Technical Memorandum

Spills/Release Report, Form 19 Review and Analysis

Prepared for: **State of Colorado Department of Natural Resources, Colorado Oil and Gas Conservation Commission**

Prepared by:

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TECHNICAL MEMORANDUM

Date: November 18, 2013

To: Margaret Ash – Colorado Oil & Gas Conservation Commission

Subject: **Spill/Release Report, Form 19 Review and Analysis**

INTRODUCTION

The Colorado Oil & Gas Conservation Commission (COGCC) has been asked to use a risk-based strategy of inspection that will target the oil and gas operational phases that are most likely to experience spills and create a health risk to the public and environment. For each oil and gas spill reported to COGCC, Rule 906 requires that the responsible party fill out a Spill/Release Report, Form 19. For COGCC, S. S. Papadopulos & Associates, Inc. (SSPA) reviewed 1638 Form 19 spill reports for the period January 2010 through August 2013 in order to determine the locations, causes, and timing of previous spills to assist in forming a risk-based approach for inspections.

METHODS

Data

For the last 20 years, the COGCC has required that spills associated with oil and gas activities that were five barrels (bbls) or greater in volume (or any volume if the spill impacted the State's waters) be reported using a Spill/Release Report, Form 19 (COGCC Rule 906.b). The contents of these forms have been input into the COGCC spills database. (A copy of Form 19 is provided in Appendix 1 and a list of the fields included in the COGCC spills database is provided in Appendix 2.) SSPA was provided with an electronic download of all of the responses contained in the Form 19 spill reports database. These data include a field containing a detailed description of the spill. This detailed description was the basis for most of the categorizations. The COGCC database also includes links to download the original submitted Form 19s. These hardcopy forms were used to supplement the data when the online database was insufficient for categorization. To facilitate analysis, SSPA categorized each spill according to:

- operational phase,
- cause,
- equipment,
- location, and
- size.

A listing of the fields created by SSPA and preserved in an augmented version of the COGCC database is provided in Appendix 3.

Categorization

The primary categorization of spills was based on the operational phase when the spill occurred. In order to analyze which operational phases were most likely to experience spills, the spill reports were separated into operational phase and sub-phase categories. Each spill report was researched to find what operational phase of oil and gas exploration and production was applicable when the spill occurred. The possible operational phases are construction, drilling, completion, stimulation, production, workover, and abandonment.

Similar categorization was done for other possible spill factors. In addition to operational phase, the categories evaluated for each of the 1638 spill reports include the following:

- Reported cause of the spill (e.g., equipment failure, human error)
- Equipment involved if equipment failure was the reported cause (e.g., process piping)
- Location of the failed equipment (e.g., well, pit, separator)
- Size of the spill by volume

Analysis

Once the data were categorized, an analysis was conducted to identify the most common factors characterizing the spills. Pivot tables were created for all of the different categories and many combinations of categories. Discussion of the factors that have the greatest relevance to assessing spill risks is provided below.

FINDINGS

Summary Statistics

There were a total of 1,638 spill records provided from January 2010 through August 2013. Table 1 through Table 5 show basic summaries for the categorized Form 19s. They show spill counts and percentages for each of the categorized fields. Table 1 through Table 4 also show the average spill volume for categorized fields (calculated only for spills where volumes have been reported).[1]

[1] This is the total reported spilled volume for all of the spill reports used for this study. It is important to note that for many historical spills, the spill volume was often unknown and unreported, therefore the total spill volume provided for each category represents a minimum value and the percentages reported may be skewed by the number of spills where no volume was reported.

Details and Trends

- **Operational Phase** – Spills that occurred during the production operational phase accounted for 78% of all reported spills as shown in Table 1 and Figure 1. Following production, the second and third highest phases for spills were stimulation and drilling, at 7.6% and 5.9%, respectively. As also shown in Table 1, the largest average volume for spills occurs during production and stimulation, the two phases with the largest number of spills.
- **Cause** – The reported causes of spills are shown in Table 2. Equipment failures (67%) and human error (23%) were the most reported causes. The upper left of Figure 2 shows a pie chart with the percentage of spills reported for each of the causes. The bottom right of Figure 2 shows the same pie chart but with the equipment failure cause broken out into the equipment that failed and caused the spills.[2]

  Table 6 compares the spills in each of the operational phases with the cause for the spill. The widespread occurrence of equipment failures across all operational phases is apparent in this table, as is the increase in frequency of human error during the drilling and stimulation phases. Table 7 is a more detailed summary of the human error cause. 58% of spills caused by human error were caused by a failure to check the equipment.
- **Equipment Failure** – There were more than 200 different pieces of equipment reported to have failed, but over 75% were identified to be process piping (27%), pipelines (18%), tanks (18%), and valves (11%). Table 3 summarizes the different pieces of equipment reported to have failed; Figure 3 is a bar chart illustrating the preponderance of the four primary pieces of equipment that failed and caused spills most often. (Only pieces of equipment that were reported on at least 5 spill reports are shown in Table 3 and Figure 3.) Figure 4 shows the most common types of equipment involved in releases broken down by operational phase. Of note, during production (including workover), process piping and pipelines are the equipment pieces that account for 50% of all failed equipment.
- **Facility Type/Equipment Failure Location** – The location of spills was often difficult to discern since the facility type listed on the Form 19s varied between actual locations, such as well or compressor station (or non-facility), and equipment type, such as separator or water line. Because of the predominance of equipment failure as a cause for spills, the equipment failure sub-category equipment location was created. Table 4 summarizes the number of spills at the various locations where oil and gas exploration and production occur. The categorization illustrates the ambiguity of the facility type vs. equipment location issue; therefore, it is footnoted to provide better distinction for equipment and

[2] Percentages of each highlighted specific failed piece of equipment in Figure 2 are calculated based on total for all causes, not just equipment failure; hence differ from percentages shown on Table 3.

location. The GAP Analysis section below includes further discussion of this situation.

- **Spill Volume** – Table 5 shows a summary of the spill size by volume. The spill sizes have been grouped into five size categories. This table shows spill size regardless of what was spilled (oil, water, etc.). The five largest water and petroleum spills are listed in Table 8 and Table 9 respectively. The three largest petroleum spills were caused by vandalism. The top five water spills were caused by equipment failures. All were during the production operational phase.

  There were 490 reports where spill size was unknown or left blank on Form 19. Many of these (56%) have been identified as historical releases. For spills not identified as historical, the lack of volume implies that the volume is unknown, but involved at least the minimum amount of hydrocarbon or water required to be reported. The uncertainty involved with spill volumes should be addressed in potential revisions to Form 19.

  Similarly, the Form 19 field of area impacted by spill was not used this analysis; this field was only minimally useful to this analysis because the largest area spills frequently involved misting of materials into the air and did not correlate with volume.

- **Inter-annual Release Variability** – Figures 5a-c show a breakdown of releases by cause, operational phase, and equipment failure detail. With minor exceptions, the relative percentages of causes, operational phase, and equipment for 2010 through August 2013 (prior to the widespread flooding in northeast Colorado) are consistent and do not vary greatly between different years.

