



Onshore Field Development

November 29th, 2016

-
- 1 Well Factory – Bakken and Utica Assets
 - 2 Bakken Well Planning - Chaos to Change to Composure
 - 3 Operations Model Well – The Next Endeavor

Bakken Planning and Permitting Chaos to Change to Composure



Bakken Well Planning Chaos



ID	Fed Mins	OH Logs	AFE #	Cost Center	Permit Appvd	Task Name	Duration	Spud	Rig Release	Predecessors
1		LEGEND:	SIX WELL PAD	EAST NESSON	GOLATH	NORTH DAKOTA DRILLING SCHEDULE				
2			THREE WELL PAD	RED SKY	TRACKER	REVISION DATE (03/31/2011 10:00 AM)				
3			TWO WELL PAD	ANTICLINE	OTHER					
4			FOUR WELL PAD	AVALANCHE						
5						NABORS #460 (ANTICLINE)	1 day?	Thu 11/09	Fri 12/09	
6	✓	RES	KEENEW10DR005	P120190	7/26/2010	HA-SANFORD-152-96-1819H-1 (DUAL)	307 days	Mon 12/13/10	Sun 10/16/11	
7	✓		KEENEW11DR001	P121260	12/17/2010	AN-DINWOODIE-153-94-2833H-1 (3F)	59 days	Mon 12/13/10	Thu 2/10/11	
8		KOP	KEENEW11DR004	P121250	10/12/2010	AN-BOHMBACH-153-94-2734H-1 (3F)	32 days	Mon 2/21/11	Fri 3/25/11	6FS+11 days
9			KEENEW11DR007	P117750	10/14/2010	BB-BUDAHN A-150-96-0403H-1 (3F)	27 days	Sat 4/2/11	Fri 4/29/11	7FS+8 days
10			KEENEW11DR060	P129470		HA-CHAPIN-152-95-3229H-2 (3F)	27 days	Fri 5/6/11	Thu 9/2/11	8FS+7 days
11			KEENEW11DR063	P129480		HA-THOMPSON-152-95-1720H-2 (3F)	27 days	Wed 7/6/11	Wed 7/6/11	9FS+7 days
12			KEENEW11DR062	P129460		HA-MOGENSEN-152-95-0805H-2 (3F)	27 days	Wed 7/13/11	Tue 8/9/11	10FS+7 days
13			KEENEW11DR061	P129450		HA-DAHL-152-95-0706H-2 (3F)	27 days	Tue 8/16/11	Mon 9/12/11	11FS+7 days
14							27 days	Mon 9/19/11	Sun 10/16/11	12FS+7 days
15						NABORS B1	524 days	Mon 4/5/10	Sun 6/11/11	
16			REDSKYW10DR006	P120290	1/12/2010	RS-NELSON FARMS A-156-90-2829H-1 (DUAL)	55 days	Mon 4/5/10	Sun 5/30/10	
17			REDSKYW10DR008	P120290	1/12/2010	RS-SHUHART-156-90-2726H-1 (DUAL)	52 days	Wed 6/2/10	Sat 7/24/10	16FS+3 days
18		RES	REDSKYW10DR007	P120300	1/12/2010	RS-NELSON FARMS A-156-90-2829H-2 (DUAL)	47 days	Mon 7/26/10	Sat 9/11/10	17FS+2 days
19			REDSKYW10DR013	P120830	1/12/2010	RS-SHUHART-156-90-2726H-2 (DUAL)	39 days	Thu 9/16/10	Mon 10/25/10	18FS+5 days
20			REDSKYW10DR012	P120820	1/12/2010	RS-NELSON FARMS A-156-90-2829H-3 (DUAL)	42 days	Fri 10/29/10	Fri 12/10/10	19FS+4 days
21			REDSKYW10DR014	P120840	1/12/2010	RS-SHUHART-156-90-2726H-3 (DUAL)	36 days	Fri 12/17/10	Sat 1/22/11	20FS+7 days
