are 3 total observations; all met with 100% compliance.

4. Accidental Release of Gas Controlled: *Accidental release of gas while performing monitored release of gas where the flow of gas is in constant control through the use of an acceptable control valve*.

There are 5 total observations; all met with 100% compliance.

5. Ground Movement (subsidence, erosion, slides) Controlled*: To mitigate the movement of soil during deep excavations with the use of shoring, benching, and or pilings. Includes protection from erosion and slides using safe environmental methodology.*

There are 23 observations in this category, all which typically represent deep excavations, requiring shoring. It was observed that crews shored via depth, and not soil type so that there is no confusion in soil classification. (Refers to Competent Person: *Who is a Competent Person? A Competent Person is someone who, through training and/or experience, is knowledgeable of the various Occupational Safety & Heath Administration (OSHA) standards that apply to their workplace, is capable of identifying workplace hazards relating to their specific operations, and has the authority invested in him or her by their employer to correct the hazards to protect workers. Therefore, it is the responsibility of Employers, and not OSHA, to determine who the Competent Person(s) is for particular construction sites. In the OSHA construction standards (see 29 CFR 1926.32(f)), the generic definition of a Competent Person is stated as "one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them").*

There is one observation in the “Highest” category.

“Crew shored to retain road integrity while adjacent to a busy intersection.”

6. Review Worker Equipment Safety: *Refers to employees wearing their Personal Protection Equipment (PPE), hardhats, vests, hearing and eye protection, and the proper foot wear. This category also included site protection, such as equipment chalks, traffic signs, cones, barricades, and flagging.*

Worker Equipment Safety has the greatest amount of field observations throughout the audit with 115 observations. Of these observations, one is in the “Highest” and four are in the “Lowest” category. A summary of the four observations in the “Lowest” category are as follows:

“One - No hard hat and or vests”
“One - No eye protection while jack hammering”
“Two - No wheel chalks while parked on an incline”

This section received the lowest ranking (refer to Appendix 4 – Item 6).

There is one observation in the “Highest” category.

“The crew leader took extra care to protect the public around their deep excavation (barricades and safety tape).”

2.3.2 Procedural Check List

The Procedural Check List is used as good insight into crew composition and alignment of craft responsibilities. Crews are more than congenial to offer their cards for review and are prideful of the importance of their demonstrated knowledge. As shown in Figure 3, there are a total of 351 observations in this category of Procedural Check List with 1 receiving a score of 1 - the “Lowest.”

Figure 3 - Procedural Check List

B. Procedural Check list	Highest 3	Neutral 2	Lowest 1
1. Completed Procedural Review	0	35	0
2. Completed Equipment Review	0	46	0
3. Completed Safety Protocol for Given Procedure	0	35	0
4. Completed Qualification Card	0	97	0
5. Reviewed Procedure Manuals	0	57	0
6. Equipment Calibration Current	0	80	1

1. Completed Procedural Review: *Refers to following practices set forth in the Standards/Procedural Manual*.

100% Compliance

2. Completed Equipment Review: *The review of equipment associated with observable work activities.*

100% Compliance

3. Completed Safety Protocol for Given Procedure: *The preparation of a procedure with the proper safety equipment and following safety precautions on the job.*

100% Compliance

4. Completed Qualification Card: *Weld, Fusion, Mechanical Joints, Hot Tap Data Card. This pertains to all individuals who have qualification cards whether they are performing qualified work or not.*

100% Compliance

5. Reviewed Procedure Manuals: *Having a current copy of the Gas Operating Standards and Gas Field Procedures available at the job site. Also applies to personnel not working under the direct supervision of the job foreman, such as a laborer watching joint trench sanding.*

All the procedure manuals have current updates, but unfortunately they also have the revisions with no notation of a change or X-out. This issue is more prevalent with crews that have a narrower scope of responsibility and feel they will never engage in the revised task. A few crews treated their manuals haphazardly and kept them behind the vehicle seat with rain gear.

100% Compliance

6. Equipment Calibration Current: *Defined as complete check of all equipment or tools needed for a job verifying calibration dates.*

Equipment Calibration was readily reviewed with the expiration dates being visible on the required devices. It was noted that crews kept “out of service equipment” (damaged) on their vehicles and did not have them tagged or black taped. The pressure gauge in particular was noted as having broken faces and kept in the same area as active equipment.

A total of 80 total observations met the compliance standards with 1 observation in the “Lowest.”

“Pressure gauges were outdated. Inspected bypass on 1 ¼” high-density pipe with a transition to 2” medium-density pipe.”

2.4 Operation Field Procedures

As previously stated in Section 1.1 Observation and Scope, field observers are instructed to observe every construction crew and document all the work functions associated with the completion of a work order. This directive necessitated staying on a project jobsite from start to

finish and some time required returning the following day. Thus, the field observers need to observe from job setup to job completion; this included meter setting and turn-on, final restoration and the gathering of footages for D-4 cards and, if possible, final as-builds. The Operational Field Procedure contains six subsections: A. Construction; B. Joining; C. Operating and Maintenance; D. Gas Leaks; E. Corrosion Control; and F. Customer Service.

2.4.1 Construction

The Construction subsection was completely activity-based and allowed the field observers to document all the various methods used in installation practices. This section accounted for over 2/3 of the field observers time and over 3/4 of the field crews daily time. Very few of activities in this section can be post inspected, thus required the field observers to stay on the job until the end of the day or completion of the project. As can be seen in Figure 4, in total there are 904 observations in this category with 3 receiving a score of 1 - the “Lowest” and 5 receiving a score of 3 - the "Highest."

Figure 4 – Construction

II. OPERATIONAL FIELD PROCEDURES	Highest	Neutral	Lowest
A. Construction	3	2	1
1. Observed Backhoe/Trencher Equipment	1	88	0
2. Observed Boring Equipment	1	37	0
3. Observed Pipeline Crossing Construction	0	16	0
4. Observed Cover and Pipe Depth	0	107	1
5. Observed Clearance, Underground	0	77	1
6. Observed Pipe Installation (laying, inserting)	0	84	0
7. Observed Abandoning/Retiring Facilities	0	14	0
8. Observed Coating Inspection	0	18	0
9. Observed Valve Installation – main, service, excess flow	0	39	0
10. Observed Repair Fitting	0	4	0
11. Observed Tapping Tee and Stopping	0	48	1
12. Observed Purging	0	58	0
13. Observed Pressure Test/Leak Test	0	62	0
14. Observed Tracer Wire Installation	0	94	0
15. Observed Steel/Plastic Reinforcement	0	25	0
16. Observed Backfill and compaction	3	73	0
17. Observed Meter Set Installation	0	52	0

1. Observed Backhoe/Trencher Equipment: *Observe the use of mechanized excavating equipment while in operation in the utility corridor.*

There are a total of 89 observations in this category with 1 in the “Highest” category.

“Operator used great care around parked cars while excavating with a full size John Deere Backhoe.”

2. Observed Boring Equipment: *There are three methods of boring: directional drilling, pneumatic ramming, and pipe pushing. The most common is pneumatic ramming (Hole Hoggs) followed by directional drilling. Directional drilling requires a grounding rod and warning signal to insulate the operator from accidentally getting energized if power contacted.*

There are a total of 38 observations in this category with 1 in the "Highest" category.

"Crew used extra caution while using Hogg to cross utilities."

3. Observed Pipeline Crossing Construction: *Two or more pipelines crossing in close proximity without a physical connection existing between the pipelines.*

100% Compliance

4. Observed Cover and Pipe Depth: *Refers to the minimum cover required in PSE standards which must be in place over natural gas main or service before installation crew can leave it gassed up. And the minimum installation depth requirements permitted by municipalities. Reinforced concrete cap in lieu of pipe depth is also inspected under this item.*

There are a total of 108 observations in this category with 1 in the "Lowest" category.

"It appeared that locates were properly marked; however multiple utilities intersect at the SE corner at point of excavation. Water, sewer, fiber, phone, and gas were in a confined space."

5. Observed Clearance, Underground: *This pertains to clearances from underground encroachments (non-gas facility) such as other utilities (pipe, wires, guys, posts, poles), sewer, storm pipes, underground vaults, septic tanks, buildings (footings, foundations), steam lines, obstacles (piles, dead-man, very large boulders), etc*.

There are a total of 78 observations in this category with 1 in the "Lowest" category.

"It appeared that locates were properly marked; however multiple utilities intersect at the SE corner at point of excavation. Water, sewer, fiber, phone, and gas were in a confined space."

6. Observed Pipeline Installation (laying, inserting): *Inspecting inserted mains or services in PVC conduit and inserting pipe (PE or Steel) in existing facilities*

100% Compliance

7. Observed Abandoning/Retiring Facilities: *Abandonment indicates that a company has received approval from the regulator to cease providing a particular service (e.g., to*

permanently shut-down operation of a particular pipeline or facility) under that regulatory agency's jurisdiction. Abandonment also refers to the process and actions taken by a company at the end of the useful life of a pipeline or pipeline facility to gain approval from the regulator.

100% Compliance

8. Observed Coating Inspection: *Coating requirements for painting of all exposed metal surfaces on meter set assemblies. Inspection includes all pipes upstream of the outlet spud including the spud. Customer fuel line is not included in this inspection.*

100% Compliance

9. Observed Valve Installation – main, service, excess flow: *Observe the installation of a mechanical valve and verify its operational condition and protection for future access.*

100% Compliance

10. Observed Repair Fitting: *Repair a damaged or defective fitting to meet PSE requirements*.

100% Compliance

11. Observed Tapping Tee and Stopping*: Observe tapping and stopping of all steel and PE pipe in accordance with PSE Standards and .Procedures.*

There are a total of 49 observations in this category with 1 in the “Lowest” category.

“Bypass inspected on 1 ¼” high-density pipe with a transition to 2” medium-density pipe. The bypass was made because they do not use high volume tapping tees. In this situation they had used eight fittings. The Quality Assurance Inspector, Carl Baggenstos, noted that the squeeze points were not to spec of at least 12” from the fitting. As a result, they would have to engage the bypass again and cut them out and install longer pups.”

12. Observed Purging*: Refers to purging of both steel and PE of air, water, and gas following the guidelines set forth in the Standards and Procedures manuals: includes static protection and CGI for gas mixture*.

100% Compliance

13. Observed Pressure Test/Leak Test: *All new temporarily abandoned, relocated or replaced pipelines shall be tested before being placed in service. Also covers pre-tested repair pipe and soap test of MSA*. *This test pertains to leak testing of steel and PE pipelines whether new,*

temporarily disconnected, or replaced before being gassed up. Also covers pre-tested repair pipe; does not cover nitrogen or hydrostatic strength tests.

100% Compliance

14. Observed Tracer Wire Installation: *Proper installation of locate (tracer) wire. Anode installations for locate wire are audited under this inspection item and not the CP requirements inspection item*.

100% Compliance

15. Observed Steel/Plastic Reinforcement: *The act or process of reinforcing or strengthening of pipes with steel or plastic material.*

100% Compliance

16. Observed Backfill and Compaction: *Refers to backfilling over and under gas piping with approved fill, and compacting trenches to meet PSE Standards or local permitting requirements.*

There are a total of 76 observations in this category with 3 in the "Highest" category. This section received the highest overall ranking (refer to Appendix 5 – Item 16).

"Crew installed conduit in rocky substrate, glued joints, hand backfilled and disposed of rocks over 6", and hauled in select over non-conduit areas."