Additional Results

- More than half of largest oil spills were caused by vandalism. Even though there were only 33 reports of spills caused by vandalism (out of 1,638 reports), 31 involved releases of hydrocarbons and 19 were greater than 120 bbls. On June 19, 2012, 12 locations were vandalized within a 2-mile radius spilling more than 2,300 bbls of oil; however, even without this incident, vandalism accounted for 35% of the remainder of the oil spills that exceeded 100 bbls. (The two releases of water that were related to vandalism were also very large, 660 bbls in one case and 1154 in the other.) There were only 11 reports of oil spills that exceeded 120 bbls for all of the other causes combined. Of these 11 oil spills, four were due to human error, five were due to equipment failure, and two were due to nature (freezing and lightening).
- As seen in Table 2the two most common causes of failures are equipment failure (67%) and human error (23%). In the production operational phase, equipment failures cause 72% of spills and human errors cause 19% of spills. In all the other operational phases combined, equipment failures account for only 47% of spills while human errors cause 38%. Nature (e.g., freezing temperatures, wildlife,

lightning strikes, and heavy rain) reported as a cause for spills, accounts for only 1% of the spills reported in 2010 through August 2013 (prior to the September flood event); however, equipment failure associated with freezing temperatures was reported 75 times.

- There are 288 spills that have been identified as historical releases (i.e., the spill was discovered after it occurred while other unrelated activities were being conducted). Table 10 is a summary of the cause and equipment failures of the historical releases. 82% of the historical releases were from equipment failures. The most common equipment that failed was water vaults (36%) and process piping (31%). Table 11 is a summary of the locations of the historical releases. The most likely location of a historical release was at a tank (67%) with the second most common being a pit (10%)

GAP ANALYSIS

Form 19 improvements

In working with the data from the Spill/Release Report, Form 19, several areas have been identified as candidates for possible improvements to Form 19 and to the data entry into the database. Overall, since the form can already be completed electronically in Acrobat format, COGCC should consider creating an online form that will allow the use of dropdown menus for selected fields so that uncertainties involved with the type of information to provide can be reduced or eliminated.

In addition, changes to the following fields (including, in some cases, the use of dropdown menus) could increase the quality of data:

- **Type of Facility** – This field should have fewer possible entries and have instructions that indicate what should be entered. The use of drop down menus to limit entries would be valuable for this field. The facility types should be limited to categories such as Well (or Well Head), Well Pad, Pit, Tank Battery, Right-of-Way (e.g., for pipelines located away from wells and processing facilities), Roadway, Processing Plant, Production Plant, Compressor Station, This restriction would help clarify the "location of equipment failure" detail mentioned above in the Details and Trends section.
- **Volume and Material Spilled (1)** – Currently some or all of these fields are left blank. It is suspected that a blank field sometimes represents an unknown volume. Redesigning this portion of the field so that a volume of zero (0) is differentiated from "unknown" would potentially be valuable. In addition, specifically providing a checkbox for Historical spills would also be helpful, and could potentially be incorporated into this portion of Form 19. As with other fields, this portion of Form 19 would be amenable to modification to use dropdown menus.

- **Volume and Material Spilled (2)** – Review of Form 19 for materials spilled indicates that drilling mud, flowback fluids, and hydraulic fracturing fluids are the most common materials involved in spills of materials other than hydrocarbons or water. The use of dropdown menus for sub-categories under "other" would allow tracking of these common spill materials.
- **Area and Vertical Extent of Spill** –This field does not have a uniform format to report the extent of the spill. The forms could require an entry of specific units (e.g., feet-squared) to determine horizontal extent and an individual field for depth (ft). Alternatively, and possibly most simply, include Length (ft), Width (ft), and Depth (ft) as individual fields. Additionally, differentiating with a checkbox or dropdown menu whether the impacted area occurs due to spills of liquid or solid material directly to the ground, or due to result of misting would constrain often anomalous appearing spill extents.
- **Cause of Spill** – COGCC should consider breaking this field into two parts. The first would have a limited number of possible entries such as those shown in Table 2 (that could be provided in a dropdown menu). The second part would be a dialog box allowing the party reporting the spill to provide detailed description of the spill and associated causative factors (currently provided in the COGCC database in the "spill_desc" field).
- **Suggested Additional Fields**
  - Because of the predominance of equipment failure as a spill cause, the addition of a simple field/dropdown box allowing entry of the most common equipment that fails would potentially be useful. In a similar manner, categorization of spills caused by human error would also potentially be useful.
  - Operational Phase could be captured with a simple field/dropdown menu that includes the phases listed in Table 1.