22		KOP	TIOGAW10DR099 10	P126980	#16560 (9/15/10)	WEYRAUCH 15-11H (GO 157-98-1102) (MB)	31 days	Sat 2/5/11	Tue 3/8/11	21FS+14 days
23			TIOGAW11DR008	P121040	10/7/2010	EN-LOKKEN-157-94-0805H-1 (MB)	27 days	Wed 3/23/11	Tue 4/19/11	22FS+15 days
24			TIOGAW11DR009	P121670	10/7/2010	EN-CHARLES WOOD-157-94-1720H-1 (MB)	27 days	Thu 4/21/11	Wed 5/18/11	23FS+2 days
25			TIOGAW11DR010	P121380	10/7/2010	EN-LOKKEN-157-94-0805H-2 (MB)	27 days	Fri 5/20/11	Thu 6/16/11	24FS+2 days
26			TIOGAW11DR011	P121410	10/7/2010	EN-CHARLES WOOD-157-94-1720H-2 (MB)	27 days	Sat 6/18/11	Fri 7/15/11	25FS+2 days
27			TIOGAW11DR012	P121390	10/7/2010	EN-LOKKEN-157-94-0805H-3 (MB)	27 days	Sun 7/17/11	Sat 8/13/11	26FS+2 days
28			TIOGAW11DR013	P121420	10/7/2010	EN-CHARLES WOOD-157-94-1720H-3 (MB)	27 days	Mon 8/15/11	Sun 9/11/11	27FS+2 days
29						NABORS B2	423 days	Sat 6/12/10	Thu 8/9/11	
30							51 days	Sat 6/12/10	Mon 8/2/10	
31		RES	TIOGAW10DR005	P120310	3/5/2010	EN-FISHER-157-94-2116H-1 (DUAL)	39 days	Wed 8/4/10	Sun 9/12/10	31FS+2 days
32			TIOGAW10DR006	P120360	3/5/2010	EN-DOLAN-157-94-2833H-1 (DUAL)	31 days	Mon 9/13/10	Thu 10/14/10	32FS+1 day
33			TIOGAW10DR024	P120850	3/5/2010	EN-FISHER-157-94-2116H-2 (DUAL)	40 days	Mon 10/18/10	Sat 11/27/10	33FS+4 days
34			TIOGAW10DR026	P120870	3/5/2010	EN-DOLAN-157-94-2833H-2 (DUAL)	38 days	Mon 11/29/10	Thu 1/6/11	34FS+2 days
35			TIOGAW10DR025	P120860	3/5/2010	EN-FISHER-157-94-2116H-3 (3F)	28 days	Sat 1/8/11	Sat 2/5/11	35FS+2 days
36			TIOGAW10DR027	P120880	3/5/2010	EN-DOLAN-157-94-2833H-3 (3F)	27 days	Wed 2/16/11	Thu 3/15/11	36FS+11 days
37		KOP	TIOGAW11DR028	P122510	11/15/2010	EN-RULAND A-155-94-1201H-1 (MB)	27 days	Thu 3/17/11	Wed 5/18/11	37FS+2 days
38			TIOGAW11DR027	P122520	11/15/2010	EN-DOBROVOLNY A-155-94-1324H-1 (MB)	27 days	Fri 4/15/11	Thu 5/12/11	38FS+2 days
39			TIOGAW11DR028	P122530	11/15/2010	EN-RULAND A-155-94-1201H-2 (MB)	27 days	Mon 5/16/11	Sun 6/12/11	39FS+4 days
40			TIOGAW11DR029	P122540	11/15/2010	EN-DOBROVOLNY A-155-94-1324H-2 (MB)	27 days	Tue 6/14/11	Mon 7/11/11	40FS+2 days
41			TIOGAW11DR030	P122550	11/15/2010	EN-RULAND A-155-94-1201H-3 (3F)	27 days	Wed 7/13/11	Tue 8/9/11	41FS+2 days
42			TIOGAW11DR031	P122560	11/15/2010	EN-DOBROVOLNY A-155-94-1324H-3 (3F)				

Bakken Well Planning Change

“We know what the problem is, and we’ve got a solution. If it doesn’t work we’ll try something different. Or we’ll just keep doing it like we are?”

