MAOP Phase II QA/QC Procedure

April 2011

MAOP Validation Project (Phase II) QA / QC Overview

I. MAOP Validation Project Overview

The MAOP Validation Project's primary purpose is to verify the Maximum Allowable Operating Pressure for PG&E's Class 3 and 4, and class 1 and 2 (HCA) gas transmission pipeline.

a. Product Overview

The output for the MAOP Verification Project is a Pipeline Features List (PFL) which will be used to establish a maximum Allowable Operating Pressure (MAOP) for PG&E gas transmission pipeline segments.

b. Process Overview

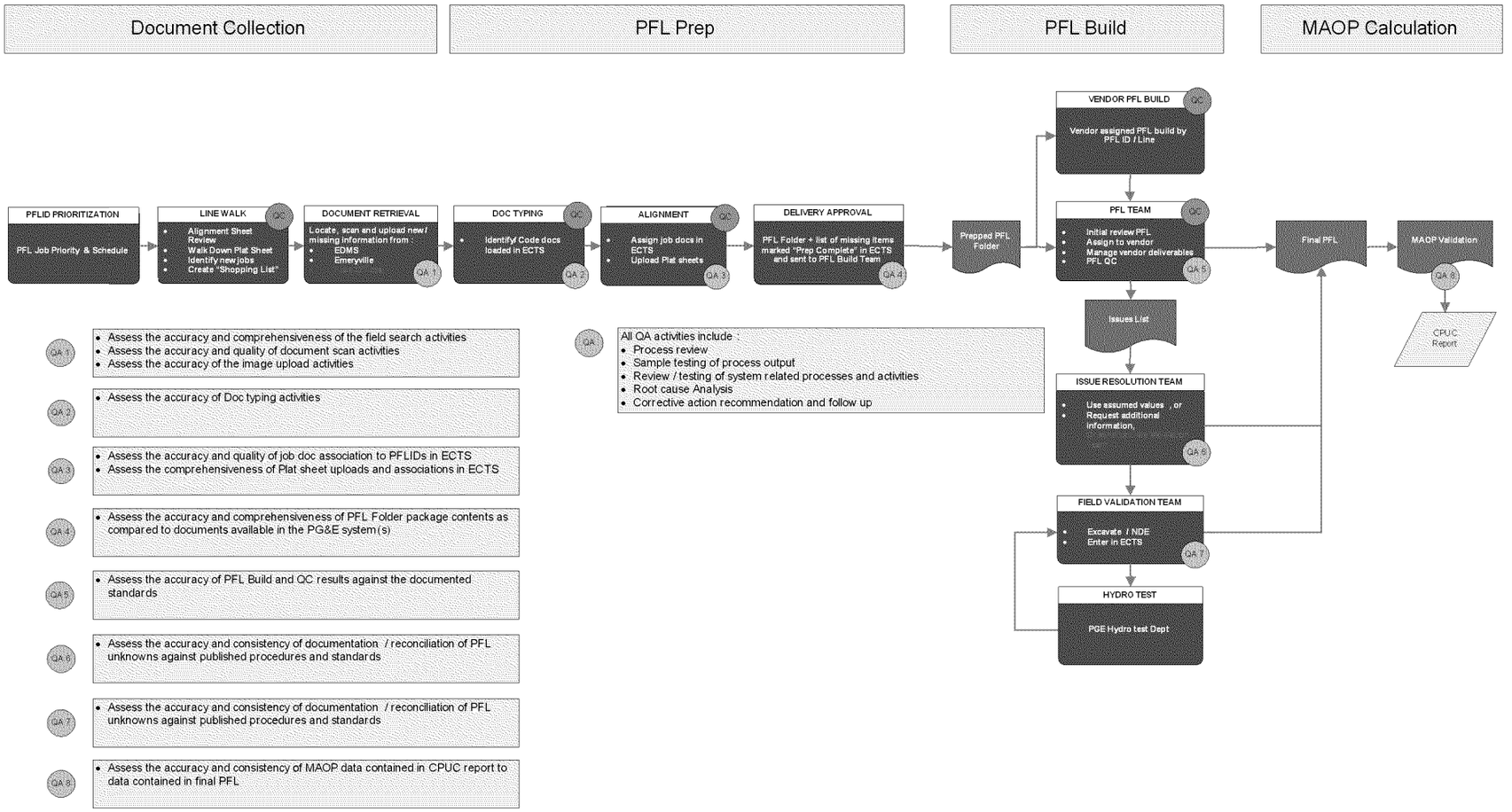
The process to develop the PFL will utilize both PG&E employees and contractor personnel, and will consist of 4 main efforts (See diagram below):

Each stage is described in more detail (descriptions and process maps) in the following stage process maps:

- **Document Preparation** - documents necessary for the building of a PFL and the establishment of MAOP will be collected, scanned into an image, and uploaded into PG&E's Workflow management system (ECTS).
- **PFL Preparation** - Documents in ECTS will be assembled into PFL build "clusters" based on their relevance and applicability to certain gas transmission pipeline segments.
- **PFL Build -** PFL "clusters" will be the framework for the PFL build. Pipeline features will be reviewed in the appropriate documentation in order to collect the information required to establish MAOP
- **MAOP Verification** - (Need Dave or Sumeet to provide some details on this…How do we know when MAOP is complete / defensible to the appropriate governing agency)
- **Data upload into Intrepid** – Once PFL build and MAOP calculation have been completed, data gathered will need to migrate to the Intrepid System.

The MAOP verification project consists of 4 main activities:

DOCUMENT RETRIEVAL & PFL SUPPORT



II. Project QA Objectives and Scope

a. Purpose

i. The purpose of this Project-Specific Quality Plan (the Plan) is to define the quality management system for the MAOP Validation Project in order to provide insight into whether the processes and procedures produce products that conform to the requirements specified.

ii. This Plan is the principal quality document for the Project and is based on the Project requirements, Industry specific and PG&E governing documents (as applicable). The plan is modelled after ISO's 9001:2008

iii. The Plan covers the full Scope of Work related to document prep, PFL prep and build and describes the Project quality organization and the specific responsibilities and authorities of personnel who will implement the plan.

iv. The Plan is a Project Management document, which demonstrates that the Project has identified the Project objectives, confirmed its quality commitment and established a system of procedures to accomplish these ends. It assigns duties, delegates authority, and sets up suitable testing, inspection and assessment programs to verify that the required standard of performance is being achieved.

b. Quality Objectives

i. To perform Work that produces products compliant the MAOP Validation standards established. To achieve these objectives, The Project will implement:

- Project procedures to ensure that key Project Work processes and their quality requirements are clearly defined, well documented and fully integrated.
- Quality Assurance Assessments to verify adequate and effective performance of the project activities.

