Monthly Leak Review Process

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Last Update May 07, 2020

I. Introduction

The leak review process is an effort by TIMP Risk Management to assign the most appropriate leak cause to the completed repaired leaks recorded in PG&E's system of record, which currently is SAP. Leaks data is consumed by the TIMP Risk evaluation algorithm in the threats: Weather Related Outside Force (WROF), Third Party Damage, Construction, Manufacturing, External Corrosion, Internal Corrosion, Selective Seam Weld Corrosion, and Stress Corrosion Cracking. Incorrect Operation and Equipment risk evaluations are based on ruptures caused by over pressures, so leaks data is not used. It is important to attribute the leak cause and leak locations correctly in order to assign the most accurate information at the most accurate location in the algorithm to generate the Likelihood of Failure (LOF) for each threat.

In addition to using leak results as data input for Risk evaluation, the other primary goal is for regulation reporting. Each year, PG&E reports leaks as part of the PHMSA 7100 and GO 112 reporting requirements. Monthly leak results are compiled and evaluated against the latest HCA data annually.

Leak information is recorded on the A-form, formally known as TD-5100P-01-F01, "Leak Repair, Inspection and Gas Quarterly Incident Report." It is published on the Technical Information Library (TIL). The A-form was filled out by hand on a hard copy in the past. Currently, it is transitioning to a mobile solution that involves filling the form electronically by field personnel, which is then transcribed into a SAP leak notification by the Mapping department.

The transcribed A-form notification in SAP has many issues regarding data quality and accuracy. There could be missing, conflicting, inconsistent, or incorrect information on the SAP record. This is the main reason why the Monthly Leak Review Process is employed in order to assign leak cause and consistent leak information to the completed and repaired leaks.

The review process consists of 2 Risk Engineers and 1 GIS Specialist. A variety of data sources are used, including, but not limited to, SAP PODS, Corrective Action Program (CAP), and first-person information from the pipeline engineers (PLEs), or repair technicians. SAP is the system of record for leaks data. The list of pipeline features is spatially represented in PODS. CAP is the repository of concerns and issues of PG&E assets, operations, procedures, processes, etc., brought up by employees or contractors.

The objective of this documentation is to discuss the Monthly Leak Review Process, including overview of the process, data sources, thought processes, limitations, and frequently occurring data quality issues.

II. Process Overview

Gather Leaks Data

At the beginning of very month, the GIS Specialist makes an email request with the IT Operations and Maintenance (O&M) team to create a work order to execute a custom SAP report. The SAP report pulls all gradable repaired leak notifications from SAP that have been modified within the last month (i.e. the request is made on the 1st of May for all repaired leak notification in SAP for the month of March). The technical specifications and the schema of the custom SAP report can be found in the document *FD CR 108149642 Leak Data Report Program for TIMP Annual Risk Analysis_V1.2.docx*.

Once the report has been pulled from SAP, the Informatica support team loads the records into the TIMPLEAKREPAIR table in the MarinerDB database located in the GASIMDBSQLDEV02 server. This is the repository for all leaks (and thus A-form inspection data) that are pulled from SAP. If there are any SAP notifications that are duplicates, the old records in the TIMPLEAKREPAIR table are overwritten with the most recent.

After the SAP report has been loaded into the TIMPLEAKREPAIR table, a SQL query is done to pull the transmission leaks for review. This query is a filter to reduce the chance that the notifications pulled for review are not distribution leaks. The query is as follows:

```
select * from timpleakrepair
where CREATE_DATE > GETDATE() -1
and (LINE_USE in ('DG', 'T', 'TP', 'G', 'U')
and (SYSTEM_PRESSURE = 'TP' or ((SYSTEM_PRESSURE = 'HP' or SYSTEM_PRESSURE is Null) and
(REPAIR_REMARKS like '%hpr%' or REPAIR_REMARKS like '%reg%' or REPAIR_REMARKS like '%pilot%' or
REPAIR_REMARKS like '%diap%' or REPAIR_REMARKS like '%mon%' or REPAIR_REMARKS like '%farm%'))
or ((SYSTEM_PRESSURE = 'HP' or SYSTEM_PRESSURE is Null) and (REPAIR_LOCATION like '%hpr%' or
REPAIR_LOCATION like '%reg%' or REPAIR_LOCATION like '%pilot%' or REPAIR_LOCATION like '%diap%'
or REPAIR_LOCATION like '%mon%' or REPAIR_LOCATION like '%farm%'))))
```

The results of this query, along with the csv file that is the result of the custom SAP report, are sent to the risk engineers for leak review.

The leak review spreadsheets are stored in the link below, separated by years and months.

\\FFShare01-NAS\RiskMgmt\RISK THEMES\Monthly Leak Review

Review Leaks Data

After the GIS Specialist consolidates all the SAP leaks to the monthly spreadsheet, it is ready for review by the 2 Risk Engineers. Once the review is completed and entered into the "LeakMaster" spreadsheet, the TIMP Risk Management Continual Evaluation (CE) Team will develop a Post Event Incident Report (PEIR) for leaks confirmed by the monthly leak reviews, except for Equipment leaks or leaks on pipe appurtenances. Each month, the leak review team targets the 15th of each month to finalize the leak

data. The data will then be provided to the TIMP Performance Metrics Committee to report out in the monthly TIMP metric reports as well as the TIMP department meeting.

Each Risk Engineer will review the leaks data and input the leak cause into the spreadsheet under one of the Risk Reviewer heading. The required field inputs of each Risk Review are LANID, Review Date, Leak Type, Leak Source, and Reason if Applicable. LANID is the identification of each PG&E employee. The Review Date is the date of when the review took place. The Leak Type is one of the nine threat categories that the leak belongs to, if applicable. There are cases where the leak does not belong in any of the 9 categories. Reason if Applicable gives the reviewer a chance to include notes about the leaks that he/she want to follow later during the group discussion.

Once all the Risk Reviewers complete their review of each leak, the group convenes, discusses, and decides what the leak type and leak source is for each instance of leaks. This information is entered under "Final" section. The Final section has additional columns to fill out, including, Date Reported, Date Repaired, Latitude, Longitude, Deactivated_GTS, Route, MP, Job Number, Install Date, Coating, SMYS, Outer Diameter, Wall Thickness, Seam, Leak Grade, Leak Cause, and Leak Type. Geospatial location under the columns, Route, MP, Latitude, and Longitude are required to map out the leak location accurately, which will ensure that the Risk Assessment assigns the proper leak score to the right pipe location. Pipe specifications under Job Number, Install Date, Coating, SMYS, OD, WT, and Seam are used to apply similar segment logic to manufacturing, construction, EC, IC, and SCC leaks. Deactivated GTS is used to inform if the leak occurred on a line that was deactivated or abandoned. Leak Type is used to inform the types of equipment leaks, types of construction leaks like weld, branch, types of WROF leaks like landslide, erosion, etc.

Historically, Distribution < 20% SMYS and > 60 psig is a hold over tracker before the new definition of transmission was implemented. It tracks whether the leak occurred on assets that operated at less than 20% SMYS and greater than 60 psig. With that said, the monthly leak data pull employs a script to include potential transmission leaks. This includes searching for key words, such as, hpr, reg, or pilot in the repair remarks instead of relying strictly on the line use field. As the data and processes continue to improve, this script-based pull may be updated.

Leaks occurring in HCA is determined annually, using the latest HCA data, for the 7100 report to PHMSA. It is not determined monthly.

III. Data Sources

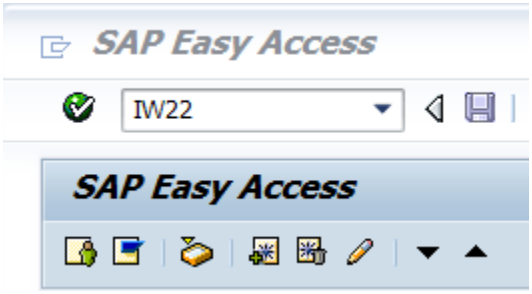
To properly determine the leak type and leak source a deep dive into the original data is necessary. To look up the original data in SAP, two methods are possible in SAP. The method for IW22 may also be used for znotif or znotifg transactions in SAP.

IW22 Methodology

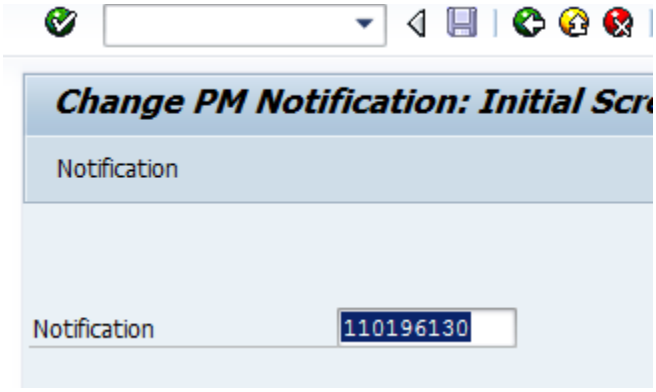
The leak notification number is often included in the monthly leak review spreadsheet, under the column, “Leak Number” or “QMNUM”. These leak numbers usually begin with “11…” and are 9 digits long.

