Transmission Regulator Station MAOP Reconfirmation and Material Validation

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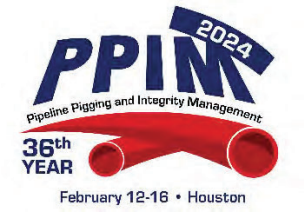

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ABSTRACT

The intent of this technical paper is to illustrate a repeatable approach to validating station assets through a complete records and material verification process to efficiently reconfirm MAOP for stations.

By using modern technology, established best practices and detailed records research, one can generate a near complete understanding of the assets at a particular facility. Using the data gathered from records and subjecting it to effective tooling with the use of a file geodatabase, the operator can understand the compliance challenges of these assets spatially and better prepare for the execution of MAOP Reconfirmation. A final, but not to be overstated, aspect of this program is a demanding definition of Traceable, Verifiable and Complete records that is well understood by all parties involved.

To better aid the understanding of the results, a series of "one line" isometric drawings are also created to act as a visual aid relative to requirements like pressure test coverage, %SMYS, Work Order History, etc. These tools are especially effective when presenting large stations (multiple settings built and upgraded over many decades) to the various stakeholders for their input and support as this evidentiary process becomes a plan of action relative to MAOP Reconfirmation.

With these deliverables [file geodatabase (FGDB), single line isometrics and a final report with relevant information and appendices] an operator can assess gaps in Compliance Material and explore further material verification efforts to mitigate the impacts of MAOP Reconfirmation to their respective systems and budgets.

While the initial efforts of this program are geared predominantly at executing MAOP Reconfirmation, by introducing the FGDB at the onset, the operator can develop a living data organism that has many applicable uses to many departments within an operator's organization over the life of that facility.

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INTRODUCTION

Transmission Regulator and Meter Stations are an important part of the Transmission Pipelines System. Ensuring that stations are operating within code and company regulations is imperative for their continued safe operation. Knowing the details of these facilities is a key step in understanding the challenges of compliance. Details like having a Traceable, Verifiable and Complete Pressure Test and primary material attribute data are the two key factors for MAOP Reconfirmation.

Creating or improving the Station Field Review Program within an organization can benefit the MAOP Reconfirmation Process, Risk Management, enhance Geospatial Interface Systems and help plan for the future of the assets. With the deadline of MAOP Reconfirmation looming, it is imperative to make this process as efficient and well defined as possible. This paper will walk through important fundamentals of defining, gathering, and reviewing station data and capturing it in a usable and efficient way for better data analytics and decision making.

Fundamentals of Transmission Stations

To implement a successful Station Field Review Program, an organization will need to define what a Transmission Station is and the station extents, i.e., where that station starts and ends. With some operators maintaining Transmission Systems across multiple States, it is of increasing importance to have an established and easily repeatable process.

Most importantly, an organization will need to define what a Transmission Station is and the extents of that station. This could be as simple as a station that has features operating at or above 20% Specified Minimum Yield Strength (SMYS) from inlet valve to outlet valve, or it could be more complex for specific stations such as Points of Delivery (PODs) where separating ownership is more challenging. This will require dedicated professionals to conduct an evaluation of all the types of stations a company operates and to categorize them based on similarity.

To break this down into its core components, the first step it to define a Transmission Station. Questions that arise from beginning to define what is a Transmission station are: Is it only having components operating at 20% SMYS or over, or any station fed by a Transmission Line? What happens if a station has a component operating at 24% SMYS with conservative assumptions and is being fed by a Distribution Line (operating below 20%)? These are all questions that need to be thought about and documented in a Company Standard as a basis for reviewing stations in compliance with code. With so much variability across an operator's footprint, this is a challenge and must be well thought-out to prevent issues during the Program's execution.

Once the definition of Transmission Station is defined and detailed, then a parameter of where the station starts and stops needs to be determined. As written above, it may be from inlet valve to outlet valve, at the demarcation point to the outlet valve, or the tap location to the outlet fire/critical valve.

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This level of analysis will need to be done on all stations that are deemed Transmission so a full review can be completed. It should be noted that the limits will change from station to station so there should be a hierarchy of determining characteristics that will need to be defined in a company standard. See 'Scope Determination' for further detail.

Gathering Transmission Station Data

Once the criteria for transmission stations is established, documented, and categorized, the next necessary step is to gather all the pertinent information for these transmission stations from historical documentation. This includes Work Order History and any relevant data for that station that will provide benefit in a review. Documents like As-Builts, Pressure Tests, Mill Test Reports (MTR), Certificate of Compliance or Conformance (COC), Purchase Records, prior material testing data etc., are critical to this step.

Review any operational history that is relevant, for example, regulator swap outs or filter changes are all useful in validating material properties. Items such as regulators, meters, flanges, filters, etc. may impact the review due their respective pressure ratings.

Alongside this documentation review process, there should be a review of the Maximum Allowable Operating Pressure (MAOP) in and out of the station. Determining where the pressure cuts are and what those MAOPs (dependent upon company standards) are determined to be, will be greatly beneficial later in the review process when performing calculations.

Part of this investigation is to locate where these documents reside, where other records may be located and creating a process to gather that information efficiently. The documents could be in a digital format such as a document management system, network drive locations, paper format in local offices, at the station itself, or a storage building, etc. All these locations need to be thoroughly searched through for later use in the review to link the documents to the data attributes. This helps the reviewer understand what information is current, and what additional information may be missing prior to going out in the field.

Having the linkage between the documents and data helps to create a traceable, verifiable, and complete (TVC) record from the Field Review. The Field Review then becomes a record that is helpful during audits and efficiently navigates locating data based off either the file geodatabase, isometrics or MAOP Table that are created for this Program. This is imperative for MAOP Reconfirmation and defining which stations need to be reconfirmed and by what method. Depending on the method chosen, the field review can highlight the areas for material verification, pressure rating constraints for pressure testing and any other MAOP Concerns.