“I didn’t hear anyone complaining, so our design must have been just fine.”

“I’ve got a dashboard. It’s on a spreadsheet on my desktop. I’ll e-mail it to you after I make 20 phone calls and update it.”

Change Is Difficult

“Metrics?! We received our permits on time and the pad is ready. It’s all good.”

“We don’t have extra time to map our work, we are out in the field actually DOING it.”

“We will spend more time planning our work than executing it. Spending all of this time planning is the real waste.”

Bakken Planning and Permitting Chaos to Change to Composure



Bakken Well Planning Change

Created Standard Work with the entire team to understand the actual processes

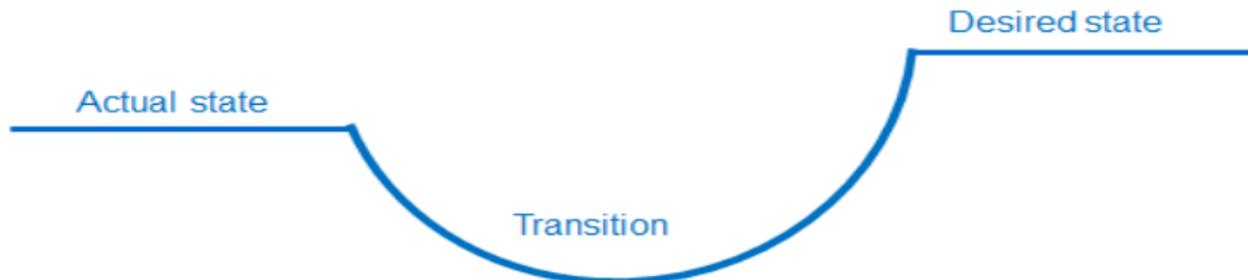


Phase	SOR (Top 20 by Δ)	SOR Completed	Survey & Stake	Landowner Terms Agreed	Agreement Signed	Permit Submitted	Permit Approved	RTB
Pad Names [Number of Wells]	CA-FERGUSON SMITH/E BURDICK- 155-95-3031/2932 4 WELL PAD (H-9,H-10,LE-H-1,H-8) Δ: (55)	AN-GUDBRANSON- 153-94-2215 5 WELL PAD (H-8,H-9,H-10,H-11,H-12) Δ: (0)	BB-OLE ANDERSON- 151-95-3130 2 WELL PAD (H-9,LW-H-1) Δ: (0)	AN-DINWOODIE- 153-94-2833 5 WELL PAD (H-4,H-5,H-6,H-7,H-8) Δ: 339			BL-A Iverson-155-96-1312 5 Well Pad (H-4,H-5,H-6,H-7,LE H-1) Δ: 124	
Total Number of Wells [Pads]	SC-5WX-152-99-0310 3 Well Pad (H-2,H-3,H-4) Δ: (6)		SC-GENE-154-98-0805 5 WELL PAD (H-3,H-4,H-5,H-6,H-7) Δ: (0)	5 Wells [1 Pads]	0 Wells [0 Pads]	0 Wells [0 Pads]	5 Wells [1 Pads]	
Phase			LK-QUILLIAM-147-97-1423 4 WELL PAD (H-5,H-6,H-7,LW-H-1) Δ: 84	Final Pad Design Approved		Federal Permit Submitted	Federal Permit Approved	
Pad Names [Number of Wells]			4 Wells 2D 113D			AN-DINWOODIE-153-94-2833 5 WELL PAD (H-4,H-5,H-6,H-7,H-8) Δ: 339	BB-LARS ROTHIE- 151-95-2932 4 WELL PAD (H-2,H-3,H-4,LE-H-1) Δ: (18)	
						5 Wells 33D 128D	4 Wells 65D 191D	
							EN-LEO E-154-94-2423 5 WELL PAD (H-8,H-9,H-10,H-11,H-12) Δ: 27	
							5 Wells 44D 607D	
Total Number of Wells [Pads]	7 Wells [2 Pads]	5 Wells [1 Pads]	11 Wells [3 Pads]	5 Wells [1 Pads]		9 Wells [2 Pads]	0 Wells [0 Pads]	0 Wells [0 Pads]