Step 1

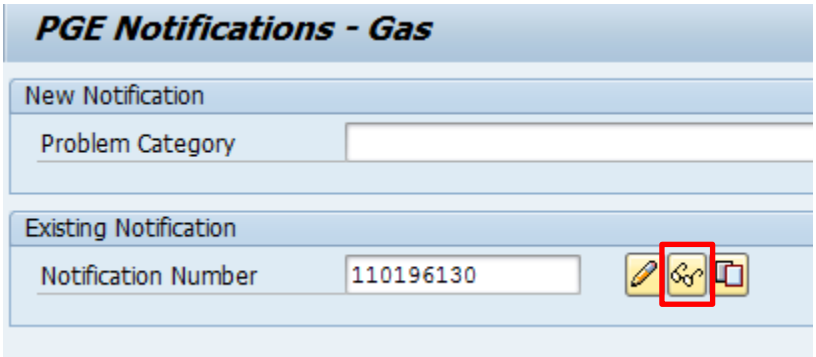
Navigate into SAP and type “IW22” into the transaction bar.



Then press enter. Once the new screen shows up, enter the leak number in the transaction box and press enter.



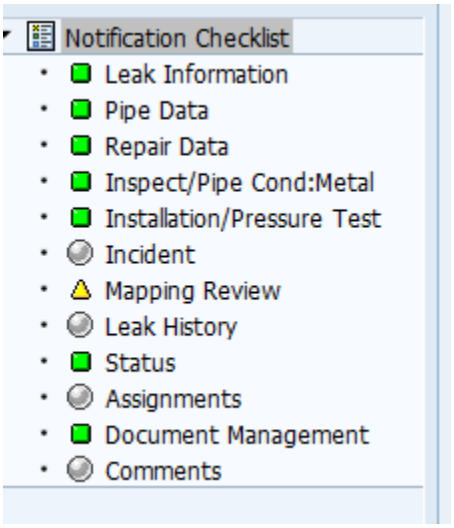
When the next screen appears, press the glasses button to bring up the main screen of IW22.



Step 2

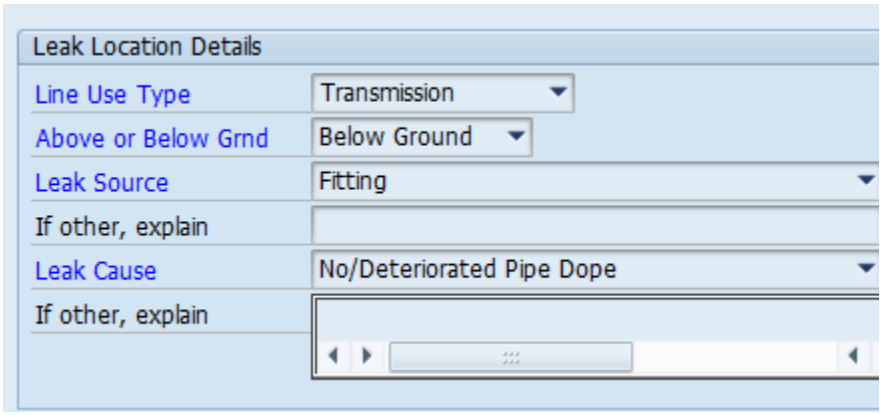
IW22 has much important information in the determination of leak type and leak source. It also has information on the location of the leaks. However, the location must be verified.

To navigate through the different screens of IW22, use the panel to the left.



"Leak Information" has data regarding the location of the leak, including route, mile point, GPS, street address. The location information is in the "Header" and "Location" tabs. Another important piece of information is the grade of the leak, which is in the "Leak Readings" tab.

"Pipe Data" tab has the extremely useful information to determine the leak type and leak source.



Leak Source and Leak Cause are the fields of primary importance, since this information can be used to determine if the leak occurred on a valve, pipe body, or caused by corrosion, etc.

"Repair Data" contains information on how the leak was repair. When a leak was repaired and the data gathered, it is a source of confirmation on the data from the initial leak survey. Repaired leaks mean that a qualified technician arrived at the scene, assessed the situation, and made the correct repairs. Information that is useful in this tab is under "Repair Location", "Repair Remarks", "Was repair

exclusively completed by tightening, lubricating, and/or adjusting", and "Repair Activity". Comments from the technician are also useful, if included in the A-form.

"Inspect/Pipe Cond:Metal" has coating information under "Coating Type".

"Mapping Review" contains information on the location of the leak. Usually, the Mapping department has reviewed the original field location input and determines the finalized leak location in this tab. The relevant data fields include route and mile point, house and street, and latitude and longitude.

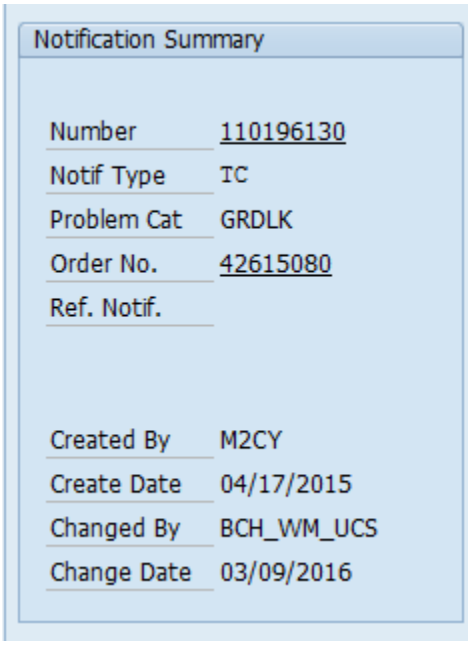
"Leak History" contains information on leaks that previously occurred at this location.

"Status" has information on the status of the leak notification. When a notification is marked "Completed", the location information has been verified by Mapping.

"Document Management" has attached files showing drawings of the location.

"Comments" often has more detailed information not covered in any of the other tabs, such as, why a leak was canceled and what job was created to fix the leak.

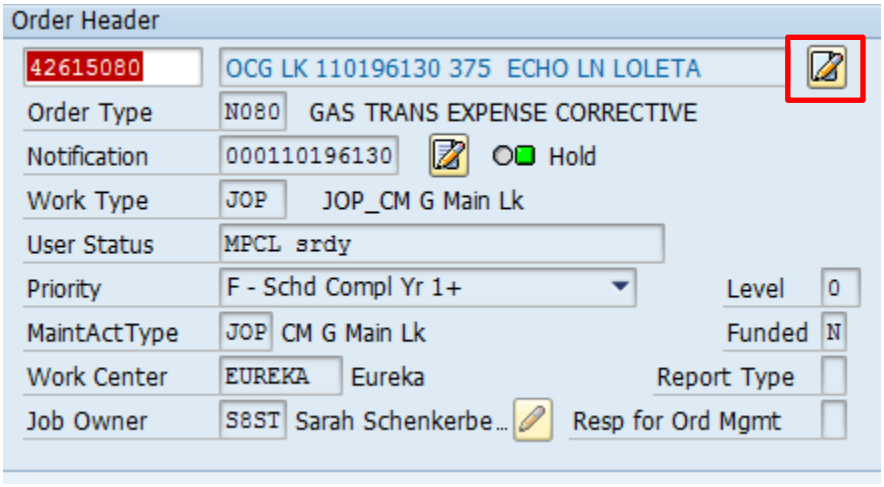
Further to the bottom left, there is information on the notification and job number of the leak.



One leak may have multiple SAP notifications.

The link of the Order No. brings the user to ZORDER. This transaction code tracks the financial and scheduling aspects of expense and capital projects.

ZORDER screens



In the ZORDER screen, the comments section on the job often contains useful information on the job, location, and reason why the job was needed.

"Costs" tab contains information on the financial aspect of the job. Often, if the job is a simple Tightening/Lubricating/Adjusting repair method, the cost will not exceed several hundred dollars. If the job cost is in the thousands of dollars, then further scrutiny is required to determine the leak type and leak source.

Gas Corrective Report Methodology

IW22 transaction code does not give a complete picture of previous leak notification at the location in question. IW22 sometimes does not contain the leak information. So, another source to use is the Gas Corrective Report from SAP. This method can be used to look up IGIS leaks where the SAP leak notification number is not known.