"Crew used screening box to screen native soil while hand backfilling to assure proper fines around riser."

17. Observed Meter Set Installation: *Refers to the installation of meter setting in accordance with the Standards and Procedures manual. Included in the Standards and Procedures manual are: clearances from ignition sources, vents, and opening closing windows, testing, calibrating, painting fittings, information tags, and locking riser cock.*

100% Compliance

2.4.2 Joining

The Joining subsection pertains to activities that mandate individuals who are Operator Qualified to perform the given tasks. Though this subsection is relatively small in overall observation numbers, it accounts for one of the greatest liabilities in underground gas distribution construction. As can be seen in Figure 5, the field observers documented 128

observations of pipe joining while reviewing crew activities. All the observations met or exceeded current compliance levels.

Figure 5 – Joining

B. Joining	Highest 3	Neutral 2	Lowest 1
1. Observed Plastic Pipe (Fusion)	2	56	0
2. Observed Welding – Arc, Thermite	0	23	0
3. Observed Mechanical Coupling	0	47	0

1. Observed Plastic Pipe (Fusion): *Fusion of all PE mains and services. Fusion environment should be protected from wind, rain, dust, etc. and preventing drafts through open pipe ends. When fusing, PE pipe must be inspected to ensure there are no cuts, gouges, or scrapes deeper than 10% of the wall thickness (OS 2525.1200 sec 6.13). This requirement should be checked under the Inspection Item: Pipe – General Installation/Retirement Requirements.*

A total of 58 observations met the minimum requirements with two in the “Highest” category.

No comments are noted for two exceeding the minimums.

2. Observed Welding – Arc, Thermite: *Welding of all steel mains and services. A manned fire extinguisher shall be present when welding (GFP 4700.1210 step 3, OS 2575.2000 sec 4.3).Only those welders with active cards shall be permitted to weld on Company piping (OS 2700.1100 sec 3.2.1). When installing a bare steel casing, a welder who is qualified through training and experience shall perform the weld (OS 2525.1900 sec 3.6). Common welding practices followed when welding steel pipe (GFP 4900.1000). Specific procedure followed for type of welding being performed (GFP 4900.1300-2100). Transition fittings welded to steel pipe kept continuously wet with a rag placed over the transition and PE portions of the fitting (GFP 4900.1120 step 1).Transition fitting has not had the steel portion shortened (GFP 4900.1120 step 3).When using mechanical line stoppers or LP bags to isolate a section of pipe, welding work shall not be performed within 18 inches of a stopper (unless approved by Quality Assurance Inspector) or against an LP bag. (OS 2575.2000 sec 3.4.2). No welder may weld on the Company piping system with a particular welding process unless, within the preceding 6 calendar months, the welder has engaged in welding with that process (OS 2700.1100 sec 6.1).*

100% Compliance

3. Observed Mechanical Coupling: *Joining pipe using means other than welding or fusion. Procedures followed when joining pipe with flanged fittings (GFP 4610.1000). Follow the specified torque requirements for flanged fittings (GFP 4610.1000 pg 4 table2 & 3). Follow the specified bolt tightening sequence for flanges (GFP 4610.1000 pg 5 fig. 1). Procedures followed when joining pipe with Dresser compression fittings (GFP 4610.1010). Procedures followed when joining pipe with Continental compression fittings (GFP 4610.1020). Procedures followed when joining pipe with Lycofit mechanical fittings (GFP 4610.1030). Procedures followed when*

joining threaded pipe (GFP 4610.1040).Procedures followed when using Lycofit stop and go (GFP 4610.1030 pg 2). Welded service tee fitting has cooled before installing PE pipe into Continental fitting (GFP 4610.1020 pg 1, step 3). Shear point protected where PE pipe connects to Continental service tees fitting (GFP4610.1020 pg 2, step 10). Notes and Best Practices: When joining pipe, PE pipe must be inspected to ensure there are no cuts, gouges, or scrapes deeper than 10% of the wall thickness (OS 2525.1200 sec 6.13). This requirement should be checked under the Inspection Item: Pipe – General Installation/Retirement Requirements.

100% Compliance

2.4.3 Operating & Maintenance

The Operating and Maintenance subsection is the first section relate wholly to O&M costing and processes. All the activities in this subsection are activity-based except: 1.Observed Facility Protection-Fence, Locks, Posts. As can be seen in Figure 6, the field observers documented 7 observations of Section C. Operating & Maintenance while reviewing crew activities. All the observations met or exceeded current compliance levels.

Figure 6 - Operating & Maintenance

C. Operating & Maintenance	Highest 3	Neutral 2	Lowest 1
1. Observed Facility Protection – Fence, Locks, Posts	0	2	0
2. Observed Metering	0	2	0
3. Observed Operating and Maintaining Valves	0	1	0
4. Observed Inspecting Pressure Regulating and Limiting	0	2	0

1. Observed Facility Protection – Fence, Locks, and Posts*: Pertains to above ground facilities that are installed or located in the proximity of vehicles which could potentially cause damage to the facility. This inspection item is also applicable when facilities are located in protective areas in lieu of guard posts.*

100% Compliance

2. Observed Metering: *Observe the setup and calibration of meters.*

100% Compliance

3. Observed Operating and Maintaining Valves: *This valve is installed for the purpose of controlling the flow of gas in the service.*

100% Compliance

4. Observed Inspecting Pressure Regulating and Limiting: *Observed equipment that under abnormal conditions will act to reduce, restrict, or shut-off the supply of gas flowing into a*

pipeline to prevent the gas pressure from exceeding a predetermined value. A pressure-limiting station may be integral to a pressure-regulating station. A pressure-reducing station that automatically regulates the pressure in the downstream main to which it is connected; includes piping and auxiliary devices such as valves, control instruments, control lines, and the enclosure.

100% Compliance

2.4.4 Gas Leaks

The Gas Leaks subsection activities are classified as O&M and relate to the maintenance of the gas distribution system. As can be seen in Figure 7, there are 27 observations that met 100% compliance in Section D Gas Leaks.

Figure 7 - Gas Leaks

D. Gas Leaks	Highest 3	Neutral 2	Lowest 1
1. Observed Recognizing and Reporting Gas Leak	0	3	0
2. Observed Leak Survey and Patrols	0	1	0
3. Observed Gas Detectors	0	9	0
4. Observed Leak Classification	0	6	0
5. Observed Bar Hole Test and Purging	0	8	0

1. Observed Recognizing and Reporting Gas Leak: *Observed the procedures for recognizing and following notification processes.*

100% Compliance

2. Observed Leak Survey and Patrols*: Observed leak surveyors' patrols and processes.*

100% Compliance

3. Observed Gas Detectors: *Observed the uses of gas detectors that were approved by PSE standards.*

100% Compliance

4. Observed Leak Classification: *The classifications of leaks with accordance to PSE Standards using combustible gas indicator.*

100% Compliance

5. Observed Bar Hole Test and Purging: *A hole made in the soil or pavement for the specific purpose of testing the subsurface atmosphere with a combustible gas indicator and the release from the confined area.*

100% Compliance

2.4.5 Corrosion Control

The subsection Corrosion Control observations are a mixture of capital and O&M observations. As can be seen in Figure 8, there are a total of 105 observations with 100% compliance.

Figure 8 - Corrosion Control

E. Corrosion Control	Highest 3	Neutral 2	Lowest 1
1. Corrosion Control Observed: Atmospheric -Condition, Painting/Coating	0	48	0
2. Corrosion Control Observed: External - Condition, Coating	0	19	0
3. Corrosion Control Observed: Internal	0	0	2
4. Observed Cathodic Protection Installation	0	36	0

1. Corrosion Control Observed: Atmospheric - Condition, Painting/Coating: *The deterioration of material, usually a metal, caused by exposure to the atmosphere and evidenced by pitting or surface rust. Observed the use of paint and or coatings to prevent atmospheric corrosion.*

100% Compliance

2. Corrosion Control Observed: External - Condition, Coating: *Observed external coating of steel pipe for signs of damage to coating.*

100% Compliance

3. Corrosion Control Observed: Internal: *Corrosion on the internal wall of a natural gas pipeline can occur when the pipe wall is exposed to water and contaminants in the gas, such as O_2, H_2S, CO_2, or chlorides. The nature and extent of the corrosion damage that may occur are functions of the concentration and particular combinations of these various corrosive constituents within the pipe, as well as of the operating conditions of the pipeline. For example, gas velocity and temperature in the pipeline play a significant role in determining if and where corrosion damage may occur. In other words, a particular gas composition may cause corrosion under some operating conditions but not others. Therefore, it would be difficult to develop a precise definition of the term "corrosive gas" that would be universally applicable under all operating conditions. Corrosion may also be caused or facilitated by the activity of microorganisms living on the pipe wall. Referred to as microbiologically influenced corrosion, or MIC, this type of corrosion can occur when microbes and nutrients are available and where*

water, corrosion products, deposits, etc., present on the pipe wall provide sites favorable for the colonization of microbes. Microbial activity, in turn, may create concentration cells or produce organic acids or acid-producing gases, making the environment aggressive for carbon steel. The microbes can also metabolize sulfur or sulfur compounds to produce products that are corrosive to steel or that otherwise accelerate the attack on steel.

"Did not observe anyone performing internal inspection of section of steel service pipe removed."

There were a total of 3 observations in this category with 2 in the "Lowest."

- The field observers indicated that they did not observe anyone performing internal inspection on steel pipe when removed.

4. Observed Cathodic Protection Installation: *A technique to reduce the corrosion of a metal surface by making that surface the cathode of an electrochemical cell.*

100% Compliance

2.4.6 Customer Service

The subsection Customer Service scored well as far as the mechanical aspect but no observations are noted on completion dates and or customer satisfaction. As can be seen in Figure 9, the field observers scored an overall 100% compliance with 15 observations in this category.

Figure 9 - Customer Service

F. Customer Service	Highest 3	Neutral 2	Lowest 1
1. Completed Inside Leak Investigation	0	0	0
2. Completed Gas Service Pressure Check	0	13	0
3. Established Gas Service	0	1	0
4. Disconnected Gas Service	0	1	0

1. Completed Inside Leak Investigation: *Observe inside leakage investigation***.**

No observations are noted.

2. Completed Gas Service Pressure Check: *Pressure gas is defined as any delivery pressure at the outlet of the meter greater than 6" water column under full load conditions.*

100% Compliance

3. Established Gas Service: *Observe the procedures of establishing gas service.*

100% Compliance

4. Disconnected Gas Service: *Observe the procedures of disconnecting of a gas service.*

100% Compliance

2.5 Post-Operational Field Procedures

The subsection, Post-Operational Field Procedures, is associated with the records and documents aspects of the field operations. Field observers noted crew leaders had large amounts of paperwork associated with each work order, and numerous requests for the same information (example: require crew leader's signature nine times). Most crew leaders are paid an hour of overtime to complete paperwork at the end of the day, either at home or in the shop. It is noted by the field observers that existing maps have errors associated with foot lines and or pipe sizes and type. Subsection 99 - Other, relates to items not covered by the field inspection form and primarily relates to system recommendations. As can be seen in Figure 10, there are a total of 433 observations in this category with 3 in the "Highest" category and 3 in the "Lowest" category.