Used one source for planning that allows visibility

Bakken Well Planning Composure

- Developed standard work processes
- Created evergreen dashboards for visual control
- Established clear visibility to direct and indirect downstream customers
- Set WIP and buffer targets based on demand, cycle time, and known variability
- Implemented daily planning - focus on controlling work, resource optimization, and waste elimination
- Developed Robust Conditions of Satisfaction and measure how we do against it
- Use SQDC metrics to evaluate process health and identify gaps/opportunities
- Data and fact based problem solving by the individuals at the coalface



Bakken Planning and Permitting Chaos to Change to Composure



Acceptance to Change was the Largest Roadblock

Training sessions that focused on waste, problem visibility, and level workloads were motivating.



Schedule changes? No big deal!

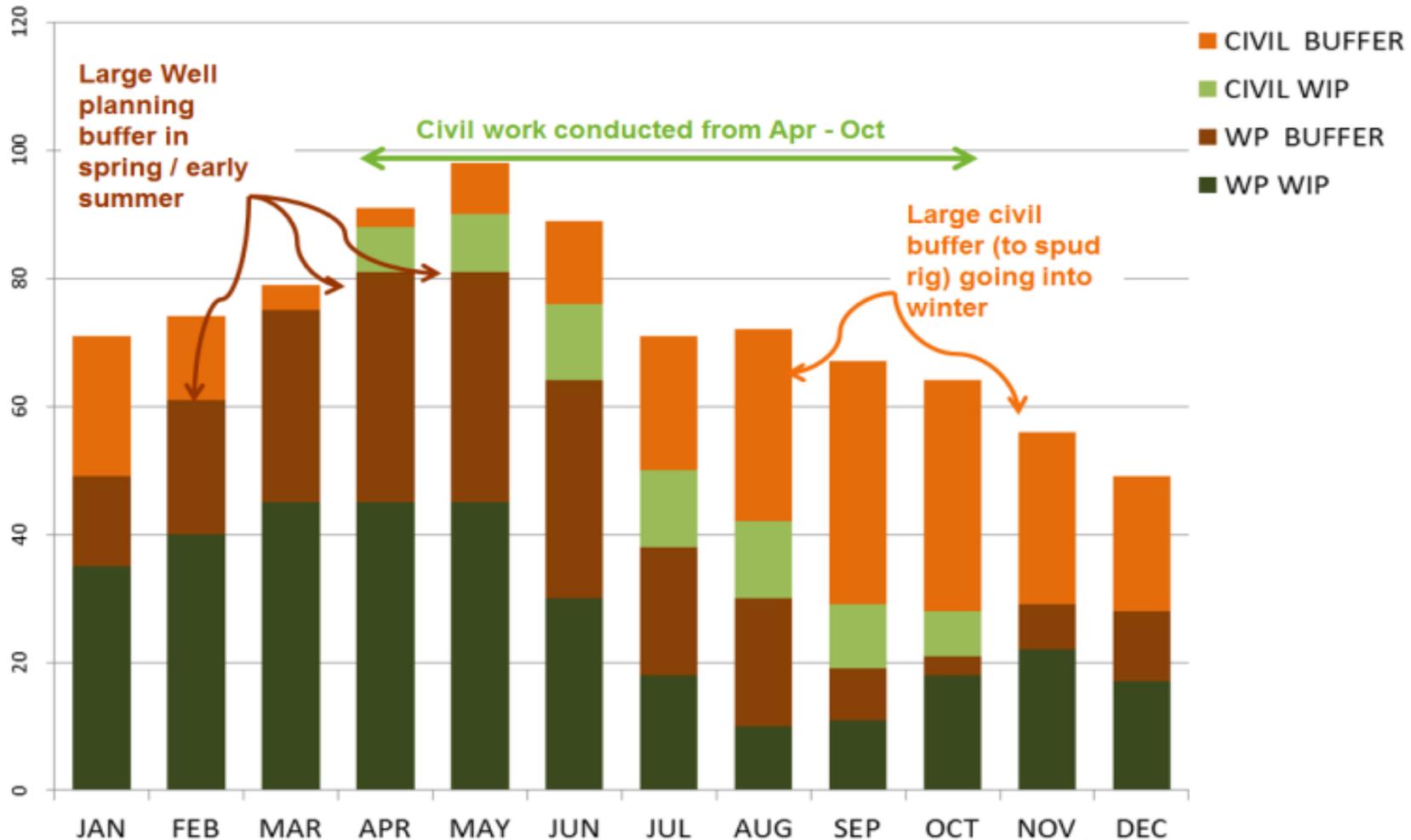
Structured Problem Solving

Empowered to Solve Problems

Bakken Planning and Permitting Chaos to Change to Composure



Bakken Well Planning Composure





Hess **The Next Endeavor**



Why Change?

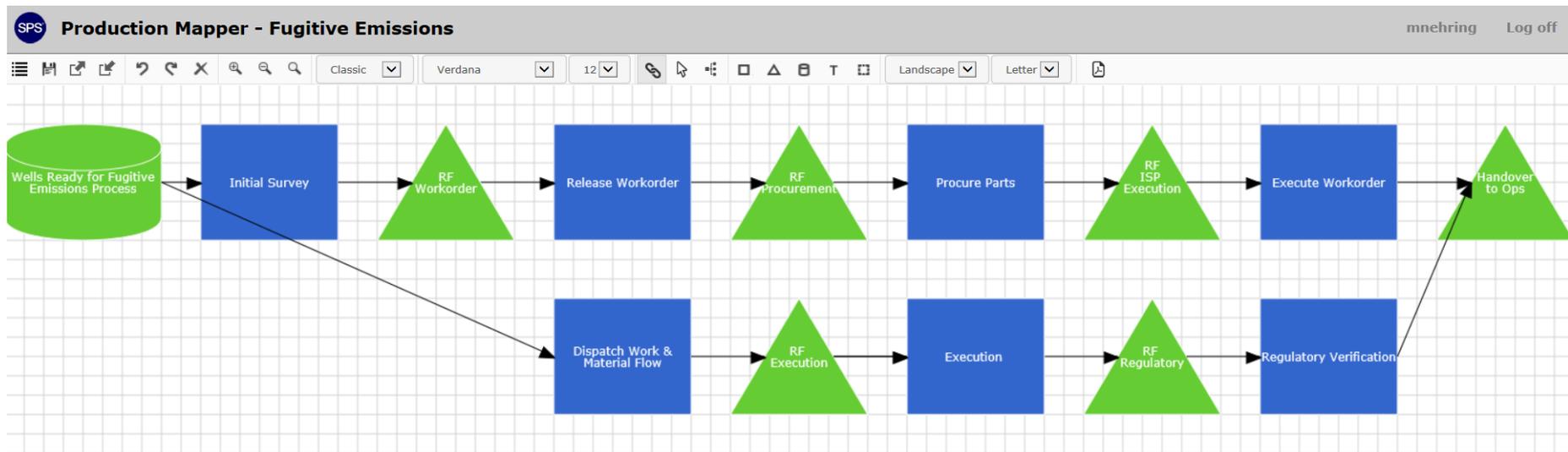
- Alignment of Work
- Responsibility of Work
- Schedule Compliance
- Collaboration
- Single Source Planning
- Space for visualization of the Work and Schedules
- Management of the Work

Model Well Fugitive Emissions Implementation



Where did we start?