FIGURES

TABLES

APPENDICES

Figures

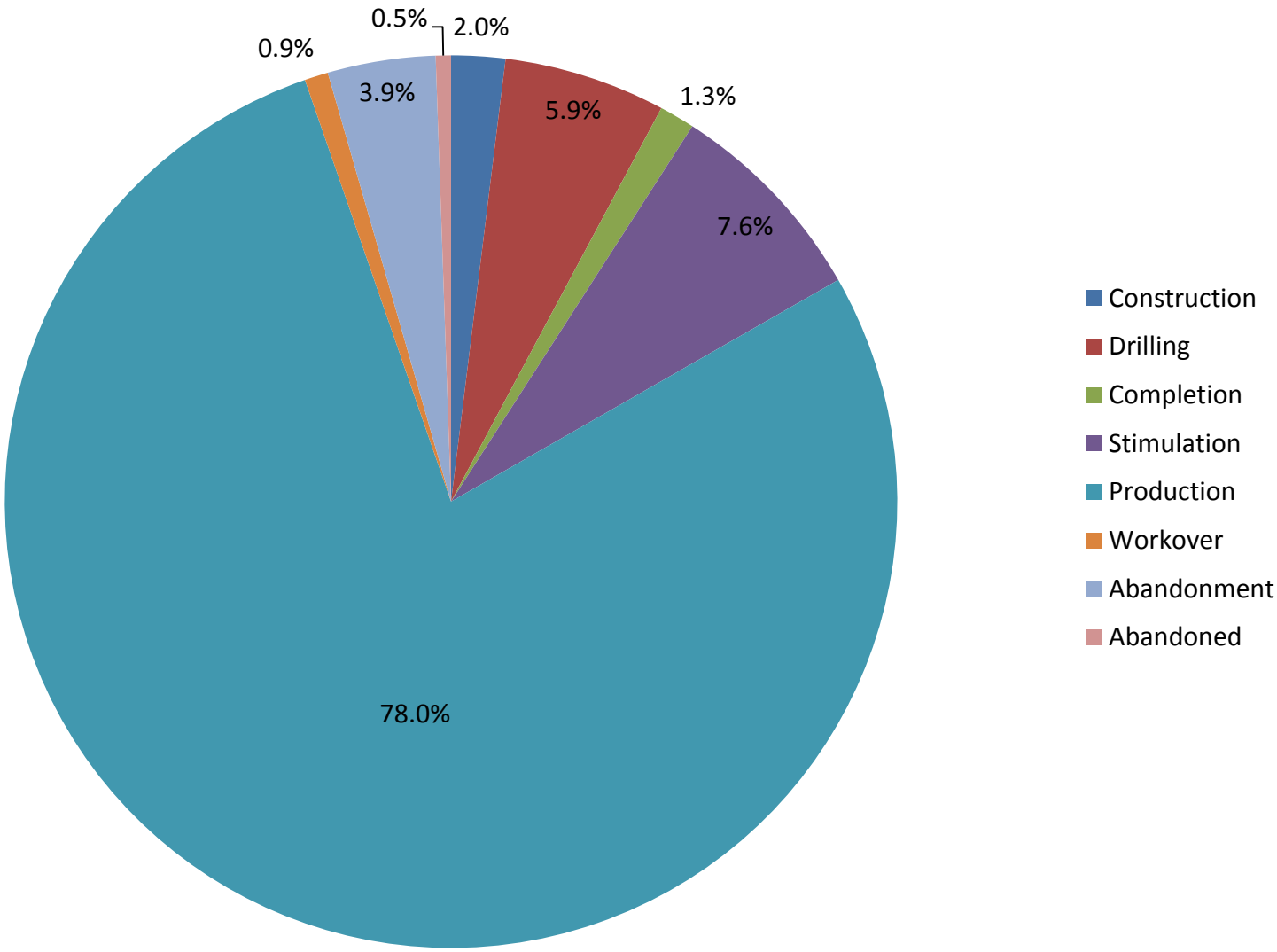
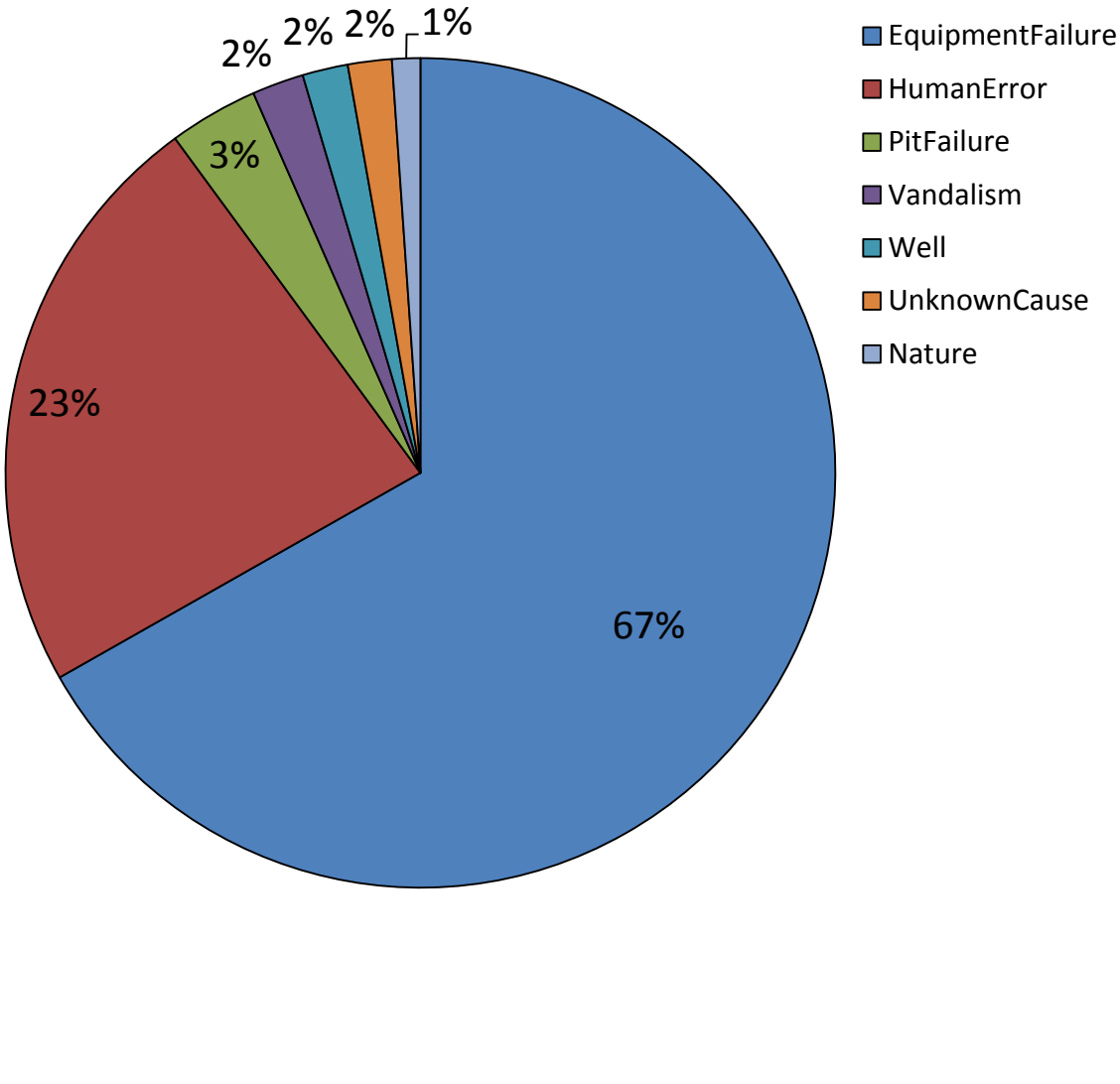


