



# Utilizing ArcGIS Schematics to Manage Chemically Treated Pipelines

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INTEGRITY

# ArcGIS Schematics 101

- Simplified representation of a network.
- Visualize the relationships of a network, its structure, and how it operates.
- Data driven - Generate diagrams using GIS data.
- Dynamically interact with GIS.
- No scalable constraints.
- Check network connectivity/Perform QC.

# Licensing

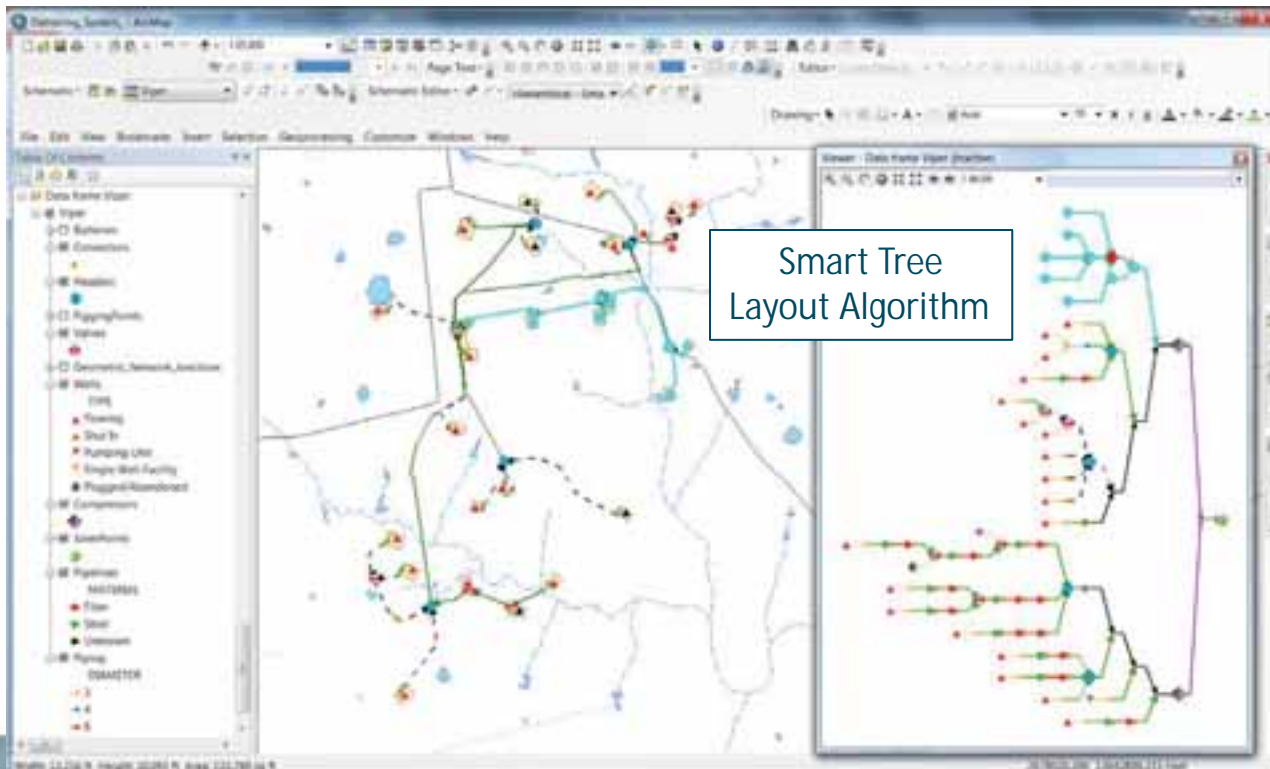
- Requires Schematics extension.
- License Levels
  - Viewing
    - Any license level
  - Generate, Update, and Edit diagrams
    - Standard
    - Advanced

# Data for Schematics

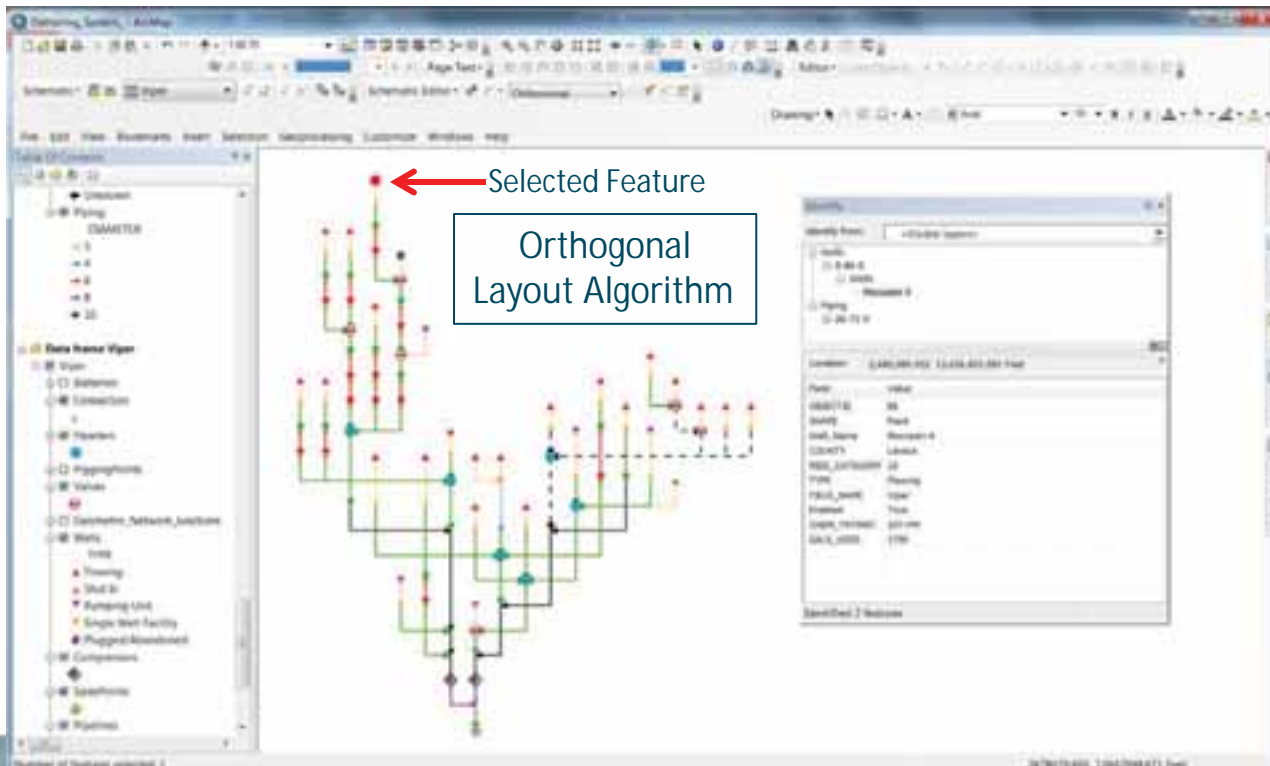
- Physical Connectivity
  - Geodatabase
    - Personal
    - File
    - SDE
  - Shapefiles
- Logical Connectivity
  - Tabular