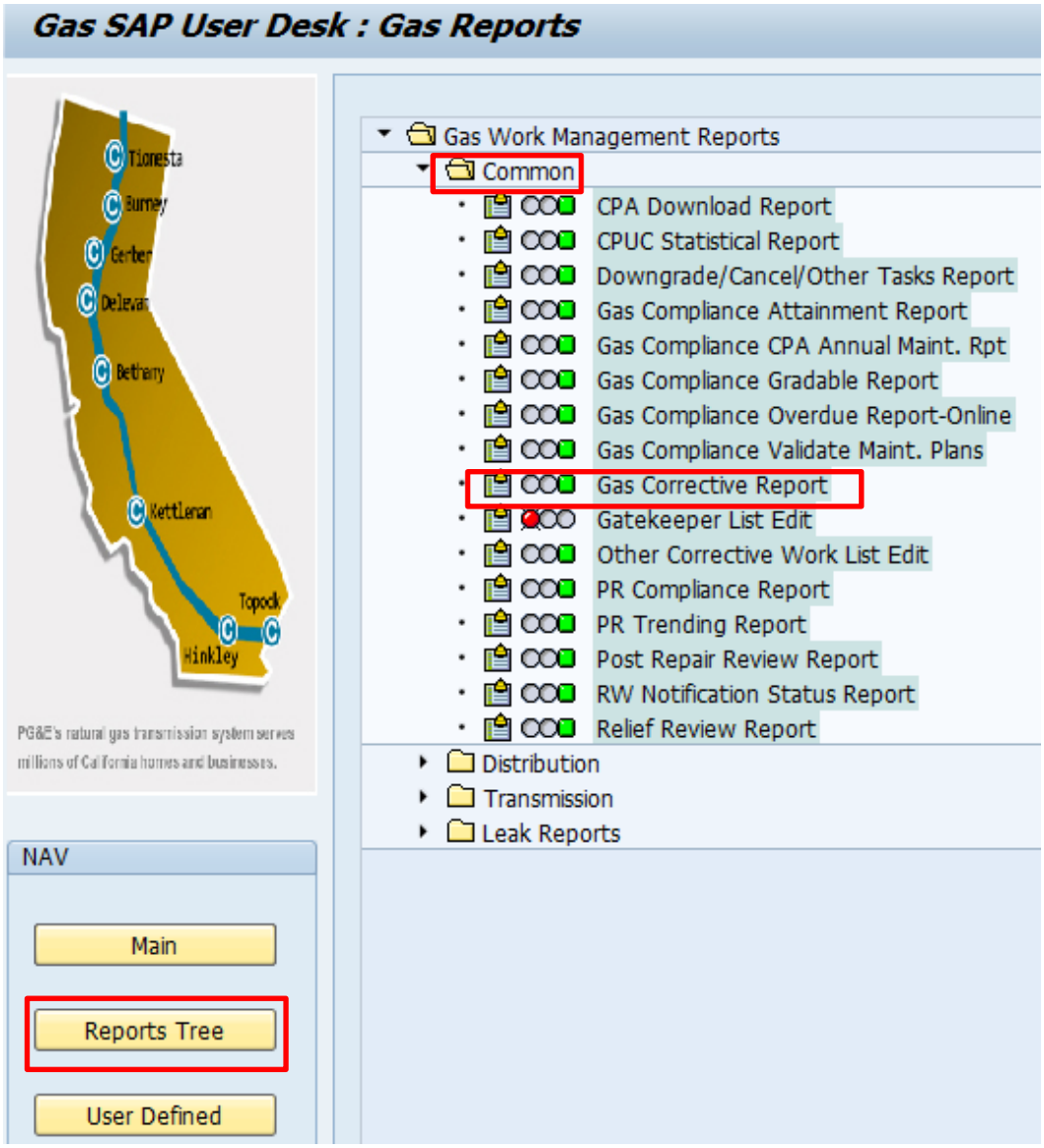
Step 1

Enter "ZIGAS" into the transaction bar in the top left corner.

Step 2

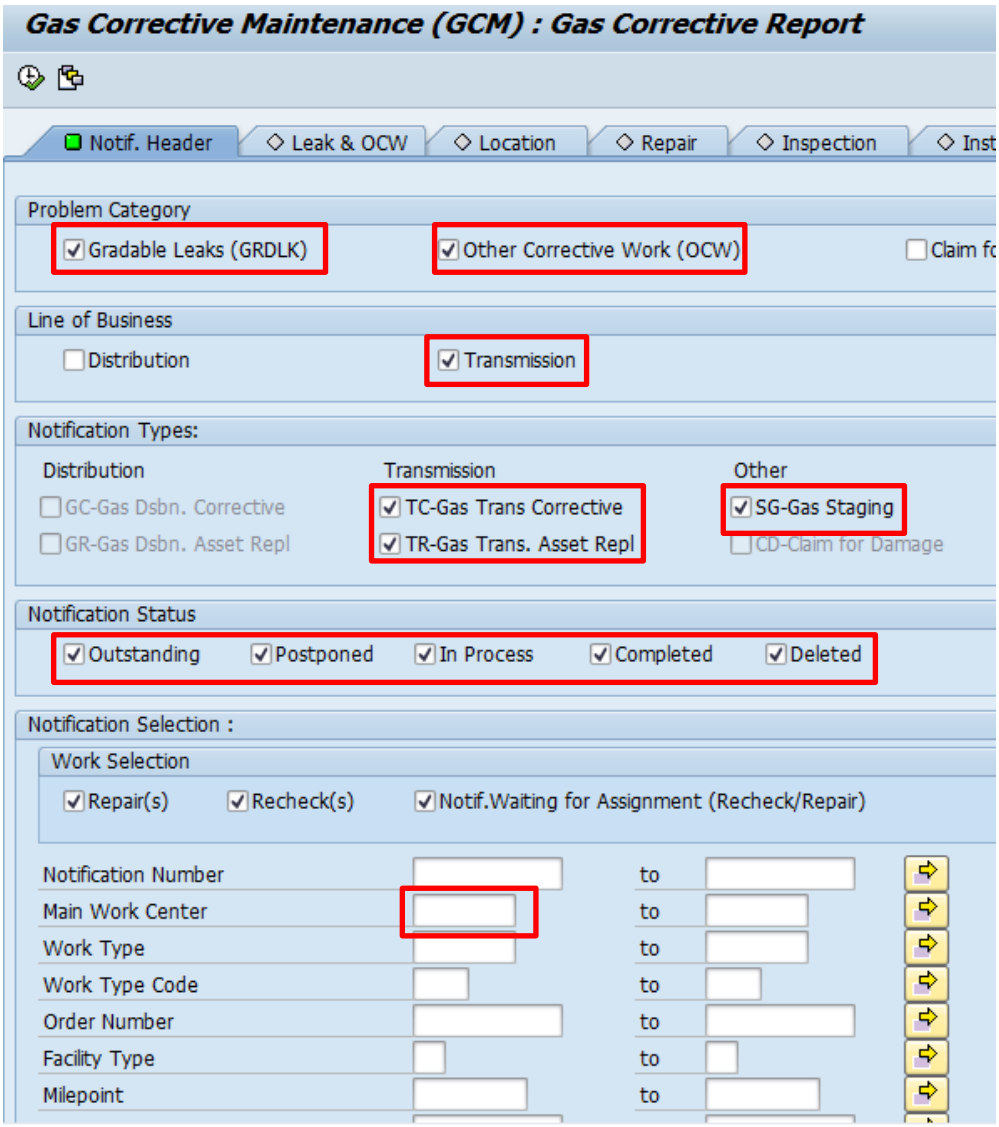
Select "Reports Tree"

Under the "Common" tab, select "Gas Corrective Report"



Step 3

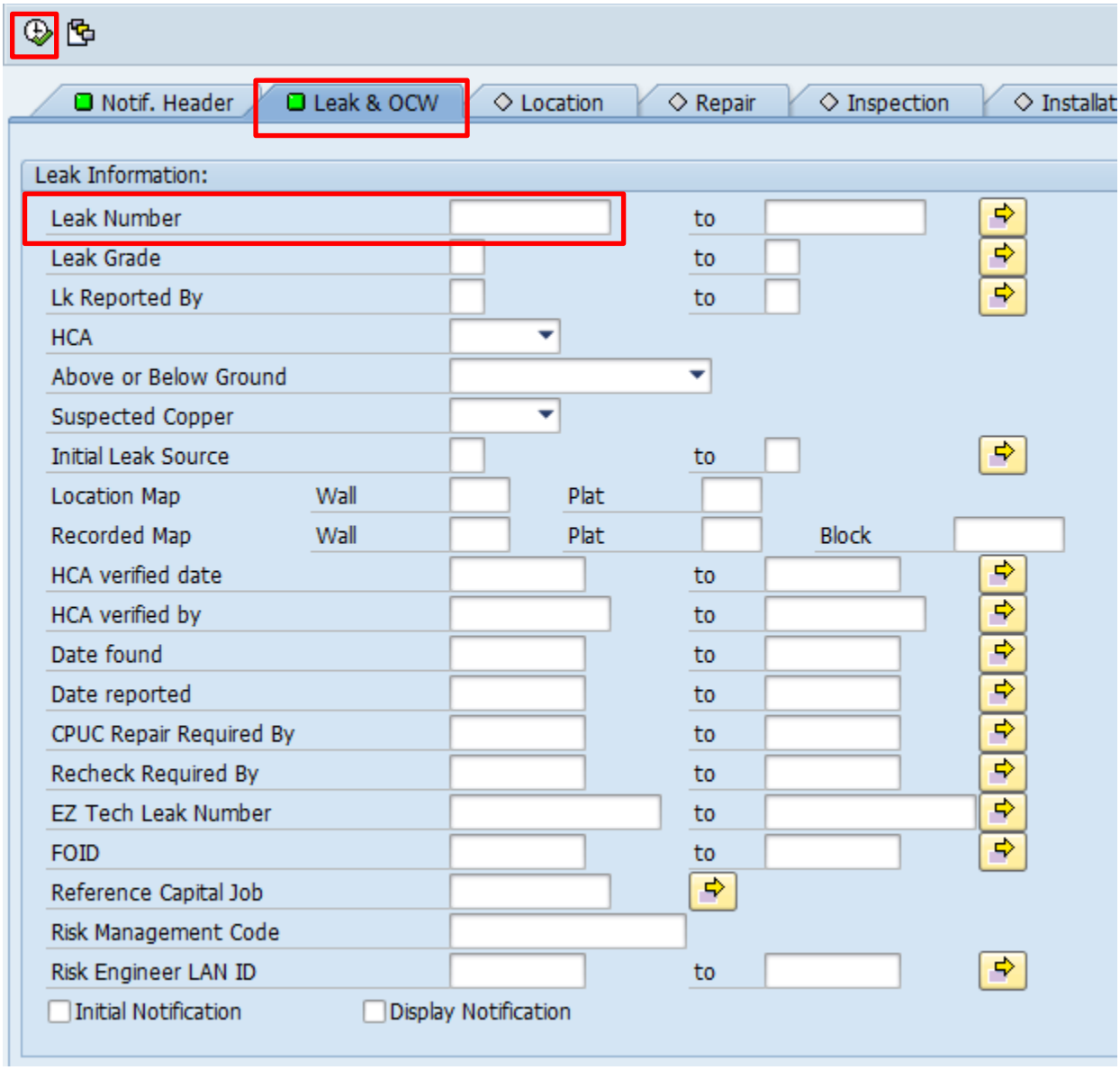
Select “Gradable Leaks”, “Other Corrective Work”, “Transmission”, “TC-Gas Trans Corrective”, “TR-Gas Trans. Asset Repl”, “SG-Gas Staging”, “Outstanding”, “Postponed”, “In Process”, “Completed”, and “Deleted”.