Figure 10 - Records & Documents

III. POST-OPERATIONAL FIELD PROCEDURES A. Records/Documents	Highest 3	Neutral 2	Lowest 1
1. Reviewed job checklist	0	56	0
2. Checked D4 card (if appropriate) for completeness	2	38	0
3. Checked D4 card (if appropriate) for accuracy	0	29	1
4. Checked yellow card (exposed pipe condition report) use	0	13	0
5. Reviewed yellow card when used for completeness	0	9	0
6. Reviewed yellow card when used for accuracy	0	8	0
7. Observed gas field order for completion	0	51	0
8. Reviewed materials quantities lists for completeness	0	44	0
9. Reviewed sketch checklist for compliance	0	33	0
10. Observed permits (where appropriate)	0	24	0
11. Reviewed as-built drawings for completeness	1	46	0
12. Reviewed as-built drawings for legibility	0	42	0
13. Reviewed as-built drawings for accuracy	0	30	2
14. Observed blue tag/card (continuing surveillance) procedure in operation	0	3	0
15. Observed blue tag/card procedure for completeness	0	1	0
16. Observed blue tag/card procedure for accuracy	0	0	0
99 Other:	0	0	0

1. Reviewed job checklist: *Observed use of a job checklist.*

100% Compliance

2. Checked D-4 card (if appropriate) for completeness: *A D-4 card is a permanent record that maps the exact service line route, from tie-in to meter set, at a residential or commercial*

building. It is used as a tool in Maps, Records, and Technology for recording all service information to the plat map, and for supplying service information back to the field upon request. Observe for completeness.

There are a total of 40 observations in this category with 2 in the “Highest” category.
“Highest” comments:

“Observers noted extra attention to completeness while filling out D-4 cards.”

3. Checked D-4 card (if appropriate) for accuracy: *A D-4 card is a permanent record that maps the exact service line route, from tie-in to meter set, at a residential or commercial building. It is used as a tool in Maps, Records, and Technology for recording all service information to the plat map, and for supplying service information back to the field upon request. Observe for accuracy.*

A total of 29 observations met the minimum requirements with 1 in the “Lowest” category.

“Foreman wrote "Cut and Cap" in the cut and cap box, along with measurements. Card was sent back to have remove "Cut and Cap."

4. Checked yellow card (exposed pipe condition report) use: *Observe the use of the yellow card or the exposed pipe condition report.*

100% Compliance

5. Reviewed yellow card when used for completeness: *Observe the use of the yellow card or the exposed pipe condition report.*

100% Compliance

6. Reviewed yellow card when used for accuracy: *Observe the use of the yellow card or the exposed pipe condition report.*

100% Compliance

7. Observed gas field order for completion: *Review gas field order for completion***.**

100% Compliance

8. Reviewed materials quantities lists for completeness: *Observe materials list for quantities completeness***.**

100% Compliance

9. Reviewed sketch checklist for compliance: *Reviewed compliance of checklist***.**

100% Compliance

10. Observed permits (where appropriate): *Reviewed permits if required.*

100% Compliance

11. Reviewed as-built drawings for completeness: *Observed as-built drawings for completeness.*

There are a total of 47 observations in this category with 1 in the "Highest" category.

"Crew leader used a stencil to complete as-built and wrote very clearly on card. He took great pride in the accuracy and completeness."

12. Reviewed as-built drawings for legibility: *Observed as-built drawings for legibility.*

100% Compliance

13. Reviewed as-built drawings for accuracy: *Observed as-built drawings for accuracy.*

A total of 30 observations met the minimum requirements with 2 in the "Lowest" category.

"Observer's comments as follows: "actual gas line location approximately 6' from curb. First locate indicated gas line as per as-built."

14. Observed blue tag/card (continuing surveillance) procedure in operation*: Observe continuing surveillance records card in operation.*

100% Compliance

15. Observed blue tag/card procedure for completeness: *Observe continuing surveillance records card for completeness.*

100% Compliance

16. Observed blue tag/card procedure for accuracy: *Observe continuing surveillance records card for accuracy.*

There are no observations in this category.

2.6 Quality Control - Service Provider Construction

The service providers both have Quality Control (QC) Programs that meet the minimums of Puget Sound Energy's (PSE) contractual specifications, but neither of the service providers had formal programs in place until requested. PSE required the QC programs covering all activities of its SPs as part of a settlement agreement with the UTC. The service providers programs respectively are similar, but were implemented in two distinctive methodologies:

- Pilchuck has assigned senior craft people to the QC follow fellow coworkers in a post project inspection only, while actual working crew inspection are conducted by supervisors. For their efforts, the senior craft people are compensated at 85% of union pay scale. QC observations are collected on a triplicate form and sent in to the office for scanning and then email.
- Potelco has assigned a senior supervisor to complete both post project and working crew inspections, as well as monitor their subcontractor. Observations are collected as notes and later entered via laptop for email distribution.

After photo documenting for records reporting, the service providers QC staff repairs deviations found in the field. Their programs are weighted heavily on above-ground cosmetic craftsmanship mainly at meter/riser. Neither company does random street excavations for visual inspections of welds, fusions, and tracer wire connections.

When deviations are discovered in the field, they are weighted the same no matter the potential liability. For example, a missing paint on a riser is equal to a bad weld/fusion. If a crew leader gets three deviations in a set time period he/she is put on a watch list and is inspected at a higher frequency.

QC observation findings consistent with both of the service providers are listed below:

- Program weighted heavily on standards and not procedures
- Changes in the standards/procedures come to service providers via an email and are distributed to crews for insertion into manuals. Supervisor will decide if the change requires additional training or a meeting to review
- Crews are not aware of a method for field information to get back to PSE for best practices
- Majority of the crews treat their manuals like a phone book and are slow to take out the old specifications and replace with the new
- Crews feel like there are too many changes to the Standards/Procedures manuals with very little explanation on what prompted the change
- Truck inventories of materials no longer used by PSE are not conducted
- Out-dated and broken gauges left on the vehicles. Gauges are poorly stored and get damaged in transit

- Both the QC staff and crews feel like there is an inconsistency among QA inspectors; one will say, “Okay,” and another say, “replace or fix”
- The QC program concentrates on the negative and not the positive
- No joint inspections of QA and QC staff (ride-alongs)
- No customer education on the QC program, QC staff avoids customer contact while inspecting
- No QC coverage during vacations because they can demonstrate that the PSE required inspection numbers have been met
- The QC staff is reviewing the jobs without prints or as-builds
- The QC staff is afraid to do more than PSE wants because they are afraid it would confuse the process
- They have full access to PSE for interpretation of a Standards or Procedures and PSE staff is timely in their reply

2.7 Quality Assurance - Service Provider Construction (PSE)

The PSE Quality Assurance team is comprised of experienced field gas distribution personnel. They not only bring to the QA program a hands-on approach, but also knowledge of the local area and any special municipality requirements. The QA team is close knit and communicates heavily via mobile phone, email and field photos on deviations and standards questions.

The QA inspection team is outfitted in vehicles with state-of-the-art communication systems and programs to perform real-time observations. QA reports, along with photos are sent via air cards to a mutual PSE photo gallery for other inspectors and supervisors to review. QA inspectors have almost immediate access to engineers for clarification on standards/procedures and or feedback on possible field changes and deviations. Inspectors are assigned to geographic areas in teams of two and rotate areas on a prescribed interval. One of their goals is not to double-team the same crew in the same day.

Observation Findings:

- QA inspectors try and start the day with working crew, but have trouble finding them randomly due to schedule errors
- Only inspect qualifications for actual work being preformed
- Cannot inspect all work until the contractor says job is complete. There have been issues in the past where contractor said he was coming back
- Inspecting without as-builds
- The inspection team is not involved with unit pricing or contracts even though they see units being performed in the field
- When deviations are found with a crew on site, they review with them the procedures/standards as described in the manuals

- General feelings among QA inspectors that the service providers do a good job of meeting the minimums, but few try to exceed
- Inspection team does not review D-4 cards
- Inspectors have given standards/procedures request change forms from the backs of their personal manuals to service provider field personnel requesting changes; they have yet to receive any back
- They do not excavate under hard surfaces to QA, and as a result they only hand excavate around the riser on a new construction for depth and piping protection
- The PSE inspection form is “key stroke hungry” and requires all fields to be completed no matter how small the inspection is
- The inspection team does not look at safety. They can only shut-down the job if it is deemed life threatening to the crew or the public

3.0 Service Provider - Locating

The locating services for PSE are provided by two vendors: Locating Inc. and Central Locating Services (CLS) each working on a unit contract. Both of the locating companies have a national footprint with a lengthy tenure locating experience. The companies are assigned areas by contractual county designation and provide services for other utilities that cross county lines. Figure 11, is summary table of locating service provider attributes that were reviewed:

Figure 11 - Service Provider Attributes

	Locating Inc.	CLS
Training	4-6 Weeks Class/Field	4-6 Weeks Class/Field
Safety	Meet Requirements	Exceed Requirements
Locating Equipment	Metrotech/ Radio Detection	Radio Detection
Mobile Wireless Computers	Yes	Yes
Real-Time Ticket System	Yes	Yes
Field Pictures of Every Locates	No	Yes
Quality Control Program	Yes: Field Assignment to Senior Locators	Yes: Supervisor Inspections of Photos and Field Visits

Each of the companies has similar training programs that combine classroom studies with hands-on field training for four to six weeks. There is a local trainer for each locating company that oversees the training of new employees and helps with continuing education.

Safety programs for each of the locating companies meet industry standards with CLS exceeding. Both programs have weekly meetings, incentives, disciplinary, and continuing education, traffic assistance, but CLS has the vehicle walk around, locate photos and 800 “how is my driving”, and wrist bands that state “get home safely.”

Quality control programs are similar in both companies but managed from different levels. Locating Inc. has assigned four senior locators to QC post locates and investigate damage claims with information being forwarded to their perspective supervisor. CLS manages a QC program from daily photo audits and a monthly field count inspections with both the locator and post inspections.

Mapping updates are quarterly via CD ROMs with a version number; for example, version 61. It appeared to the locating vendors that there was a considerable lag for updates to reach their laptops, and they both requested greater accuracy and more frequent updates.

4.0 Service Provider - Leakage Survey

The walking leakage survey is outsourced to the service provider, Heath Consultants, on a mixture of units and incidental hourly rates. Heath Consultants has been established since 1933 with their main focus on leakage detection and damage prevention. Heath has established three points of dispatch in the PSE service provider area: north, central, and south. There are six to eight employees and one team leader working out of each of the dispatch points. The leak surveyors meet in the morning and turn in the previous day's production, time sheets and receive new work areas for survey. They review with the crew leader any AOC's (Abnormal Operating Conditions), Blue Cards, and CGI forms (Can't Get In).

Training:

The leakage surveyors receive two days of class room training followed with two weeks in depth field training. They are Operator Qualified for three covered tasks: patrol; corrosion; and leak survey.

Quality Control:

There are two integral parts to the Heath QC program: pre-placed meter cards; and team leader re-walks. The pre-placed meter cards are placed randomly on meters by the team leader in advance of the surveyors. This program is to insure that each meter is physically inspected and guarantees standardization among the surveyors. The second part of the program is random re-walks of completed leakage surveyor prints by the crew leader to verifying mapping information and leakage results.

Safety:

The team leader conducts weekly safety meetings where they read out of their personal safety notebook and discuss current safety issues. The leakage surveyors are very field conscious about safety since they are constantly in traffic. Surveyors wear traffic vests and walk against traffic so that they can establish two-way visual contacts with motorists. Surveyors park their vehicles (company or personal) in positions to protect themselves and the public, coning both the front and rear for visual awareness.