# Dynamically Interact with GIS Data

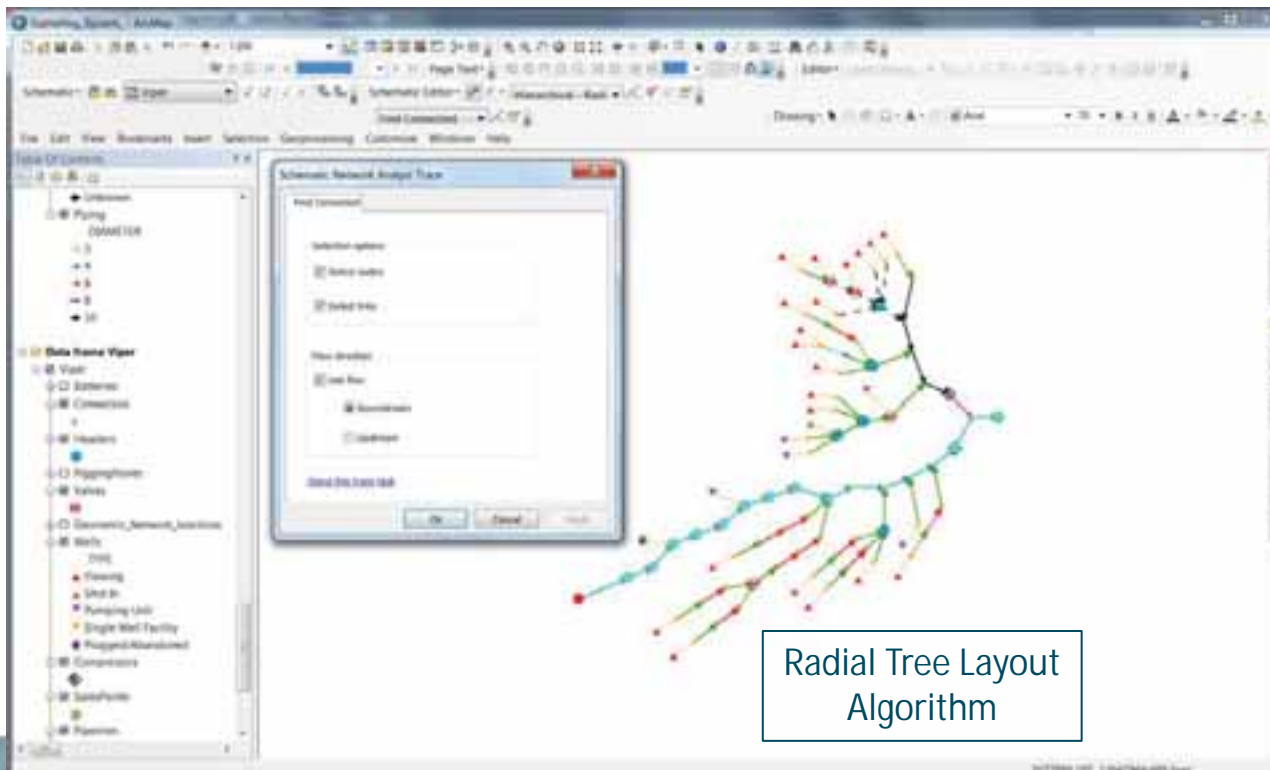
Propagate selections from diagrams to map or from maps to diagrams.



# Identify schematic features by GIS data attributes.



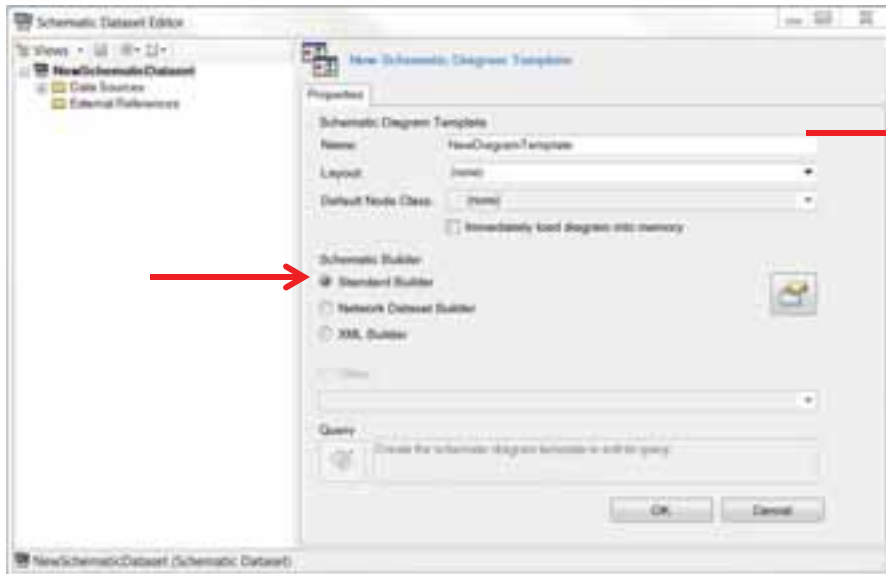
# Perform network traces.



Radial Tree Layout Algorithm

# Schematics for Pipelines

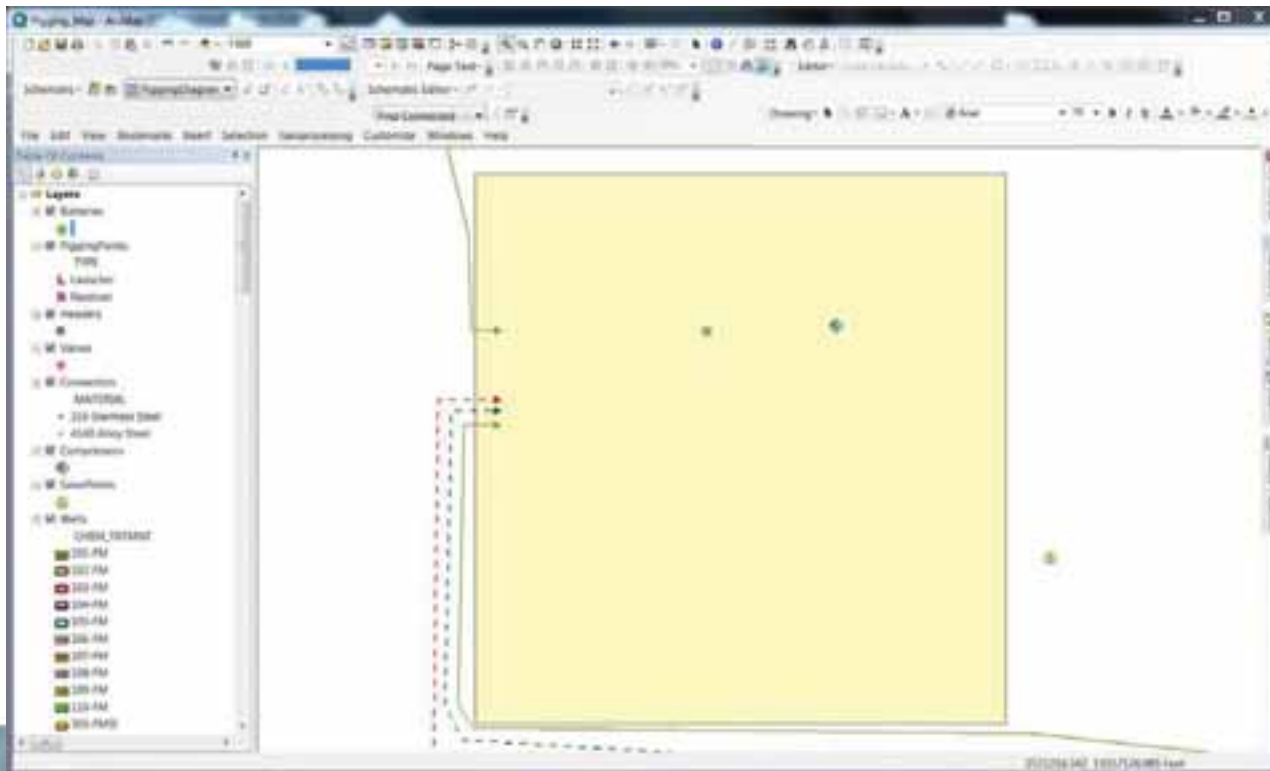
Typically, utilizes a geometric network to create diagrams using the Standard Builder.