Interpreting TVC

One of the biggest aspects of gathering data and defining compliance for Transmission Stations is defining internally what traceable, verifiable, and complete means for the company. TVC is defined in the Federal Registers "Pipeline Safety: Safety of Gas Transmission Pipelines: MAOP Reconfirmation, Expansion of Assessment Requirements, and Other Related Amendments"[i] The Code can be interpreted in a variety of different ways and because of that, there needs to be a clear internal definition on how to interpret TVC to follow a repeatable process to navigate several

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complex scenarios. Defining how TVC is interpreted in a company standard will benefit all parties that are a part of the Field Review activities.

How does your company currently define TVC? Is it on an attribute basis, documentation as TVC or another way? Is a Single Quality Record (SQR) acceptable if it meets all the required attribution for Traceability and Completeness[ii]? Are these documents connected via a unique identifier, such as a Work Order number? These questions will need to be answered prior to the start of the Field Review. There will be certain scenarios that are particular to an organization such as older document management systems which might need to be validated as a credible source, and how to interpret TVC in those cases. Creating a hierarchy of documents that, together can be TVC when reviewed is a necessary part of the TVC process.

It should be noted, as it is in the below Figure, that there is no exhaustive "menu" of TVC documentation combinations but setting a framework of expectations is vital to a consistent approach.

Once an approach is defined, it should also be considered how to record and store the TVC designation that accompanies the asset or document.

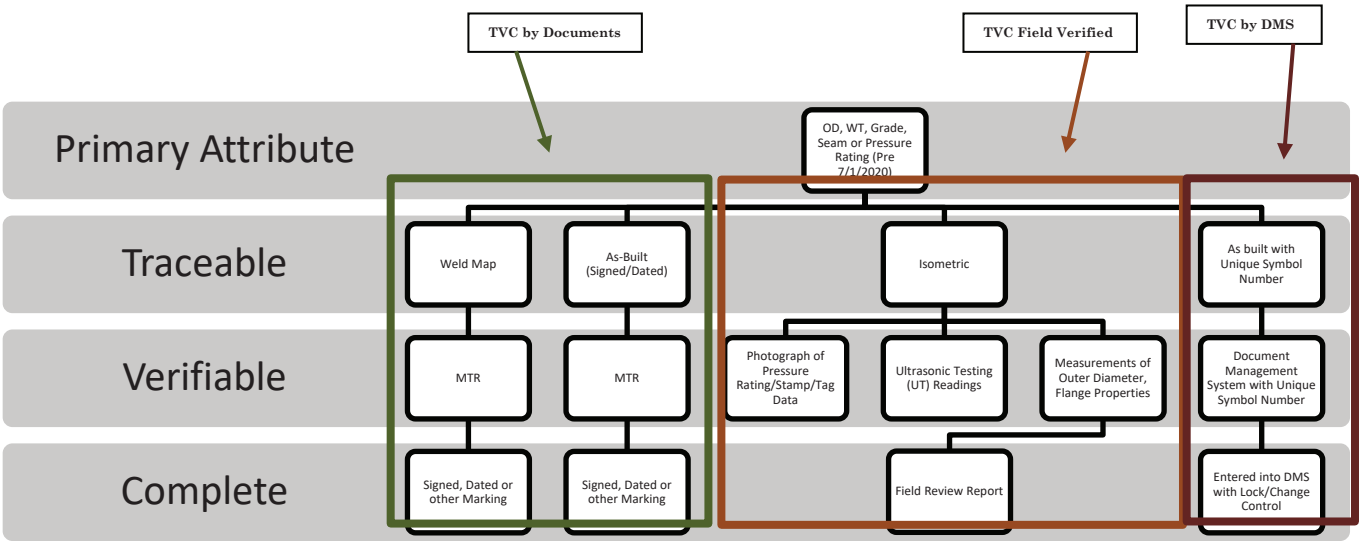

Figure 1 Example of TVC Hierarchy.

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USING DATA IN ALL FORMS

Records review

For the purposes of this technical paper the 'Review Team' will be a group of individuals with the goal of completing a Field Review. The 'Field Team' will be a group of individuals who are collecting data in the field to support the Field Review.

As the Review Team evaluates a path forward and determines the stations that are the highest priority to Field Review, for example which Transmission Stations are in a High Consequence Area (HCA), a Class 3 Location, stations with high MAOPs, or older stations, the scope can be defined. Once the list is created for priority stations, collect as much readily available information as possible for those stations. This will serve the purpose of preparing the Field Crews and allow for a more accurate schedule but also highlight the known or unknown aspects of the station. This allows the Review Team to seek additional information from secondary resources/locations depending on the level of available documentation.

As with many other parts of a successful Integrity Program, communication and engagement with stakeholders are critical in the effective collection of records. The Review Team will rely on local engineering resources and operations personnel to learn the most recent updates of a station and the most likely location of current or legacy records that may prove critical in developing TVC support.

It is also important to understand what resources/locations are most likely to be beneficial given the location, size and most often age of the station. Quickly finding the best and most up-to-date project documentation can save hours not only in the research, but also the assessment of documents that are not relevant to current conditions.

System(s) of Record

A familiarity with an operator's Systems of Record will be pivotal for the Field Review. A Work Management System houses everything from installation dates to pressure test data to asset properties (OD, WT, SMYS, MAOP, etc.). Understanding the weight that may be placed on these records and any caveats that may be considered is key to creating a full picture of the Transmission Station. If the system of record is not tied to the documents that provided the data, then the company should perform an evaluation to determine if the data can be used as TVC and document the determination in Company Standards. Understanding how the Systems of Record work, how they are organized and which search functions to execute when searching for records are paramount to a successful Records Review. If the Systems of Record are organized differently, it would benefit the Review Team to find the right individuals to contact to make sure that the Records Review yields all the documents for a given Transmission Station. This could mean Field Engineering Personnel, Local Measurement and Regulation (M&R) Techs or even Records Clerks that might have the records that would help complete the whole view of the station.

