Quality Control in all steps

The quality control of Pipeline Features List (PFL) data occurs in all major steps in the over-all process. This work begins with the PFL Build stage of the process. The PFL is initially created by a PFL Builder; after this work is completed all PFLs are 100% quality reviewed by another member of the PFL Build team. After this peer review and correction of the PFL, it will go to a PFL Build Quality Check. This is at least one more person that will do a 100% review of the data gathered, data source information and interpretation of the data. This PFL Build Quality Check will result in review by a Professional Engineer and signature on the transmittal of the finished product.

Quality Control Group

All PFLs are subject to a complete review by PG&E's Quality Control (QC) group, typically a team of between 35 and 40 engineers. The QC team, which incorporates a two-pass system, reviews all the original source documents associated with each PFL to confirm that the PFL data is consistent and accurate. The QC team also searches for possible missed documentation as needed to improve the quality of the data in the PFL, specifically for those components with specifications identified as "unknown." In addition to the corrected PFL, the QC team also produces a list of suggestions to the Build team, including trending of errors that improve build quality when identified and addressed.

Two metrics are used to evaluate build quality: completeness and accuracy. "Completeness" analyzes possible missed features, while "accuracy" looks at whether specifications were transferred correctly from the respective source documents and at the quality of the source documentation. Transmission records used for PFLs are assigned a quality rating based on reliability factors like signatures, completeness, and recentness. For instance a "Q2" rated document should be relied on for PFL values over a "Q4" document, which was checked by the QC team.

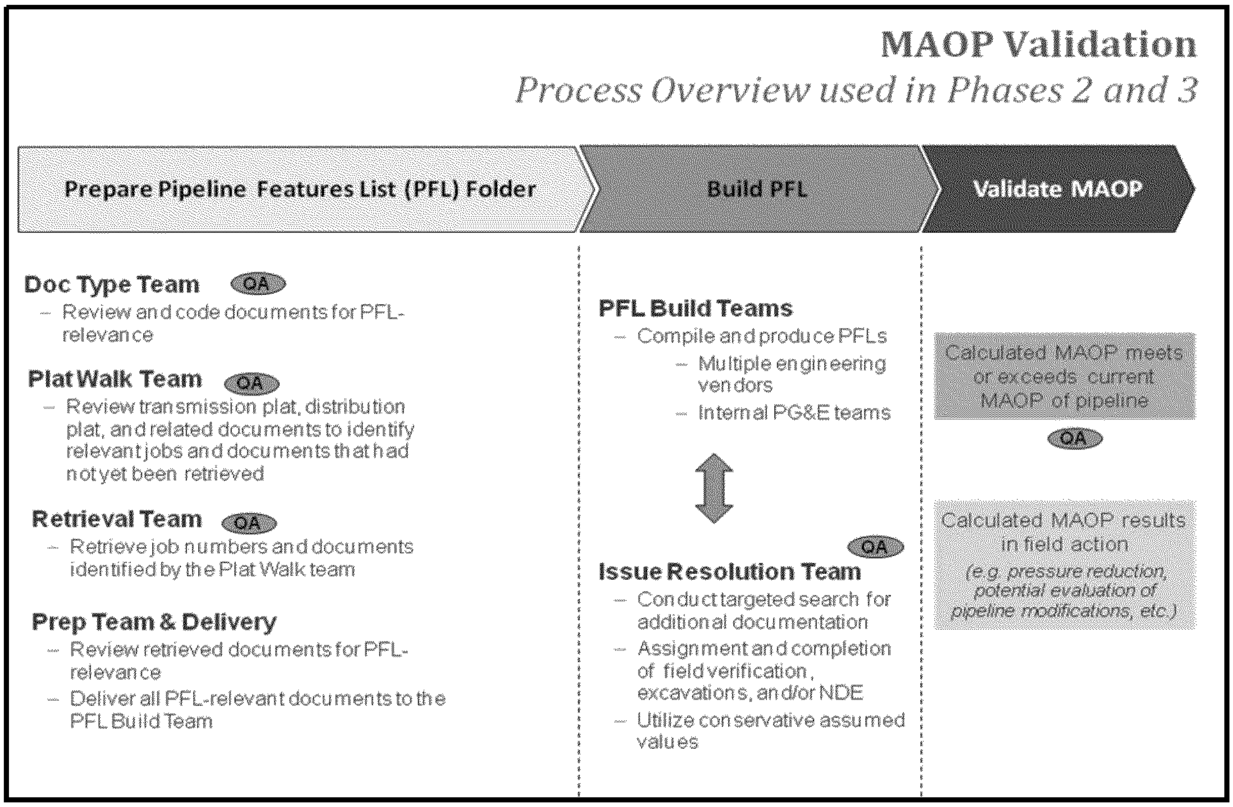
Data Source Quality Tiers For Pipe, Fittings, Welded components		
Q1	Mill Test Reports, factory test reports. These are most important for the Yield Strength of the metal. Wall thickness and OD should match to as-built information.	Represents Manufacture Delivered and Certified for a particular job or project
Q2	Receipt / Delivery Tags with clear dates, job number and/or locations. The specifications may be on another document, but this document proves delivery.	Represents Manufacture Delivered to the job.
Q3	Purchase Orders, As-built Drawings, As-built Strength Test Pressure Reports, As-built Bill of Materials or Bill of Material with Purchase Order numbers listed. Material requisitions that are signed or dated as received.	Represents Company Purchase or Witness of Installatio n
Q4	Construction Reports, Inspection Reports, Project Close out reports. Distribution and Transmission Plat Sheets, Operating Maps and Diagrams.	Represents witness of installation, from a secondary document source.
Q5	Material Requisitions, Bill of Materials with Engineers Material Memo (EMM) listed.	Represents early intent
Q6	Design Packages and Bill of Materials Approved for construction	Represents early intent