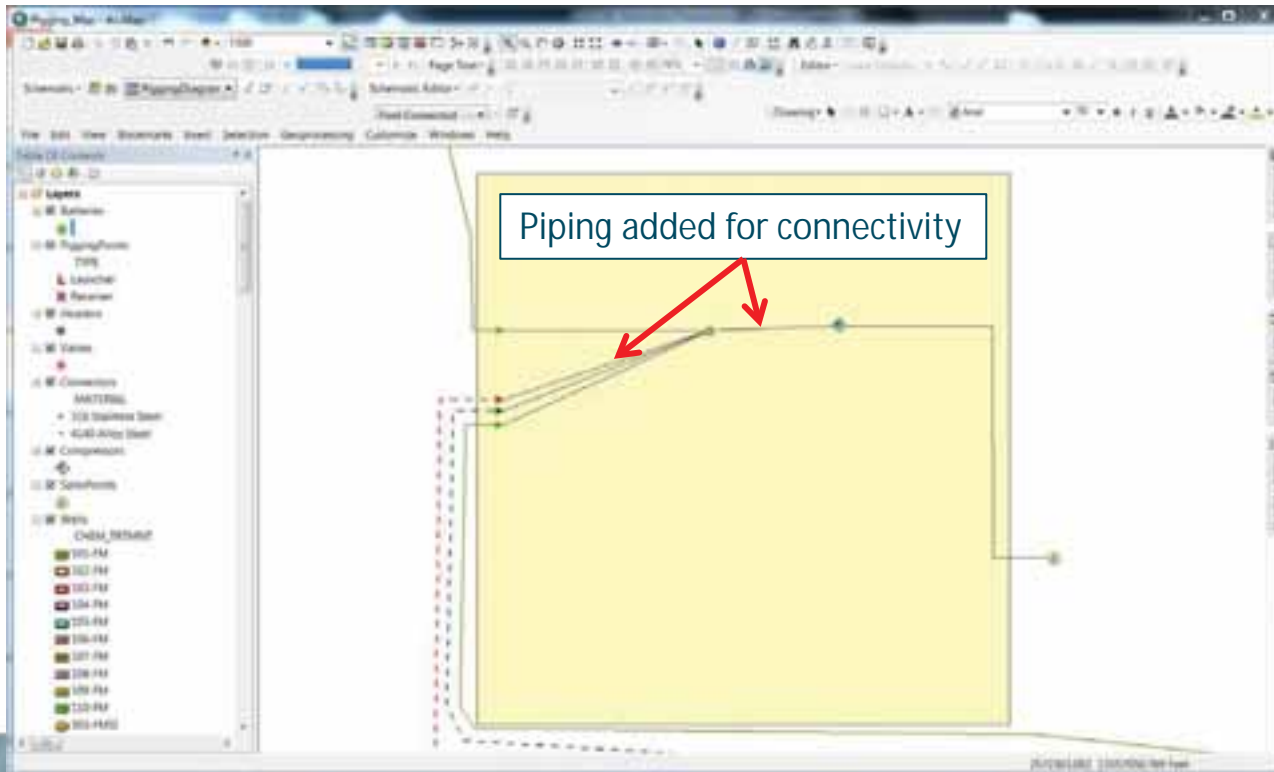


# Evaluate Existing GIS Data

Data exists for pipelines, wells, and other point type data, but connectivity doesn't exist.



# Establish connections between pipeline and point data.



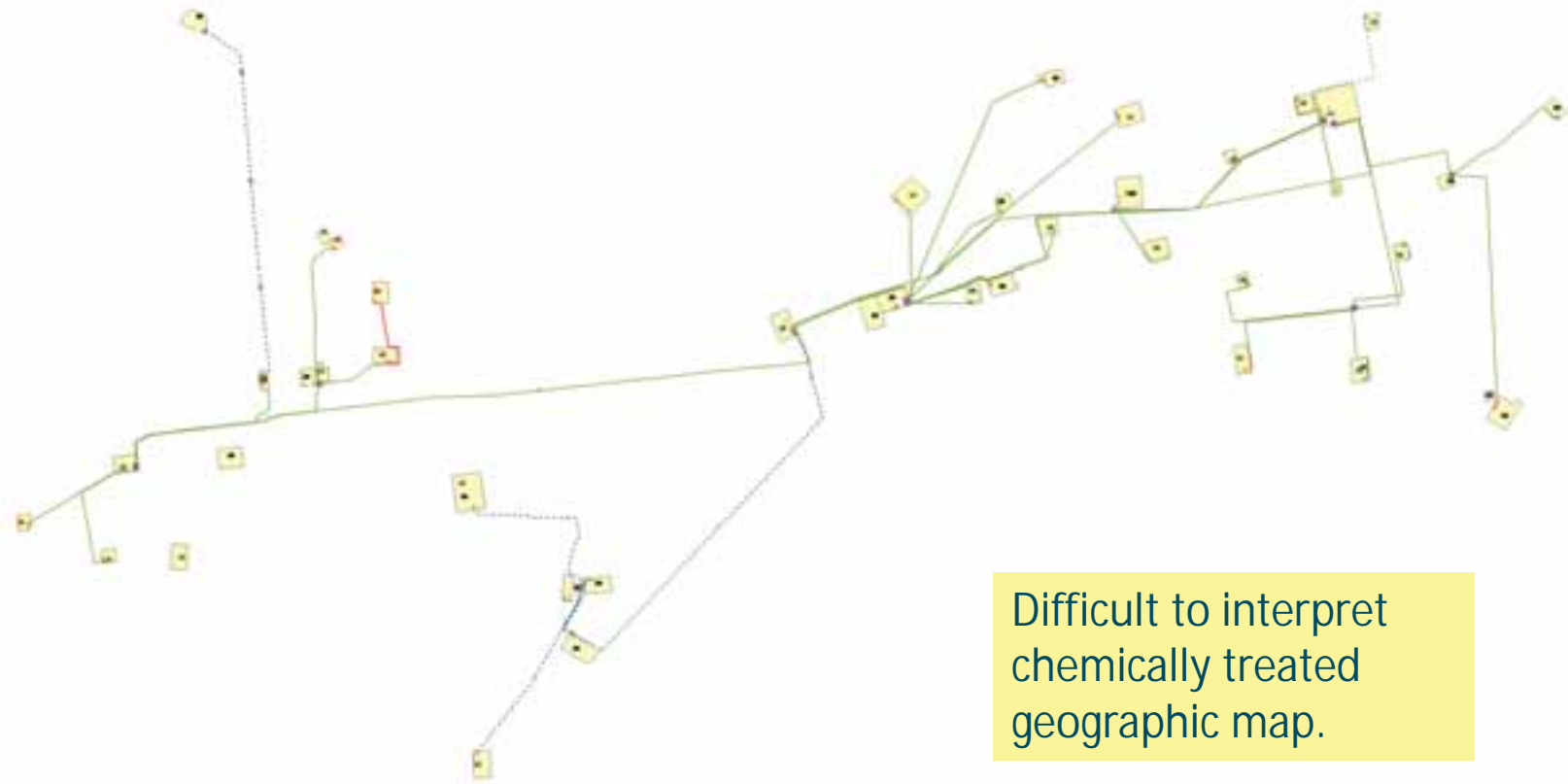
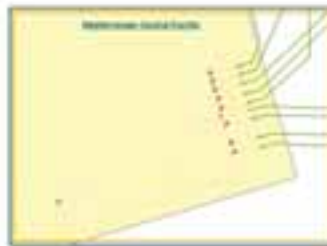
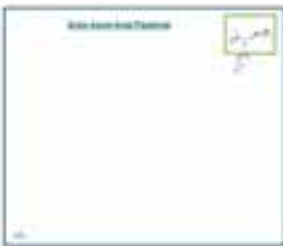
# Add Chemical Treatment Data