Legacy Records

These are records that are possibly not housed within a current Document Management System and may be provided by interconnecting parties i.e., other operators that deliver gas, or departments within an organization who could have paper or operational records. Paper Records like installation work orders or rebuild work orders if they are older, may be housed in local offices vs. in a locked controlled environment. Too often these records are limited in quantity and quality. Due to the

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robust qualifications of TVC, documentation is seldom a sole source of support for validating primary attributes (Outside Diameter, Wall Thickness, Grade, Seam, and Pressure Rating) and must be paired with As-Builts, Weld Maps or other drawings for Traceability purposes.

Legacy Records are useful in establishing a baseline of the station's configuration when no other information is available and when paired with a field visit, the Review Team can determine how many improvements have been made and the window in which they were made.

Field Data Collection

Once the Review Team finalizes the Records Review and gathers a good understating of each station that will be reviewed, the Field Data Collection efforts can take place. Please note that during the records review, if documentation found during the review supports that stations are distribution it will eliminate the need for a field review for the station(s) since the focus is on Transmission stations at this time. When tasked with Field Data collection, the focus is on gathering as much data as possible given the site constraints, client requirements, budget, and worker safety. It is important for the field team(s) to understand how to use the required data collection equipment and to why it is being used. Tool tolerances also need to be considered when starting the Data Collection. It is of equal importance to maintain detailed notes and a Photo Appendix of these observations for citation in later steps and TVC support.

While Operator Qualifications and general physical ability are essential, it is important for the personnel collecting the data to have a thorough understanding of why the data is being collected and how it will be used. For this reason, a Field Team would ideally be staffed with Engineers who have Field Experience. The Engineers will be responsible for attributing data from documentation and populating the tables and reports for delivery to the Operator(s). While Field Technicians may be readily available and may be used in a limited capacity or as a support to the Engineers, it is important and beneficial for the Engineers to be in the field. Simply stated, they have the best understanding of what is important and what the impacts are of ineffective data collection. Specifically, Engineers can collect the most data available for each feature that eliminates the need for unknown data or conservative assumptions. In the absence of this data the operator may need to apply conservative assumptions that do not correctly represent the operator's system. An operator will need to define a list of conservative assumptions for each feature that are acceptable based on an operators' historic practices among other considerations and can be used in cases where there is no documentation to supplement the review process.

As mentioned above, the more data that is collected the more data that can be assessed and the stronger the conclusion and more definite the Remediation Path. The following are the primary attributes and some key points for consideration in Field Data Collection.

Scope Determination

As the Review Team starts to consider the assets of a station, the limits of review must be established. To be repeatable and consistent a clear hierarchy is to be used throughout all Station Filed Reviews. For the current Program, the hierarchy is as follows:

1. Ownership Transfers – determined when the operator neither owns, operates nor maintains station assets. If one of the levels of involvement are satisfied, these assets will be within scope.

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2. Inlet Valve (off the tap, often designated as Critical and subject to yearly inspection) to Outlet Valve (downstream of all station assets)
3. Scope will start at the outlet valve cluster for a Pig Receiver. It will stop at the inlet valve cluster for a Pig Launcher. This criterion is dependent upon whether a pig launcher/ receiver is considered a station asset or a mainline asset. Review processes and procedures or define this as part of an existing one.
4. Facility Limits (all assets within the fence line or building structure)
5. When there is no fence or structure, scope will extend thirty feet upstream and downstream of where assets go below grade.

MAOP Transition Point(s)

Like the start and stop of the station review, it is equally important to have a consistent understanding of where the pressure drops downstream of the regulators to allow for accurate Design Pressure and %SMYS calculations. The pressure drops need to be clearly defined within the boundaries of the station to ensure proper delineation of MAOP for review purposes. For example, the first operable valve downstream of the control or working regulator could be used as the final appurtenance under the MAOP inlet pressure in the absence of properly delineating MAOP within the station. This could also include the inlet valve and extend to the second inlet valve if the design includes two bypass valves in series. Note that this definition excludes check valves from acting as a transition point due to their operability.

Outer Diameter (OD)

Whether using a low-tech method such as a calliper or measuring tape with OD conversion capabilities or a hi-tech method such as LIDAR scanning, having an accurate OD for above grade components is fundamental for a Field Assessment and impacts the conservative assumptions made throughout the review process. Field verification and effective site photos linked with supporting data i.e., GPS points creates a TVC Record if no suitable documents are available.

Wall Thickness (WT)

The importance of effective WT verification should not be understated. Within this program the conservative assumption as determined/interpreted by 192.109[iii] is to use the lowest commercially available WT for a specific OD per the company's Steel Pipe Design Gas Stands at the time the component was constructed.

The most common tool to determine the WT of a station asset is to gather it with Ultrasonic Thickness (UT) practices, when the asset is above grade. Through effective preparation, most often cleaning off algae or accumulated dirt, and by following the Best Management Practices (BMPs) of industry accepted UT sensors the Field Teams can gather reliable readings to be used as TVC Records when/if effective documentation is not available to provide WTs.

At times, a station allows for the readings of stamps (ELLs, Reducers, Tees) to determine certain primary attributes (as well as SMYS, Heat, Manufacturer, etc.) and in this case an effective photo coupled with supporting data can serve as a TVC record as well. This most often occurs when a station is either relatively new or indoors and protected from the elements. In the field, a single

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verification WT measurement is taken out of an abundance of caution in the event of unseen internal corrosion.

These readings can validate current records, support TVC, or identify areas for potential Internal Corrosion. With the help of a relatively simple and inexpensive tool and a modicum of field time an effective crew can validate the WT for most above grade appurtenances.

Grade

As mentioned above, in limited cases the Grade can be determined (TVC) in the field through the review of stamps but is most often supported by documentation. While the conservative assumption is the most well established in the Code (192.107(b)(2)) the impacts of dropping a SMYS down to 24,000psi has a significant impact on both the %SMYS and Calculated MAOP for a station asset. However, 24,000 is a TVC value per code, should this showcase a % SMYS below 20% for certain features to disprove Transmission class assets.