These metrics were generated for all PFLs and provide an objective measure of quality. As a result of the QC group's efforts and the feedback provided the PFL Build Team, the overall initial PFL Build quality by the engineering vendors increased dramatically over time and reduced a significant amount of the rework required.

Quality Assurance

Quality Assurance (QA) was an independent function on the MAOP project tasked with performing periodic assessments and sample testing in order to ensure that the end product of each process meets the intended requirements. A team of approximately ten people performed assessments and periodic sample testing on each step of the MAOP Validation Process from the Plat Walk Team through Issues Resolution. See Figure 39 for a summary of Quality Assurance efforts as performed by PWC during Phase 2 and 3.

Figure 39



The QA approach[1], modeled after ISO 9001:2000, consisted of the following high level activities:

Assess whether the Project uses formally defined and documented processes, to include Quality Control (QC).

Assess whether those processes are designed and implemented using documented specifications, and that those specifications flow from an appropriate governing standard.

Apply QA oversight by performing scheduled QA 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, including recommendations for corrective actions.

These QA activities validated that the process produced outputs as expected (documents, data, or calculations). The QA activities also employ ample testing data to verify the comprehensiveness and robustness of quality checking for each process by comparing the results of the QC to the QA sample testing results. The results of the periodic testing fed into root cause analyses and corrective action discussions. The QA team was able to propose corrective action, and it was the primary management resource for follow up on the implementation of the corrective action.

[1] See Appendix Q for QA Plan for Phase III

A rigorous process existed to test each process step to provide as much data to the build teams for review as possible. A sample of the completed PFLs was tested on a weekly basis to ensure consistency in the application of standards, data interpretation, and the application of conservative assumptions. The acceptable level for errors on a PFL that result in a less conservative MAOP for a particular PFL was zero percent. The project team always placed safety as the foremost priority; therefore the QA teams would consistently side with the most conservative response in each of its testing criteria.

A PFL Build was deemed complete and ready for QA evaluation when it has passed Quality Control. Quality Assurance occurred in parallel with the Issues Resolution Team process. QA results, including documentation of any errors in the PFL, are shared with the PFL builders, QC team and Issues Resolution team. Quality Assurance of the PFL Build process included assessment of the following:

QA Metrics

Completeness	To ensure that all features encompassed by the assigned mile points are captured
Scope and accuracy of data captured	To ensure that the appropriate and accuracy of specifications for each feature are captured, and that the data is valid and accurate
Traceability of data captured	To ensure that the captured data can be traced appropriately to the correct source document(s)
Transfer	To ensure that the PFL transferred to the Issues Resolution team is traceable and complete

A Quality Assurance Assessment was performed on a number of PFLs on a sampling basis. Each PFL is also evaluated for the following:

All features within the assigned boundary end points are detailed on the PFL. In accordance with the PFL Build procedure, this may necessitate inclusion of additional features if the beginning mile point is not at a geographically significant location (e.g., some distance along a pipe segment).

All critical specifications for all features are correctly identified, or correctly highlighted as unknown.

Accuracy of non-critical specification

Traceability of the data captured

Format in accordance with the PFL build procedure

Inclusion of unnecessary or erroneous extra features

The results of these last evaluation criteria were recorded but had no bearing on the overall PFL pass/fail criteria as they did not impact the MAOP calculation. Refer to the "QA Assessment for Pass, Error and Fail" table for detail about the types of errors that were assigned and reported to management regularly. Some examples of these errors are summarized in Figure 40.