OBJECTID	Well_Name	RISK_CATEGORY	TYPE	Reaction/Event	Inventory Date	Prod ID	Cost/Unit	Req L	End L	Volume Delivered	Vol Used
2	Japanumb 6	22	Single Well Facility	Annular	08/1/2014	104-FM	\$ 5.25	2000	1700	2000	2000
3	Japanumb 7	2	Single Well Facility		08/1/2014	None					
4	Japanumb 8	16	Single Well Facility	Annular	08/1/2014	106-FM	\$ 4.25	100	100	0	20
5	Japanumb 2	10	Single Well Facility	Annular	08/1/2014	103-FM2	\$ 8.50	1400	1250	2700	2000
6	Japanumb 1	11	Single Well Facility	Annular	08/1/2014	107-FM	\$ 8.00	1200	1700	800	800
7	Cooper 1	20	Single Well Facility	Annular	08/1/2014	104-FM	\$ 5.25	300	300	0	200
8	Cooper 2	22	Single Well Facility	Annular	08/1/2014	101-FM	\$ 8.00	100	100	0	0
9	Cooper 3	15	Single Well Facility	Annular	08/1/2014	103-FM3	\$ 8.50	1700	1600	0	200
10	Japanumb 4	2	Single Well Facility		08/1/2014	None					
11	Japanumb 3	11	Single Well Facility	Annular	08/1/2014	107-FM	\$ 8.20	1700	1700	1000	1000
12	Goekel 1	20	Single Well Facility	Annular	08/1/2014	106-FM	\$ 4.25	200	200	0	0
13	Japanumb 5	20	Single Well Facility	Annular	08/1/2014	104-FM	\$ 5.25	1700	1500	0	200
14	Mergey 1	16	Single Well Facility	Annular	08/1/2014	101-FM	\$ 8.30	2100	2100	0	0
15	Mergey 2	12	Single Well Facility	Annular	08/1/2014	102-FM	\$ 8.20	1300	1100	2000	2000
16	Japanumb 9	18	Single Well Facility	Annular	08/1/2014	104-FM	\$ 5.25	300	300	0	0
17	Retracted 4	11	Shut In		08/1/2014	None					
18	Retracted 3	16	Flowing	Annular	08/1/2014	101-FM	\$ 8.00	1700	1300	1300	1300
19	Retracted 2	11	Flowing	Annular	08/1/2014	101-FM	\$ 8.00	2100	1300	800	1400
20	Mediterranean 1	18	Flowing (Shut)		08/1/2014	None					
21	Rough Taked 1	18	Flowing	Annular	08/1/2014	104-FM	\$ 5.25	1700	1000	2000	2000
22	Mediterranean 2	22	Pumping Unit		08/1/2014	None					
23	Mediterranean 3	21	Flowing	Annular	08/1/2014	106-FM	\$ 4.25	300	80	200	400
24	Rough Taked 2	14	Flowing		08/1/2014	None					
25	Retracted 1A	11	Flowing		08/1/2014	None					
26	Retracted 1B	2	Flowing	Annular	08/1/2014	101-FM	\$ 8.00	500	2100	1000	400
27	Rough Taked 3	18	Flowing	Annular	08/1/2014	106-FM	\$ 4.25	140	100	100	140
28	San Marcos 3A	15	Flowing	Annular	08/1/2014	109-FM	\$ 8.50	0	0	0	0
29	San Marcos 3B	8	Flowing		08/1/2014	None					
30	San Marcos 2	12	Flowing	Annular	08/1/2014	107-FM	\$ 8.20	1000	1000	2400	2700
31	San Marcos 1	15	Flowing	Annular	08/1/2014	102-FM	\$ 8.20	1400	1300	700	400
32	Barlow Springs 1	15	Shut In	Annular	08/1/2014	107-FM	\$ 8.00	1400	1300	2000	2000

- Import chemical data
- Join/Incorporate with chemically treated feature layers

**MCS Field Chemical Treatment Map**

Symbol	Meaning	Symbol	Meaning
1	Wellhead	100	Water Treatment
2	Compressor	101	Water Treatment
3	Separator	102	Water Treatment
4	Water Tank	103	Water Treatment
5	Water Tank	104	Water Treatment
6	Water Tank	105	Water Treatment
7	Water Tank	106	Water Treatment
8	Water Tank	107	Water Treatment
9	Water Tank	108	Water Treatment
10	Water Tank	109	Water Treatment
11	Water Tank	110	Water Treatment
12	Water Tank	111	Water Treatment
13	Water Tank	112	Water Treatment
14	Water Tank	113	Water Treatment
15	Water Tank	114	Water Treatment
16	Water Tank	115	Water Treatment
17	Water Tank	116	Water Treatment
18	Water Tank	117	Water Treatment
19	Water Tank	118	Water Treatment
20	Water Tank	119	Water Treatment
21	Water Tank	120	Water Treatment
22	Water Tank	121	Water Treatment
23	Water Tank	122	Water Treatment
24	Water Tank	123	Water Treatment
25	Water Tank	124	Water Treatment
26	Water Tank	125	Water Treatment
27	Water Tank	126	Water Treatment
28	Water Tank	127	Water Treatment
29	Water Tank	128	Water Treatment
30	Water Tank	129	Water Treatment
31	Water Tank	130	Water Treatment
32	Water Tank	131	Water Treatment
33	Water Tank	132	Water Treatment
34	Water Tank	133	Water Treatment
35	Water Tank	134	Water Treatment
36	Water Tank	135	Water Treatment
37	Water Tank	136	Water Treatment
38	Water Tank	137	Water Treatment
39	Water Tank	138	Water Treatment
40	Water Tank	139	Water Treatment
41	Water Tank	140	Water Treatment
42	Water Tank	141	Water Treatment
43	Water Tank	142	Water Treatment
44	Water Tank	143	Water Treatment
45	Water Tank	144	Water Treatment
46	Water Tank	145	Water Treatment
47	Water Tank	146	Water Treatment
48	Water Tank	147	Water Treatment
49	Water Tank	148	Water Treatment
50	Water Tank	149	Water Treatment
51	Water Tank	150	Water Treatment
52	Water Tank	151	Water Treatment
53	Water Tank	152	Water Treatment
54	Water Tank	153	Water Treatment
55	Water Tank	154	Water Treatment
56	Water Tank	155	Water Treatment
57	Water Tank	156	Water Treatment
58	Water Tank	157	Water Treatment
59	Water Tank	158	Water Treatment
60	Water Tank	159	Water Treatment
61	Water Tank	160	Water Treatment
62	Water Tank	161	Water Treatment
63	Water Tank	162	Water Treatment
64	Water Tank	163	Water Treatment
65	Water Tank	164	Water Treatment
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75	Water Tank	174	Water Treatment
76	Water Tank	175	Water Treatment
77	Water Tank	176	Water Treatment
78	Water Tank	177	Water Treatment
79	Water Tank	178	Water Treatment
80	Water Tank	179	Water Treatment
81	Water Tank	180	Water Treatment
82	Water Tank	181	Water Treatment
83	Water Tank	182	Water Treatment
84	Water Tank	183	Water Treatment
85	Water Tank	184	Water Treatment
86	Water Tank	185	Water Treatment
87	Water Tank	186	Water Treatment
88	Water Tank	187	Water Treatment
89	Water Tank	188	Water Treatment
90	Water Tank	189	Water Treatment
91	Water Tank	190	Water Treatment
92	Water Tank	191	Water Treatment
93	Water Tank	192	Water Treatment
94	Water Tank	193	Water Treatment
95	Water Tank	194	Water Treatment
96	Water Tank	195	Water Treatment
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99	Water Tank	198	Water Treatment
100	Water Tank	199	Water Treatment
101	Water Tank	200	Water Treatment