c. Scope of Quality activities

i. Project Quality Assurance oversight will cover all Product definition documents, Project process documents, Process Quality Control (QC) activities, and document change control for the following Project activities:

- Document preparation
- PFL preparation
- PFL build
- GIS information upload

ii. Quality Assurance (QA) is an independent function on the Project and has no in-line Project duties. QA is therefore free to assessment and examine all areas of the Project,

to highlight all identified non-compliances and to ensure that agreed corrective actions are taken.

iii. Quality Control (QC) consists of procedures built into each of the sub-processes within the project.

iv. The QA Plan will present the plan and approach for QA. The QC plan for each sub process will be planned and executed by the appropriate sub process team, and be reviewed by QA

v. Project Quality activities will apply to external vendors and contractors working on MAOP Validation Project activities.

d. Definitions

i. Defective: A defective product contains a flaw that prevents it from achieving its intended purpose. A unit of product or service containing at least one defect, or having several imperfections that in combination cause the unit not to satisfy intended normal or reasonably foreseeable, usage requirements. "Defective" is appropriate or use when a unit of product/service is evaluated in terms of usage (as contrasted to conformance to specifications).

ii. Defects: A nonconformity or deviation from a standard or specification. A defect will be considered an "imperfection" that does not affect the product's ability to meet the ultimate usage requirement (e.g. to serve as a basis for MAOP calculation).

iii. Scheduled Assessment / Assessment: Scheduled QA assessments consist of both sample testing product and process assessment. They are scheduled at the appropriate cadence to ensure a representative sample is pulled from the population of PFLIDs. Scheduled assessments could be at different times for each sub process, depending on the unique requirements of each sub process.

iv. Ad Hoc Assessment / Assessment: Ad Hoc QA assessment requests come from MAOP Verification Project management and could consist of either sample testing or process assessment

v. PFL (Pipeline Features List): A Pipeline Features List ("PFL") was initially developed as a method to capture pipeline data elements during the pre-assessment phase of an ILI project. The PFL consolidates the current pipe features (pipe, valve, bend, reducer, tee, sleeve, tap, flange, PCF) into a common worksheet along with feature specifications (pipe size, class, wall thickness, yield strength, seam, rating) using various original design drawings and as-built information. Although PFL's were traditionally developed as the pre-assessment phase of an ILI project, it is created to include all the required information to successfully calculate the Maximum Allowable Operating Pressure ("MAOP") of a pipeline. Furthermore, the PFLs in conjunction with the Marked-Up Drawings can provide traceable access to the verified and complete PG&E records of the transmission pipeline per the directive of the CPUC.

III. Quality Overview

a. QA Approach

The approach to Quality Assurance for the Project consists of the following high level activities:

- Assess whether the Project uses formally defined and documented processes
- Assess whether those processes are designed and implemented using documented product specifications, and that those specifications flow from an appropriate governing standard
- Apply Quality Assurance oversight by performing scheduled Quality Assurance assessments of Project processes, procedures, QC activities, and results in order to assess the existence of and compliance with the documented processes, procedures, and QC activities
- Assess the effectiveness of the procedures and Controls in producing the desired results
- Perform QA assessments of specific Project activities as requested by Project leadership
- Report to Project Leadership the results of the QA assessments/assessments, including recommendations for improvements

b. Quality Organization

i. Quality manager

- The Project quality management system is developed, implemented and maintained by the Quality Assurance Manager (QA Manager) who reports directly to the Project Director.
- He has the authority and responsibility to ensure, as the Management representative (as defined in ISO 9001:2008) that the requirements of the Project quality system are established, implemented and maintained.
- He is independent of all other managers on the Project and has no in-line Project duties. He is therefore free to assessment and examine all areas of the Project, to highlight all identified non-compliances and to ensure that agreed corrective actions are taken.

ii. The QA Manager will be responsible for establishing and monitoring Project quality in the following areas:

- Work performed on the Project by supporting Departments related to MAOP Validation Project activities
- Basic and Detailed Engineering activities related to PFL Preparation and build

iii. The QA Manager will be indirectly responsible for the quality of the following groups:

- Document prep Sub-contractors through their own QA Managers
- PFL Build Contractors through their own QA Managers

iv. The main responsibilities of the QA Manager include:

- Preparing the Project Quality Plan and quality related procedures.
- Carrying out internal and external quality assessments, and ensuring that all corrective actions are followed-up and closed-out.
- Liaising as required with the Owner's QA representatives on Project quality matters.
- Liaising with the Project Director and other managers on quality related matters.
- Assessing the quality system documentation of contractors and suppliers.
- Developing and maintaining Internal Quality Assessment Schedules.
- Developing and maintaining External Quality Assessment Schedules for assessments on selected contractors, sub-contractors and suppliers etc.
- Reviewing trend results for quality problems and initiating root cause preventive action, including monitoring quality assessment reports, nonconformance reports, material delivery deficiency reports, and correspondence and minutes of meetings for quality trends. Following-up identified quality problems and agreeing the necessary preventive actions with the managers concerned.
- Controlling and coordinating quality records, including establishing the requirements for filing and backing-up of quality records; and agreeing with contractors on the retention and handover requirements for quality records.