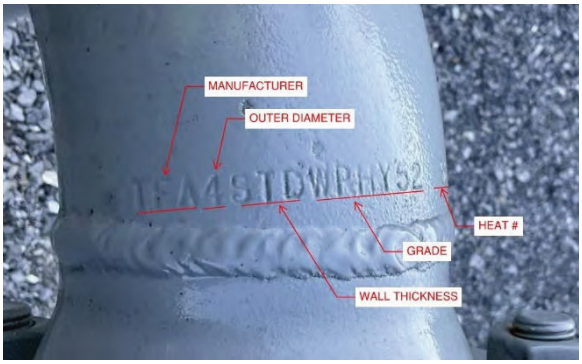

Figure 2 Typical Fitting Stamp

Seam type

Seam type will be most reliably assigned because of supporting documentation. While possible during the field visits, the presence of coating and wrapping make seam identification difficult and unreliable. Given these challenges, within the current Program, a field verification that can be considered TVC is not pursued given that the coating or wrapping is not removed/reapplied during this assessment.

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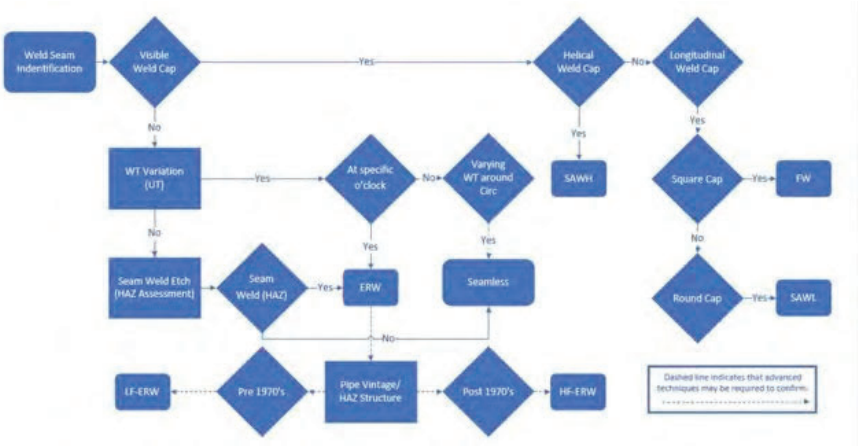

Figure 3 Seam Identification Flow Chart

While a concerted effort may be made to verify Seam Type in the field, typically it is provided by TVC documentation. If it not available in either case, a conservative assumption may be required for the Longitudinal Joint Factor (E). This has a significant impact on the Design Pressure and should be avoided.

To this end it is prudent to review, and if appropriate, use industry accepted and peer reviewed White Papers such as Kiefner & Associates, INC.'s 2012 "Joint Efficiency Factors for Seam-Welded Factory-Made Pipeline Bends[iv]".

Pressure Rating

Understanding the ANSI/ASME/ASA ratings over time and how they have evolved can help determine the pressure rating of certain features. The following table shows flange attributes and how one can ascertain a pressure rating based off five criteria.

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Table 1 Flange Dimensions to Determine ANSI Class per ASME B16.5 (Current – 3/18/93)

NPS	ANSI Class	150	300	600
4	OD of Flange (in)	9.00	10.00	10.75
	Bolt Circle Diameter (in)	7.500	7.875	8.500
	Bolt Hole Diameter (in)	0.750	0.875	1.000
	Bolt Count (ct)	8	8	8
	Bolt Diameter (in)	0.625	0.750	0.875
6	OD of Flange (in)	11.00	12.50	14.00
	Bolt Circle Diameter (in)	9.500	10.625	11.500
	Bolt Hole Diameter (in)	0.875	0.875	0.125
	Bolt Count (ct)	8	12	12
	Bolt Diameter (in)	0.750	0.750	1.000
8	OD of Flange (in)	13.50	15.00	16.50
	Bolt Circle Diameter (in)	11.750	13.000	13.750
	Bolt Hole Diameter (in)	0.875	1.000	1.250
	Bolt Count (ct)	8	12	12
	Bolt Diameter (in)	0.750	0.875	1.125

Challenges of Above Grade Data Collection

Stations are complex and vary widely in size and scope. As a result, there may be many station assets that are not able to be fully (or partially) assessed as part of this program. Challenges such as wrapping and poor coating prevent effective WT readings. Conducting field assessments during the cold season is problematic for several reasons. Typically, the most problematic is the ability to function efficiently in the cold. UT coupling fluid (gel) can freeze on cold steel main, and worker hazards due to temperature should always be considered. Iced over valves may prevent the verification of the rating or maximum allowable working pressure (MAWP).

One other consideration tied closely to temperature is noise. When the load on the system is greatest, the regulator runs are at their loudest. While adequate PPE can mitigate the issues it will impact communication and should not be overlooked. This is most considerable on stations within shelters.

Due to these circumstances, it is usually best to perform a field review in the warmer months/ typically after the final frost of the season.

Special access may be required for certain types of stations (vaults, shared ownership stations etc.) and with adequate planning, communication, and training this may be mitigated. Confined spaces or the necessity of a ladder/harness are conditions where safety is paramount, and the owner and Field Team need to work together to plan a safe field review. The Field Team and owner will also need to discuss the potential gaps that may arise from the exclusion of items that are not able to be Field Reviewed.

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Challenges of Below Grade Data Collection

One of the pivotal parts of this process is making a clear distinction between pipeline and station assets. Often, this is going to occur below grade on the inlet and/or outlet valve. This will require an assessment of below grade station components and pipe through solely documentation.

Excavations or exploratory digs are not a part of the project scope and therefore all attribution needs to happen because of available documentation. While some valve stems may extend above grade and have faceplates, most buried station assets will present a challenge for field verification.

Role of Photographs in TVC Support

When select assets have visible indicators related to their properties it is crucial for the Field Team to capture an effective photo or series of photos to support those findings. It can be a challenge in the field making the distinction between what is legible in person and what can be effectively photographed so that the image is equally legible.