The “Main Work Center” information is not necessary but will cut down the run time during the search for the leak number. The Main Work Center is the District information from the leak database, such as, “2015GasLeaks.xlsx”.

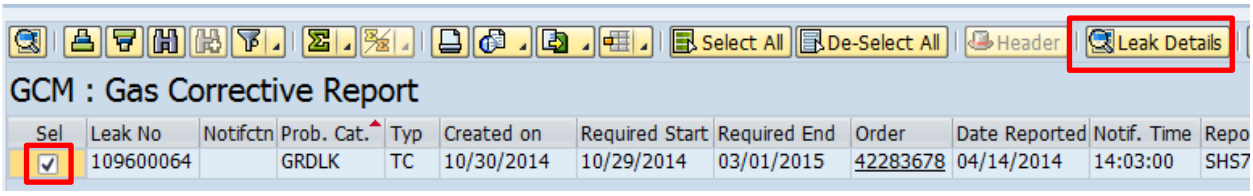
Step 4

After Step 3, click on the "Leak & OCW" tab and enter the notification number in "Leak Number". Then click the clock button to run the query.



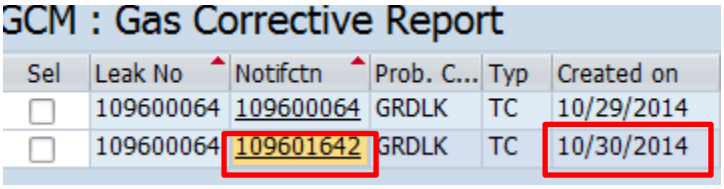
Step 5

Once the query is complete, click the check box under "Sel" column. Then click "Leak Details".



Step 6

Then click on the notification number under "Notifctn" column. Usually, the latest notification in terms of date under "Created on" column has the information on the leak in question. However, other notification numbers also contain useful information. So, use engineering judgement to get the most relevant information about the leak.



The screen that is brought up is similar in layout and information to the screen in IW22.

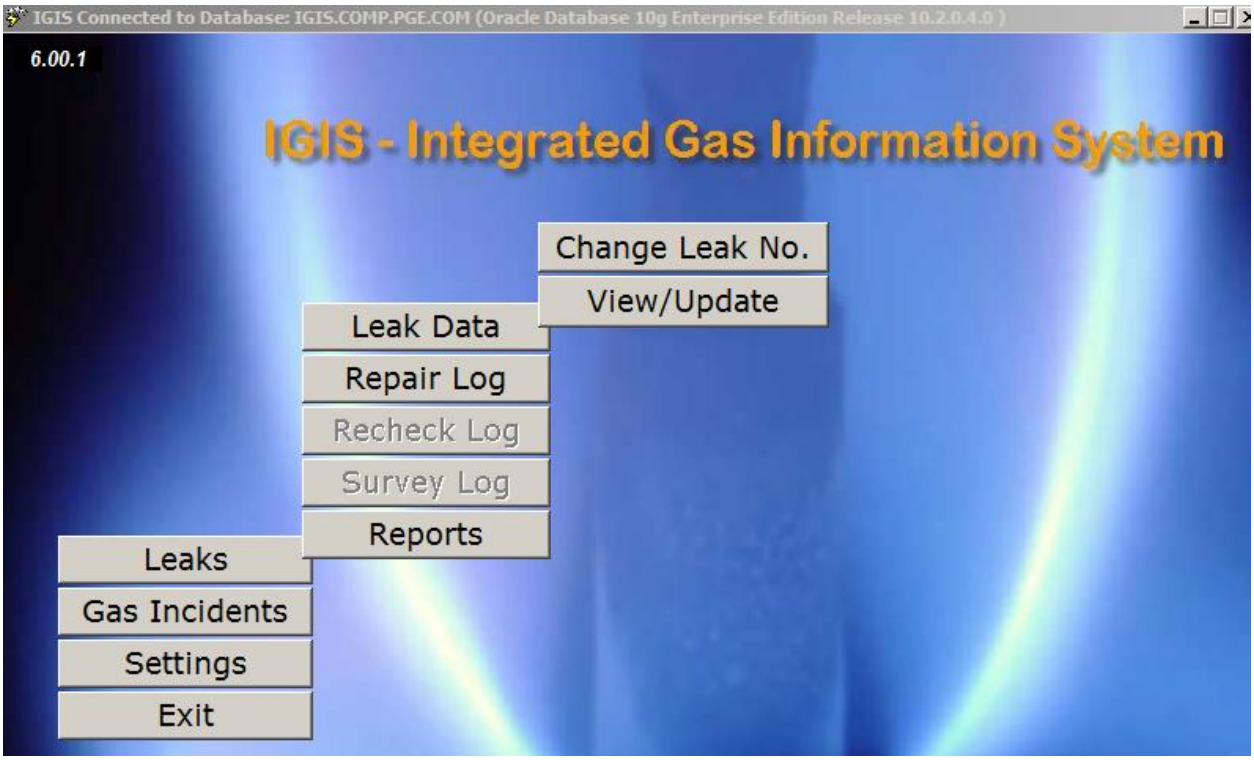
IGIS

The methodology described here is for reference only. Historically, leak data was maintained in the program called IGIS. However, this program has since been deactivated after migrating leak data into SAP.

Step 1

Hover the mouse or click in the following sequence.

Leaks → Leak Data → View/Update



Step 2

The first two digit of the leak number designate the district and division of the leak location. This information is used to find the leak in IGIS.

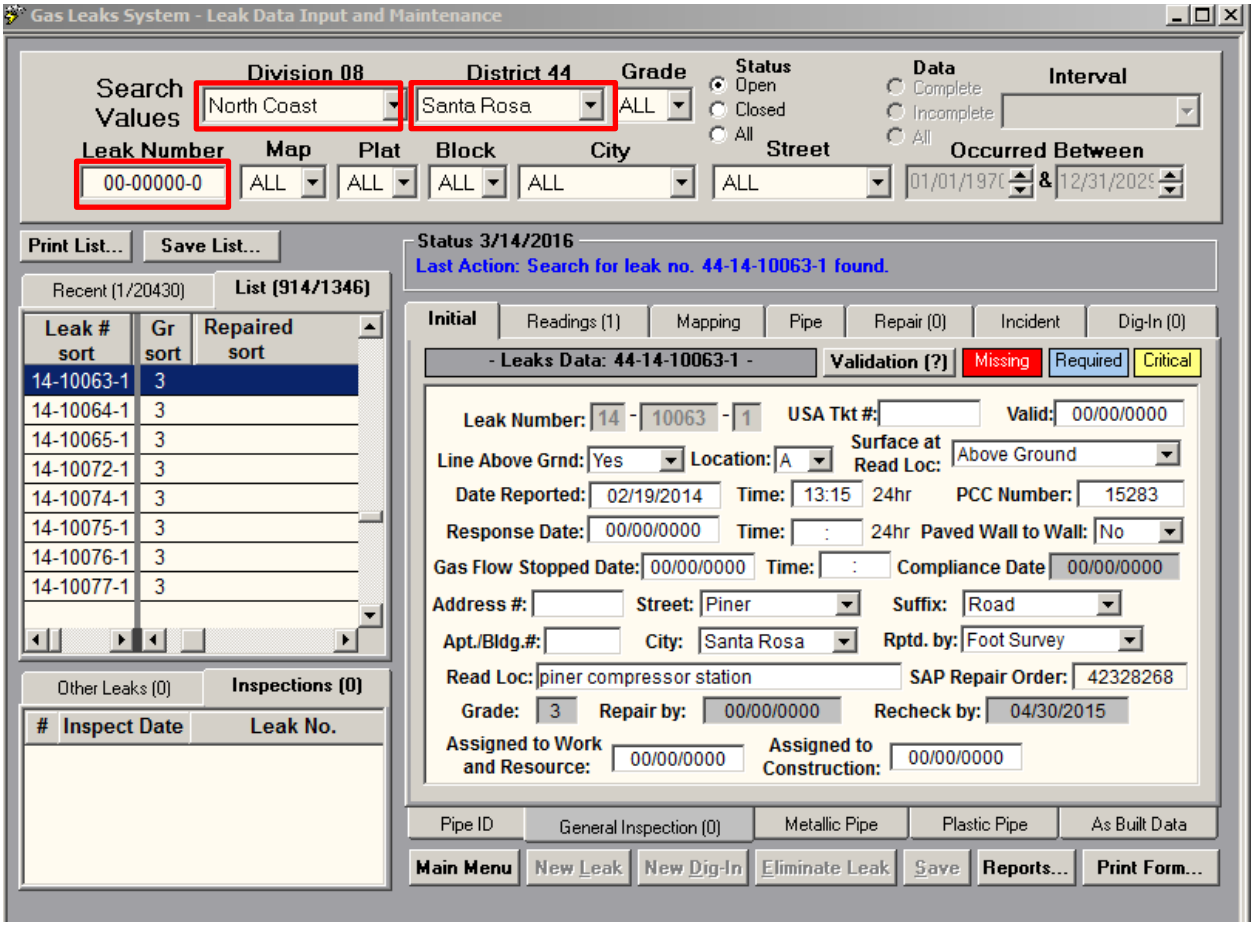
District Num	District Name	Division	Area
01	Santa Maria	Central Coast	3
02	Los Padres	Central Coast	3
04	King City	Central Coast	3
05	Salinas	Central Coast	3
07	Monterey	Central Coast	3
08	Hollister	Central Coast	3
09	Colusa	Sacramento	6
11	Colgate	Sierra	6
13	Oroville	North Valley	6
14	Glenn	North Valley	6
16	Chico	North Valley	6
17	Paradise	North Valley	6
20	Placer	Sierra	6
21	El Dorado	Sierra	6
22	Nevada	Sierra	6
24	Mission	Mission	2
26	Central	East Bay	2
28	Bay	East Bay	2
30	Diablo	Diablo	2
35	Fortuna	North Coast	7
36	Eureka	North Coast	7
37	Arcata	North Coast	7
40	Marin	North Bay	7
42	Vallejo	North Bay	7
43	Napa	North Bay	7
44	Santa Rosa	North Coast	7
46	Ukiah	North Coast	7
48	Solano	Sacramento	6
50	Yolo	Sacramento	6
52	Sacramento	Sacramento	6
56	Skyline	Peninsula	1
58	Peninsula	Peninsula	1
60	San Francisco	San Francisco	1
66	Kern	Kern	4
70	Fresno	Fresno	4
72	Yosemite	Yosemite	5
76	Coast	Central Coast	3
78	San Jose	San Jose	3
80	De Anza	De Anza	3
85	Red Bluff	North Valley	6
87	Redding	North Valley	6
91	Stanislaus	Yosemite	5
93	Delta	Stockton	5
95	Mother Lode	Stockton	5
96	GS - North	Gas Transmission	
98	GS - South	Gas Transmission	