The walking leakage surveyors announce each time before they enter private property, "PSE doing a safety survey." Dogs are their second greatest risk of injury (first are slips and falls). Surveyors carry small collapsible umbrellas that they open to deter dogs from biting. If they can't gain access, they leave a door hanger and notify PSE who calls the home owner to schedule access.

Walking Leakage Survey:

The walking leakage survey is completed every three years. With the advent of AMR (Automated Meter Reading), the meters are only visited and inspected during these leakage

surveys. The surveyor starts his route by calibrating his DP-4 portable flame ionization detector. This consists of changing filters and using the hydrocarbons in butane lighter to verify detection.

Then they take their paper print furnished by PSE and establish their route. The surveyor walks both sides of the road even if the print shows the main just on one side. Customer services are checked walking in and out; the meter is inspected for atmospheric corrosion and clearances from sources of ignition. If there is atmospheric corrosion or other violations, the meter information is taken down so they can fill out an AOC or Blue Card. If the surveyor detects a meter leak, they then soap test the fittings for the exact location and severity.

The gas distribution prints are the standard flat line and not GIS (Geographic Information System). There seemed to be inaccuracies with both the roads and the house numbers on each of the three prints which we worked. The surveyor highlighted the area so that when the as-builds were turned in, PSE could make corrections.

There is no consistency in the meter locations and the prints aren't much help in finding the meters. The surveyor's production varies with location and density of homes, but they average 6000-10,000 feet of main and 40 to 80 services per day. All services length are calculated at 87 feet and all main is double walked (both sides of the street).

Field observations with deviations noted in the two days of the walking leakage survey:

- Riser with missing tracer wire
- Atmospheric corrosion on one meter
- Meter set that needed a guard post due to RV parking
- Two meters that had been installed for ten years that were not tied into house lines and appeared to have had AMR added later
- House with a gas service not on the print

5.0 PSE Employees

5.1 Labor Pool

The Puget Sound Energy labor pool is primarily comprised of employees that are hired and trained from the ground up (homegrown). They are members in a bargaining agreement that is seniority-based; this is used as the basis for movement within the company.

For the most part the work force interviewed ages range from 30's to 60's with an average of 10-30 years field work experience. All employees observed are highly experienced-trained professionals and prideful of their contribution to the integrity of the gas piping system.

5.2 Field Observation Form and Data Collected

The Field Observation form is designed to capture measurable unbiased data points for analysis. Each section is designed by work activities so that granulated data can be collected within the large scope of work activities. The form went through considerable field beta testing before finalization and application.

The form has three basic sections of operational functions: 1. Pre-Operational Field Procedures, 2. Operational Field Procedures, 3. Post Operational Field Procedures. Each of these sections is further divided into subsets for data aggregation and reflection of the work functions.

There are four columns of expression in the Compliance Levels Scoring Section each with a numeric value (Highest-3, Neutral-2, Lowest-1, and NA-0). The Field Observation forms design is an enhancement over a typical pass or fail in that it gives a value to efforts that Exceeds Compliance (Highest) or Fail-Does Not Meet Compliance Levels (Lowest). It should be noted that the Jacobs field observers are directed to make written comments and or take photos for all observations receiving a numeric value of 1 or 3.

In order to ensure high confidence in the observation findings, a broad and adequate number of audits needed to be conducted and a sufficient number of line items needed to be observed and evaluated. In total 153 PSE – O&M audits were conducted. These audits resulted in 951 line items being evaluated. Figure 12 highlights the overall expectation percentage evaluated for the PSE O&M activities. PSE received a score of 946 out of 951 line items, of which met compliance expectations. This equates to PSE achieving an overall compliance percentage of 99.4%.

Figure 12 - PSE Employee Operation and Maintenance

PSE Employees:	Rank 3 Above Expectation	Rank 2 Expectation Met	Rank 1 Below Expectation	Total Field Observations
PSE Employees	0	946	5	153

5.3 Pre-Operational Field Procedure Worker and Site Safety

Worker and site safety are of the utmost importance in keeping the public and PSE employee's safe during construction activities. The PSE employees use safe work practices and local knowledge of road traffic to protect both themselves and the motorist during field activities.

The data demonstrates 100% compliance to safe work practices.

The field observer attended both tail gate and safety meetings where active participation from the employees was noted. In reviewing personal safety, field observers also inspected documentation of First Aid/CPR training, Competent Person (Shoring Training) and Flagging Cards for compliance with the State of Washington.

The field observers also inspected for adherence to the Washington Dig Laws and proper excavation techniques around existing utilities. It was observed that all excavation crews understood and were well trained in hand exposing around utility locates, crews also used field experience to determine if there were possible utilities not identified.

All safety equipment met current inspection requirements. As shown in Figure 13, in total there are 188 observations meeting 100% compliance.

Listed below is a review of the field observations.

Figure 13 - Worker and Site Safety

I. PRE-OPERATIONAL FIELD PROCEDURES	Highest	Neutral	Lowest
A. Worker and Site Safety	3	2	1
1. Located Facilities – paint, signs, markers	0	25	0
2. Located Potential Ignition Sources	0	12	0
3. Implemented Emergency Conditions	0	2	0
4. Accidental Release of Gas Controlled	0	1	0
5. Ground Movement (subsidence, erosion, slides) Controlled	0	5	0
6. Review Worker Safety Equipment	0	143	0

1. Located Facilities – paint, signs, markers:

Locate refers to the process of determining the existence and location of an underground facility and indicating that location through the use of stakes, flags, paint or some other customary

manner. Such markings identify the location of the underground facility so that excavators can avoid damage to the facility when digging.

100% Compliance

2. Located Potential Ignition Sources:
Refers to sources of ignition: static discharge, high temperatures, open flames, electrical devices and outlets.

100% Compliance

3. Implemented Emergency Conditions:
This refers to keeping the public and employees safe while mediating an emergency, this includes pre-determined notification sequence.

100% Compliance

4. Accidental Release of Gas Controlled:
Accidental release of gas while performing monitored release of gas where the flow of gas is in constant control through the use of an acceptable control valve.

100% Compliance

5. Ground Movement (subsidence, erosion, slides) Controlled*:*
To mitigate the movement of soil during deep excavations with the use of shoring, benching, and or pilings. Includes protection from erosion and slides using safe environmental methodology.

100% Compliance

6. Review Worker Equipment Safety:
Refers to employees wearing their PPE (Personal Protection Equipment), hardhats, vests, hearing and eye protection, and the proper foot wear. This category also included site protection such as equipment chalks, traffic signs, cones, barricades, and flagging.

100% Compliance

5.4 Procedural Check List

PSE employees are more than congenial to offer their cards for review and understand their importance. As shown in Figure 14, there are a total of 409 observations in this category of Procedural Check List with one receiving a score of 1 - the “Lowest” category.

Figure 14 - Procedural Checklist

B. Procedural Check list	Highest 3	Neutral 2	Lowest 1
1. Completed Procedural Review	0	37	1
2. Completed Equipment Review	0	3	0
3. Completed Safety Protocol for Given Procedure	0	21	0
4. Completed Qualification Card	0	116	0
5. Reviewed Procedure Manuals	0	104	0
6. Equipment Calibration Current	0	127	0

1. Completed Procedural Review:
Refers to following practices set forth in the Standards/Procedural Manual.

A total of 37 observations met the compliance requirements with 1 in the “Lowest” “Not Meeting Compliance Standards.”

“Poor quality district regulator data sheets, no MAOPs listed, wrong regulator design pressures and confusing as still contains details of previously removed equipment. Stream 1 - no regulator lockup (marginal). Low system risk (large downstream volume), but still rebuild anyway.”

2. Completed Equipment Review:
The review of equipment associated with observable work activities.

100% Compliance

3. Completed Safety Protocol for Given Procedure:
The preparation of a procedure with the proper safety equipment and following safety precautions on the job.

100% Compliance

4. Completed Qualification Card:
Weld, Fusion, Mechanical Joints, Hot Tap Data Card. This pertains to all individuals who have qualification cards whether they are performing qualified work or not.

100% Compliance

5. Reviewed Procedure Manuals:
Having a current copy of the Gas Operating Standards and Gas Field Procedures available at the job site. Also applies to personnel not working under the direct supervision of the job foreman such as a laborer watching joint trench sanding.

100% Compliance

6. Equipment Calibration Current:
Defined as complete check of all equipment or tools needed for a job verifying calibration dates.

100% Compliance

5.5 Operation Field Procedures – PSE O&M

It was the field observer's initiative to observe as many different work functions associated with the yearly activities of the PSE O&M crews. This edict offered a wide range of activities that on an average was a one-person work.

All excavations were by hand and to depth with backfill requirements being followed with good compaction techniques.

Meter sets were picture perfect and inspected with hand mirrors to assure that the underside was paint protected. All fittings were soap tested for leaks.

There are a total of 70 observations in this category and 1 observation in the "Lowest" "Not Meeting Compliance" and can be reviewed in Figure 15.

Figure 15 – Construction

II. OPERATIONAL FIELD PROCEDURES	Highest	Neutral	Lowest
A. Construction	**3**	**2**	**1**
1. Observed Backhoe/Trencher Equipment	0	0	0
2. Observed Boring Equipment	0	0	0
3. Observed Pipeline Crossing Construction	0	0	0
4. Observed Cover and Pipe Depth	0	15	1
5. Observed Clearance, Underground	0	3	0
6. Observed Pipe Installation (laying, inserting)	0	0	0
7. Observed Abandoning/Retiring Facilities	0	0	0
8. Observed Coating Inspection	0	21	0
9. Observed Valve Installation – main, service, excess flow	0	2	0
10. Observed Repair Fitting	0	1	0
11. Observed Tapping Tee and Stopping	0	1	0
12. Observed Purging	0	1	0
13. Observed Pressure Test/Leak Test	0	3	0
14. Observed Tracer Wire Installation	0	4	0
15. Observed Steel/Plastic Reinforcement	0	1	0
16. Observed Backfill and compaction	0	7	0
17. Observed Meter Set Installation	0	10	0

1. Observed Cover and Pipe Depth:
Refers to the minimum cover required in PSE Standards which must be in place over natural gas main or service before installation crew can leave it gassed up. And the minimum installation depth requirements permitted by municipalities. Reinforced concrete cap in lieu of pipe depth is also inspected under this item.

There are a total of 16 observations in this category with 1 in the “Lowest” “Not Meeting Compliance Standards”.

“Observed a section of exposed 20 inch casing that has a 16 inch high-pressure in it. PI had previously turned in as Blue Card for cover and it had not been completed yet. He has it on a watch monitor until covered.”

2. Observed Clearance, Underground:
This pertains to clearances from underground encroachments (non gas facility) such as other utilities (pipe, wires, guys, posts, poles), sewer, storm pipes, underground vaults, septic tanks, buildings (footings, foundations), steam lines, obstacles (piles, deadman, very large boulders), etc.

100% Compliance

3. Observed Pipeline Installation (laying, inserting):
Inspecting inserted mains or services in PVC conduit and inserting pipe (PE or Steel) in existing facilities

There are no observations in this category.

4. Observed Abandoning/Retiring Facilities:
Abandonment indicates that a company has received approval from the regulator to cease providing a particular service (e.g., to permanently shut down operation of a particular pipeline or facility) under that regulatory agency's jurisdiction. Abandonment also refers to the process and actions taken by a company at the end of the useful life of a pipeline or pipeline facility to gain approval from the regulator. This process requires that the Company follow strict guidelines regarding

There are no observations in this category.