As a matter of practice, when a stamp is visible, which is the minority of times, the field crew will review the photo recently taken and make a note if the Stamp is Visible but Not Legible (SV-NL). This can serve as an indicator to the owner that if TVC field verification is required, company personnel, holding the proper Operator Qualifications (OQ) can remove the coating and likely capture an effective photo before preparing and reapplying the coating.

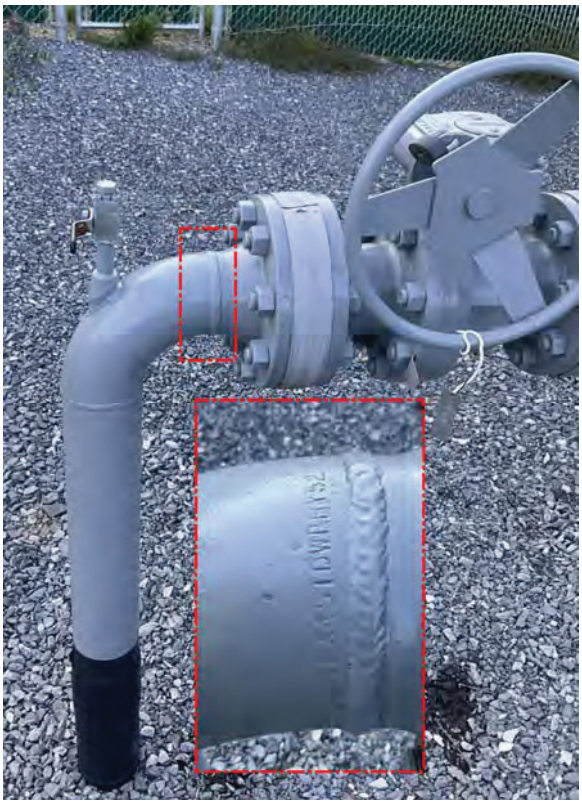

Figure 4 Effective Photo (90deg ELL)

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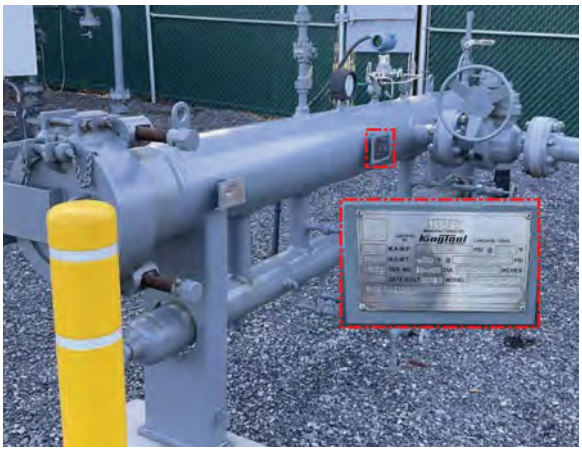

Figure 5 Effective Photo (Filter/Separator)

Figure 6 Ineffective Photo (WN Flange) – SV-NL

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Figure 7 Borderline Ineffective Photo (90deg ELL) – Limited Applicability

It should be noted that while it is important that these photos exist it is of equal importance that they may be accessed quickly and consistently. This will require a standard naming convention as well as folder structure discipline. Linking photos that have the stamp or tag information visible in the file geodatabase with other supporting data is a good rule of thumb for creating a TVC record.

Using a File Geodatabase (FGDB)

The inclusion of a FGDB will allow the owner to make the data collected be dynamic and accessible. While it requires an investment of time and infrastructure, the benefits go beyond the Integrity Program.

While it is an accumulation of data, it is also a living data organism that has many applicable uses to many departments within an operator's organization. With relative ease and limited training, it places you in an environment where you can easily query data and see the supporting material to validate the attributes and their TVC Sources if the documents from the document management system have been accurately linked to the data. In the case here, the most beneficial item would be to easily pull up the supporting TVC documentation, pressure test or site photographs. This will be an important part of audits in the future.

The use of a FGDB has a wide range of applicability. It may be accessed by multiple departments as "read only" participants where they can use the data collected/organized to their own ends and to support their initiatives. Though the use of 3D station views (isometrics) the users can see where these specific assets are in space and traverse upstream or downstream as required per the challenges of their task.

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Figure 8: Aerial of Transmission Station in GIS Environment