Figure 1. Releases by Operational Phase



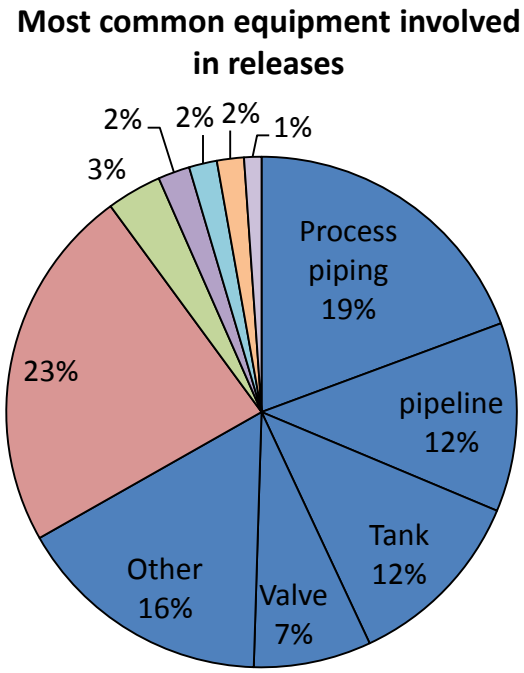


Figure 2. Release Causes

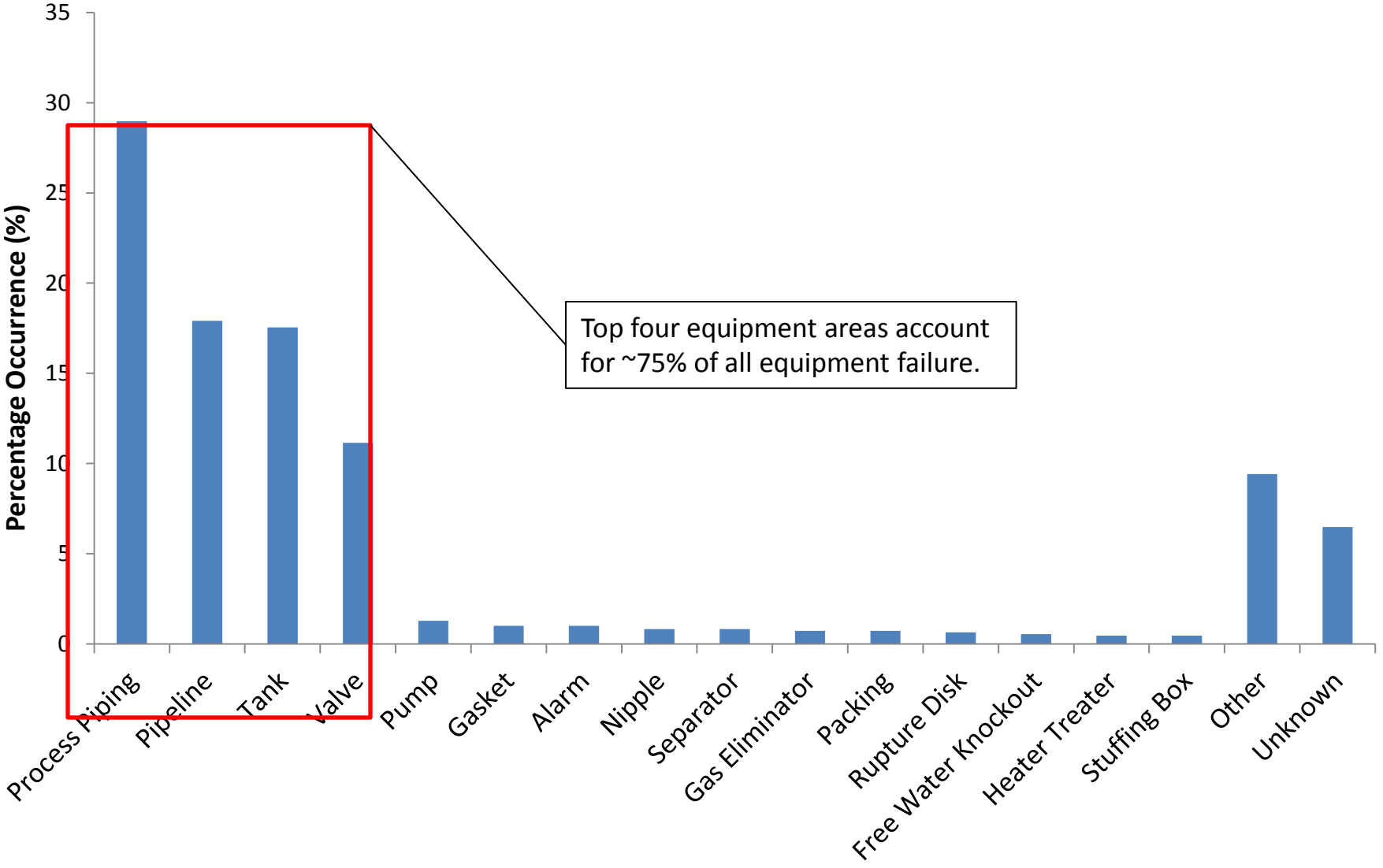


Figure 3. Equipment Involved in Releases

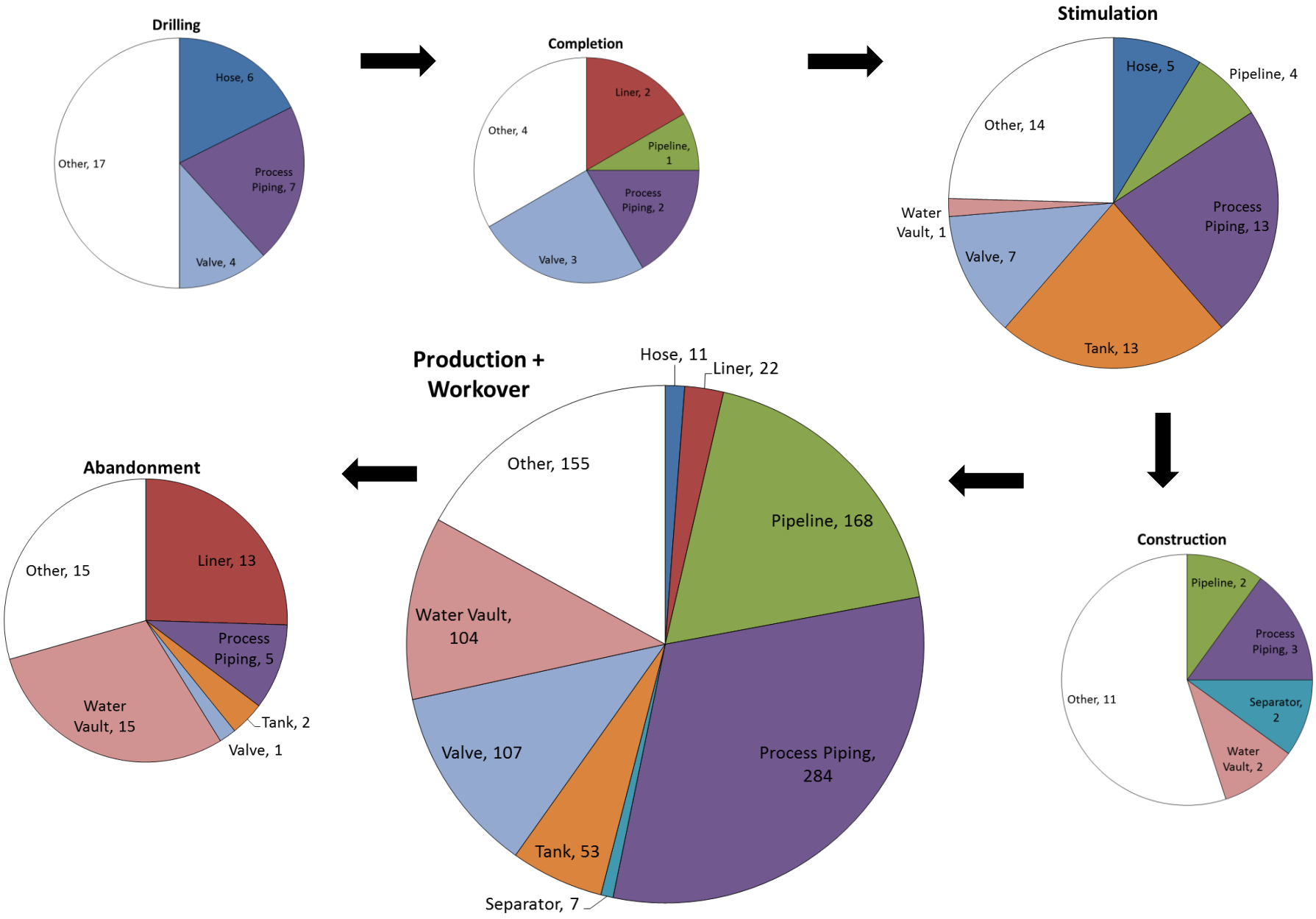
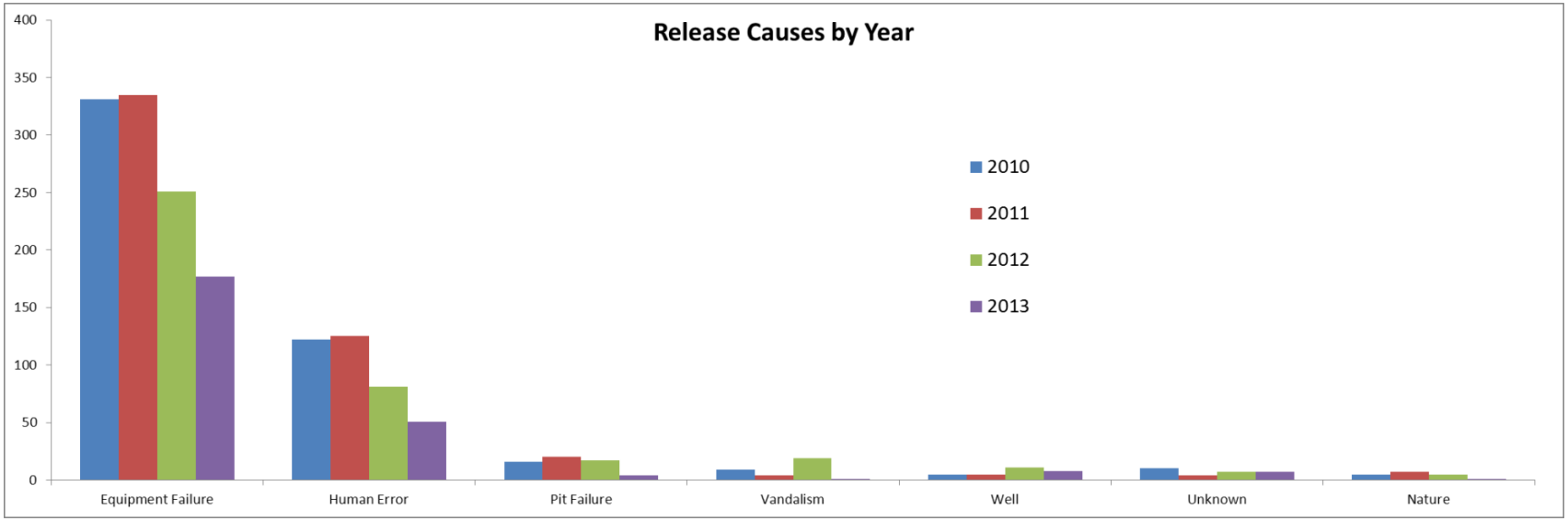