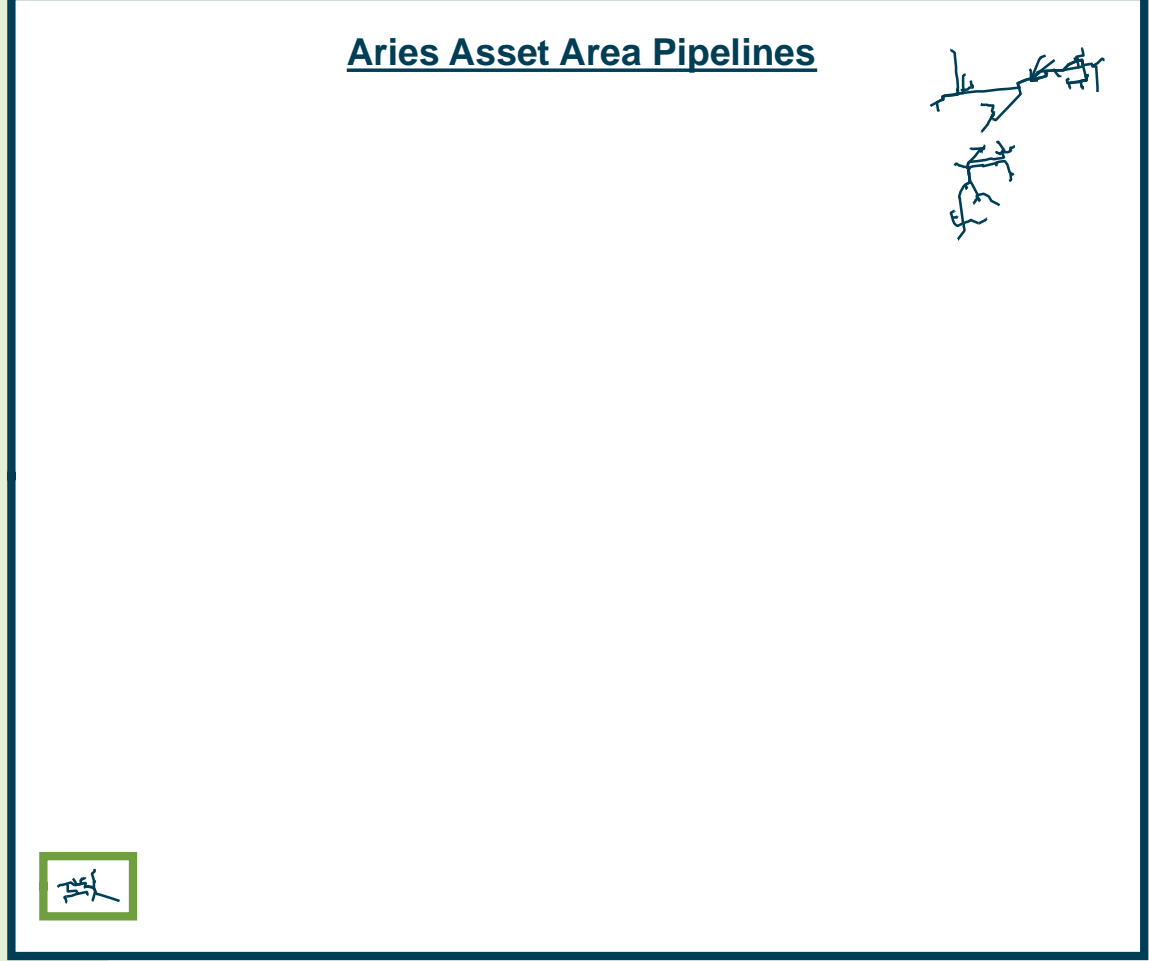
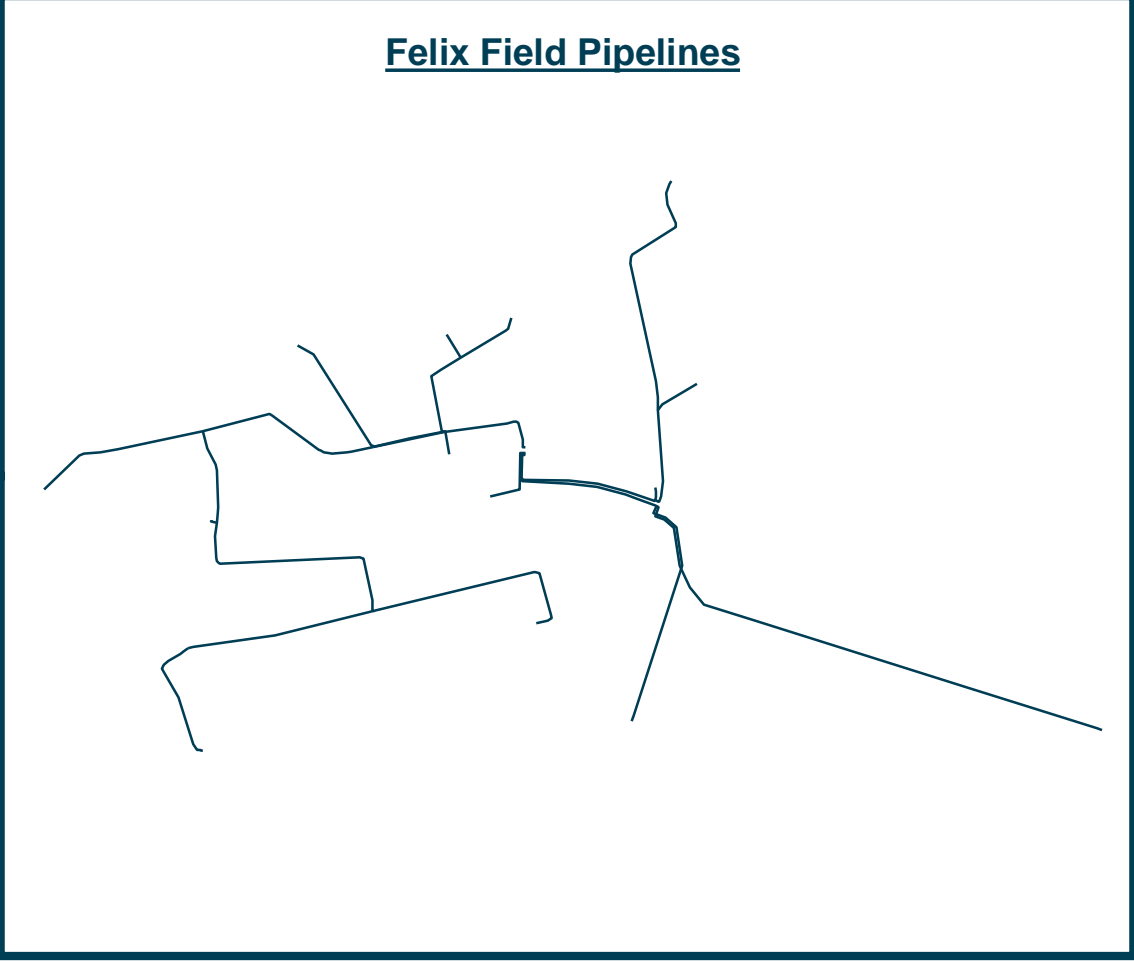
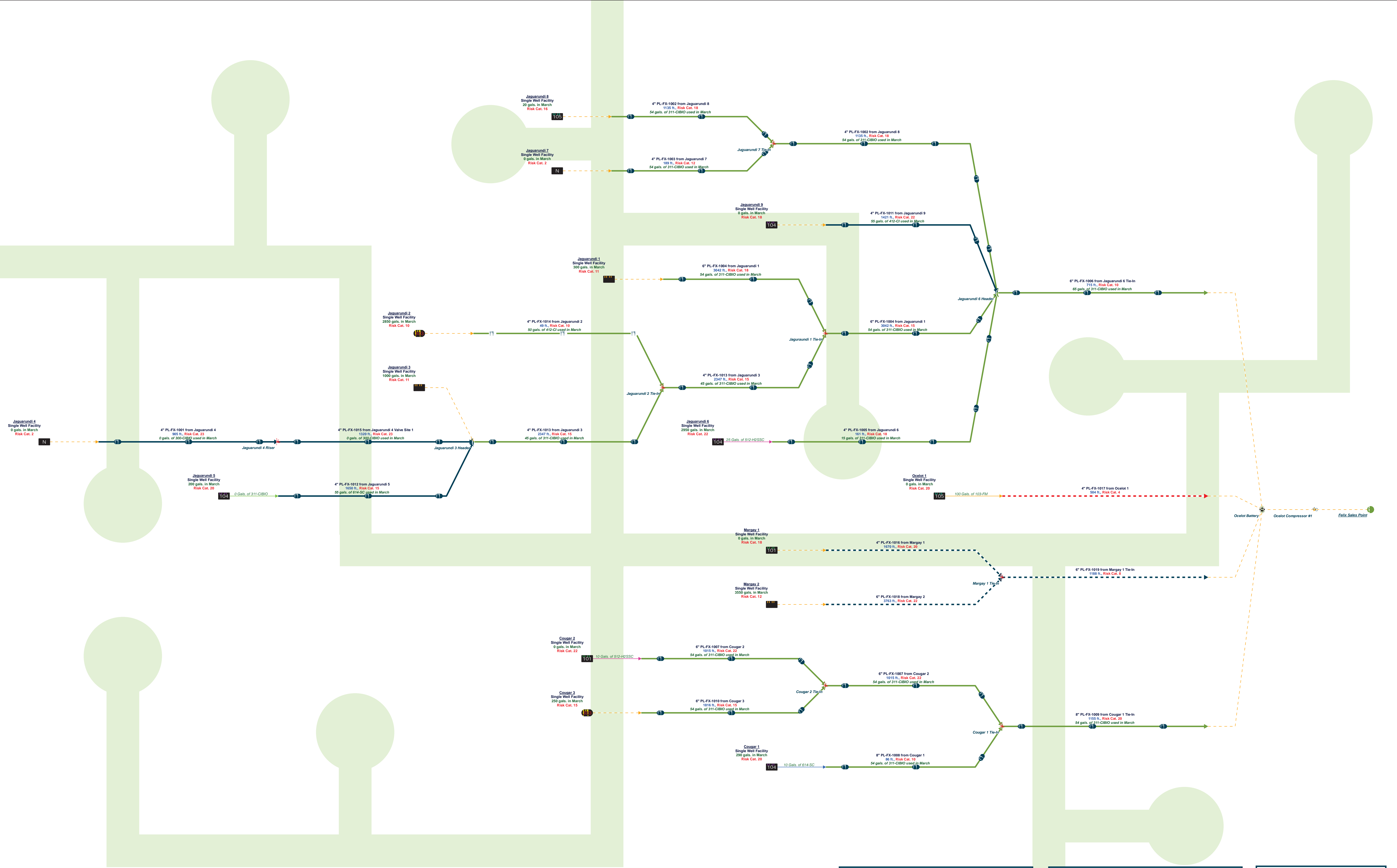
Difficult to interpret chemically treated geographic map.