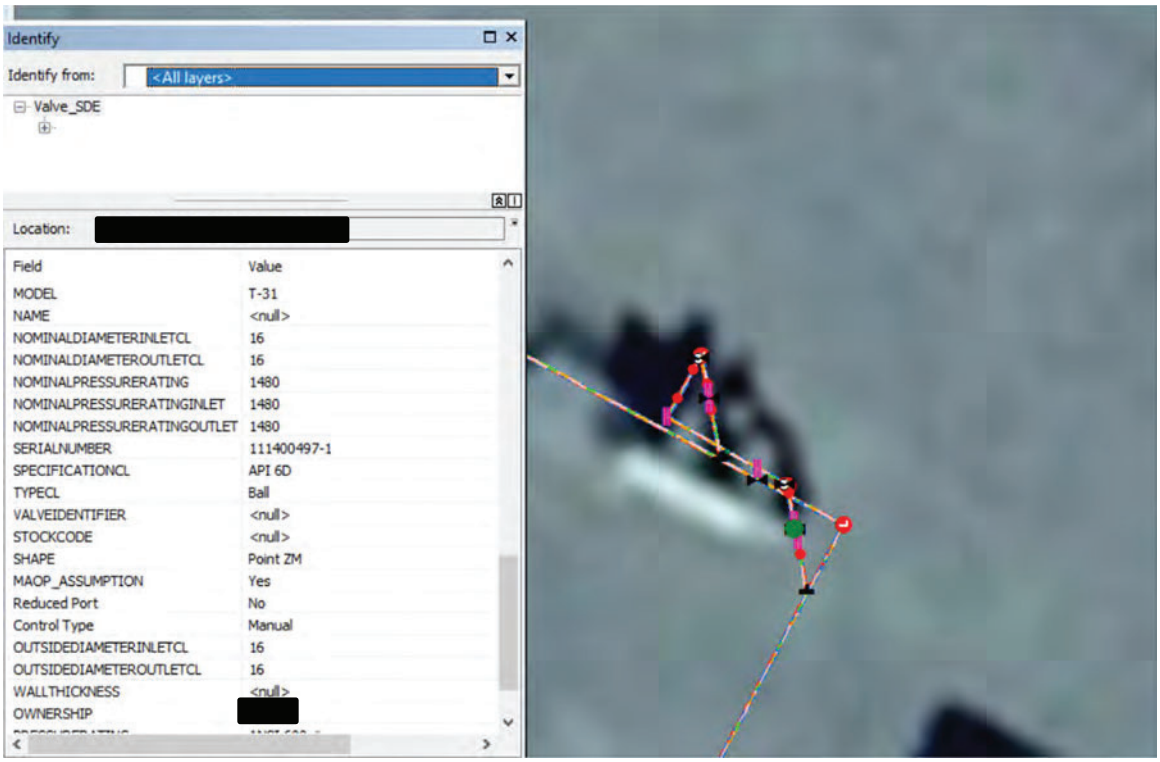

Figure 9: Valve Specification

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PACKAGING THE DATA

Showing Data (Tables)

Once the records review and field data collection are complete the next step is to put all the data in easily digestible formats for a multitude of viewers. Packaging the data in useful forms is an important part of making sure that the program is successful and accepted by all stakeholders. Building data tables is one such way to show the results and run the relatively simple calculations required to support compliance or the need for system improvement.

The following data that is collected is provided in the MAOP Table (excel) on a "per asset" basis:

1. Primary attributes (with TVC status Yes/NO per attribute)
    a. OD (nominal)
    b. WT (in)
        i. Conservative Assumption per 192.109
    c. Grade (psi)
        i. Conservative Assumption per 192.107
    d. Seam Type
        i. Conservative Assumption per 192.113
    e. Rating/MAWP
        i. Conservative Assumption per Operator's Historical Data
2. System Information
    a. MAOP
3. Pressure Test Results (with TVC Status)
    a. Minimum Test Pressure
4. Calculations using the information listed above.
    a. SMYS Calculation
    b. MAOP Calculation
5. Links to relevant and required supporting documents and photographs (supporting TVC) are essential in this table. This is especially important when in an audit situation. Having the supporting documents and photos easily reachable in this format can enhance finding the required information with ease.

The clear and logical layout of these properties and the resultant calculations create a record where the data and documents live together harmoniously and serve as an additional single place to view all station assets.

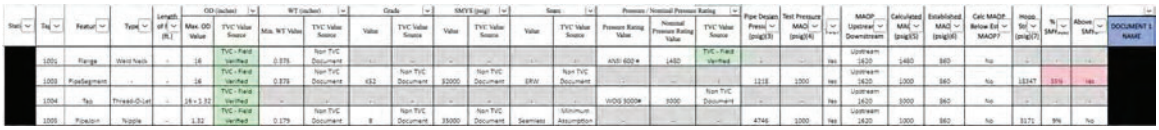

Figure 10: Example of MAOP Table

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Sharing Data (Isometrics)

While the Isometric referenced in the FGDB is a very effective tool to look at the specific details of the station review, the Program generates another Isometric (typically CAD or PDF Drawing) that serves the function to provide an overall understanding of the station's TVC coverage and the potential Compliance challenges that may still need to be pursued at a glance.

This portfolio of drawings effectively lets the reader see the conclusions of the MAOP Table and are generated to show the following:

- Job Order History
- TVC Pressure Test Coverage
- Areas at/over 20% SMYS
- Areas where the Calculated MAOP at greater than the established MAOP

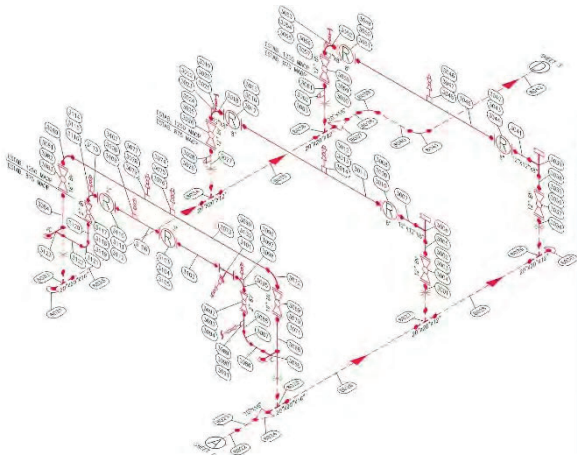

Figure 11: Standard Station Isometric

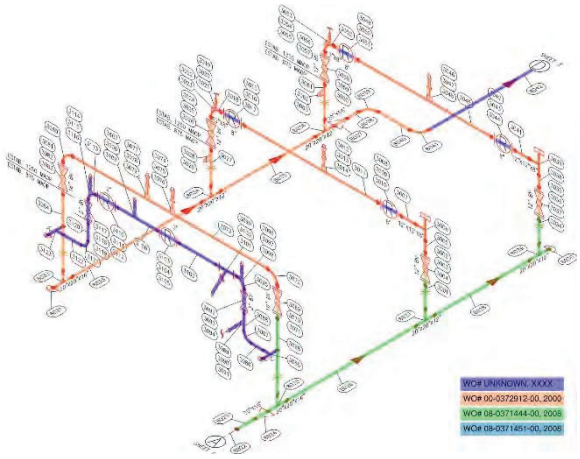

Figure 12: Station Isometric with Job Oder History

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Figure 13 Station Isometric with Pressure Test Data