Figure 4. Equipment Failure by Operational Phase (counts)



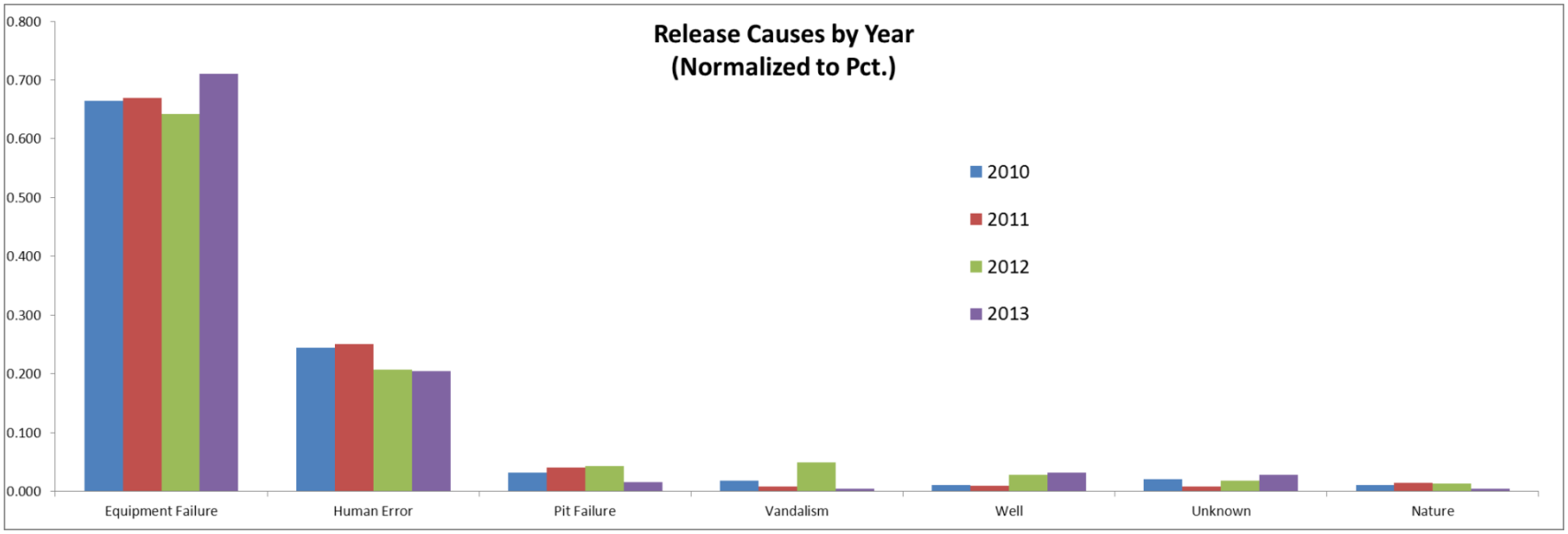
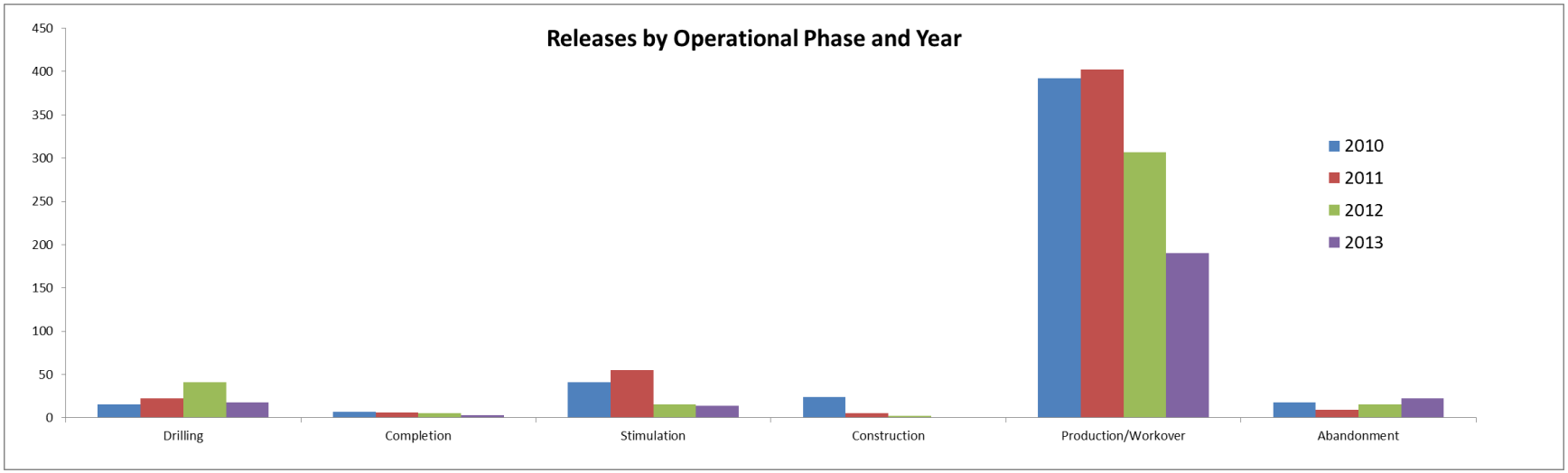