# Geographic Maps

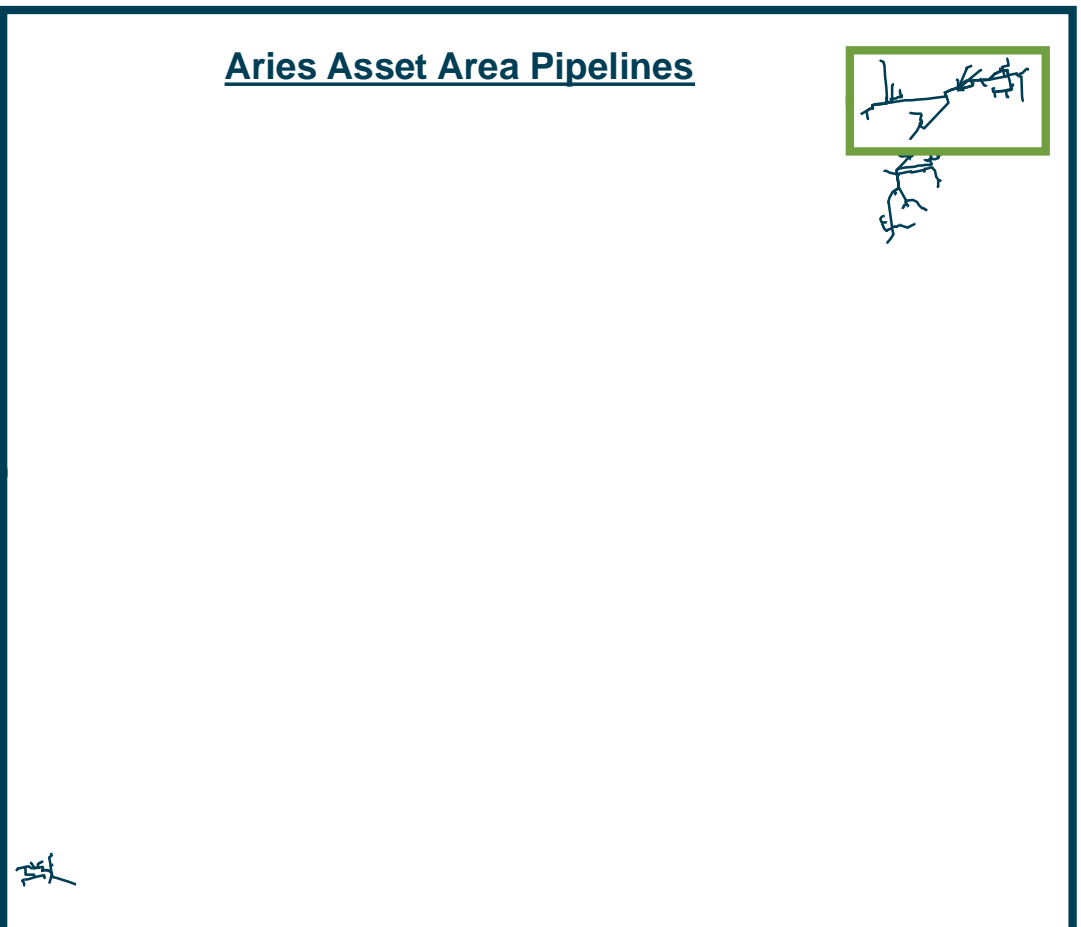
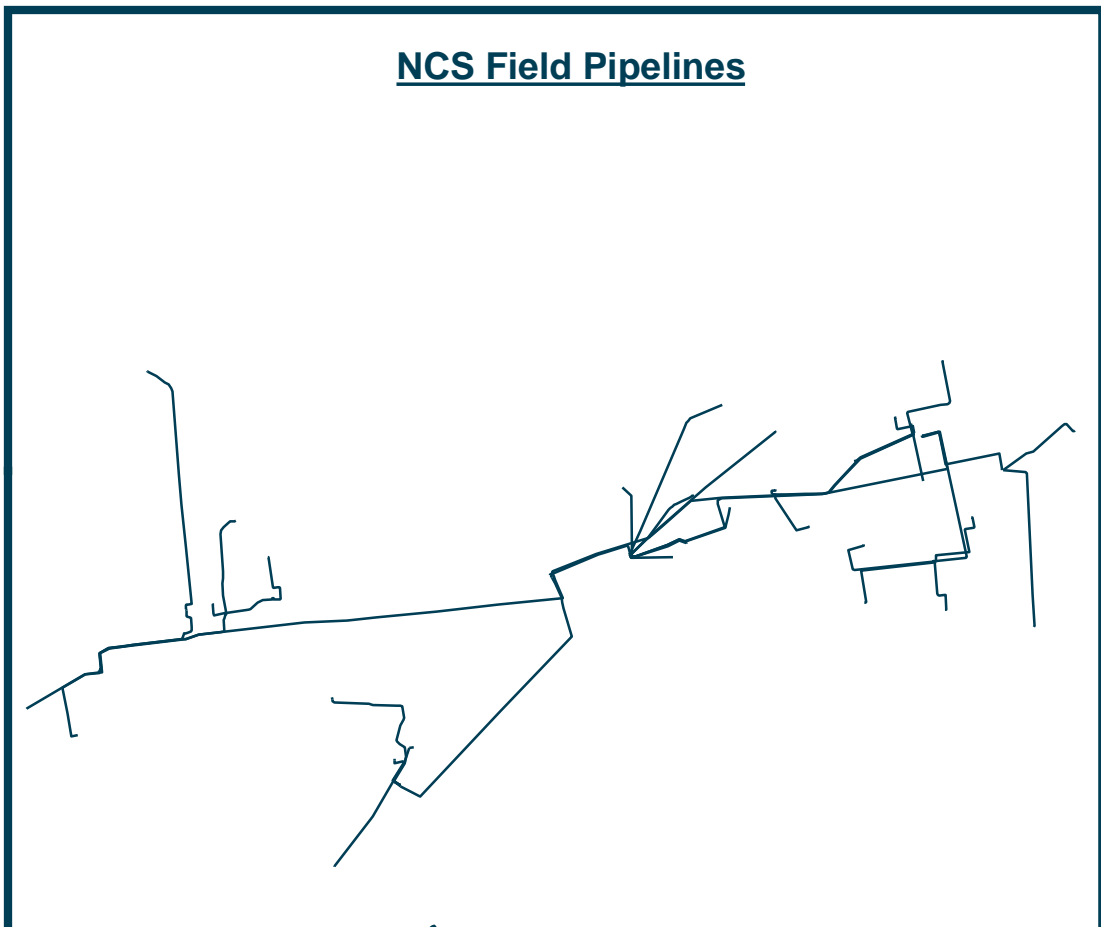
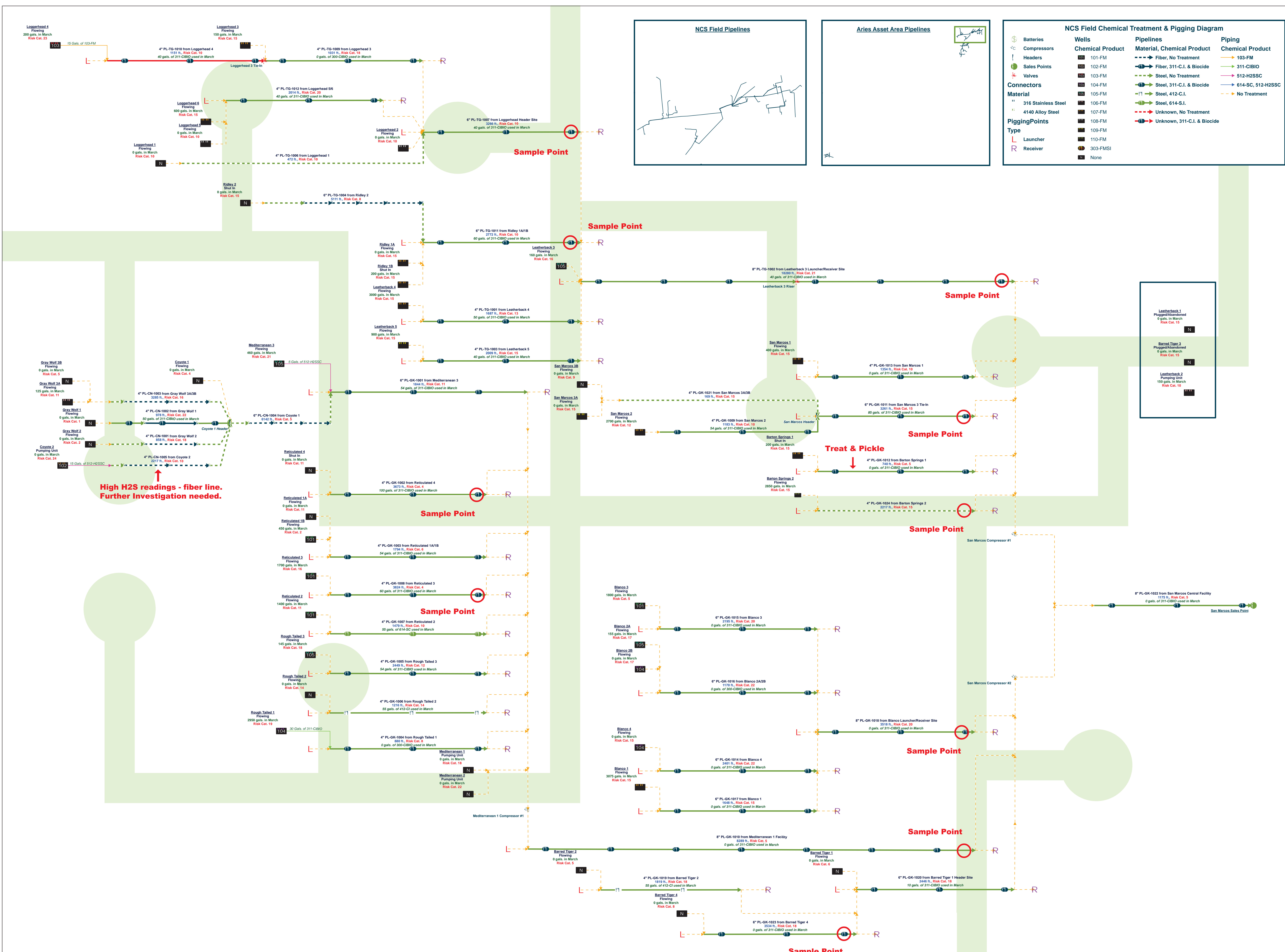
## - Drawbacks -