v.Engineering lead

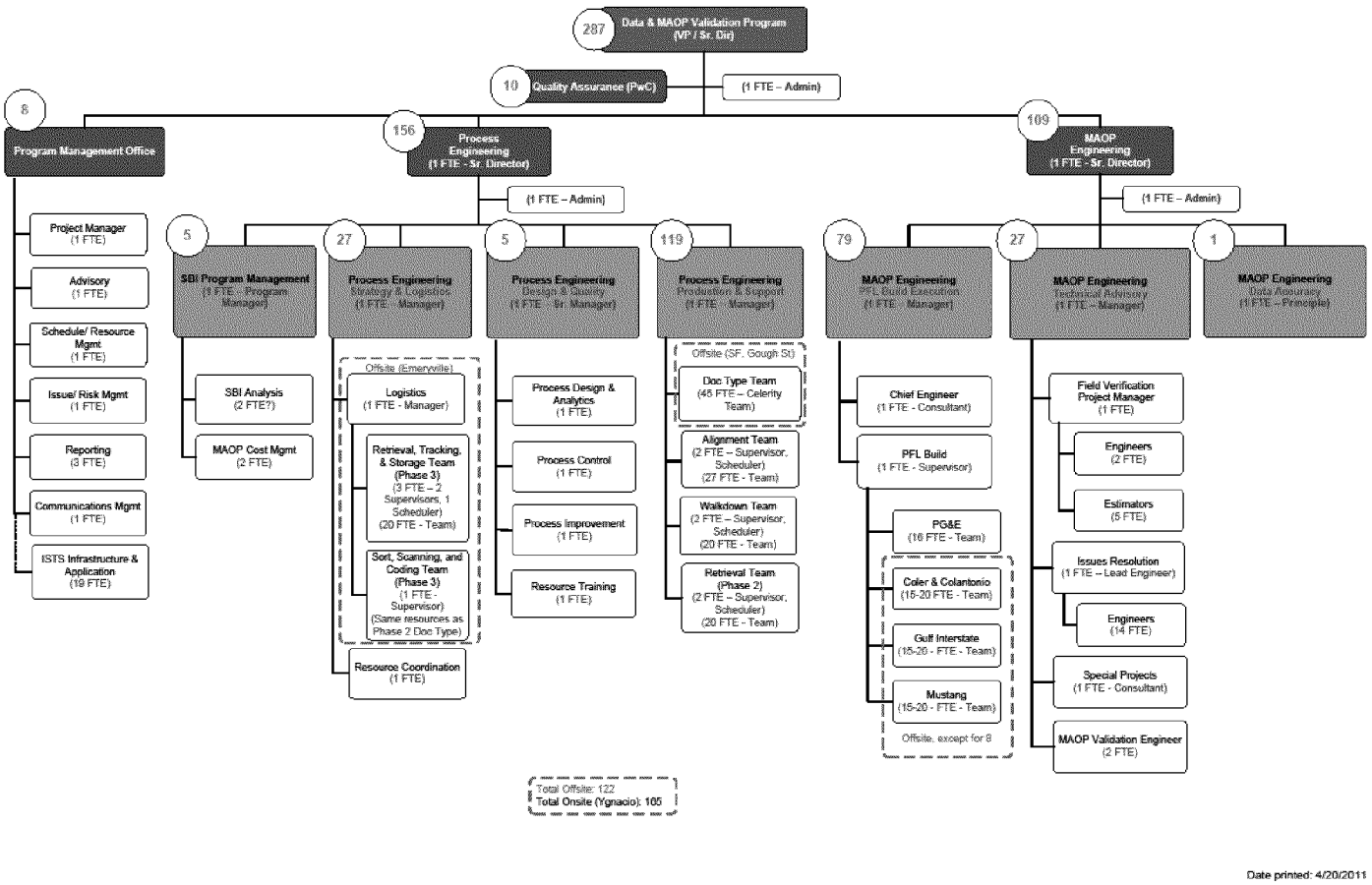
- Delivery of all Engineering Scope of Work on this Project.
- Preparation and implementation of Project Engineering Procedures
- Controlling engineering progress
- Preparation of the engineering portion of progress reports
- Control of Project engineering documentation
- Performance of engineering Work for the various packages, including data acquisition, preparation of Design Basis/Philosophies and drawings and specified deliverables.
- Reviewing and approving engineering Work carried out by the Project and sub-contract design houses.
- Reviewing and incorporating specifications and standards into the Project
- Preparing, and verifying by checking, inter-discipline reviews, and technical reviews, as appropriate, all issues of design deliverables.

- Incorporating technical review comments into the deliverables as appropriate
- Interfacing with Contracts on all Engineering matters relating to purchasing, e.g., material requisitions, technical bid evaluations, Supplier document reviews
- Carrying out technical bid evaluations including clarification meetings with bidders as appropriate and making recommendations based on technical acceptability of bids
- Monitoring the Engineering scope of design-build contractors, etc
- Managing all Engineering interfaces between design packages and design build Contractors.
- As necessary, carrying out various studies.

vi. QA Oversight

- The QA Advisor maintains an independent advisory role focused on maximizing the effectiveness of the QA program from process design and planning through process execution, assessment and review. The QA Advisor observes process activities in order to provide recommendations to the Quality Assurance Manager, and supports the implementation of corrective actions and continuous improvement efforts.

MAOP Organizational Structure below:



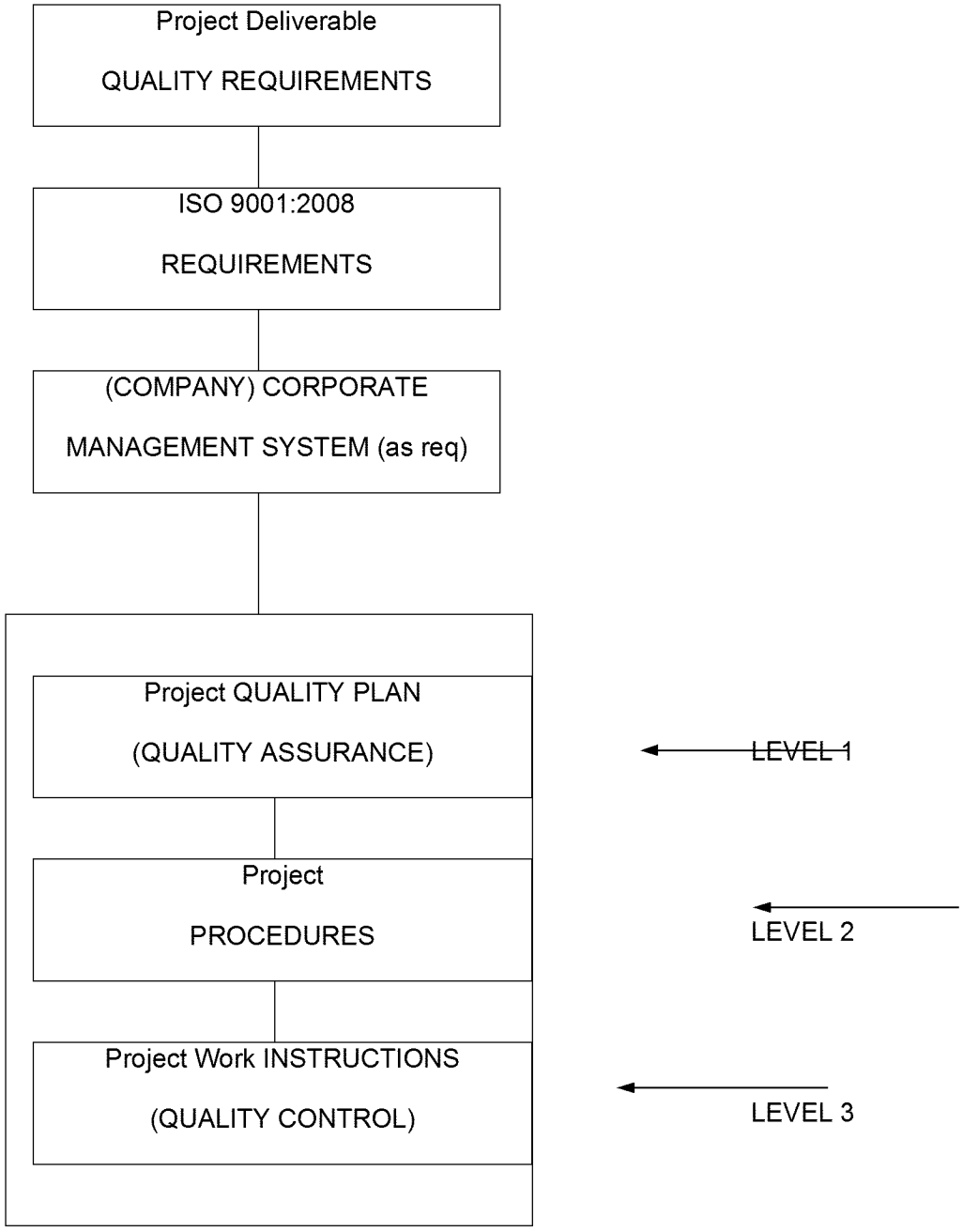
c. Specifications and Standards

i. The MAOP Validation Project's Quality Management Plan contains elements of applicable ISO 9001:2008 standards.

ii. Certain elements of product and process could be subject to more stringent industry and/or PG&E governing documents and standards. Where this is the case, the more stringent will take precedence, as appropriate.

iii. The applicable governing documents and standards should be defined, and the adherence to the standard described in the sub process product and process description.

iv.



d. Assessment and Assessment Approach

The QA assessment approach will consist of the following general activities. More specific procedures will be documented in the appropriate functional area testing section.

i. The Project Quality Assurance Manager will prepare issue and maintain a Project QA assessment schedule covering internal assessments of quality systems to include all aspects of work in accordance with this document.

ii. The QA assessments will be performed by or under the direction of the Project Quality Assurance Manager at various stages throughout the duration of the Project, in accordance with the schedule. He will be assisted by others as necessary.

iii. The QA assessments will cover Project interfaces, Project controls, contractor selection, including testing and quality records.

iv. External assessment schedules will be prepared and performed to assess the effectiveness of the quality systems of external contractors and subcontractors.

v. The results of the assessments will be documented in Assessment Reports and corrective action requests (CARs) will be raised, as appropriate, to require implementation of necessary remedial and/or corrective and preventive actions.

vi. Assessment reports will be usually submitted within one week of completing the activity, followed by their respective closeout details when completed.

e. Statistical techniques and sampling

(Note: this procedure was developed and written for PG&E's MAOP process using ANSI Z1.4 as a guide. It does not intend to implement the ASNI Z1.4 system which includes tightened, normal, and reduced sampling plans and rules for switching.)

To select a statistically valid sampling plan, first, the objective of the inspection should be determined based on past performance, other controls that are in place, potential failure modes and so on. Then the AQL and LTPD of the sampling plan should be documented to demonstrate that the sampling plan meets this objective. Further, since different sampling plans may be statistically valid at different times during the life of a process, all sampling plans should be periodically reviewed. The sampling plan should answer the question: **"Is the protection provided by the sample appropriate based on past performance and current controls?"**

Inspection by Attributes - Inspection by attributes is one whereby either the unit of product is classified simply as defective or non-defective or the number of defects in the unit of product is counted, with respect to a given set or set or requirements.

Acceptable Quality Level - Quality level that is the limit of a satisfactory process average. Satisfactory process average can be established using avg % defective or avg defects / 100 units.

Defective - A defective product contains a flaw that prevents it from achieving its intended purpose. A unit of product or service containing at least one defect, or having several imperfections that in combination cause the unit not to satisfy intended normal, or reasonably foreseeable, usage requirements. "Defective" is appropriate or use when a unit of product/service is evaluated in terms of usage (as contrasted to conformance to specifications).

Defects - A nonconformity or deviation from a standard or specification. A defect will be considered an "imperfection" that does not affect the product's ability to meet the ultimate usage requirement (e.g. to serve as a basis for MAOP calculation).

Documenting the protection provided by the sampling plan is only half the job; justification for the AQLs and LTPDs used is also required. **This requires that the purpose of each inspection be clearly defined.** Depending on past history and other circumstances, sampling plans can be used for a variety of purposes.

Consider use of the following to determine the sample size selected:

Samples for testing will be selected using attributes (vs. variables). The intent is to select a representative sample size that gives confidence that the results represent the overall population of ~2000 PFLs. This method will be based on a 95% confidence of 2% errors with +/- 4% precision, which effectively means that the expected compliance rate is 98% with an uncertainty range of +/- 4%. The table below shows sample sizes required to achieve a 95% confidence for 2000 units. If a QA test discovers a completed PFL that is defective, a recommendation could be to use an expected error rate of 1% with a 2% precision to increase the sample size tested.

Attributes Sample Sizes (non-stratified)

Population Size	2,000
Confidence Level	95%

		Desired Precision Level														
		1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%
Expected Occurrence Rate of an Attribute	1%	320	91	42	24	16	11	8	6	5	4	4	3	3	2	2
	2%	548	173	81	46	30	21	16	12	10	8	7	6	5	4	4
	3%	718	246	117	68	44	31	23	18	14	12	10	8	7	6	5
	4%	850	312	152	89	58	41	30	23	19	15	13	11	9	8	7
	5%	955	372	185	108	71	50	37	29	23	19	15	13	11	10	9
	6%	1,041	427	215	127	84	59	44	34	27	22	18	15	13	11	10
	7%	1,112	477	245	146	96	68	50	39	31	25	21	18	15	13	12
	8%	1,172	523	272	163	108	76	57	44	35	28	24	20	17	15	13
	9%	1,223	565	298	180	119	84	63	49	39	31	26	22	19	16	14
	10%	1,268	604	323	196	130	92	69	53	42	35	29	24	21	18	16

$$n = \frac{\frac{z^2 P(1-P)}{d^2}}{1 + \frac{1}{N}\left(\frac{z^2 P(1-P)}{d^2} - 1\right)}$$

The current QA compliance standard is assessed versus the established statistical parameters, which are 95% confidence level of 98% compliance with a precision of 4%. These parameters lead to the following acceptance criteria:

$$\text{Error rate} = \frac{\#\ \text{Errors}}{\text{Sample Size x Attributes}} \text{ X } 100$$

f. Metrics and Reporting

i. The purpose of collecting metrics is to analyse the results in order to pinpoint areas to focus root cause analysis and corrective actions.