Figure 5a. Release Causes Broken Down by Year



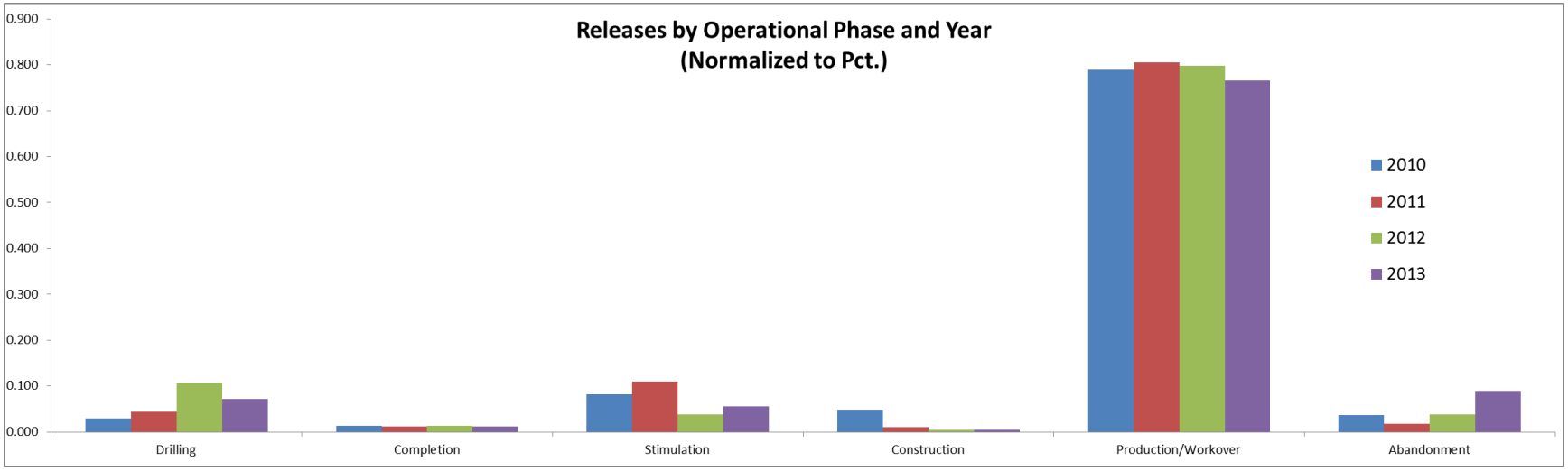


Figure 5b. Releases by Operational Phase Broken Down by Year

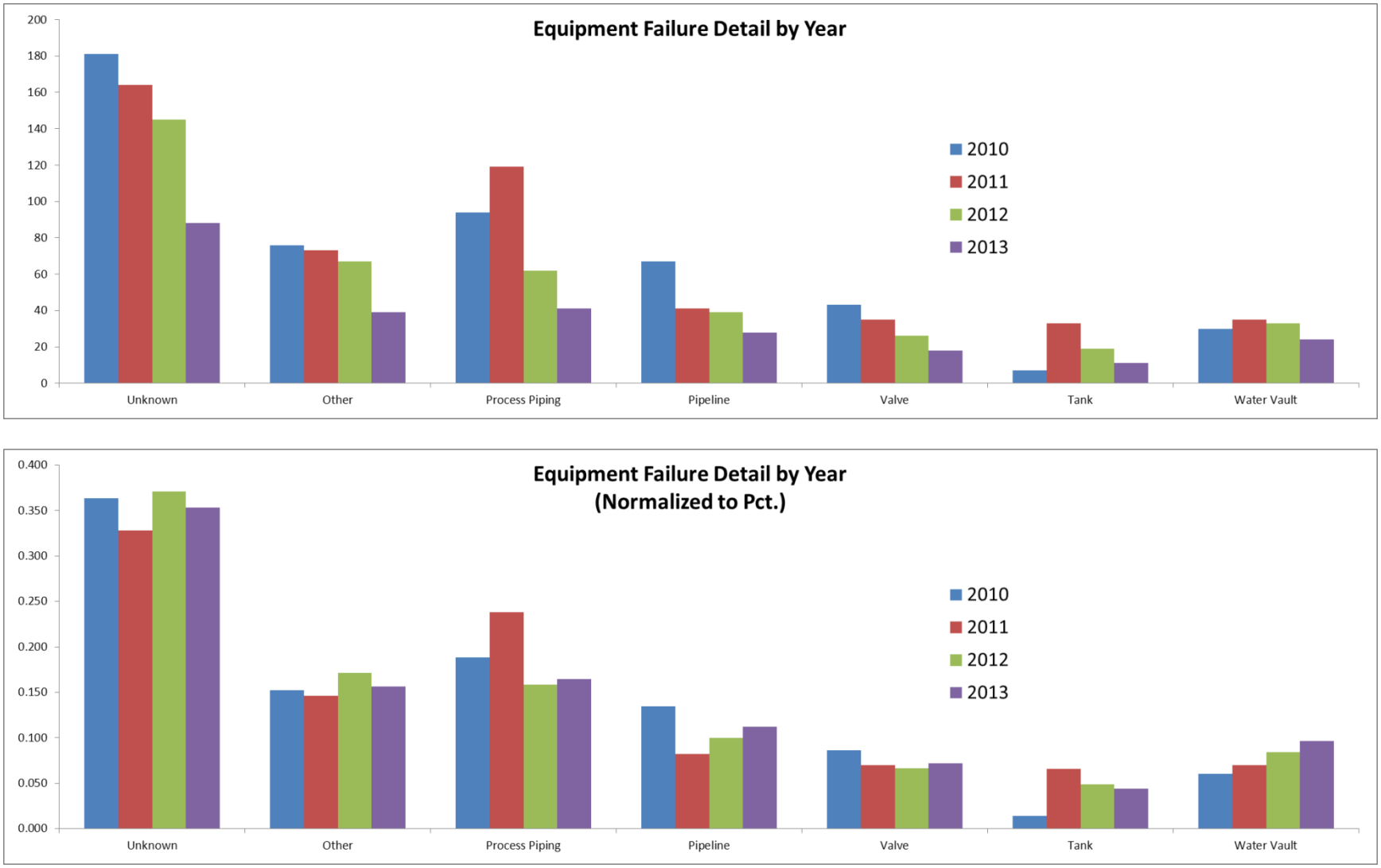


Figure 5c. Equipment Failure Detail Broken Down by Year

Tables

Table 1 – Summary of Operational Phases

Operational Phase	Count of Reported Spills	Percent of Count	Average Spill Volume (bbls)[1]
Production	1,277	78%	104[2]
Stimulation	125	8%	86
Drilling	96	6%	50
Completion	21	1%	33 (147)[3]
Workover	14	1%	44
Construction	32	2%	31
Abandoned	73	4%	24
Totals	**1,638**	**100%**	**--**

[1] For many spills, the spill volume is unknown and unreported; therefore, the average spill volume provided for each category represents the sum of the known volume (in bbls) divided by the total number of reported releases that *also* had a reported volume.

[2] Does not include one 35,000-bbl fresh water spill.

[3] Including one 1,500-bbl spill due to a torn liner and one 740-bbl spill due to a well casing failure at the well head.