- Analysis of geographic map is hindered by scale.
  - Difficult to understand the relationships at facilities, well pads.
  - Pipeline crossings and pipelines sharing ROWs make interpretation of the data difficult – pipelines not spaced apart.
  - A compilation of many maps would be needed to approach the analytical value of one diagram.



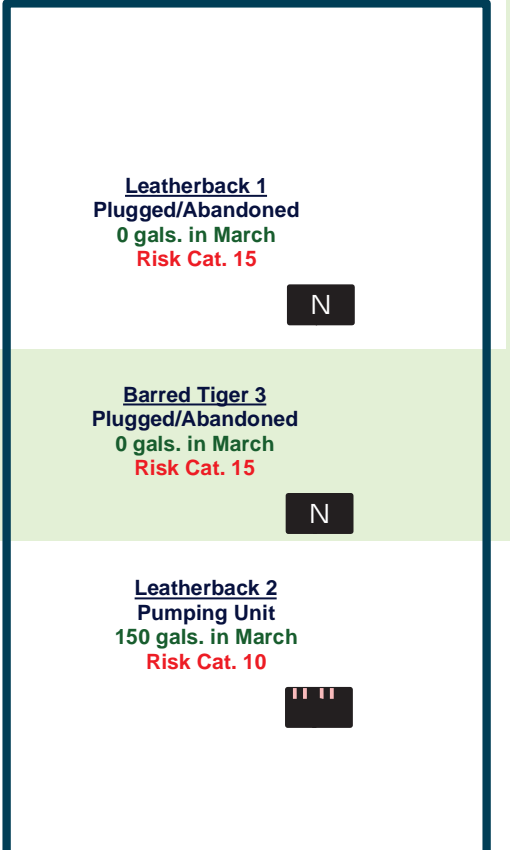
### Felix Field Chemical Treatment Diagram

	Batteries		Pipelines
	Compressors		Material, Chemical Product
	Headers		Fiber, No Treatment
	Sales Points		Fiber, 311 - C.I. & Biocide
	Tie-Ins		Steel, No Treatment
	Wells		Steel, 614-S.L.
			Steel, 412-C.L.
			Steel, 311-C.I. & Biocide
			Unknown, No Treatment & Biocide
	101-FM		Piping
	102-FM		
	103-FM		
	104-FM		
	105-FM		
	106-FM		
	107-FM		
	108-FM		
	109-FM		
	110-FM		
	303-FMSI		
	None		



**NCS Field Chemical Treatment & Pigging Diagram**

Symbol	Wells	Pipelines	Pigging Points
⊕	101-FM	--- Fiber, No Treatment	⊕ 103-FM
⊖	102-FM	--- Fiber, 311-C.I. & Biocide	⊕ 311-CIBIO
⊕	103-FM	--- Steel, No Treatment	⊕ 512-H2SSC
⊖	104-FM	--- Steel, 311-C.I. & Biocide	⊕ 614-SC, 512-H2SSC
⊕	105-FM	--- Steel, 412-C.I.	⊕ No Treatment
⊖	106-FM	--- Steel, 614-S.I.	
⊕	107-FM	--- Unknown, No Treatment	
⊖	108-FM	--- Unknown, 311-C.I. & Biocide	
⊕	109-FM		
⊖	110-FM		
⊕	303-FMSI		
⊖	None		



# Schematic Diagrams

## - Advantages -

- Analysis of diagrams is not constrained by scale.
  - Easy to understand the relationships of all pipelines and asset features.
  - Pipeline crossings eliminated with the creation of a diagram.
  - Pipelines sharing ROWs are spaced apart.
  - One diagram can model an entire system in the place of many geographical maps.