ii. Metrics will be captured by each of the individual QA teams representing each step of the process. Metrics will be presented and reviewed on a weekly basis, and archived on the following SharePoint site: http://wss/sites/GasProgramAndPerfMgmt/Shared%20Documents/Forms/AllItems.aspx?RootFolder=%2fsites%2fGasProgramAndPerfMgmt%2fShared%20Documents%2fSan%20Bruno%20Incident%20PMO%2fGT%20Data%20Validation%20Project%2fQA%5fQC%2fPhase%20II%20PFL%20Build%2f25%20Test%20Metrics%20Dashboard&FolderCTID=&View=%7b82923FF0%2dA62E%2d43C0%2d981B%2d80024F56BC50%7d

g. Corrective Actions

i. Results of the QA assessments (both process and sample testing) are to be communicated to the process owner. The process owner and QA representative will agree on a plan and timeline for corrective action.

ii. Corrective Actions will be logged in the appropriate tracker with owner and resolution date, and QA representative will record when corrective action is complete. Corrective action logs will be maintained in the QA SharePoint folder for each QA process.

h. Change Control

i. Changes to processes as a result of QA assessments should follow the change control procedures for the MAOP project, located on the following SharePoint site:

http://wss/sites/GasProgramAndPerfMgmt/Shared%20Documents/Forms/AllItems.aspx?RootFolder=%2fsites%2fGasProgramAndPerfMgmt%2fShared%20Documents%2fSan%20Bruno%20Incident%20PMO%2fGT%20Data%20Validation

%20Project%2fMAOP%20Validation%20Operating%20Manual%20Source%20Documents%2fProcess%20Maps%2f02%2dDrafts&FolderCTID=&View=%7b82923FF0%2dA62E%2d43C0%2d981B%2d80024F56BC50%7d

i. External Contractor QA

i. General Requirements – Vendor Qualification

- Design and Construction contractors shall be required to implement the requirements of this section to the extent it is applicable to their scope of work. PG&E shall be the final judge as to which parts are applicable and which are not.
- The Contractor shall nominate a member of his management staff to act as the Quality Representative for this Contract. The Quality Representative shall be provided with adequate resources and shall be delegated the necessary authority to enable the quality of work on the Contract to be managed effectively.
- The Quality System is to be capable of demonstrating that all the requirements of the Contract and all relevant standards, regulations etc are being met.
- The Contractor shall manage all Inspection and Testing activities is such a way as to be able to demonstrate that all specified requirements have been met. All defective products are to be resolved before final acceptance.
- PG&E MAOP Validation project representative will monitor the implementation of the Contractors QA / QC program by assessing procedures, work instructions, method statements etc, and by assessing whether Quality oversight and control exists for all significant activities. PG&E MAOP Validation project representative(s) will identify those activities they wish to witness and will assess adequate presence of activity documentation. PG&E MAOP Validation project QA group will perform scheduled quality assessments on the Contractors QC and inspection activities.
- PG&E MAOP Validation project representative and any authorized third parties shall have the right to conduct assessments, inspections and tests of all Contract works that are being executed by the Contractor, his consultants, subcontractors, suppliers and sub-tiers thereof, and to observe the execution of these activities by others.
- The Contractor, his consultants, subcontractors, suppliers and sub-tiers thereof shall make available for assessment all records necessary to demonstrate that the Contract works have been executed in accordance with the Contract. They shall also provide PG&E MAOP Validation project representative with documents that demonstrate that the Contract works

are progressing in accordance with specified requirements. These are to be provided in a timely manner as the work progresses.

ii. Contractor Quality plan

- Contractors shall prepare a specific Project Quality Plan (PQP) which addresses all activities relevant to the Work and shall demonstrate how all work performed by Contractor will conform to the contract specified requirements. The Contractor's Quality Plan shall include the controls to be applied by subcontractors, suppliers and sub-tiers thereof, both directly and by identifying the Quality System documentation that subcontractors, suppliers and sub-tiers thereof are required to produce to meet the Contractor's requirements.
- The plan shall define the documented quality system to be applied by Contractor throughout the Work, and make reference to all of the Contractor's relevant procedures and manuals.
- The Plan shall address the interfaces between PG&E MAOP Validation project and Contractor and other relevant organizational entities. The Plan shall include an organization chart showing Contractor's corporate and Project organization responsible for managing, performing and verifying the Work. The organization chart shall be supported with a reporting and functional description of Contractor's project organization and identification of the quality and environmental related responsibilities of key positions.
- The plan shall be updated as necessary throughout the contract, to reflect any changes to Contractor's documented quality system. Contract Quality Plans shall, as a minimum:
    - Cover the relevant phases of the Contract (as applicable)
    - Incorporate or reference necessary quality control procedures
    - Describe the relationships and activities of the Contractor and any Subcontractors suppliers and consultants including provision of organization charts

iii. Processes and procedures

- Supporting the Quality Plan shall be Quality Processes/Procedures (QPs) for the works. The responsibility for review and approval of QPs is with the Contractor. . The primary activities addressed by QPs and to be implemented by the Contractor are to include:
    - document control including preparation, checking, approval, updating, receipt and control of incoming documents, distribution, storage and maintenance of records;
    - design control including verification, approval and acceptance by others;
    - performance of quality verification reviews

- monitoring the activities of any consultants, subcontractors, suppliers and sub-tiers thereof, to ensure their compliance with the Contract;
- administration of non-conformity and reporting to the Project Director;
- Production of weekly reports of quality issues including non-conformity records and KPIs as deemed appropriate.

- The Contractor, and through him, his consultants, subcontractors and suppliers etc, engaged in designing and supplying or any other service connected with the works, shall develop and maintain procedures for carrying out checks, reviews and verification activities appropriate for the services they provide. These procedures shall be subject to the review and acceptance of the PG&E Engineer.
- The Contract Quality Plan shall include or reference the controls to be applied by subcontractors, suppliers and sub-tiers thereof, both directly and by identifying the Quality System documentation that Subcontractors, suppliers and sub-tiers thereof are required to produce. The Contractor shall ensure that subcontractors, suppliers and sub-tiers thereof agree to and implement the applicable controls specified in the Contract Quality Plan and the identified Quality System documentation.

iv. Assessments and Assessments

- The Contractor shall submit with his Quality Plan a schedule of his internal and external consultant, subcontractor and supplier assessments that are to be conducted by his personnel. The schedule, scope and method of the assessments are such as to enable the Contractor to verify that all aspects of the works are being conducted in accordance with contractual requirements.
- The Contractor shall allow PG&E MAOP Validation Project representative and authorized third parties to observe/participate in these assessments and to conduct additional independent assessments, as they consider appropriate to provide assurance that the works are being conducted in accordance with contractual requirements. The Contractor shall provide the facilities and access necessary for these assessments to be carried out effectively. The Contractor shall place similar requirements on his consultants, Subcontractors, and suppliers.
- All project related assessments performed by the Contractor, his consultants, subcontractors, suppliers and sub-tiers thereof, shall be reported and copied to PG&E MAOP Validation Project Director, who will review and analyze for serious findings and trends. The Contractor will close-out all assessment findings in a timely manner and instigate measures to prevent a recurrence. PG&E MAOP Validation Project Director will monitor the closure of Contractor assessment findings through assessment, surveillance and review activities to

demonstrate that the works are progressing in accordance with specified requirements.