5. Observed Coating Inspection:
Coating requirements for painting of all exposed metal surfaces on meter set assemblies. Inspection includes all pipes upstream of the outlet spud including the spud. Customer fuel line is not included in this inspection.

100% Compliance

6. Observed Valve Installation – main, service, excess flow:
Observe the installation of a mechanical valve and verify it' operational condition and protection for future access.

100% Compliance

7. Observed Repair Fitting:
Repair a damaged or defective fitting to meet PSE requirements.

100% Compliance

8. Observed Tapping Tee and Stopping*:*
Observe tapping and stopping of all steel and PE pipe in accordance with PSE Standards and Procedures.

100% Compliance

9. Observed Purging*:*
Refers to purging of both steel and PE of air, water, and gas following the guidelines set forth in the Standards and Procedures manuals: includes static protection and CGI for gas mixture.

100% Compliance

10. Observed Pressure Test/Leak Test:
All new temporarily abandoned, relocated or replaced pipelines shall be tested before being placed in service. Also covers pre-tested repair pipe and soap test of MSA. This test pertains to leak testing of steel and PE pipelines whether new, temporarily disconnected, or replaced before being gassed up. Also covers pre-tested repair pipe. Does not cover nitrogen or hydrostatic strength tests.

100% Compliance

11. Observed Tracer Wire Installation:
Proper installation of locate (tracer) wire. Anode installations for locate wire are audited under this inspection item and not the CP requirements inspection item.

100% Compliance

12. Observed Steel/Plastic Reinforcement:
The act or process of reinforcing or strengthening of pipes with steel or plastic material.

100% Compliance

13. Observed Backfill and Compaction:
Refers to backfilling over and under gas piping with approved fill, and compacting trenches to meet to meet PSE Standards or local permitting requirements.

100% Compliance

14. Observed Meter Set Installation:
Refers to the installation of meter setting in accordance with the Standards and Procedure manual. Includes: clearances from ignition sources, vents, and opening closing windows, testing, calibrating, painting fittings, information tags, and locking riser cock.

100% Compliance

5.6 Joining

The field observers documented 8 observations of pipe joining while reviewing crew activities. All the observations met 100% compliance levels and can be viewed in Figure 16.

Figure 16 - Joining

B. Joining	Highest 3	Neutral 2	Lowest 1
1. Observed Plastic Pipe (Fusion)	0	0	0
2. Observed Welding – Arc, Thermite	0	6	0
3. Observed Mechanical Coupling	0	2	0

1. Observed Welding – Arc, Thermite:

Welding of all steel mains and services. A manned fire extinguisher shall be present when welding (GFP 4700.1210 step 3, OS 2575.2000 sec 4.3).Only those welders with active cards shall be permitted to weld on Company piping (OS 2700.1100 sec 3.2.1). When installing a bare steel casing, a welder who is qualified through training and experience shall perform the weld (OS 2525.1900 sec 3.6). Common welding practices followed when welding steel pipe (GFP 4900.1000). Specific procedure followed for type of welding being performed (GFP 4900.1300-2100). Transition fittings welded to steel pipe kept continuously wet with a rag placed over the transition and PE portions of the fitting (GFP 4900.1120 step 1).Transition fitting has not had the steel portion shortened (GFP 4900.1120 step 3).When using mechanical line stoppers or LP bags to isolate a section of pipe, welding work shall not be performed within 18 inches of a stopper (unless approved by Quality Assurance Inspector) or against an LP bag. (OS 2575.2000 sec 3.4.2). No welder may weld on the Company piping system with a particular welding process unless, within the preceding 6 calendar months, the welder has engaged in welding with that process (OS 2700.1100 sec 6.1).

100% Compliance

2. Observed Mechanical Coupling:

Joining pipe using means other than welding or fusion. Procedures followed when joining pipe with flanged fittings (GFP 4610.1000). Follow the specified torque requirements for flanged fittings (GFP 4610.1000 pg 4 table2 & 3). Follow the specified bolt tightening sequence for flanges (GFP 4610.1000 pg 5 fig. 1). Procedures followed when joining pipe with Dresser compression fittings (GFP 4610.1010). Procedures followed when joining pipe with Continental compression fittings (GFP 4610.1020). Procedures followed when joining pipe with Lycofit mechanical fittings (GFP 4610.1030). Procedures followed when joining threaded pipe (GFP 4610.1040).Procedures followed when using Lycofit stop and go (GFP 4610.1030 pg 2). Welded service tee fitting has cooled before installing PE pipe into Continental fitting (GFP 4610.1020 pg 1, step 3). Shear point protected where PE pipe connects to Continental service tees fitting (GFP4610.1020 pg 2, step 10). Notes and Best Practices: When joining pipe, PE pipe must be inspected to ensure there are no cuts, gouges, or scrapes deeper than 10% of the wall thickness (OS 2525.1200 sec 6.13). This requirement should be checked under the Inspection Item: Pipe – General Installation/Retirement Requirements.

100% Compliance

5.7 Operating &Maintenance

The field observers documented 39 observations of Section C - Operating & Maintenance while reviewing crew activities. All the observations met 100% compliance levels and can be viewed in Figure 17.

Figure 17 - Operating and Maintenance

C. Operating & Maintenance	Highest 3	Neutral 2	Lowest 1
1. Observed Facility Protection – Fence, Locks, Posts	0	10	0
2. Observed Metering	0	6	0
3. Observed Operating and Maintaining Valves	0	12	0
4. Observed Inspecting Pressure Regulating and Limiting	0	11	0

1. Observed Facility Protection – Fence, Locks, and Posts*:*
Pertains to above ground facilities that are installed or located in the proximity of vehicles which could potentially cause damage to the facility. This inspection item is also applicable when facilities are located in protective areas in lieu of guard posts.

100% Compliance

2. Observed Metering:
Observe the setup and calibration of meters.

100% Compliance

3. Observed Operating and Maintaining Valves:
This valve is installed for the purpose of controlling the flow of gas in the service.

100% Compliance

4. Observed Inspecting Pressure Regulating and Limiting:
Observe equipment that under abnormal conditions will act to reduce, restrict, or shut-off the supply of gas flowing into a pipeline to prevent the gas pressure from exceeding a predetermined value. A pressure limiting station may be integral to a pressure regulating station. A pressure-reducing station that automatically regulates the pressure in the downstream main to which it is connected. Includes piping and auxiliary devices such as valves, control instruments, control lines, and the enclosure.

100% Compliance

5.8 Gas Leaks

The field observers scored an overall 100% compliance with 23 observations in this category and can reviewed in Figure 18.

Figure 18 - Gas Leaks

D. Gas Leaks	Highest 3	Neutral 2	Lowest 1
1. Observed Recognizing and Reporting Gas Leak	0	3	0
2. Observed Leak Survey and Patrols	0	7	0
3. Observed Gas Detectors	0	11	0
4. Observed Leak Classification	0	2	0
5. Observed Bar Hole Test and Purging	0	0	0

1. Observed Recognizing and Reporting Gas Leak:
Observed the procedures for recognizing and following notification processes.

100% Compliance

2. Observed Leak Survey and Patrols*:*
Observed leak surveyors' patrols and processes.

100% Compliance

3. Observed Gas Detectors:
Observed the uses of gas detectors that were approved by PSE Standards.

100% Compliance

4. Observed Leak Classification:
The classifications of leaks with accordance to PSE Standards using combustible gas indicator.

100% Compliance

5. Observed Bar Hole Test and Purging:
A hole made in the soil or pavement for the specific purpose of testing the subsurface atmosphere with a combustible gas indicator and the release from the confined area.

There are no observations in this category.

5.9 Corrosion Control

The field observers documented 136 observations with 1 scored in the “Lowest” “Not Meeting Compliance Standards” and can be reviewed in Figure 19 below.

Figure 19 - Corrosion Control

E. Corrosion Control	Highest 3	Neutral 2	Lowest 1
1. Corrosion Control Observed: Atmospheric -Condition, Painting/Coating	0	36	1
2. Corrosion Control Observed: External - Condition, Coating	0	18	0
3. Corrosion Control Observed: Internal	0	1	0
4. Observed Cathodic Protection Installation	0	80	0

1. Corrosion Control Observed: Atmospheric -Condition, Painting/Coating:
The deterioration of material, usually a metal, caused by exposure to the atmosphere and evidenced by pitting or surface rust. Observed the use of paint and or coatings to prevent atmospheric corrosion.

There are a total of 37 observations in this category with 1 in the “Lowest” “Not Meeting Compliance Standards.”

“Meter set had significant atmospheric corrosion. Reviewed D-4 from previous service turn-off, card showed no work order to paint meter set.”

2. Corrosion Control Observed: External - Condition, Coating:
Observed external coating of steel pipe for signs of damage to coating.

100% Compliance

3. Corrosion Control Observed: Internal:
Corrosion on the internal wall of a natural gas pipeline can occur when the pipe wall is exposed to water and contaminants in the gas, such as O_2, H_2S, CO_2, or chlorides. The nature and extent of the corrosion damage that may occur are functions of the concentration and particular combinations of these various corrosive constituents within the pipe, as well as of the operating conditions of the pipeline. For example, gas velocity and temperature in the pipeline play a significant role in determining if and where corrosion damage may occur. In other words, a particular gas composition may cause corrosion under some operating conditions but not others. Therefore, it would be difficult to develop a precise definition of the term "corrosive gas" that would be universally applicable under all operating conditions. Corrosion may also be caused or facilitated by the activity of microorganisms living on the pipe wall. Referred to as microbiologically influenced corrosion, or MIC, this type of corrosion can occur when microbes

and nutrients are available and where water, corrosion products, deposits, etc., present on the pipe wall provide sites favorable for the colonization of microbes. Microbial activity, in turn, may create concentration cells or produce organic acids or acid-producing gases, making the environment aggressive for carbon steel. The microbes can also metabolize sulfur or sulfur compounds to produce products that are corrosive to steel or that otherwise accelerate the attack on steel.

100% Compliance

4. Observed Cathodic Protection Installation:
A technique to reduce the corrosion of a metal surface by making that surface the cathode of an electrochemical cell.

100% Compliance

5.10 Customer Service

The field observers scored an overall 100% compliance with 36 observations in this category as reviewed in Figure 20.

Figure 20 - Customer Service

F. Customer Service	Highest 3	Neutral 2	Lowest 1
1. Completed Inside Leak Investigation	0	9	0
2. Completed Gas Service Pressure Check	0	1	0
3. Established Gas Service	0	21	0
4. Disconnected Gas Service	0	5	0

1. Completed Inside Leak Investigation:
*Observe inside leakage investigation***.**

100% Compliance

2. Completed Gas Service Pressure Check:
Pressure gas is defined as any delivery pressure at the outlet of the meter greater than 6 inch water column under full load conditions.

100% Compliance

3. Established Gas Service:
Observe the procedures of establishing gas service.

100% Compliance

4. Disconnected Gas Service:
Observe the procedures of disconnecting of a gas service.

100% Compliance

5.11 Post-Operational Field Procedures

There are a total of 42 observations in this category 2 in the “Lowest” “Not Meeting Compliance Standards” and can be reviewed in Figure 21.