# Evaluating Pipeline/Asset Chemical Data

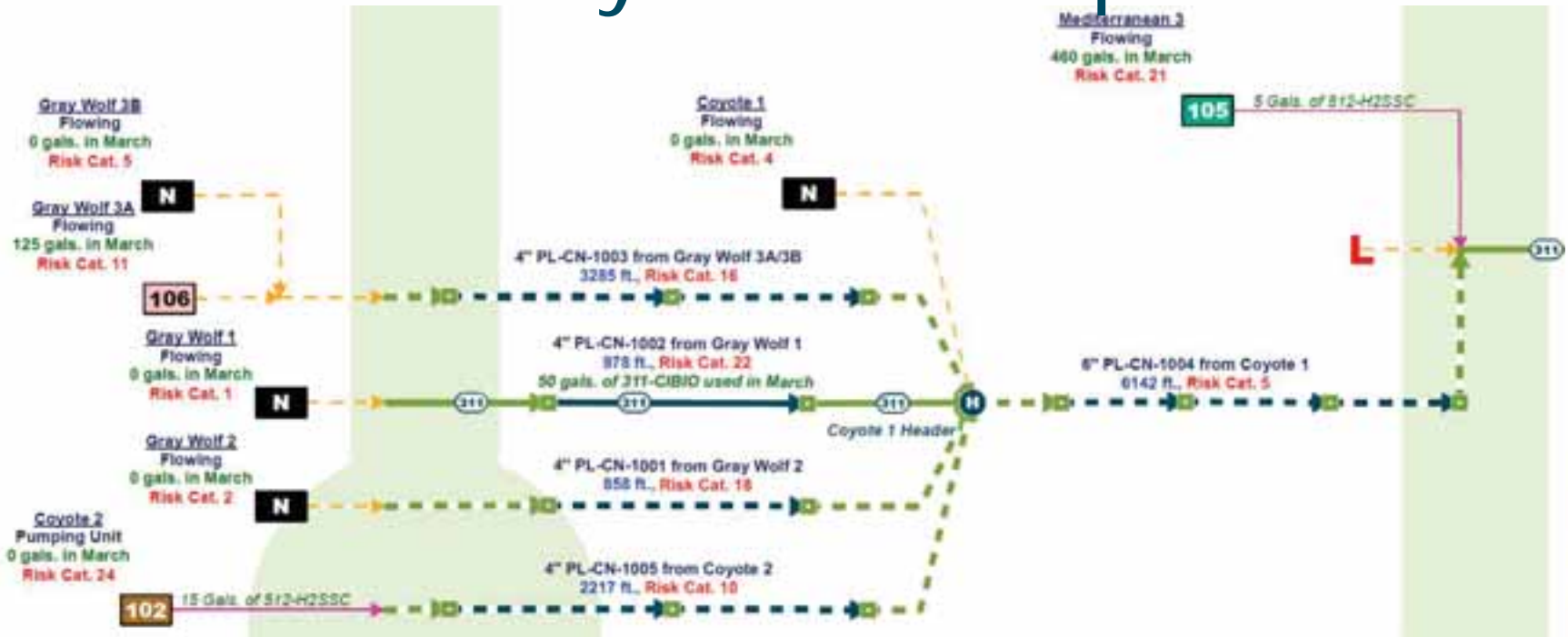
Reticulated 2  
Flowing  
1400 gals. in March  
Risk Cat. 11



- Questions to consider:
  - Scale Inhibitor used on pipeline.
  - Should it be used on well?



# Poly & Fiber Pipelines



- Corrosion Inhibitor and Biocide treatment of fiber pipe to protect metal assets (Valves, Connectors) along the line.

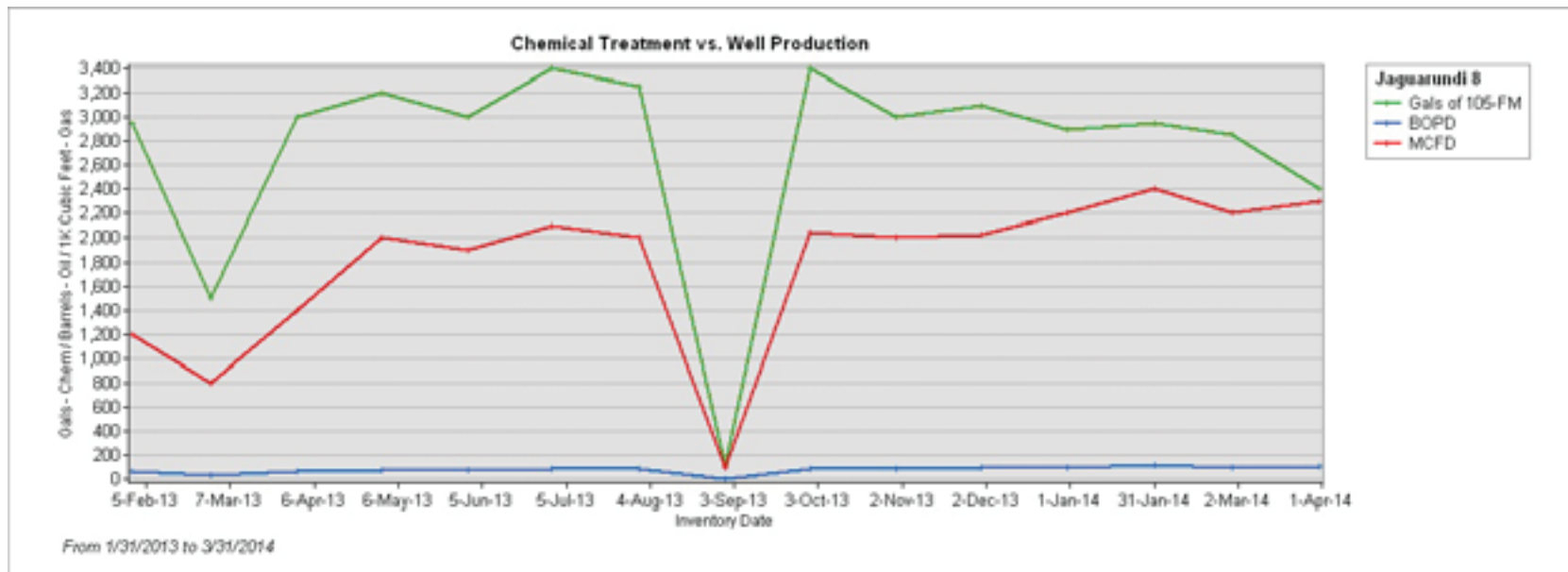
# Take Residual Samples



- Pipeline is categorized as high risk (21).
- Length of pipeline exceeds 3 miles.
- Residual sample should be taken to determine effectiveness (and extent) of chemical treatment.

# Well Production Analysis

- Monitor well production increases as a result of changes in chemical treatment.



# Track Pipeline Failures

- Monitor pipeline and asset feature failures to identify areas where the present chemical treatment is ineffective.



# Useful Resources

- [ArcGIS Desktop Help](#)
- [ArcGIS Video Series](#)
- [ArcGIS Schematics Forum](#)

Special Thanks to:

ESRI ArcGIS Schematics Team  
Rick Anderson, Ardeshir Behi

# Questions?



# Contact Information

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