v. Organization and resources

- The Contractor shall develop his own, and his, major subcontractors', consultants' and suppliers' their own, organization charts. The charts shall show the reporting structure of the key personnel on the Project. The charts shall identify all personnel responsible for Safety Critical Work and key activities.
- The Contractor shall demonstrate that adequate resources are provided to fulfill the requirements for quality and environmental management, inspection & testing and certification as detailed in the Contract. This shall include demonstrating that personnel possess the necessary qualifications and competencies required to carry out specific tasks.
- The Contractor shall provide regular and appropriate training to all personnel in the operation of the Quality System and as necessary to ensure their competence to do their work and shall maintain records of all such training.

vi. Acceptance criteria for PFL

- PG&E MAOP Validation Project will issue PFL acceptance criteria that will describe in detail the requirements with regard to assembly, compilation and content of final turnover documentation.
- Requests for Information (RFIs) shall be used by the Contractor to formally request from the Engineer information, clarification or agreement to a proposed action.
- Each PFL attribute requiring a concession or design change shall be referred to PG&E MAOP Validation Project by the Contractor for appropriate resolution.
- The Contractor shall be responsible for demonstrating that specified requirements have been met. This includes the implementation of effective controls to ensure that the checking, review, inspection and testing of the Contract works are completed.
- PG&E MAOP Validation Project shall manage the effectiveness of the Contractor's certification system through:
    - surveillance,
    - witnessing appropriate key activities,
    - review of certification and records,
    - monitoring and participation in the Contractor's assessment schedule,
    - Independent assessment.

vii. Contractor / Vendor Qualification

- Each vendor / external contractor shall demonstrate the ability to meet the following set of predetermined parameters through a "trial" demonstration period. The details of the qualification activities shall be documented and the results recorded for each vendor performing PFL build activities.

IV. Project Sub process assessment

a. Document preparation

i. Specifications and Standards

- The document preparation sub process consists of the following activities:
  - ***Doc Typing*** - All job document images that are imported into the ECTS tool go through the doc typing process. These document images are categorized based on their specific document type. The document types have been organized by primary and secondary documents which are required for the PFL Build process. All other documents that are not relevant for PFL build are categorized as "Non-PFL". Doc typing occurs currently in ECTS and in Concordance, which is Celerity's doc typing database. Please see SharePoint for the full list of document types http://wss/sites/GasProgramAndPerfMgmt/Shared%20Documents/Forms/AllItems.aspx?RootFolder=%2fsites%2fGasProgramAndPerfMgmt%2fShared%20Documents%2fSan%20Bruno%20Incident%20PMO%2fGT%20Data%20Validation%20Project%2fQA%5fQC%2fPhase%20II%20PFL%20Build%2f30%20QA%20%2dDocument%20Preparation&FolderCTID=&View=%7b82923FF0%2dA62E%2d43C0%2d981B%2d80024F56BC50%7d
  - ***Hardcopy Retrieval*** - The Hardcopy retrieval process is initiated during the PFL build process when job document images that are being reviewed by the PFL builders on-line or printed are difficult to read and require retrieval of the "original" hardcopy. These documents are requested through the hardcopy retrieval process and the job documents are located at the PG&E's storage facility and sent back to the PFL build team that initiated the request.

ii. Process description

- The process maps, work procedures for Doc Typing and Hardcopy Retrieval and are available on SharePointhttp://wss/sites/GasProgramAndPerfMgmt/Shared%20Documents/Forms/AllItems.aspx?RootFolder=%2fsites%2fGasProgramAndPerfMgmt%2fShared%20Documents%2fSan%20Bruno%20Incident%20PMO%2fGT%20Data%20Validation%20Project%2fQA%5fQC%2fPhase%20II%20PFL%20Build%2f30%20QA%20%2dDoc%20Type%2f10%20Overall%20Test%

20Procedure&FolderCTID=&View=%7b82923FF0%2dA62E%2d43C0%2d981B%2d80024F56BC50%7d. QC procedures have been included specific for Doc Typing and Scan and Index and are included in the process maps.

iii. Assessment procedures

- QA assessments can come in two main forms, Scheduled and Ad Hoc. Ad Hoc QA assessment requests from management could consist of either sample testing or process assessment. Scheduled assessments will consist of both activities. The following pertain to scheduled assessments. Both Scheduled and Ad Hoc assessment reports will be reviewed by the Process and Quality manager, and reported out as appropriate.

- The following include high-level testing procedures and QA schedule and cadence for the Document Preparation sub-process activities:

Document Preparation Activities	Testing Procedures	QA Schedule
1. Doc Typing	Doc Typing will include the following activities: + Random sample for each document type from a defined sample set from ECTS and Concordance. + Sample size is determined by the following criteria: 95% confidence level with 2% error rate + Review process documentation and control points. + Review document type procedures	Doc Typing schedule will include the following: + Scheduled requests to occur daily for the next 1 to 2 months. + Adhoc requests as defined by management
2. Hardcopy Retrieval	Hardcopy Retrieval will include the following activities: + Random sample for images from a defined sample set from ECTS. + Sample size is determined by the following criteria: 95% confidence level with 2% error rate + Review process documentation and control points.	Hardcopy schedule will include the following: + Scheduled requests to occur bi-weekly for the next 1 to 2 months. + Adhoc requests as defined by management
3.		

iv. Results and Metrics

- Templates for recording results can be found on the following Sharepoint Site:

http://wss/sites/GasProgramAndPerfMgmt/Shared%20Documents/Forms/AllItems.aspx?RootFolder=%2fsites%2fGasProgramAndPerfMgmt%2fShared%20Documents%2fSan%20Bruno%20Incident%20PMO%2fGT%20Data%20Validation%20Project%2fQA%5fQC%2fPhase%20II%20PFL%20Build%2f25%20Test%20Metrics%20Dashboard&FolderCTID=&View=%7b82923FF0%2dA62E%2d43C0%2d981B%2d80024F56BC50%7d

- Corrective Actions: Discrepancies found in the QA assessments (both process and sample testing) will be communicated to the process owner and follow a defined corrective action process. The process owner and QA representative will agree on a plan and timeline for corrective action.