Figure 21 - Post-Operational Field Procedures

III. POST-OPERATIONAL FIELD PROCEDURES A. Records/Documents	Highest 3	Neutral 2	Lowest 1
1. Reviewed job checklist	0	4	0
2. Checked D4 card (if appropriate) for completeness	0	1	1
3. Checked D4 card (if appropriate) for accuracy	0	1	1
4. Checked yellow card (exposed pipe condition report) use	0	2	0
5. Reviewed yellow card when used for completeness	0	2	0
6. Reviewed yellow card when used for accuracy	0	2	0
7. Observed gas field order for completion	0	15	0
8. Reviewed materials quantities lists for completeness	0	0	0
9. Reviewed sketch checklist for compliance	0	5	0
10. Observed permits (where appropriate)	0	0	0
11. Reviewed as-built drawings for completeness	0	2	0
12. Reviewed as-built drawings for legibility	0	3	0
13. Reviewed as-built drawings for accuracy	0	3	0
14. Observed blue tag/card (continuing surveillance) procedure in operation	0	0	0
15. Observed blue tag/card procedure for completeness	0	0	0
16. Observed blue tag/card procedure for accuracy	0	0	0

1. Reviewed job checklist:
Observed use of a job checklist.

100% Compliance

2. Checked D-4 card (if appropriate) for completeness:
A D-4 card is a permanent record that maps the exact service line route, from tie-in to meter set, at a residential or commercial building. It is used as a tool in Maps, Records, and Technology for recording all service information to the plat map, and for supplying service information back to the field upon request. Observe for completeness.

There are a total of two observations in this category with 1 being in the “Lowest” “Not Meeting Compliance Standards.”

"Service Technician returned for service re-lights and the D-4 showed no work order to paint meter set that had noticeable corrosion."

3. Checked D-4 card (if appropriate) for accuracy:
A D-4 card is a permanent record that maps the exact service line route, from tie-in to meter set, at a residential or commercial building. It is used as a tool in Maps, Records, and Technology for recording all service information to the plat map, and for supplying service information back to the field upon request. Observe for accuracy.

There are a total of two observations in this category with 1 being in the "Lowest" "Not Meeting Compliance Standards."

"Service Technician returned for service re-lights and the D-4 showed no work order to paint meter set that had noticeable corrosion."

4. Checked yellow card (exposed pipe condition report) use:
Observe the use of the yellow card or the exposed pipe condition report.

100% Compliance

5. Reviewed yellow card when used for completeness:
Observe the use of the yellow card or the exposed pipe condition report.

100% Compliance

6. Reviewed yellow card when used for accuracy:
Observe the use of the yellow card or the exposed pipe condition report.

100% Compliance

7. Observed gas field order for completion:
*Review gas field order for completion***.**

100% Compliance

8. Reviewed sketch checklist for compliance:
*Reviewed compliance of checklist***.**

100% Compliance

9. Reviewed as-built drawings for completeness:
Observed as-built drawings for completeness.

100% Compliance

10. Reviewed as-built drawings for legibility:
Observed as-built drawings for legibility.

100% Compliance

11. Reviewed as-built drawings for accuracy:
Observed as-built drawings for accuracy.

100% Compliance

JACOBS CONSULTANCY

Appendix 1

Service Provider Audit Locations

	City	# of jobs observed in that city	Rank High	Rank Low
1	Auburn	5	0	0
2	Bellevue	5	0	0
3	Bonney Lake	2	0	0
4	Bothell	1	0	0
5	Burien	5	0	0
6	Centralia	2	0	0
7	Covington	1	0	0
8	Des Moines	1	0	0
9	Edmonds	1	0	0
10	Everett	8	0	0
11	Federal Way	2	0	0
12	Gig Harbor	2	0	3
13	Kenmore	1	0	0
14	Kent	3	0	0
15	Kirkland	2	0	1
16	Lacey	3	0	0
17	Lakewood	4	1	0
18	Lynnwood	3	0	0
19	Maple Valley	1	0	0
20	Marysville	8	0	1
21	Monroe	1	0	1
22	Mukilteo	3	0	0
23	North Bend	1	0	0
24	Olympia	3	0	0
25	Pacific	2	0	0
26	Puyallup	4	9	0
27	Redmond	7	0	0
28	Renton	2	0	0
29	Sammamish	1	0	0
30	Seattle	49	1	4
31	Shoreline	3	0	4
32	Snohomish	1	0	0
33	Spanaway	2	2	0
34	Sumner	3	0	0
35	Tacoma	9	0	1
36	University Palace	1	0	1
37	Woodinville	2	0	0
38	Yelm	2	0	0
	Total Jobs:	**156**	**13**	**16**

JACOBS CONSULTANCY

Appendix 2A

PSE Audit Locations

	City	# of jobs observed in that city	**Rank 3** Above Expectation	**Rank 2** Expectation Met	**Rank 1** Below Expectation
1	Auburn	1	0	6	0
2	Black Diamond	1	0	6	0
3	Bonney Lake	1	0	13	0
4	Bothell	1	0	11	0
5	Burien	2	0	18	0
6	Centralia	1	0	5	0
7	Clearview	1	0	8	0
8	Covington	1	0	6	0
9	Edwards	1	0	11	0
10	Everett	3	0	27	3
11	Federal Way	2	0	17	1
12	Gig Harbor	1	0	2	0
13	Issaquah	5	0	20	0
14	Kent	20	0	100	0
15	King	1	0	2	0
16	Kirkland	1	0	13	0
17	Kittitas	1	0	2	0
18	Lacey	1	0	1	0
19	Lakewood	1	0	7	0
20	North Bend	1	0	6	0
21	Olympia	6	0	15	0
22	Puyallup	15	0	126	0
23	Redmond	2	0	17	0
24	Renton	2	0	14	0
25	Seattle	20	0	142	0
26	South King	1	0	4	0
27	Sumner	1	0	4	0
28	Tacoma	57	0	319	1
29	Woodinville	2	0	24	0
	Total Jobs:	**153**	**0**	**946**	**5**

Overall Total	**951**

JACOBS CONSULTANCY

Appendix 2B

Service Provider Crew Leaders

No.	Crew Leader	# of Times Spotted	Ranked 3	Ranked 2	Ranked 1
1	Aaron Holmes	4	0	31	0
2	Andy Baunsgard	2	0	16	0
3	Anthony Fay	3	2	39	0
4	Ariel Gates	1	0	14	0
5	Bartelson	1	0	1	3
6	Beverly Gordon	3	0	27	0
7	Bo Bowling	2	0	17	0
8	Brett Cullum	1	0	13	0
9	Brian Hunt	1	0	6	0
10	Chris Ellis	3	0	74	0
11	Chuck Pierce	2	0	30	3
12	Craig Austin	2	0	62	0
13	Cricket Shires	6	0	92	0
14	Dave Berka	1	0	12	0
15	David Nichols	4	0	40	0
16	Derrick Layher	1	0	8	0
17	Don Smith	1	0	12	1
18	Duane Flynn	2	0	40	0
19	Eric Miller	1	0	21	0
20	Frank Grab	3	0	52	0
21	Garrett Kelderman	1	0	6	0
22	Gary Inglin	1	0	29	0
23	Glen Fair	2	0	71	4
24	Hallie Blankenship	3	0	79	0
25	J. Lackie	1	0	0	0
26	Jarin Pate	1	0	2	0
27	Jason Fladebo	5	0	99	0
28	Jason Paul	2	0	40	0
29	Jeff Wooden	1	0	8	0
30	Jim Cargill	1	0	2	0
31	Jim Hartman	2	0	18	0
32	Jim Kapelos	3	0	41	0
33	Jim McGrath	3	0	51	1
34	Jim Murray	2	0	15	0
35	Jimmy Allen	2	3	37	0
36	Jody Vorpahl	2	0	28	0
37	Joe Laskody	2	1	30	0
38	John Frederickes	1	0	11	0
39	John Ivanich	6	0	33	0
40	John Kohler	3	0	77	0

41	John Ringer	1	0	22	0
42	Jon Henderson	1	0	21	0
43	Justin Harris	2	0	51	0
44	Keith Matlock	2	0	36	0
45	Ken Miller	2	0	22	0
46	Kevin Banister	2	0	41	0
47	Kevin Canodau	2	0	35	0
48	Lupe Mejia	6	0	76	0
49	Mark Bowling	3	0	38	0
50	Matt Erb	1	0	14	0
51	Michael Hale	4	0	31	0
52	Mike Berhardy	1	0	5	0
53	Mike Blood	2	0	23	0
54	Mike Sawyer	4	6	20	1
55	Mike Sweet	2	0	30	0
56	Nick Summons	1	0	12	0
57	Norm Simpson	2	0	41	0
58	Phil Trulson	2	0	20	0
59	Proger Arrington	1	0	0	0
60	Randy Inama	1	0	5	0
61	Robert Clark	2	0	58	0
62	Roger Arrington	2	0	26	1
63	Roger Rowe	1	0	9	0
64	Ronald Wiediger	3	0	34	0
65	Roy Bryson	1	0	2	0
66	Rudy Rudolph	1	0	10	0
67	Stan Bouchard	1	1	20	0
68	Stephen Powe	1	0	23	0
69	Steve Boyd	2	0	20	0
70	Steve Lynch	2	0	41	0
71	Steve Mellinger	1	0	22	1
72	Todd Kilty	1	0	9	1
73	Tom Green	1	0	22	0
74	Tom Timm	1	0	15	0
75	Tony Glenn	2	0	30	0
76	Tracy Schatz	2	0	38	0
77	Travis Taylor	1	0	8	0
78	Vince Gourley	1	0	14	0
	TOTAL:	**156**	**13**	**2228**	**16**

JACOBS CONSULTANCY

Appendix 3

PSE Crew Individuals

No.	Crew Leader	# of Times Spotted
1	Alvin Schlecht	9
2	Arne Johansen	42
3	Bill Molden	1
4	Bye LaFreniere	1
5	Craig Ford	1
6	Cynthia Silvernale	2
7	Dave Montgomery	1
8	Dick Smith	4
9	Glen Hulton	3
10	Jerry Ruston	2
11	Jim Billings	6
12	John Batinovich	6
13	John Rockford	2
14	JW Hill	7
15	Keith Raines	1
16	Kirk Goodrich	3
17	Mark Babcock	16
18	Michael Ross	3
19	Mike Armstrong	1
20	Mike Cowin	3
21	Mike Dupuis	1
22	Rich Eberley	2
23	Rick Ferderer	1
24	Rick Shillander	2
25	Robin Hanson	6
26	Sam Gallaway	3
27	Scott Guthrie	13
28	Scott Husted	1
29	Stacey Sheets	1
30	Steve Durant	1
31	Terry Linnville	3
32	Tim Johnson	1
33	Tom Ramberg	1
34	Tom Vessey	2
35	Tonya Klippert	1
	TOTAL:	**153**

Appendix 4A

JACOBS Consultancy

FIELD OBSERVATION FORM

Jacobs Observer:	**Time:**	**Date:**	**File Name:** YYMMDD_SAP#
Inspection Location(s):	**City:**		**Compliance Levels:** Highest = Exceeded expectations of procedure
Weather Conditions:	**SAP/Work Order No:**		Neutral = Met procedure
Service Provider:	**Work Type:**		Lowest = Did not meet procedure
Contractor Rep Name and Title:			
PSE Rep Name and Title:			
PSE Employees Number Observed:	**Contractor Employees Number**		