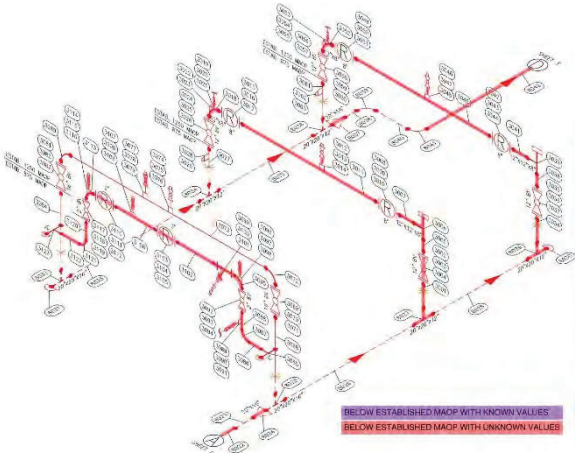

Figure 14 Station Isometric with Calculated MAOP vs Established MAOP Data

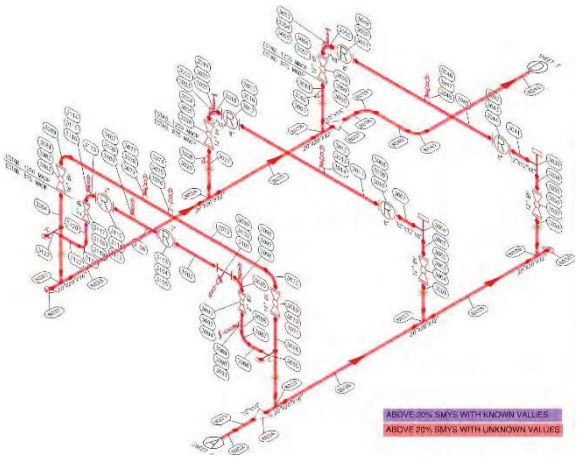

Figure 15 Station Isometric with %SMYS Data

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Sharing Data (Report)

The most effective purpose of the report is to combine the Data Tables and the Isometrics into an easily shared format, and to provide a summary of Remediation Options. When pursuing MAOP Reconfirmation, it is useful for the Engineering Team to pass along the knowledge and recommendations to the operator which may allow them to quickly develop a path to compliance.

This document and the related Appendices (data tables, isometrics, and supporting documents) can be shared and if necessary, taken on the road to help Local Engineering and Operations understand not only the work done to develop the report, but also the work that may yet be required. The more tools you have to generate buy in, the better off the Program will be in future conversations surrounding MAOP Reconfirmation and Capital Planning.

SUPPORTING DATA

Document Management System

Managing the documentation that prove TVC (or non-TVC) for each asset/attribute is vital to an effective program that can stand up to an audit. Well defined organization and structure can foster confidence in the overall Program. If the data is good but accessing it is problematic, then it is less likely that it will be used as the initial resource when necessary.

This may require a fair amount of file shifting most notably the separating of relevant files into single documents and the requisite naming of said resources – and the recording within the FGDB, MAOP Table, Report of the file paths to direct users right to the resources. This will also require mining the appropriate metadata for the document management system. Once the files are created and named per the SOW and company practices, they must be saved in a central repository with the appropriate meta data to allow for searching, which will allow them to be cited and retrieved at will.

MATERIAL VALIDATION

There are two options for Material Validation within the Station Field Review Program. One being that a separate program is created for validating materials as a part of the Field Review process. This separate program would solely focus on validating material attribution, namely grade, and wall thickness through industry accepted Non-Destructive Testing methods. This would require that the records review be done well in advance so that one can adequately plan for NDT to take place for either above grade or below grade features. This option would also require having NDT consultants or inhouse NDT personnel trained in the chosen technology to be on standby while the Field Review is taking place. This option would likely increase the time to complete the Field Review.

The other option is to implement a plan after the Field Review has been completed. This is typically the more efficient option. The Field Review produces a specific set of Isometrics as detailed above that helps create a more targeted approach to create a site-specific plan for Non-Destructively testing sections of pipe or pipe like components at the station to gather TVC records for unknown attributes. A Material Verification Program coupled with a Field Review Program of this calibre will help

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produce the knowledge of where true gaps exist and how to plan for Reconfirmation or any future Capital plans for the stations.

CONSIDERATIONS

Need for Data

As with any large program, a review of the undertaking and level of effort is necessary. How much is known about these assets currently? If a robust data set is available and there are well defined parameters, this program may not be necessary/beneficial. In the opposite direction, if data is not readily available or a review of the asset has not been done, this program, if implemented correctly can be greatly beneficial to many stakeholders within an organization. Consideration of where documentation is stored, current knowledge of the existing assets and operational concerns can help prioritize a Field Review program to target the necessary stations.

Time

Time is a crucial factor in this program. How quickly is data needed and at what level? This program can be modified for various scenarios. Considering the 15-year time frame for MAOP Reconfirmation, now 12 years, a Field Review program may be implemented for just applicable stations or if a review is needed on all Transmission Stations this program can be modified for that as well.

The Field Review can be done in whatever timeframe is necessary with the proper scoping and parameters. Depending on the scope and time in which the data is needed, a budget can be established, and expectations can be set.

Research/Availability of Records

Whenever possible, it is best to conduct research into the site prior to field activities. This will allow the Project Team to understand the scope, station history and availability of documentation (TVC or otherwise) before the costly field assessment.

By firmly establishing jurisdictional boundaries and demarcation points it will be well known what areas of the facility are within scope. By knowing the Job Order History and the general layout of the station it will allow for appropriate scheduling as there will be an understanding of how quickly or slowly UT measurements will be taken, how many runs are under the purview, etc.

It should also be assessed whether full TVC data is available due to the detailed record keeping of either the Construction Team(s) or Integrity. It may be possible to limit or even eliminate portions of stations from Field Assessment or MAOP Reconfirmation activities. This in turn saves the operator time and resources as they work to achieve compliance and is most often encountered when a large station is partially rebuilt.

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Resources

After determining the total number of Transmission Stations that need to be field reviewed for a given program year and what can be accomplished in the set time span, a pool of resources can be estimated.