Table 2 – Summary of Cause

Cause	Count of Reported Spills	Percent of Count	Average Spill Volume (bbls)[1]
Equipment Failure	1,094	67%	104[2]
Human Error	379	23%	66
Pit Failure	57	3%	483
Vandalism	33	2%	181
Well	29	2%	22
Nature	18	1%	61
Unknown Cause	28	2%	117
Totals	**1,638**	**100%**	**--**

[1] For many spills, the spill volume is unknown and unreported; therefore, the average spill volume provided for each category represents the sum of the known volume (in bbls) divided by the total number of reported releases that *also* had a reported volume.

[2] Does not include one 35,000-bbl fresh water spill.

Table 3 – Summary of Equipment Failure

Equipment	Count of Reported Spills	Percent of Count	Average Spill Volume (bbls)[1]
Process Piping	317	29%	139
Pipeline	196	18%	100
Tank + Water Vault	192	18%	52[2]
Valve	122	11%	129
Pump	14	1%	69
Alarm	12	1%	65
Gasket	11	1%	54
Nipple	9	1%	28
Separator	9	1%	8
Gas Eliminator	8	1%	27[3]
Packing	8	1%	9
Rupture Disk	7	1%	36
Free Water Knockout	6	1%	38
Heater Treater	5	0%	25
Stuffing Box	5	0%	11
Other	123	11%	55
Unknown	71	6%	236
Totals	**1,094**	**100%**	**--**

[1] For many spills, the spill volume is unknown and unreported; therefore, the average spill volume provided for each category represents the sum of the known volume (in bbls) divided by the total number of reported releases that *also* had a reported volume.

[2] Does not include one 35,000-bbl fresh water spill.

[3] Does not include one 4,500-bbl produced water spill.

Table 4 – Summary of Equipment Failure Location

Equipment Location	Count of Reported Spills	Percent of Count	Average Spill Volume (bbls)[1]
Tank	452	39%	55[2]
Well	240	21%	176
Pipeline	217	19%	128
Separator[3]	83	7%	36
Drill Pad	34	3%	37
Pump[4]	34	3%	87
Compressor[5]	12	1%	47
Gas Processing Plant	9	1%	20
Truck	8	1%	25
Pit	5	0%	205
Totals	**1,094**	**100%**	**--**

[1] For many spills, the spill volume is unknown and unreported; therefore, the average spill volume provided for each category represents the sum of the known volume (in bbls) divided by the total number of reported releases that *also* had a reported volume.

[2] Does not include one 35,000-bbl fresh water spill.

[3] Associated equipment includes process piping (28), valve (12),,separator (9), rupture disk (6), free water knockout (5), and heater-treater (5).

[4] Includes well or well pad (22), tank battery (6), water plant (4).

[5] Nine of 12 failures at compressor stations.

Table 5 – Summary of Spill Size by Volume

Spill Size	Count of Reported Spills	Percent of Count
XL - more than 100 bbls	192	12%
L - 51 to 100 bbls	128	8%
M - 11 to 50 bbls	496	30%
S - 2 to 10 bbls	318	19%
XS - 1 bbl	14	1%
Unknown	490	30%
Totals	**1,638**	**100%**

Table 6 – Summary of Cause by Operational Phase – Counts

Cause	Construction	Drilling	Completion	Stimulation	Production	Workover	Abandonment	Totals
Equipment Failure	20	34	10	57	926	6	41	**1094**
Human Error	9	49	9	64	241	4	3	**379**
Nature		1			17			**18**
Pit Failure		3	2		28	1	23	**57**
Vandalism					33			**33**
Well		8		4	12	2	3	**29**
Unknown Cause	3	1			20	1	3	**28**
Totals	**32**	**96**	**21**	**125**	**1277**	**14**	**73**	**1638**

Table 7 – Summary of Human Error Cause

Human Error	Count	Percent
Failure to Check Equipment	221	58%
Overfill	87	23%
Inadequate Training	40	11%
Damage While Digging	15	4%
Truck Crash	15	4%
None	1	0%
Totals	**379**	**100%**

Table 8 –Five Largest Petroleum Spills by Volume

Petroleum Spilled (bbls)	Operational Phase	Cause
398	Production	Vandalism
377	Production	Vandalism
340	Production	Vandalism
318	Production	Human Error
311	Production	Human Error

Table 9 – Five Largest Water Spills by Volume

Water Spilled (bbls)	Operational Phase	Cause	Equipment Location	Equipment
35,000	Production	Equipment Failure	Tank	Tank
4,500	Production	Equipment Failure	Pipeline	Gas Eliminator
4,000	Production	Equipment Failure	Well	Process Piping
3,700	Production	Equipment Failure	Well	Valve
3,000	Production	Equipment Failure	Well	Valve

Table 10 – Cause of Historical Releases

Cause	Count of Reported Spills	Percent of Count
Equipment Failure	**235**	**82%**
Water Vault	85	36%
Process Piping	73	31%
Unknown	59	25%
Tank	5	2%
Gathering Line	4	2%
Valve	3	1%
Pipeline	3	1%
Separator	2	1%
Seal	1	0%
Pit Failure	**29**	**10%**
Unknown Cause	**19**	**7%**
Human Error	**5**	**2%**
Totals	**288**	**100%**

Table 11 – Location of Historical Releases

Location	Count of Reported Spills	Percent of Count
Tank	194	67%
Pit	29	10%
Unknown	24	8%
Well	21	7%
Separator	9	3%
Pipeline	6	2%
Gas Processing Plant	3	1%
Compressor	2	1%
Totals	**288**	**100%**

Appendices

Appendix 1 – Spill/Release Report, Form 19

FORM 19 Rev 6/99

Click here to reset form

State of Colorado
Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80203 (303)894-2100 Fax:(303)894-2109

FOR OGCC USE ONLY

Spill report taken by:

FACILITY ID:

SPILL/RELEASE REPORT

This form is to be submitted by the party responsible for the oil and gas spill or release. Any spill or release which may impact waters of the State must be reported as soon as practicable; any spill over 20 bbls must be reported within 24 hours and all spills over five bbls must be reported within ten days. Submit a Site Investigation and Remediation Workplan (Form 27) when requested by the Director.

OPERATOR INFORMATION

Name of Operator: _____ OGCC Operator No: _____

Address: _____

City: _____ State: ____ Zip: _____

Contact Person: _____

Phone Numbers

No: ___ _____

Fax: _____

E-Mail:_____

DESCRIPTION OF SPILL OR RELEASE

Date of Incident _____ Facility Name & No.: _____

Type of Facility (well, tank battery, flow line, pit): _____

Well Name and Number: _____

API Number: _____

County: _____

QtrQtr: _____ Section: _____

Township: _____ Range: _____

Meridian: _____

Specify volume spilled and recovered (in bbls) for the following materials:

Oil spilled: _____ Oil recov'd: _____ Water spilled: _____ Water recov'd: _____ Other spilled: _____ Other recov'd:_____

Ground Water impacted? ☐ Yes ☐ No Surface Water impacted? ☐ Yes ☒ No

Contained within berm? ☐ Yes ☐ No Area and vertical extent of spill: _____x_____

Current land use: _____ Weather conditions: _____

Soil/geology description: _____

IF LESS THAN A MILE, report distance **IN FEET** to nearest.... Surface water: _____ wetlands: _____ buildings: _____

Livestock: _____ water wells: _____ Depth to shallowest ground water: _____

Cause of spill (e.g., equipment failure, human error, etc.): _____ Detailed description of the spill/release incident:

CORRECTIVE ACTION

Describe immediate response (how stopped, contained and recovered):

Describe any emergency pits constructed:

How was the extent of contamination determined:

Further remediation activities proposed (attach separate sheet if needed):

Describe measures taken to prevent problem from reoccurring:

OTHER NOTIFICATIONS

List the parties and agencies notified (County, BLM, EPA, DOT, Local Emergency Planning Coordinator or other).