QA Assessment for Pass, Error and Fail

Type 1 Pass	No error: the spec is within the defined tolerance range (refer to Technical QA/QC Tolerances)
Type 2 Error	The error does not affect the feature MAOP calculation.
Type 3 Error	The error affects the feature MAOP, but the input value is more conservative than the correct value.
Type 4 Error	The error affects the feature MAOP, and the input value is less conservative than the correct value, but the error does not affect the MAOP of the entire PFL.
Type 5 Error	The error affects the feature MAOP, with the input value being less conservative than the correct value, and the error affects the MAOP of the entire PFL, which becomes lower when the correct value is input.

Figure 40

PFL Build

MAOP Tech QA Summary
May 24, 2012

Description	Theme
Builder had the correct document but interpreted the document incorrectly	Incorrect Interpretation
Error within the reference document and/or the builder made an error choosing one reference document over another.	Reference Material Error
Two or more documents have inconsistent data	Conflicting Documentation
Non-technical error	Admin Error
Builder chooses the wrong date when reviewing install, coating, build, and/or operation dates.	Date Inconsistency
Builder did not search for documents long enough, and/or errors related to document availability	Document Search
Builder left off information	Incomplete Information
QC/QA could not reproduce source of data cited by builder	Untraceable

The QA results, including documentation recording the errors in the reviewed PFLs, were shared with the PG&E Build, QC, and Issues Resolution teams. These Technical QA results were shared with the QA/QC Manager weekly each Thursday. The QA/QC Manager then disseminated the results to the appropriate team managers, who were in charge of communicating corrective action to their teams.

Corrective actions were required where failures or errors occur on critical specifications, or when a process improvement was identified. These actions were detailed on the Technical QA Log, which was maintained by the QA team to verify that corrective actions were carried out.

Further Quality Checks in the GIS System

After the Pipeline Features List (PFL) are created and checked for quality in the steps mentioned above, this information must be loaded into the GIS system. We must ensure that the data was uploaded correctly and that the system is functioning correctly. We have defined a Certification Project to ensure the quality of this data.

Background

The purpose of a GIS certification plan is to verify the data in the GIS database to ensure that it supports the Verifiable, Traceable and Complete definitions defined in PHMSA, CPUC Decisions and the PG&E Standard 4125. This will result in improved quality data for use by the gas transmission data end users.

Summary

The GIS Certification will be completed by focusing on the following specific tasks:

- 1.1. Defining and controlling the specific data that is certified. (in progress)
- 1.2. Verification that the upload process from the PFL to GIS is working correctly. (in progress)
- 1.3. Find and correct large quantity errors in the GIS data. (in progress)
- 1.4. Find and correct input inconsistencies such as miss-spellings, missing installation dates, missing job numbers, etc. (in progress)
- 1.5. Find and correct technical data inconsistencies such as no seamless pipe greater than 26 inch, long seam factors correct for the seam type, etc.
- 1.6. Develop, find and correct data inconsistencies across systems, such as image names that are not available in Documentum, SAP leaks that are not in GIS, etc.

1.7. Continuing regression checks that the MAOP Calculator is working correctly.
1.8. Verification of the proper operation of the assumptions logic. (PRUPF WP-4199)
1.9. Creating a process to monitor the system quality using the queries developed.
1.10. Handing off the quality monitoring process to the Data Quality Management group for permanent implementation as the process becomes stable.
1.11. Continuing development of quality control checks and monitoring as other functionality and data is added to the system.

For the initial work all corrections will be accomplished through the correction and reloading of PFL data. This ensures that the PFLs are up to date and available for end users of the data while this certification process is under way.

This Certification plan and more importantly the queries will be reviewed with our internal customers of the data. Additional queries and modifications will be gathered and utilized as needed. These internal groups are: Integrity Management, PSEP, regulatory compliance and Pipeline Engineering.

Quality Metrics

The purpose is to certify the GIS data as useful and accurate. However, how do we know when we get there? This will be evaluated at the individual query and research item level. Associated with each query we will establish a goal for the remaining number or percent of issues remaining in the system.

For example, fittings that are longer than standard length is one query. Initially we will evaluate fittings that are more than 10 feet long to identify the large problems. We will investigate all occurrences and either approve them or fix them. Each investigation outcome will be documented. In this situation we must have zero fittings that do not pass the review.

We will then develop a query that used the fitting length calculation that is available in the PFL spreadsheet. This calculation will be implemented into the query and we will more accurately review every fitting to ensure it is not too short or too long. The radius of the fitting will be involved with this query and will be checked at the same time as part of the query results review. In this case all fittings must pass the test after investigation or be fixed.

There are many other queries that have zero tolerance, such as unusual combinations of specifications.

Other types of queries must use a tolerance. We are comparing the length of routes in GIS to the length in other systems. We are expecting to find differences that are not mistakes. Initial results indicate that tolerances of +/- 1 to 2% will probably indicate acceptable lengths.