Future State

This program, if implemented, is intended to be cyclical. Legacy stations will be reviewed to the level of detail set by an organization for TVC, and newly constructed stations will be TVC per code. Once the Field Reviews are completed for legacy stations and MAOP Reconfirmation efforts are underway, the new documentation from the determined remediation method will need to be reviewed to make sure it aligns with the established processes and procedures.

As with any project, the opportunity for human error is ever-present, which is why establishing Company processes and procedures are tantamount to success. When new documentation is available for a Field Review that has already been completed, the obsolete version will need to be updated, so that there is a constant state of current information available for stakeholders. This might mean that the entire field review deliverable needs to be updated and the complementary FGDB may need to be redrawn. This will require a management of change process for handling the data and deliverables.

CONCLUSION

Creating or implementing a Field Review program requires significant forethought but overall is a highly effective tool to use for gathering, supporting, and reviewing TVC data. Define what a Transmission Station is, where it starts and stops and how much data is currently known about it. Prioritize stations that are Applicable for MAOP Reconfirmation (192.624[v]). Create a team of qualified individuals to sort through the available documentation and link it to the specific assets. Perform a field review and gather all available data onsite at the stations.

Package this information in easily digestible formats and update them when new information is available. Following this Program will help in audit situations and individuals who use this data in their day-to-day jobs. Ensuring there is complete and accurate data available for all who intend to use it will assist in the effort of safely operating natural gas transmission stations.

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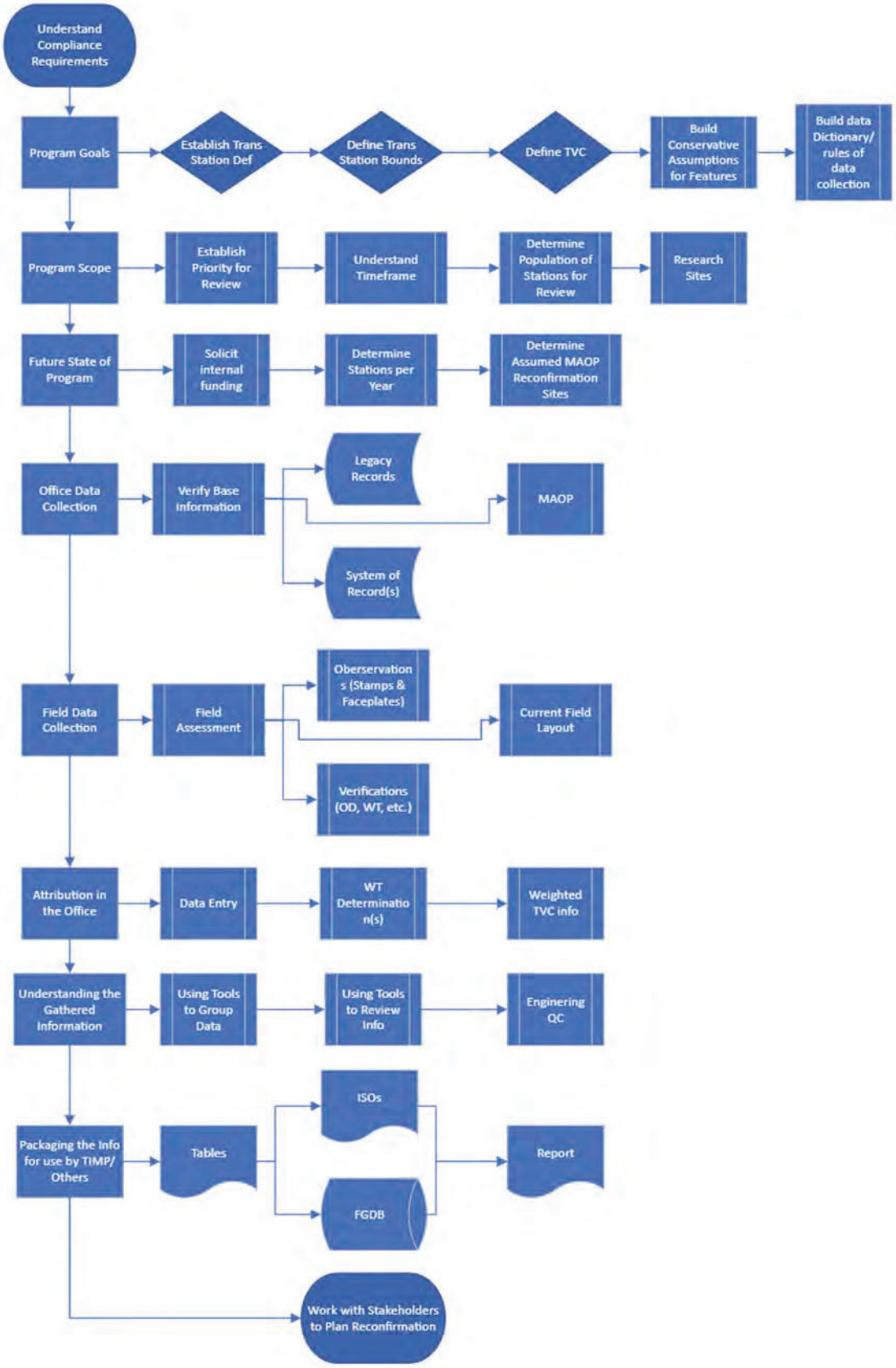

Figure 16: Overall Station Field Review Program

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[i] 84 FR 52219; https://www.federalregister.gov/d/2019-20306

[ii] Gale, John A. "04.d_PMHSA to AGA_SQR Letter_2012-07-31phmsa-maop-record-response." 07/31/2012. US DOT Pipeline and Hazardous Materials Safety Administration, Washington, DC.

[iii] eCFR :: 49 CFR 192.109 -- Nominal wall thickness (t) for steel pipe.

[iv] Seam Joint Efficiency Factors for Factory Pipeline Bends (kiefner.com)

[v] eCFR :: 49 CFR Part 192 -- Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards

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