Step 3

Look up the first two digits of the leak number in the table in Step 2. For example, leak number 44-14-10063-1.

"44" corresponds to North Coast Division, Santa Rosa District.

Once IGIS loads the correct district and division, enter the remaining leak number sans the first 2 digits in "Leak Number" box. In this case, enter 14-10063-1.



Step 4

The data quality of leak information in IGIS varies. But important information can be found.

<u>"Initial" tab</u>

Location information can be derived from the address related fields: "Address #", "Street", "Suffix", "Apt/Bldg", and "City".

"Read Loc" gives good clues on the gas leak location.

"Grade" gives the grade of the leak. Grades 1, 2, 2+, and 3 are considered leaks. Grade 1 is hazardous. Grade 0 is not a leak.

"Mapping" tab

"System Pressure" gives information regarding the pressure of the location that is leaking. This will indicate whether the leak is distribution (< 60 psig) or transmission (>= 60 psig).

"TP Line #" and "Mile Point" gives information on the location of the leak.

"Pipe" tab

The Pipe tab usually contains a lot of useful information.

"Source" contains information on the where the leak occurs.

"Cause" contains information on what caused the leak.

"Line Use" tells whether the location is transmission or distribution.

"Repair" tab

The Repair tab contains information that usually determines the leak type and leak source.

"Location" is a written description of where the repairs took place. This can be used in conjunction with other location information in IGIS, such as, line and mile point, and address to determine where the leak occurred.

"Remarks" contains the most useful information. The technician usually writes a description of what was done to complete the repair of the leak. Determination of the leak type and leak source highly depends on the information located in the "Remarks" section.

"Incident" tab and "Dig-In" tabs are used to report incident and dig-ins.

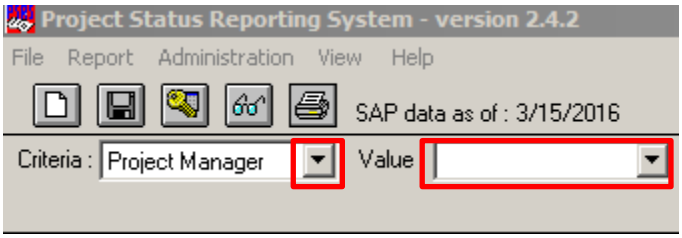
Project Status Reporting System (PSRS)

This is another historic reference. PSRS contains highly useful information most of the time concerning engineering projects. It is written by the project engineer to request funding and track the progress of work. The primary limitation is the PSRS number or project number, which is not always known. The PSRS number is sometimes included in the "Comments" portion of IW22 or the Gas Corrective Report. Like IGIS, PSRS has been retired. Projects of recent repairs may be accessed via zorder.

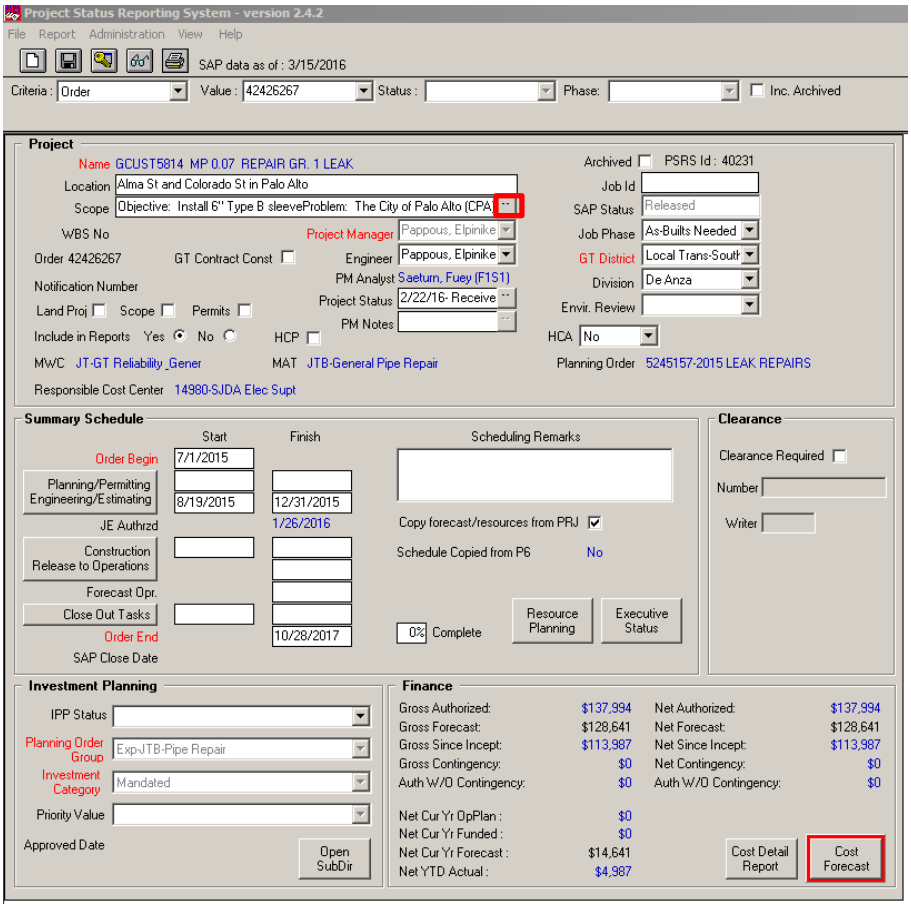
Please contact TSC if you do not have access to PSRS.

Step 1

The "Criteria" drop down menu has a variety of options, but some are more important than others. The informational options include, PSRS ID, Order, and Job ID. Enter the information in the "Value" box.

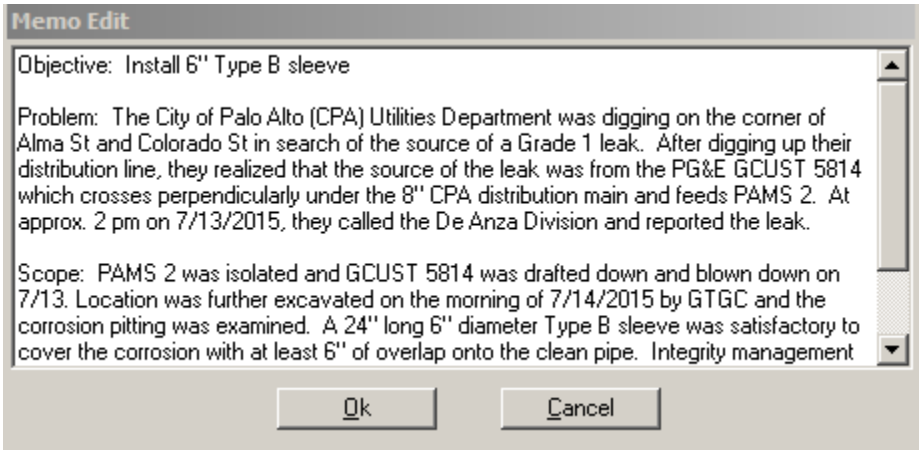


Step 2



The "Scope" section has valuable information, which can be expanded out further by clicking on the ellipsis button.

The ellipsis button will bring up a written description of the project scope and reason why it was needed. However, the quality of the information is dependent on what the project engineer wrote.