b. PFL Prep

i. Specifications and Standards

- Definition of the product – The PFL Prep sub process consists of two primary activities:
  - PFL Prep: PFL prep creates a PFL cluster record in ECTS that contains all PFL related documents that are relevant to that particular cluster.
  - Line Walk: Line Walk activities create a record (in ECTS) of a completed search of transmission plats in GIS to ensure all job file information related to a particular PFL cluster is identified. The record is meant to initiate a field search for any relevant job docs not in ECTS.
- Definition of a "defective" product
  - PFL Prep: A defective record from the PFL Prep activity would display one (or more) of the following characteristics:
    - Record contains PFL job docs incorrectly assigned (not relevant to that particular section of line)
    - Record fails to accurately identify missing docs (gaps)
  - Line Walk: A defective record from the Line Walk activity would display one (or more) of the following characteristics:
    - Missing D Plat or T Plat
    - Appropriate detail to enable field search
    - Work order GM in / not in ECTS

- Listing of applicable specifications and reference documents

ii. Process description:

- Process map describing the steps in the process, to include QC control points
- Work procedures
- QC procedures
  - QC procedures are embedded in the ECTS process. See process map and work procedures at the below Sharepoint link

For Line Walk and PFL Prep process and procedures documents, see docs at following SharePoint link:
http://wss/sites/GasProgramAndPerfMgmt/Shared%20Documents/Forms/AllItems.aspx?RootFolder=%2fsites%2fGasProgramAndPerfMgmt%2fShared%20Documents%2fSan%20Bruno%20Incident%20PMO%2fGT%20Data%20Validation%20Project%2fPhase%202%2fPhase%20II%20Process%20Map&FolderCTID=&View=%7bA976F191%2dDBF6%2d499D%2d9AD6%2d934F04648538%7d

iii. Assessment procedures

- Line Walk
  - Process assessment: process assessments consist of the following:
    - Review of the process documentation
    - Comparison of actual activities to process documentation
    - Review of QC control points, procedures and results
  - QA sample testing: During scheduled reviews, a sample of the final product will be tested for adherence to published acceptance criteria
    - For sampling techniques, see section III.f
    - For scheduled assessments, pull an appropriate sample (using techniques in III.f) of completed PFL clusters. Compare the attributes of the completed record to the product definition and acceptance criteria.
- Schedule / cadence of QA assessments / assessments: Scheduled assessments will have at least a week of lead time before assessment begins. Ad hoc assessments will be performed as required.
  - PFL Prep
    - Scheduled assessments should take place quarterly

- Ad Hoc assessments as directed by management

- Line Walk
  - Scheduled assessments should take place quarterly
  - Ad Hoc assessments as directed by management

iv. Results and Metrics

- Templates for recording results can be found on the following Sharepoint Site:

  http://wss/sites/GasProgramAndPerfMgmt/Shared%20Documents/Forms/AllItems.aspx?RootFolder=%2fsites%2fGasProgramAndPerfMgmt%2fShared%20Documents%2fSan%20Bruno%20Incident%20PMO%2fGT%20Data%20Validation%20Project%2fQA%5fQC%2fPhase%20II%20PFL%20Build%2fPFL%20Prep&FolderCTID=&View=%7bA976F191%2dDBF6%2d499D%2d9AD6%2d934F04648538%7d

- Corrective Actions: Discrepancies found in the QA assessments (both process and sample testing) will be communicated to the PFL Prep process owner. The process owner and QA representative will agree on a plan and timeline for corrective action. Corrective Actions will be logged in the appropriate tracker with owner and resolution date, and QA representative will record when corrective action is complete.
- QC Metrics will be established by the process owner and QA representative. Acceptable Quality Levels for the process should be established, and testing results should be compiled for comparison. Metrics should be available the next day business day after testing is complete.
- Reports: Assessment reports should be completed within 3 working days of the assessment completion. Results and Reports should be shared with process owner in order to facilitate discussions corrective actions required.

c. PFL Build

i. Specifications and Standards

- PFL Definition- A Pipeline Features List ("PFL") was initially developed as a method to capture pipeline data elements during the pre-assessment phase of an ILI project. The PFL consolidates the current pipe features (pipe, valve, bend, reducer, tee, sleeve, tap, flange, PCF) into a common worksheet along with feature specifications (pipe size, class, wall thickness, yield strength, seam, rating) using various original design drawings and as-built information. Although PFL's were traditionally developed as the pre-assessment phase of an ILI project, it is created to include all the required information to successfully calculate the Maximum Allowable Operating Pressure ("MAOP") of a pipeline. Furthermore, the PFLs in conjunction with the Marked-Up

Drawings can provide traceable access to the verified and complete PG&E records of the transmission pipeline per the directive of the CPUC.

- PFL Specifications: The minimum federal pipeline safety standards, 49 CFR Part 192, require that each section of pipeline have a maximum allowable operating pressure (MAOP) established. The definition of a pipeline found in the standards is: all parts *of those physical facilities through which gas moves in transportation, including pipe, valves, and other appurtenance attached to pipe, compressor units, metering stations, regulator stations, delivery stations, holders, and fabricated assemblies.* A separate MAOP must be established for each distinct segment of a gas pipeline system. Each transmission line must each have a designated MAOP. Section 192.619 of the standards lists the factors to review in determining the MAOP. Records and the basis for any assumptions must be available to substantiate any value determined.

ii. Process Descriptions

- Process Map
- Work Procedures
- QC Procedures

See the following Sharepoint Link:

http://wss/sites/GasProgramAndPerfMgmt/Shared%20Documents/Forms/AllItems.aspx?RootFolder=%2fsites%2fGasProgramAndPerfMgmt%2fShared%20Documents%2fSan%20Bruno%20Incident%20PMO%2fGT%20Data%20Validation%20Project%2fPhase%202%2fPhase%20II%20Process%20Map&FolderCTID=&View=%7bA976F191%2dDBF6%2d499D%2d9AD6%2d934F04648538%7d

iii. Test Procedures

- Purpose: The purpose of this section is to detail the QA test procedures related to the PFL build. QA is an independent function on the Project and exists to highlight all identified non-compliances and to ensure that agreed corrective actions are taken. The PFL Build QA Team is tasked with ensuring that PFLs are developed in accordance with the PFL Build procedures and that proper controls exist to confirm the accuracy of the information.
- Sample Methodology: In order to reach a conclusion about the entire PFL ID population without examining every PFL ID, a statistically correct sample may be used. Two conditions must be met in order to infer statistically significant conclusions from the selected sample:
  - The population under consideration must be homogeneous
  - The sample must be randomly selected, such that each item has an equal chance of being chosen.

The QA Team has established the following statistical parameters: a 95% confidence level, an estimated 2% error rate, and 96% precision. The QA test procedures, defined below, will be performed on the population that makes up the mileage established for predetermined Milestones set by PG&E. A representative sample of PFLs from each 25% portion will be tested. The QA Team will then test the remaining Milestone population in 25% intervals. The intervals will allow the PFL Project Team the ability to increase the sample size based on results.