I. PRE-OPERATIONAL FIELD PROCEDURES		Compliance Level				NOTES		
		Highest	Neutral	Lowest	NA			
A. Worker and Site Safety	Score	3	2	1	0			
1. Located Facilities – paint, signs, markers		0	0	0	0			
2. Located Potential Ignition Sources		0	0	0	0			
3. Implemented Emergency Conditions		0	0	0	0			
4. Accidental Release of Gas Controlled		0	0	0	0			
5. Ground Movement (subsidence, erosion, slides) Controlled		0	0	0	0			
6. Review Worker Safety Equipment		0	0	0	0			
						Scored	Potential	Percent
Compliance Level Totals/Percent		0	0	0	0	0	0	#DIV/0!
		Compliance Level				NOTES		
		Highest	Neutral	Lowest	NA			
B. Procedural Check list	Score	3	2	1	0			
1. Completed Procedural Review		0	0	0	0			
2. Completed Equipment Review		0	0	0	0			
3. Completed Safety Protocol for Given Procedure		0	0	0	0			
4. Completed Qualification Card		0	0	0	0			
5. Reviewed Procedure Manuals		0	0	0	0			
6. Equipment Calibration Current		0	0	0	0			
						Scored	Potential	Percent
Compliance Level Totals/Percent		0	0	0	0	0	0	#DIV/0!
I. PRE-OPERATIONAL FIELD PROCEDURES SUBTOTALS		0	0	0	0	0	0	#DIV/0!
II. OPERATIONAL FIELD PROCEDURES		Compliance Level				NOTES		
		Highest	Neutral	Lowest	NA			
A. Construction	Score	3	2	1	0			
1. Observed Backhoe/Trencher Equipment		0	0	0	0			
2. Observed Boring Equipment		0	0	0	0			
3. Observed Pipeline Crossing Construction		0	0	0	0			
4. Observed Cover and Pipe Depth		0	0	0	0			
5. Observed Clearance, Underground		0	0	0	0			
6. Observed Pipe Installation (laying, inserting)		0	0	0	0			
7. Observed Abandoning/Retiring Facilities		0	0	0	0			
8. Observed Coating Inspection		0	0	0	0			
9. Observed Valve Installation – main, service, excess flow		0	0	0	0			
10. Observed Repair Fitting		0	0	0	0			
11. Observed Tapping Tee and Stopping		0	0	0	0			
12. Observed Purging		0	0	0	0			
13. Observed Pressure Test/Leak Test		0	0	0	0			
14. Observed Tracer Wire Installation		0	0	0	0			
15. Observed Steel/Plastic Reinforcement		0	0	0	0			
16. Observed Backfill and compaction		0	0	0	0			
17. Observed Meter Set Installation		0	0	0	0			
						Scored	Potential	Percent
Compliance Level Totals/Percent		0	0	0	0	0	0	#DIV/0!

B. Joining	Score	Compliance Level Highest 3	Neutral 2	Lowest 1	NA 0	NOTES
1. Observed Plastic Pipe (Fusion)		0	0	0	0	
2. Observed Welding – Arc, Thermite		0	0	0	0	
3. Observed Mechanical Coupling		0	0	0	0	
						Scored / Potential / Percent
Compliance Level Totals/Percent		0	0	0	0	0 / 0 / #DIV/0!

C. Operating & Maintenance	Score	Compliance Level Highest 3	Neutral 2	Lowest 1	NA 0	NOTES
1. Observed Facility Protection – Fence, Locks, Posts		0	0	0	0	
2. Observed Metering		0	0	0	0	
3. Observed Operating and Maintaining Valves		0	0	0	0	
4. Observed Inspecting Pressure Regulating and Limiting		0	0	0	0	
						Scored / Potential / Percent
Compliance Level Totals/Percent		0	0	0	0	0 / 0 / #DIV/0!

D. Gas Leaks	Score	Compliance Level Highest 3	Neutral 2	Lowest 1	NA 0	NOTES
1. Observed Recognizing and Reporting Gas Leak		0	0	0	0	
2. Observed Leak Survey and Patrols		0	0	0	0	
3. Observed Gas Detectors		0	0	0	0	
4. Observed Leak Classification		0	0	0	0	
5. Observed Bar Hole Test and Purging		0	0	0	0	
						Scored / Potential / Percent
Compliance Level Totals/Percent		0	0	0	0	0 / 0 / #DIV/0!

E. Corrosion Control	Score	Compliance Level Highest 3	Neutral 2	Lowest 1	NA 0	NOTES
1. Corrosion Control Observed: Atmospheric -Condition, Painting/Coating		0	0	0	0	
2. Corrosion Control Observed: External - Condition, Coating		0	0	0	0	
3. Corrosion Control Observed: Internal		0	0	0	0	
4. Observed Cathodic Protection Installation		0	0	0	0	
						Scored / Potential / Percent
Compliance Level Totals/Percent		0	0	0	0	0 / 0 / #DIV/0!

F. Customer Service	Score	Compliance Level Highest 3	Neutral 2	Lowest 1	NA 0	NOTES
1. Completed Inside Leak Investigation		0	0	0	0	
2. Completed Gas Service Pressure Check		0	0	0	0	
3. Established Gas Service		0	0	0	0	
4. Disconnected Gas Service		0	0	0	0	
						Scored / Potential / Percent
Compliance Level Totals/Percent		0	0	0	0	0 / 0 / #DIV/0!
II. OPERATIONAL FIELD PROCEDURES SUBTOTALS		0	0	0	0	0 / 0 / #DIV/0!

III. POST-OPERATIONAL FIELD PROCEDURES A. Records/Documents	Score	Compliance Level Highest 3	Neutral 2	Lowest 1	NA 0	NOTES
1. Reviewed job checklist		0	0	0	0	
2. Checked D4 card (if appropriate) for completeness		0	0	0	0	
3. Checked D4 card (if appropriate) for accuracy		0	0	0	0	
4. Checked yellow card (exposed pipe condition report) use		0	0	0	0	
5. Reviewed yellow card when used for completeness		0	0	0	0	
6. Reviewed yellow card when used for accuracy		0	0	0	0	
7. Observed gas field order for completion		0	0	0	0	
8. Reviewed materials quantities lists for completeness		0	0	0	0	
9. Reviewed sketch checklist for compliance		0	0	0	0	
10. Observed permits (where appropriate)		0	0	0	0	
11. Reviewed as-built drawings for completeness		0	0	0	0	
12. Reviewed as-built drawings for legibility		0	0	0	0	
13. Reviewed as-built drawings for accuracy		0	0	0	0	
14. Observed blue tag/card (continuing surveillance) procedure in operation		0	0	0	0	
15. Observed blue tag/card procedure for completeness		0	0	0	0	
16. Observed blue tag/card procedure for accuracy		0	0	0	0	
99 Other:		0	0	0	0	
						Scored / Potential / Percent
Compliance Level Totals/Percent		0	0	0	0	0 / 0 / #DIV/0!
III. POST-OPERATIONAL FIELD PROCEDURES SUBTOTALS		0	0	0	0	0 / 0 / #DIV/0!
Compliance Level GRAND TOTALS/Percent						0 / 0 / #DIV/0!

Notes

JACOBS CONSULTANCY

Appendix 4B

Service Provider-Lowest Ranked

I. PRE-OPERATIONAL FIELD PROCEDURES	Lowest
A. Worker and Site Safety	1
1. Located Facilities – paint, signs, markers	3
2. Located Potential Ignition Sources	0
4. Accidental Release of Gas Controlled	0
6. Review Worker Safety Equipment	4
	Lowest
B. Procedural Check list	1
1. Completed Procedural Review	0
6. Equipment Calibration Current	1
II. OPERATIONAL FIELD PROCEDURES	Lowest
A. Construction	1
3. Observed Pipeline Crossing Construction	0
4. Observed Cover and Pipe Depth	1
5. Observed Clearance, Underground	1
7. Observed Abandoning/Retiring Facilities	0
11. Observed Tapping Tee and Stopping	1
17. Observed Meter Set Installation	0
	Lowest
D. Gas Leaks	1
4. Observed Leak Classification	0
	Lowest
E. Corrosion Control	1
1. Corrosion Control Observed: Atmospheric -Condition, Painting/C	0
2. Corrosion Control Observed: External - Condition, Coating	0
3. Corrosion Control Observed: Internal	2
4. Observed Cathodic Protection Installation	0
III. POST-OPERATIONAL FIELD PROCEDURES	Lowest
A. Records/Documents	1
2. Checked D4 card (if appropriate) for completeness	0
3. Checked D4 card (if appropriate) for accuracy	1
11. Reviewed as-built drawings for completeness	0
13. Reviewed as-built drawings for accuracy	2
99 Other:	0
TOTAL:	16

Appendix 4C

PSE-Lowest Ranked

I. PRE-OPERATIONAL FIELD PROCEDURES	Lowest
A. Worker and Site Safety	**1**
1. Located Facilities – paint, signs, markers	0
2. Located Potential Ignition Sources	0
4. Accidental Release of Gas Controlled	0
6. Review Worker Safety Equipment	0
	Lowest
B. Procedural Check list	**1**
1. Completed Procedural Review	1
6. Equipment Calibration Current	0
II. OPERATIONAL FIELD PROCEDURES	**Lowest**
A. Construction	**1**
3. Observed Pipeline Crossing Construction	0
4. Observed Cover and Pipe Depth	1
5. Observed Clearance, Underground	0
7. Observed Abandoning/Retiring Facilities	0
11. Observed Tapping Tee and Stopping	0
17. Observed Meter Set Installation	0
	Lowest
E. Corrosion Control	**1**
1. Corrosion Control Observed: Atmospheric -Condition, Painting/Coating	1
2. Corrosion Control Observed: External - Condition, Coating	0
3. Corrosion Control Observed: Internal	0
4. Observed Cathodic Protection Installation	0
III. POST-OPERATIONAL FIELD PROCEDURES	**Lowest**
A. Records/Documents	**1**
2. Checked D4 card (if appropriate) for completeness	1
3. Checked D4 card (if appropriate) for accuracy	1
11. Reviewed as-built drawings for completeness	0
13. Reviewed as-built drawings for accuracy	0
99 Other:	0
TOTAL:	**5**

Appendix 5

Service Provider-Highest Ranked

I. PRE-OPERATIONAL FIELD PROCEDURES	Highest
A. Worker and Site Safety	**3**
1. Located Facilities – paint, signs, markers	1
5. Ground Movement (subsidence, erosion, slides) Controlled	1
6. Review Worker Safety Equipment	1
II. OPERATIONAL FIELD PROCEDURES	**Highest**
A. Construction	**3**
1. Observed Backhoe/Trencher Equipment	1
2. Observed Boring Equipment	1
16. Observed Backfill and compaction	3
	Highest
B. Joining	**3**
1. Observed Plastic Pipe (Fusion)	2
	Highest
C. Operating & Maintenance	**3**
4. Observed Inspecting Pressure Regulating and Limiting	0
III. POST-OPERATIONAL FIELD PROCEDURES	**Highest**
A. Records/Documents	**3**
2. Checked D4 card (if appropriate) for completeness	2
11. Reviewed as-built drawings for completeness	1
TOTAL:	**13**

Appendix 5A

PSE-Highest Ranked

I. PRE-OPERATIONAL FIELD PROCEDURES	Highest
A. Worker and Site Safety	**3**
1. Located Facilities – paint, signs, markers	0
5. Ground Movement (subsidence, erosion, slides) Controlled	0
6. Review Worker Safety Equipment	0
II. OPERATIONAL FIELD PROCEDURES	**Highest**
A. Construction	**3**
1. Observed Backhoe/Trencher Equipment	0
2. Observed Boring Equipment	0
16. Observed Backfill and compaction	0
	Highest
B. Joining	**3**
1. Observed Plastic Pipe (Fusion)	0
	Highest
C. Operating & Maintenance	**3**
4. Observed Inspecting Pressure Regulating and Limiting	0
III. POST-OPERATIONAL FIELD PROCEDURES	**Highest**
A. Records/Documents	**3**
2. Checked D4 card (if appropriate) for completeness	0
11. Reviewed as-built drawings for completeness	0
TOTAL:	**0**