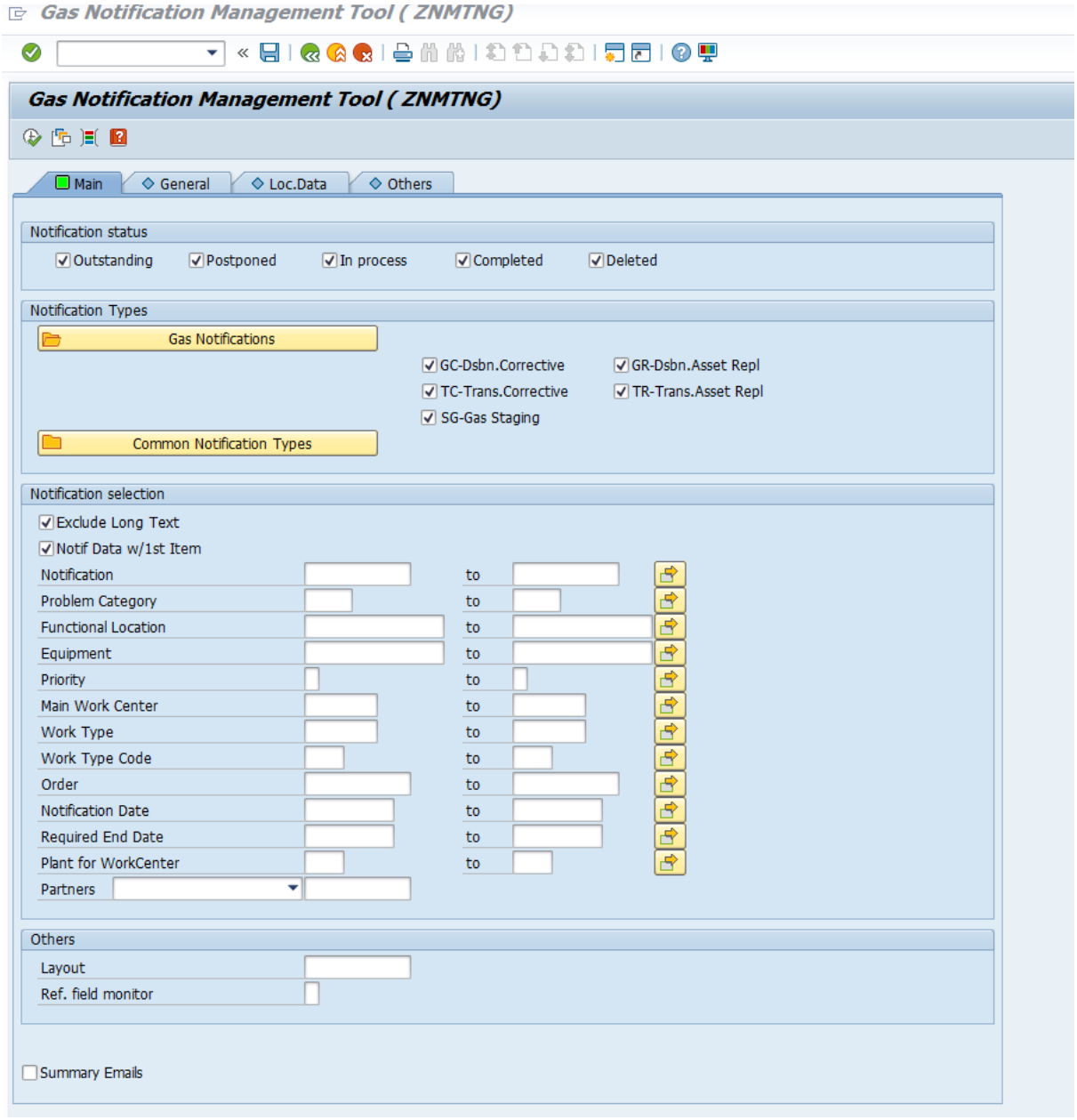


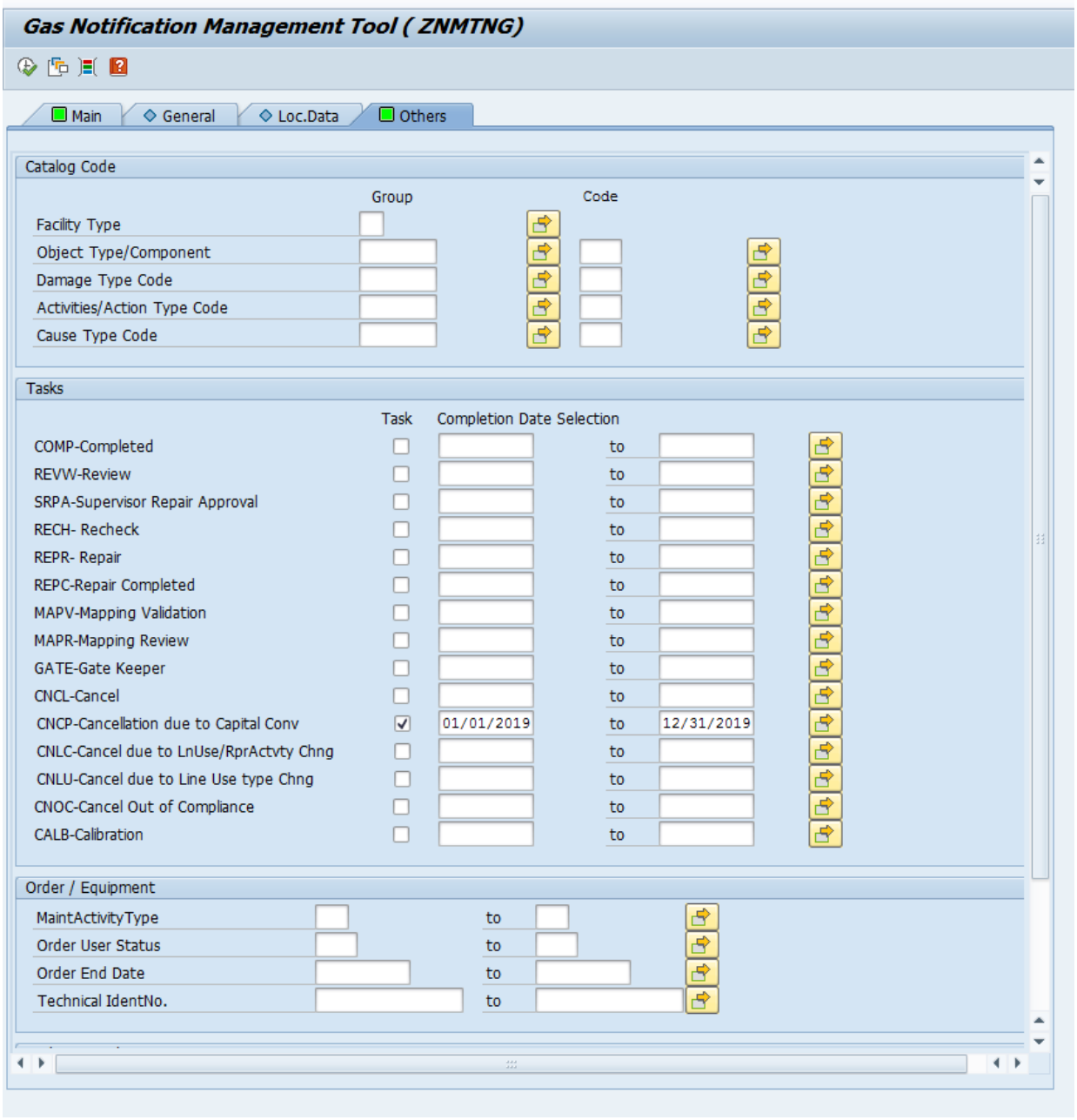
SAP Canceled Leaks

Update 01/25/2019

Leaks canceled because of capital conversions are not pulled monthly using the current methodology. TIMP Risk Management is not reviewing canceled leaks. Canceled leaks can be pulled using the method below.

Use SAP ZNMTNG, with the selections below, run the reports.





Update 05/07/2020

Canceled leaks are now processed through the Leak Closeout Desk, which will review the reason behind the cancellation, including but not limited to duplicate, zero out leaks, or capital project conversion to repair the leak. The Leak Closeout Desk is managed under the Business Analyst group, which rolls under the Gas T&D Maintenance and Construction Department. The leak closeout process is described in "Summary" and job aid "CNCL Review Book of Knowledge R2" spreadsheet. Canceled leaks are tracked in "Leak Cancellation Desk Master Tracker – V1" spreadsheet. These documents are maintained by the Business Analyst group.

IV. Thought Process

The main objective of the Leak Review Process is to determine the leak type, leak source, and location. The leak type falls under categories including TLA, Grade 1 TLA, and the nine ASME B31.8S threats, Other, No Leak, Distribution, and Duplicate. The nine ASME B31.8S threats are construction, third party damage (TPD), equipment, incorrect operations, manufacturing, external corrosion, internal corrosion, stress corrosion cracking, and weather related and outside force (WROF). WROF is further categorized into the 15 types listed under TD-4810P-01, Attachment 3. In 2019, a new threat that is considered in the annual Risk evaluation is Selective Seam Weld Corrosion (SSWC).

TLA

TLA is an acronym for tightening, lubricating, adjusting. TLA is not considered a reportable leak. Based on PHMSA 7100 instructions, the reasoning is the following:

A "leak" is defined as an unintentional escape of gas from the pipeline. A non-hazardous release that can be eliminated by lubrication, adjustment, or tightening is not a leak. (Per PHMSA F 7100.1-1 Rev. 01/11)

The quickest way of determining TLA is by using the leak spreadsheet and looking at the columns "Leak Source", "Leak Cause", "Repair Method", "Repair Remarks", and "Reading Location". Information under Repair Type and Repair Remarks has higher value than the other columns. However, a combination of information from these columns should be used to determine the leak type and leak source.