Consider use of the following to determine the sample size selected:

Samples for testing will be selected using attributes (vs. variables). The intent is to select a representative sample size that gives confidence that the results represent the overall population of ~2000 PFLs. This method will be based on a 95% confidence of 2% errors with +/- 4% precision, which effectively means that the expected compliance rate is 98% with an uncertainty range of +/- 4%. *(This sample may not be strict enough for "critical" PFL attributes…)*

iv. PFL Build QA Procedures: Similar to the QC methodology, the QA Team will be evaluating the PFL ID's for:

- Completeness – To ensure that all features encompassed by the scope are captured
- Scope of data captured – To ensure that the appropriate specifications for each feature is captured
- Accuracy of data captured – To ensure that the captured data is valid and accurate for each feature
- Traceability of data captured – To ensure that the captured data can be traced appropriately to the correct primary or secondary document(s).

The purpose of the QC Team is to evaluate the PFL IDs provided by both the vendors and PG&E's internal PFL Builders. The PFL IDs are evaluated to achieve a 95% confidence rate that the information captured within the PFL ID's is complete and accurate. To achieve this, the QC Team will use critical unknowns in conjunction with random selection to determine the sample population. Each sample set will be greater than 10 sequential features and less than 30. In contrast to the methodology used by the QC Team, the QA Team will use the statistical sampling criteria to randomly select a population of PFL IDs, per the above sample methodology, to perform a 100% evaluation of the identified PFL IDs.

A PFL ID is deemed complete and ready for the QA Team evaluation once the following criteria are met

- PFL QC Team has completed its evaluation;
- Issues and defective features have been addressed; and
- Unknowns have been identified and escalated to the Field Verification Team

Once a sample population has been identified the QA Team will gather all pertinent documentation related to the PFL ID's. The required documentation to properly evaluate a complete PFL package includes, but is not limited to, the following

- PFL ID spreadsheet
- Marked-up drawings
- Primary documentation
- Secondary documentation
- Valid Unknowns Spreadsheet

v. Evaluation Criteria: Upon gathering all the required documentation, the QA Team will begin testing the completeness, scope, accuracy and traceability of the data captured with the PFL ID.

- Completeness: In order to determine the completeness of a PFL ID, the following criteria must be evaluated:
- Boundary Endpoints – To ensure that features are not missed between two PFLs
- Comprehensive Coverage – To ensure that the entire line is captured to the level of detail that source documents can provide.

vi. Scope of Data Captured: In order to determine if the scope of data captured is consistent with the desired outputs of the PFL, the QA Team must first ensure that all features have been captured and secondly that all critical specifications of those features have been captured.

- Desired Features
  - Pipe
  - Value
  - Bend
  - Reducer
  - Tee
  - Sleeve
  - Flange
  - Pressure Control Fitting
  - Relief Value
  - Meter
  - Strength Test Data
  - Job Number Data
  - Casing

- Critical Specifications
  - Pipe or Fitting Outer Diameter
  - Class Location
  - Wall Thickness
  - Specified Minimum Yield Strength

- Seam Type
- ANSI Rating
- Strength Test Data Elements

vii. Accuracy of Data Captured: In order to confirm the accuracy of the data that was captured in the PFL, the QA Team will evaluate the following criteria:

- Missed Feature – To ensure that all features are captured
- Extra Feature – To verify traceability of a given feature
- Inaccurate Specification – To ensure that MAOP-related specifications are accurately captured
- Inaccurate Location – To ensure that the feature can be located in the field.

viii. Traceability of the Data Captured: In order to confirm that the traceability of the data was captured in the PFL, the QA Team will utilize the mark-up drawings to evaluate the following criteria:

- Format/Scheme Followed – To ensure a uniform product across multiple vendors/PFL Builders.
- Accuracy – To ensure that the data captured in the PFL can be traced through the marked-up drawings.

ix. Metrics and reporting

- Documentation of the Test Results and Archiving

d. QA - System Upload and Query (incl Intrepid)

Introduction

As part of the Quality Assurance ("QA") procedures for Pacific Gas and Electric's ("PG&E") Gas Transmission ("GT") Pipeline Maximum Allowable Operating Pressure ("MAOP") Calculation Project, programmatic QA testing of the underlying database support systems - the Enterprise Compliance Tracking System ("ECTS"), the Geographical Information System ("GIS") and Coler & Colantonio Inc.'s Intrepid enterprise software solution ("Intrepid") - is essential to ensure that the data reviewed, analyzed and reported on conforms to PG&E quality standards. ECTS is used to capture, track input, and maintain in a centralized location, the data captured from the collection and review of hard copy GT job file documents into a robust, searchable, electronic database. GIS is the geospatial database utilized by the GT team to capture and store data around PG&E's gas transmission pipeline system. Intrepid is the enterprise-wide software solution used by PG&E to calculate and report MAOP on PG&E's gas transmission pipeline system using the Pipeline Features List ("PFL") data being built by PG&E's gas transmission engineers.

Purpose

The purpose of this document is to describe the QA approach and methodology for the ECTS, GIS and Intrepid database supporting PG&E's Gas Transmission MAOP Calculation Project. This plan is not intended to replace any existing programs or procedures, but is to define the overall QA approach for the ECTS, GIS and Intrepid databases and to reference applicable procedures.

Quality Assurance Testing

An objective, programmatic view of all loaded, analyzed and reviewed records is needed to provide additional views into the data, which would not be evident from the QA processes around the physical record and production processes. Independent testing will be performed on a snapshot of data from the ECTS, GIS and Intrepid systems triggered by business-process driven events, and the quality of the data will be objectively assessed by:

- Interviewing the ECTS system owners and data preparation team to understand current processes and controls related to upload of Doc Type data into ECTS;
- Performing tests of selected data elements in ECTS and source data / load files received from vendor, and providing statistics on pass/failure rates, as well as recommendations for corrective action and process improvements as required;
- Performing periodic tests of selected data elements in ECTS to validate that user input is valid and appropriate, and providing recommendations for corrective action and process improvements as required;
- Interviewing PG&E engineering team to understand input for MAOP calculation, and mapping these inputs to PFL data elements;
- Upon upload of data from PFL into Intrepid, performing tests of selected data elements in Intrepid that are utilized in the MAOP calculation to validate that the upload is valid and appropriate, and providing recommendations for corrective actions and process improvements as required;
- Interviewing the GIS system owners and data migration team to understand processes and controls related to migration of data from vendors into GIS;
- Performing tests of selected data elements updated in GIS as a result of migration of data from vendors into GIS