- Understanding the overall flow of the value stream
- Created detailed processes
- Created a space for the meeting along with a daily/weekly rhythm for production planning



Model Well Fugitive Emissions Implementation



Start: 21 Nov 16 (Mon) * Finish: 21 Nov 16 (Mon) * Dates valid if committed today. Click [here](#) to change.

ID	S1	Desc	Member	Next Plan	No Plan	Dur	Δ	Forecast Start	Forecast Finish	Prt	At Risk	Step No	Rework	Docs	Compl-NP	Insert	Constraint	
Antelope / AN-Bohmbach-153-94-2734 4 Well Pad (H-2,H-3,H-4,H-5) / - / -																		
Drilling Rig: H&P 241 Constr. Supervisor: Craig Ward/Rocky Krohn Total Man-Days Planned: 0.00 / Total Man-Hours Planned: 0.00																		
697297	11	Regulatory	Field Assurance Crew Completes Compliance Inspections and Quantifies Leaks.	Reg	<input type="radio"/>	<input checked="" type="radio"/>		24.00Hr	0	24 May 17	▲	26 May 17		Normal	93020	None	Compl-NP	Insert
Antelope / AN-Brenna-153-94-3130 6 Well Pad (H-5,H-6,H-7,H-8,H-1,H-2) / - / -																		
Drilling Rig: H&P 295 Constr. Supervisor: Joe Pype / Rocky Krohn Total Man-Days Planned: 0.00 / Total Man-Hours Planned: 0.00																		
701803	11	Regulatory	Execution by WFM Complete; Ready for Regulatory	Reg	<input type="radio"/>	<input checked="" type="radio"/>	Split	0.00Hr	150	21 Nov 16	▲	22 Nov 16		Normal	93370	PS	Compl-NP	Insert
Antelope / AN-Brenna-153-94-3130H-1 / - / -																		
Drilling Rig: Nabors 460 Constr. Supervisor: - Total Man-Days Planned: 0.00 / Total Man-Hours Planned: 0.00																		
698923	11	Regulatory	Field Assurance Crew Completes Compliance Inspections and Quantifies Leaks.	Reg	<input type="radio"/>	<input checked="" type="radio"/>		24.00Hr	0	24 May 17	▲	26 May 17		Normal	93020	PS	Compl-NP	Insert
Antelope / AN-Dinwoodie-153-94-3328H-1 / - / -																		
Drilling Rig: - Constr. Supervisor: - Total Man-Days Planned: 0.00 / Total Man-Hours Planned: 0.00																		
697382	33	WMF	Dispatch notified; Ready for Notifications and Workorder	WFMD	<input type="radio"/>	<input checked="" type="radio"/>	Split	0.00Hr	174	21 Nov 16	▲	21 Nov 16		Normal	93310	None	Compl-NP	Insert
697380	11	Regulatory	Execution by ISP is complete; Ready for Regulatory	Reg	<input type="radio"/>	<input checked="" type="radio"/>	Split	0.00Hr	150	21 Nov 16	▲	22 Nov 16		Normal	93250	None	Compl-NP	Insert
Antelope / AN-Evenson 42-104 Bakken Facility / - / -																		
Drilling Rig: - Constr. Supervisor: - Total Man-Days Planned: 0.00 / Total Man-Hours Planned: 0.00																		
701816	33	WMF	Place Location on the Schedule to Execute	WFMD	<input type="radio"/>	<input checked="" type="radio"/>		0.80Hr	0	13 Jun 17	▲	13 Jun 17		Normal	93340	None	Compl-NP	Insert

Model Well

Fugitive Emissions Challenges



What Challenges Did We and Are We Facing?

1. Defining the Value Stream and the Processes
 - Varying Opinions
 - Identifying the Work
 - Understanding Who is Responsible

2. Management Support
 - Resistance
 - The Unknown
 - Misconceptions
 - Expectations

3. Management Engagement
 - Too Much
 - Not Enough