<u>"Leak Source"</u>

Information under this column is low value. There is an often inconsistency between information under Leak Source and the other columns. Based on the 2019 leaks spreadsheet, the possible choices under Source are the following: compression coupling stainless steel, other, threads, line valve, tap connection, leak repair, fitting, curb valve, standpac – pressure control fitting, valve, pressure control fitting, regulator/pilot, riser valve threads, other mechanical joint, stanpac – leak, stanpac – threads, unknown (replaced facility), leak, not assigned, other welds, and drip. This list is not all inclusive. Refer to the "Leak_Source" tab in the monthly leak spreadsheet. The Leak_Source tab must be unhidden to be viewed.

Usually, only a few options under Source are indicative that the leak is TLA. These options include compression coupling stainless steel, threads, fitting, riser valve threads, and Other mechanical joint. These options are indicative of TLA because threads and fittings often require tightening or re-lubrication to eliminate the leak. The remaining options need further research to determine the leak type and leak source.

<u>"Leak Cause"</u>

Information under Leak Cause may be useful. Based on the 2019 leak spreadsheet, the possible choices under Leak Cause are the following: other, no/deteriorated pipe dope, weld failure, construction defect, equipment malfunction, compression coupling, leak, atmospheric corrosion, digin/excavation, internal

corrosion, incorrect operation, leak – unknown, damage by third party, (non-digin), stress corrosion cracking, external corrosion, unknown (replaced facility), material failure, and not assigned. This list is not all inclusive. Refer to the "Leak_Cause" tab in the monthly leak spreadsheet. The Leak_Cause tab must be unhidden to be viewed.

The only option that is indicative of TLA is no/deteriorated pipe dope. This option is chosen when the pipe dope is old, which causes gas to escape between the threads of a mechanical fitting. The repair option is to re-lubricate and tighten the fitting or threads. The information under Leak Cause should be combined with Repair Method and Repair Remarks to determine the leak type and leak source.

The other options require further research and combination with other columns to determine if the leak is TLA or not.

"Repair Method"

Information under Repair Method is extremely useful.

Based on the 2019 leaks spreadsheet, the possible choices of Repair Method are the following: tighten cap/bolt – fitting, greased – other, not assigned, replaced service valve < 2 inch, replaced main valve >= 2 inch, other – expense, mechanical repair fitting – fitting, type b sleeve – weld, deactivate #TP main, full circle clamp – clamp, remove/replaced completion plug – fitting, replaced #TP main < 50 ft., repair default, welded sav-a-valve – weld, deactivate partial service, welded sleeve/can – weld, and not assigned. This list is not all inclusive. Refer to the "Repair_Method" tab in the monthly leak spreadsheet. The Repair_Method tab must be unhidden to be viewed.

The options that are indicative of TLA are tighten cap/bolt – fitting, and greased – other. The remaining options require further research to determine if the leak is TLA or not.

"Repair Remarks"

This section contains information written by the repair technician. The quality of the information is relatively high because the technician took time to write a description of what was done on the job to stop gas from leaking. This column is one of the main key information points for determining a leak type and leak source. Key words that indicate TLA are tighten, grease, redope, clean, dope, threads, lube, pipe dope, tighten bolts, or tighten nuts.

Union and fitting are key words of TLA but should be combined with information from the rest of the A-form.

"Repair Location"

The information in this column gives a good indication of where the leak occurs, if used in conjunction with other information such as address, route and mile point. It also gives good clues on what type of assets the leak occurred on, such as, pipe, regulator, valve, relief, cap, fitting, union, HPR, tee, or wells.

By itself, the information in under this column is not concrete enough to determine leak type and leak source.

Grade 1 TLA

A TLA leak is considered hazardous when it is Grade 1, based on PHMSA reporting and PG&E rules.

Grade 1 TLAs that are classified under "Equipment Other" leaks. The reasoning is that the TLA occurred on valves, associated with valves that are not regulators, relief or gasket/o-rings, fittings, or pipe appurtenances. The characteristics these Grade 1 TLA and Equipment Other, leaks shared are the following:

* Grease valve, tighten fitting in valve box, or repaired valve in station.

ASME B31.8S Nine Leak Types

To reiterate, only when a leak is assigned to one of the nine threat categories from ASME B31.8S, is the leak counted towards the Likelihood of Failure calculation of the Risk Assessment. It is therefore very important that enough evidence is gathered to prove that the leak belongs to one of the nine categories. In many cases, a call or email to the repair technician and PLE is required to confirm or clarify the location, type, and source of the leak.

WROF

WROF leaks have not been encountered in both 2014 and 2015 leaks. This is most likely due to leaks associated with WROF are being cut out to repair the pipeline. The cut out would be transferred to a capital or GC job order and not be captured in the Monthly Leak Review Process, which is one of the main limitations and will be addressed in Section V, Limitations. The Monthly Leak Review Process only captures gradable and completed repair leaks.

An example of WROF leak is documented in order number 31045235 or PSRS ID 32486 on L-172A, at mile point 74.48. The original leak was found and documented in notification number 107566040. The notification was subsequently canceled and transferred to 31045235. A crack developed in body of pipe due to earth movement in the levee. Therefore, the leak on L-172A is considered WROF.

Besides Vehicular or Vandalism leaks, WROF leaks often require more information from the PLEs or Geoscience department to determine the cause of the leak, which may include landslide, subsidence, erosion, etc. These causes often require expert knowledge to make the determination.

TPD

Third Party Damage leaks on a transmission pipelines are usually due to excavation, construction, or agriculture activities. However, these dig in incidents sometime results in severing, rupturing, or even explosion of the pipeline, which will be categorized by our Regulator and Compliance team as reportable ruptures per PHMSA reporting requirements or just incidents. These incidents may not show up in the monthly SAP query for leaks if they are categorized under PHMSA ruptures or incidents. For example, in 2015, there was one TPD leak, with notification number 109109232. Initial assignment of the leak would indicate that it is equipment regulator leak because a fitting was replaced for the mooney pilot.

However, further consultation with the PLE finalized the leak assignment as TPD because the regulator was damaged by a third party.

Therefore, it is always beneficial to seek PLE consultation on the cause of a leak.

Incorrect Operations (IO)

IO is one of the leak causes inputs in the A-form. However, using the leak cause results blindly is not the best practice. All fields in the A-form should be read to get an understanding on the nature of the leak type and leak source.

In 2015, there was one IO leak, with leak notification number 109605114. Under "Leak Information", and "If other, explain" of the IW22 screen, the explanation of the leak is "RELIEF SET TO LOW". This explanation indicates that the leak was caused by incorrect operations because the technician programmed the set point too low causing the relief valve to pop and release gas below the intended pressure.

IO leaks are a small percentage of leaks. They only occur when human error directly leads to leaks like in the case of set point programming error for the relief valve. However, in the absence of further evidence, repair technician input, or PLE consultation, it is best to go with data already entered in the SAP leak database. For example, if the "Leak Cause" in "Pipe Data" screen was chosen as Incorrect Operations and there is no other evidence to refute the record, it is conservative to go with the data as-is and take it at face value.

Equipment (EQ)

Equipment leaks form most leaks. In 2015, Equipment leaks made up 60% of the leaks or 46 out of 78 leaks, not counting TLAs. The total leaks include construction, equipment, IC, EC, TPD, Grade 1 TLA, and IO. Equipment leaks are broken into four categories:

Equipment – Regulator

Equipment – Relief

Equipment – gasket/O-ring

Equipment – Other

Regulator Leaks

Regulator leaks include both regulators and monitors. It is important to emphasize that both are pressure regulating equipment and should be included when determining leak types and leak source.

Clues indicating regulator leaks include language in the repair remarks discussing replacing regulator, leak on the regulator, repairing or replacing diaphragm, and sensing line or valve. The repair remark may also call out a specific valve name at a specific regulator station. When we find where the valve is on an operating diagram or GIS, we can determine whether the valve is a regulator or not.

Relief Valve Leaks

There are seldom relief valve leaks. In both 2014 and 2015, there were no relief valve leaks.

However, clues from repair remarks discussing replacing or repairing relief valve will indicate that the leak is from relief valves.

Gasket / O-ring

Clues indicating gasket or O-ring leaks come from repair remarks discussing replacing O-ring or gasket on valves or flanges. Sometime, further research is required such as contacting the technician on what repair procedure was used or looking into PSRS or zorder to see what the repair job entailed.

Equipment Other

"Other" equipment leak is a catch all for leaks relating to equipment. This refers to replacing or repairing block valve, fire valve, needle valve, plug valve, gate valve, ball valve, check valve, blow down valve, actuator, and unspecified valve type that is not relief or regulator/monitor. Grade 1 TLAs are assigned to Equipment Other leaks because the hazardous TLA occurred on a valve that is not regulator/monitor or relief. And in one case from 2015, Grade 1 TLA was assigned to Equipment Other when the hazardous TLA occurred in a valve box to be conservative. When there is any sort of replacement concerning fittings, plugs, or packing as a repair method, the leak will be categorized as equipment other.

Construction

Construction leaks are primarily associated with welds. More specifically, most of the construction leaks from 2014 and 2015 are due to girth weld construction defects. To be precise, construction leaks require PLE input to ensure that the leak is indeed construction. This is because construction leaks are assigned to similar segments in the Construction threat of the Risk Assessment.