Date	Agency	Contact	Phone	Response

Spill/Release Tracking No: _____

Appendix 2 – Database fields supplied by COGCC and the associated Form 19 field

Field Name (COGCC database)	How it looks on the Form 19
company_name	Name of Operator:
operator_num	OGCC Operator No:
incident_date	Date of Incident:
county	County:
facility_type	Type of Facility (well, tank battery, flowline, pit):
	The following six fields have this header - Specify volume spilled and recovered (in bbls) for the following materials:
oil_Spill	Oil spilled:
Oil_Recover	Oil recov'd:
water_spill	Water spilled:
water_recov	Water recov'd
other_spill	Other spilled:
other_recov	Other recov'd
water_impact	Ground Water impacted? Y N
Surf_Impact	Surface Water impacted? Y N
contained	Contained within berm? Y N
	The following four database fields come from one field on Form 19 -
area	Area and vertical extent of spill:
area_unit	Area and vertical extent of spill:
vertical	Area and vertical extent of spill:
vert_unit	Area and vertical extent of spill:
land_use	Current land use:
	The following six fields have this header - IF LESS THAN A MILE, report distance IN FEET to nearest…
wetlands	wetlands:
surf_water	Surface water:
shallow_depth	Depth to shallowest ground water:
buildings	buildings:
livestock	Livestock:
water_wells	Water wells:
spill_desc	Detailed description of the spill/release incident:
extent	How was the extent of contamination determined?
preventative	Describe measures taken to prevent problem from reoccurring:
desc	Cause of spill (e.g. equipment failure, human error, etc.):
doc_num	Spill/Release Tracking No:
trkg_num	Spill/Release Tracking No:

Appendix 3 – Database fields created by SSPA to aid in analysis

Created Field for Research	Description
Operational Phase	Categorized spill reports into operational phases
Operational Sub-Phase	Sub-Categorized spill report operational phases (historical, etc)
Cause	Categorized spill reports into causes
Sub-Cause	Sub-Categorized spill report causes
Equipment Location	Categorized equipment failures into locations
Equipment	Categorized equipment failures by equipment name
Equipment Details	Sub-Categorized equipment failures by equipment name
Spill Size - Oil	Categorized oil spill sizes (S, M, L, etc.)
Spill Size - Water	Categorized water spill sizes (S, M, L, etc.)
Spill Size - Other	Categorized other spill sizes (S, M, L, etc.)
Spill Type	Categorized spill reports into material spilled (oil, water, mixture)
Size (bbls)	Summed oil, water, and other spill size
Total Size	Categorized summed spill sizes (S, M, L, etc.)

Appendix 4 – Complete List of Equipment Failure Detail

Row Labels	Count of Equipment Details
Actuator	1
Alarm	1
Automatic Shut-in Valve	1
Baffles	1
Ball Valve	7
Beam Pump	1
Bearing	1
Blender Discharge	1
Block Valve	1
Blown Crush Cap	1
Blowout Preventer	2
Bradenhead Valve	2
Bull Plug	1
Bull Valve	1
Burner Tube	1
Butterfly Valve	3
Bypass Line	5
Cam Lock Fitting	3
Cap	1
Catch Tank	1
Centrifuge	1
Check Valve	8
Coalbed Methane Pipeline	1
Collar	3
Concrete	51
Condensate Tank	1
Connection	7
Consolidation Line	1
Coupling	1
Dewatering Pump	1
Discharge Line	11
Drain Line	2
Drain Valve	5
Dresser Sleeve	3
Drive Head	1
Dump Line	115
Dump Valve	1

Row Labels	Count of Equipment Details
Elbow	1
Electromagnetic Meter Valve	1
Equalization Valve	1
Equalizing Line	1
Fiberglass Collar	1
Fire Tube	4
Fitting	5
Flange	1
Float Chamber	1
Flowback Line	3
Flowback Tank	6
Flowline	83
Flowline Relief Valve	1
Flowline Valve	1
Frac Line	2
Frac Tank	8
Frost Free Valve	1
Fuse	4
Fusion Coupler	1
Gas Eliminator	1
Gas Supply Line	1
Gasket	5
Gate Valve	2
Gathering Line	20
Gunbarrel Tank	3
Hammer Union	1
Hammer Union Gasket	1
Hatch	3
Hatch Seal	1
HDPE Line	1
Header Line	2
Header Manifold	1
Hi Low Valve	1
High Fluid Alarm	1
High Level Shut Down	1
High Point Vent	1
High Pressure Plumbing	1
High Tank Level Alarm	2

Row Labels	Count of Equipment Details
High Water Alarm	3
Hose	1
Hydraulic Line	2
Injection Line	14
Injection Pump	1
Injection Pump Plunger	2
Inspection Plate Gasket	2
Insulating Gasket	1
Isolation Valve	4
Kill Switch	1
Level Sensor	1
Liner	2
Load Line	5
Load Line Valve	3
Low Pressure Safety Valve	1
Low Suction Manifold	1
Low Torc Valve	1
Lubricator Cap	1
Manifold	3
Motor Valve	1
Mud Flowline	5
Mud Pump	2
Mud Tank	1
Needle Valve	1
None	398
Oil Dump Line	15
Oil Dump Valve	1
Oil Line	1
Overflow Piping	1
Overflow Valve	1
Packing	5
Pipe connector	1
Plug	1
Plunger end cap	1
Plunger Packing	1
Poly Pipe	12
Poly Pipe Valve	1
Popoff	1

Row Labels	Count of Equipment Details
Pressure Safety Valve	1
Pressure Valve	1
Primer Valve	1
Produced Water Line	27
Produced Water Pump	3
Produced Water Tank	3
Production Line	1
Production Lines	2
Production Tank	31
Radigan Valve	1
Recycle Pump	1
Return Line	1
Riser	3
Rubbers	4
Seal	3
Seat	1
Shaker Screen	1
Shut-In Valve	1
Sight Glass	2
Sledge	1
Slope Tee Blow Down	1
Slug Catch	1
Spool Piece	1
Storage Tank	3
Stuffing Box	1
Suction Hose	1
Suction Pressure Transmitter	1
Surface Casing Valve	1
SWD Line	1
Swedge	2
Tank Valve	11
Tee	1
Top Dump Valve	1
Transfer Pump	4
Treater Fire Tube Gasket	1
Tubing	1
Union	2
Unloading Valve	1

Row Labels	Count of Equipment Details
Upper Manifold Valve	1
Vac Truck	1
Vessel	1
Water Drain Valve	1
Water Dump Line	7
Water Injection Line	1
Water Lateral Line	1
Water Line	24
Water Manifold	1
Water Pump	1
Water Sensing Line	1
Water Supply Tank	1
Water Tank	1
Water Transfer Line	4
Water Vault	1
Grand Total	**1094**