Appendix 6

PSE Work Types Observed

#	PSE Only - Work Type	QTY	Rank High	Rank Mid	Rank Low
1	Bridge Inspection	(2)	0	8	0
2	Cathodic Placement	(6)	0	58	0
3	DCVG	(1)	0	4	0
4	Direct Assessment	(1)	0	11	0
5	District Regulator Repair	(2)	0	24	0
6	DR (District Regulator) Inspection	(3)	0	13	1
7	Establish Gas Service	(12)	0	108	0
8	Establish Gas Service Commercial	(1)	0	9	0
9	First Response	(1)	0	18	0
10	Gas Site Audit	(1)	0	11	0
11	Gas Site Audit Service Conversion	(2)	0	22	0
12	Gate Station Repair	(1)	0	10	0
13	Hard to Reach Locations (H2RL)	(12)	0	83	0
14	Indoor odor call	(1)	0	3	0
15	Isolated Facility	(3)	0	10	0
16	ISP Program	(1)	0	5	0
17	Locate Valves	(1)	0	6	0
18	Meter Change Out	(6)	0	81	0
19	Meter Mix-up Investigation	(1)	0	5	0
20	Meter Turn On	(1)	0	8	3
21	Odor Testing	(1)	0	2	0
22	Odorant Check	(6)	0	36	0
23	Pre-Construction Meeting	(1)	0	1	0
24	PSP Reads	(9)	0	47	0
25	Respond to Damage	(2)	0	9	0
26	Road Grading Exposed Pipe Monitor	(1)	0	5	0
27	Slide Area Inspection	(1)	0	2	0
28	Steel Casing Investigation	(2)	0	10	0
29	Surveillance	(3)	0	4	0
30	Trailer Park Inspection	(1)	0	2	0
31	Transmission Line Inspection	(3)	0	11	1
32	Valve Inspection	(1)	0	7	0
33	Yearly Inspection Reads	(63)	0	313	0
	Total # of Observations Completed:	153	0	946	5

Appendix C

33	**Gas Meter: Atmospheric remediation, inside meter survey, master meter inspect & maintain, meter changes** - Meters (Industrial)	**Industrial Meter Changes**	$505,504.85	PSE Gas Operations, Heath and Pilchuck	SC&P
34	**Integrity Management** - Transmission Mains	**Integrity Management**	$47,987.20	PSE / SC&P	
35		**Integrity Management**	$23,993.60	PSE / GSE	GSE
36		**Integrity Management**	$39,600.00		
37		**Integrity Management**	$316,800.00	Pilchuck	GSW
38		**Integrity Management**	$95,974.40		
39		**Integrity Management**	$750,000.00	Pilchuck, PSE Gas Operations, or other 3rd party contractors.	Other
40	**Integrity Management** - Gas Distribution System	**Distribution Integrity Management**	$500,000.00		SMP
41	**Isolated Facilities** - Mains	**Isolated Facilities Program - GSE Support**	$0.00	PSE / GSE	Gas System Engr.
42		**Isolated facilities program - Mains Remediation**	$25,000.00	Pilchuck	GSW
43		**Isolated facilities program - Mains Inspection**	$75,000.00	Pilchuck, PSE Gas Operations, or other 3rd party contractors.	SC&P
44		**Isolated facilities program - Mains Inspection**	$0.00		Other - MRT
45	**Isolated Facilities** - Casings and Mains	**Isolated facilities program - Casing Inspection (Mains)**	$50,000.00		Isol Fac
46	**Isolated Facilities** - Services	**Isolated facilities program - Casing Inspection (Services)**	$75,000.00		SC&P
47		**Isolated facilities program - Services Inspection**	$0.00		Other - MRT
48		**Isolated facilities program - PSP Reads**	$268,483.82	Pilchuck	GSW
49	**Leak Monitoring -** Mains with active B and C Leaks	**Leak Monitoring**	$195,113.00	PSE / GFR	GFR
50		**Leak Monitoring**	$278,362.00	Pilchuck	GSW
51		**Leak Monitoring**	$75,960.00	Heath	SC&P
52	**Leak Monitoring -** Services with Active B and C Leaks	**Leak Monitoring**	$180,177.00	PSE / GFR	GFR
53		**Leak Monitoring**	$180,564.00	Pilchuck	GSW
54		**Leak Monitoring**	$67,155.00	Heath	SC&P
55	**Leak Repair -** MSA Heath Leak Repairs (Industrial)	**Leak Repair**	$167,375.75		
56	**Leak Repair** - Distribution Mains	**Underwater Crossings Maintenance**	$0.00	PSE Gas Operations, Heath and Pilchuck	
57	**Leak Repair -** Services with Active B and C Leaks	**Leak Repairs**	$835,020.00	Pilchuck	GSW
58	**Leak Repair** - Mains with active B and C leaks and unplanned leak repairs	**Leak Repairs**	$11,098.00	PSE / GFR	GFR
59		**Leak Repairs**	$5,636.00		
60		**Leak Repairs**	$8,452.00		
61		**Leak Repairs**	$0.00		
62		**Leak Repairs**	$688,205.00	Pilchuck	GSW
63		**Leak Repairs**	$0.00		
64		**Leak Repairs**	$430,437.00		
65		**Leak Repairs**	$88,606.00		
66	**Leak Survey** - Supply Mains	**Leak Survey & Patrol**	$7,824.50	Heath	SC&P
67	**Leak Survey -** Cathodically Protected Services	**Leak Survey & Patrol**	$451,860.00		
68	**Leak Survey -** Cathodically Protected Mains	**Leak Survey & Patrol**	$403,000.00		
69	**Leak Survey -** Gas Mains and Services affected by special circumstances	**Other Leak Surveys**	$25,000.00		
70		**Other Leak Surveys**	$0.00		
71	**Leak Survey -** Gas Mains & Services associated to Business District and High Occupancy Structures	**Leak Survey & Patrol**	$167,586.00		
72		**Leak Survey & Patrol**	$220,100.00	PSE Gas Operations, Heath and Pilchuck	
73	**Leak Survey** - Gas Mains and Services that are of Non-Cathodically Protected Steel Pipe (Cast Iron, Bare Steel)	**Leak survey & Patrol**	$21,624.00	Heath	
74		**Leak survey & Patrol**	$54,560.00		
75	**Leak Survey -** Supply Mains	**Leak Survey & Patrol**	$18,848.00		
76	**Leak Survey -** Transmission Mains	**Leak Survey & Patrol**	$30,054.00		
77	**Leak Survey -** Distribution Mains	**Underwater Crossings Surveying**	$10,000.80		

78	**Regulator Station Maintenance -** Transmission Regulator Stations which are defined as Gate Stations	**Transmission Gate Station Inspection & Routine Maintenance**	$161,885.10	PSE Gas Operations, Heath and Pilchuck	SC&P
79	**Regulator Station Maintenance** - Master Meter regulator stations	**Master meter inspection and routine maintenance**	$18,000.00		
80		**Master meter maintenance**	$6,000.00		
81	**Regulator Station Maintenance -** Distribution Regulator Stations which are defined as District Regulator	**Distribution Regulator Station Maintenance**	$70,000.00		
82		**Distribution Regulator Station Inspection & Routine Maintenance**	$983,101.28		
83		**Maintenance**	$95,000.00	PSE / SMP	
84		**Regulator Station Maintenance (Pipe Supports)**	$200,000.00	Pilchuck, PSE Gas Operations, or other 3rd party contractors.	
85	**Regulator Station Maintenance -** Farm Taps (Single Service)	**Farm Tap Atmospheric Inspections**	$10,129.58	PSE Gas Operations, Heath and Pilchuck	
86	**Regulator Station Maintenance**	**Distric Regulator Station Maintenance**	$50,000.00		
87	**Regulator Station Maintenance -** Farm Taps	**Farm Tap Inlet Retesting**	$0.00	Pilchuck	GSW
88		**Farm Tap Inlet Retesting**	$0.00	Pilchuck, PSE Gas Operations, or other 3rd party contractors.	SC&P
89	**Sumas Transmission -** Transmission Mains	**Sumas Transmission Operation & Maintenance**	$100,000.00	PSE Gas Operations, Heath and Pilchuck	SC&P, GSO, GFR
90	**Valve Locate, Operate, and Maintain -** Distribution Critical Main Valves	**Locate & Operate**	$98,982.00	PSE / GFR & SP	GFR
91		**Valve maintenance & repair**	$61,237.00	PSE Gas Operations, Heath and Pilchuck	
92	**Valve Locate, Operate, and Maintain -** Critical Valves on Transmission Main	**Locate & Operate**	$8,256.43	Pilchuck	SC&P
93		**Valve maintenance & repair**	$0.00	PSE Gas Operations, Heath and Pilchuck	
94	**Valve Locate, Operate, and Maintain -** Critical Valves on Distribution Main	**Locate & Operate**	$167,408.64	Pilchuck	
95		**Valve maintenance & repair**	$85,000.00	PSE Gas Operations, Heath and Pilchuck	
96	**Valve Locate, Operate, and Maintain -** Service Valves at "Buildings of Major Assembly"	**Locate & Operate**	$272,950.00	Pilchuck	GSW
97	**Valve Locate, Operate, and Maintain -** Distribution Critical Main Valves & Transmission Critical Main Valves	**Valve maintenance & repair**	$682,784.00		
98	**Valve Locate, Operate, and Maintain -** Service Valves (all)	**Valve maintenance & repair**	$657,000.00		
99	**Valve Locate, Operate, and Maintain -** Valves	**Double IF Program - Locate & Inspect**	$60,000.00	Pilchuck, PSE Gas Operations, or other 3rd party contractors.	SC&P
100	**Valve Locate, Operate, and Maintain -** Gas mains located in slide areas or installed across bridges	**Maintenance resulting from Continual Patrols- Bridge and Slide - Valves**	$20,600.00	Pilchuck	GSW
101	**Wrapped Steel Service Assessment Program -** Pre-1972 STW Services	**WSSAP - Field Confirmation**	$125,202.00		
102		**WSSAP - Direct Examinations**	$0.00		
103		**WSSAP - Direct Examinations**	$144,000.00		
104		**WSSAP - Direct Examinations**	$33,600.00	PSE / CP	SC&P
105		**WSSAP - Electrical Surveys**	$93,386.00	PSE / SC&P	
106		**WSSAP - Direct Examinations**	$2,367.00		
107		**WSSAP - Electrical Surveys**	$85,727.00		
108		**WSSAP - Leak Surveys**	$138,339.00	Pilchuck, PSE Gas Operations, or other 3rd party contractors.	

Managing Organization:

EFR = Electric First Response
GFR = Gas First Response
GSE = Gas System Engineering
GSO = Gas System Operations
GSW = Service provider, Pilchuck
SCP = System Controls & Protection
SP-Asp = Service Provider, Asplundh
SP-Other = Service provider, other
SP-Pot = Service provider, Potelco
SUB = Substation Operations
MP = Maintenance Planning
STD = Standards
TESP = TES Planning
PM = Project Management

Pilchuck Contractors Inc.= PCI
Potelco =
Central Locating Services = CLS
Locating Inc. = LI
Puget Sound Energy = PSE