Clues from repair type or repair remarks indicating that further research is required prior to assigning a leak to construction includes, replacing transmission main less than 50 feet, welded sleeve or can, or full circle clamp. Furthermore, under source or cause, key words such as girth weld, weld failure, or construction defect are good clues to towards researching the leak for construction as the leak type.

Construction leaks may also occur on fillet welds, branch welds, or vintage construction features, such as, bell-bell chill ring, wrinkle bends, etc. The complete list of vintage construction features is in TD-4810P-01, Attachment 3.

Manufacturing

Manufacturing leaks are also rare. In 2015, there were no manufacturing leaks. In 2014, there were two manufacturing leaks. Like Construction leaks, assigning a leak to Manufacturing requires due diligence by researching to see if a repair project, or zorder was created and contacting the PLE to ensure that the leak was due to manufacturing defects.

Key words from source, repair type, and repair remarks discussing body of pipe, replace transmission main greater or equal to 50 feet, and pipe replacement gives clue that the leak could be due to manufacturing defect, most likely long seam defect. The two cases in 2014 that were assigned to Manufacturing – Seam leaks had evidence from a direct cause analysis, report from ATS, and project

description from PSRS to support the assignment of leaks to Manufacturing Seam. There was manufacturing body of pipe leaks in neither 2014 nor 2015.

Internal Corrosion (IC)

Assigning leaks to internal corrosion cannot be based on the A-form results alone. This is because the technician seldom can look inside the pipe to determine that IC was the leak cause. In many cases, a pipe cutout is required, and root cause analysis performed to determine that the leak is due to internal corrosion.

Clues indicating that the leak is IC come from leak cause, repair type, and repair remarks discussing body of pipe, internal corrosion, or the installation of PLIDLO fitting. However, IC leaks must be confirmed with PLEs to ensure accuracy.

The IC leaks from 2015 were all confirmed by PLEs, root cause analysis, or direct cause analysis.

External Corrosion (EC)

External corrosion leaks can be determined by the technician in the field because visual evidence of corrosion is on the pipe. However, to be accurate, PLE input, root cause analysis, or direct cause analysis confirming that the leak is EC is preferable.

Clues indicating the leak is EC come from source, cause, repair type, and repair remarks discussing body of pipe, external corrosion, or replace transmission main under 50 feet.

However, confirmation from the PLE is the most reliable way to assign leaks to EC. For example, the PLE suggested external corrosion is the leak type when gauge lines were removed and replaced. Another case involved external corrosion at the 6 o-clock position of a pipe that required cut out. PSRS or zorder is also a good source of information if the PSRS ID or order number is known.

Stress Corrosion Cracking (SCC)

If the cause column indicates SCC, consult the PLE to confirm if the leak cause is SCC. In 2015, there was a case when SCC was marked as the leak cause; the PLE later determined that EC should be assigned as the leak type.

Clues indicating the leak are possible SCC is taken from the leak cause column describing stress corrosion cracking. However, this must be furthered research to ensure that the leak is SCC.

Selective Seam Weld Corrosion (SSWC)

SSWC is a new threat that is considered in the annual Risk Assessment in 2019. To initially identify SSWC, look for leak causes that involve corrosion, external and internal, at the long seam. Seams that are susceptible to SSWC include flash weld, low frequency Electric Resistance Weld (ERW), and ERW manufactured before 1985, and high frequency ERW manufactured after 1985. However, always consult the PLE to confirm that the leak is caused by SSWC.

Other

Revised: 05/07/2020

If there is not enough information to positively conclude what caused a leak, then contact the technician who completed the leak repair or the corresponding pipeline engineer. Leaks that replace cap, union, save-a-valve, compression fitting, coupling, or other fittings should be categorized as "Equipment – Other" leaks.

"Other" leak should be limited to only leaks where the cause is not known the technician or PLE, but there is enough location to determine location of the leak. "Other" is an acceptable category in the PHMSA 7100 annual report. "Unknown" leaks should be limited to only when the leak location is not known. Leak location is required to determine HCA or non-HCA for the PHMSA 7100 annual report.

No Leak

When a leak survey is performed, a leak grade is assigned in the A-form. Then the leak is assigned a technician to fix the leak if it is grade 2 or greater. The technician goes to the leak location and will regrade the leak. In some cases, the leak regrade will indicate that the grade is 0, which means that there is no leak.

When the leak grade is 0, the leak review process does not assign leak type and leak source because the technician has confirmed that there is no leak.

Duplicate

Duplicates of leaks are hard to spot on an individual basis because all the information presented in the A-form represent an actual leak. Information from one location that repeats across multiple leak notifications indicates possible duplicates. Care should be placed when assigning a leak as duplicate since it can lead to non-conservative representation of the leaks' information in the Risk Assessment.

To help identify duplicates, the leak notification number in the monthly leak review spreadsheet is compared to the leak notification number in the LeakMaster. If the notification numbers match, then it is a duplicate.

Station Equipment

In previous years, station equipment is not pulled in the SAP report because it does not look at corrective notifications. Station leak survey is governed by TD-4430P-02, which is the guidance for inspection and testing of gas transmission station. TD-4430P-02 is supplemented with Utility Bulletins 322 and 325.

The Northern Area Superintendent gave a good summary of how leaks are surveyed, repaired, and documented.

"Leak survey is performed annually. If leaks are found, then they are not graded. A corrective notification is created in SAP to document and track repair of the leak. If the leak can easily be fixed by TLA, then the leak may be fixed on the spot and documented on a corrective notification. The station leak survey is documented on TD-4430P-02-F08.

A-forms are not created. Leaks are documented and tracked on a SAP corrective notification, which is formerly tracked with a PLM work request."

Recently, there have been station leaks pulled from SAP. In these cases, the leaks are also reviewed by Risk Management to determine leak cause and location. However, the location is assigned to the station, if there is not enough information to assign the leak to a specific route and mile point.

V. Limitations

SAP is the current system of record at PG&E. However, there are instances of leaks not being entered in SAP. The monthly SAP pull only take leaks with the gradable and "Repair Completed" status checked. The gap in this process is that some leaks are canceled in SAP because the job is transferred to a capital project or to General Contracting. These canceled leaks are not pulled in the monthly SAP process. Leaks not in the SAP pull are not reviewed and not included into the Risk Assessment.

VI. Frequent Data Issues & TBD Metrics

Data quality on A forms varies from adequate to completely empty and inconsistent. There are too many types of data issues and their variance to include it in this white paper. Major data issues include a lack of location information, inconsistency between leak source and repair type, empty forms, non-existent leak numbers, and incomplete information.

To address these issues, we will track the number of to be determined (TBD) leaks for each month that elapsed 90 days. The 90-day period is to account for the mapping process from attributing physical repair A-forms from the field to SAP. Risk management will continue to follow up with the TBD leaks to determine their cause. If it is not possible to determine the leak cause after 90 days, Risk Management will create a CAP to address the missing data.

VII. Continual Evaluation

The Continual Evaluation process has been established to capture relevant information from assessments and events to ensure that any changes to the pipeline integrity or threats are promptly identified. This process includes Post Event Integrity Reports (PEIRs), which are written to address events that have impacted transmission pipelines. One category of these events is leaks. Consequently, the monthly leak review process is vital to ensure that all leaks are properly captured and that the data associated with the leak is accurate.

The current process for capturing leaks for Continual Evaluation includes transferring all leaks from the monthly spreadsheets (see Section II) to the LeakMaster list. Then the Continual Evaluation group will review the new leaks in the LeakMaster list to determine if the leaks meet the criteria require a PEIR or not. A PEIR will be written based on the available information for each leak within 180 days of the leak being entered in LeakMaster. In many cases, items captured in the monthly leak review spreadsheets will not require a PEIR. TLA, equipment, and appurtenances do not require a PEIR.

VIII. Future Improvements

To improve the monthly leak review process, canceled leak data with the cancellation code "CNCP*" from the spreadsheet "Leak Cancellation Desk Master Tracker – V1" will be requested from the Business Analyst group once a month and will be reviewed by Risk Management. This canceled leak data set will supplement the monthly leak review process by incorporating data that is not in monthly SAP leak notification pull. The cancellation code "CNCP*" is used for leaks canceled due to "Capital Conversion – for correct accounting purposes due to job scope change." This code tracks leaks that were repaired via a capital project, which is not suitable to track in SAP, which only tracks expense projects. So, the code is used for accounting purposes. The other cancellation reason codes are not relevant since they track reasons like zero out leaks, repair method change, duplicate, which do not represent actual canceled leaks but only category changes.

Per the comments made by the federal monitor team, TIMP Risk Management is collaborating with DIMP to evaluate a methodology to pull all leaks entered into SAP each month. However, this will be an intermediate-term project as it involves the SAP Change Committee project.

To enhance the underlying data quality, TIMP Risk Management actively engage in the A-form reform project and Leak Survey committee that strive to improve the response, documentation, and data delivery. The committee includes stakeholders from M&C, GPOM, Leak Survey, Mapping, Standards Engineer, and DIMP.

IX. References

1. 2014 Gas Leaks

2. 2015 Gas Leaks

3. TD-4430P-02, "Gas Transmission Stations Inspection, Testing, and Maintenance Procedure"

4. TD-5100P-01-F01, "Leak Repair, Inspection, Gas Quarterly Incident Report (A-form)"

5. TD-4810P-01, Attachment 3

6. FD CR 108149642 Leak Data Report Program for TIMP Annual Risk Analysis_V1.2