SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED

UBIE003L
SAND CLEAN-OUT AND ZONE CHANGE PROPOSAL ADDENDUM

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1. OBJECTIVE

WELL/RESERVOIR	UBIE003L (E3000M)
TYPE	Rigless Intervention (STOG)
OBJECTIVE	To restore production of UBIE003L by carrying out sand wash of the tubing, open the sleeve (SSD) to access the E3000M reservoir, nitrogen lift and flow the interval via the Long string. This activity will restore a base case potential of ca. 350 bopd and safeguard resource volume of 1.41 MMstb from the E3000M sand.
PROPOSAL	Sand Cleanout & Zone Change

2. WELL HISTORY/ PRESENT STATUS

The well was drilled and suspended in February1967. It was later re-entered and initially completed as a Two String Multiple (TSM) oil producer on the E1000M, E3000M and E5000M sands in May 1973, with all intervals chemically consolidated for sand control.

UBIE003L E1000M: 8289-8293 ftah, 8238 - 8243 ftss (SCON)

This interval came on stream in 1979 and produced dry to a peak production of 1628 bopd in 1985 on bean 48/64". There is no documented reason why the interval was closed in 1987. The interval was re-opened with reduced production in 1996 on bean 24/64" post a mechanical intervention on the string. Water broke through in the same year when the bean was increased from 24/64" to 26/64". HGOR was also recorded that year and the interval was shut-in in1998. The intervals last production data as at early 1998 are 658 bopd, 12% BS&W, GOR of 680 Scf/bbl on bean 26/64". This interval was completed without SCSSSV, thus considered not integral. In 2012, the interval was secured with a downhole plug at 8076 ftah and NRV.

In 2017, a tubing investigation was carried out and the result confirmed that the short string is non integral. During that operation, HUD/restriction was observed in the long string at 8360ftah suspected to be a separation tool. Attempts to retrieve it proved abortive and the interval was secured with downhole plug at 8076 ftah and NRV. A later well intervention activity successfully fished the separation tool at 8360 ftah. However, the planned zone change was aborted due to HUD observed at 8535 ftah above the target SSD @ 8592ftah. An LIB run showed a clear impression which was suspected to be sand and further confirmed by sand bailer run. The sand bailer run was repeated thrice recovering sand each time and gaining 2 feet - HUD now at 8537 ftah. The well has remained closed-in till date.

UBIE003S E3000M: 8518-8522 ftah, 8468 - 8472 ftss (SCON)

The interval came on-stream in May 1973 at the rate of 500 bopd on bean 16/64". Water breakthrough occurred in December, 1979 on bean 32/64". The interval was beaned down to 26/64" and water production stabilized until September 1987 when water production rose up significantly to about 42% BSW. HGOR of about 2450 scf/bbl was also observed in 1990; it receded afterwards and increased again in 1994 when the interval was re- opened.

In 1996 the SS was suspected to be in communication with the annulus during an intervention activity on the long string, subsequently the interval was shut in for safety reasons. The interval was then secured with downhole plug at 8242 ftah and NRV in 2012. In 2017, a tubing investigation was carried out and the result showed that there is communication between the short string and the casing. Thereafter, it was secured with a downhole plug at 8242 ftah and NRV. The interval has remained secured and closed-in till date. Last production data from the interval in 1996 was GOR of 2360 Scf/bbl, 1196 bopd, 14% BS&W on bean 40/64".

3. PROPOSED ACTION AND JUSTIFICATION

Four conduits have been completed on the E3000M reservoir – UBIE003S, 003L (behind sleeve), 005L & 006L. UBIE006L and UBIE003S have been secured due to well integrity issues (tubing leak and pressure communication issues respectively) while UBIE005L requires PBV installation and Wellhead Maintenance after retrieval of DW plug in hole.

This is an addendum to the previously signed UBIE003L Wireline Recompletion & PBV Installation proposal in 2018. This addendum was necessitated based on operational challenges encountered during execution of the initial scope - wireline recompletion via the long string. HUD was encountered at 8535 ftah during the drift run prior to the proposed objective to retrieve the separation tool and shift open the SSD at 8592 ftah. An LIB run showed a clear impression which was suspected to be sand and further confirmed by sand bailer run. The sand bailer run was repeated thrice recovering sand each time and gaining 2 feet - HUD now at 8537 ftah. This sand restriction is suspected to have resulted due to previous production from the E1000M interval via the long string, leading to sand/debris packing above the separation tool on the E3000M.

In addition, the review of the BSW trend of UBIE003L shows that water production behavior is suspected to be due to coning caused by fluid withdrawal at an increased bean size up to bean 44/64" in 1990 (See water cut diagnostic plot in **Appendix 8**). Comparing the BSW trend for UBIE005L and UBIE003S, it is observed that UBIE005L produced at an higher BSW than UBIE003S even with shallower perforation in UBIE005L. Also, it is expected that after a long shut-in time of over 6 years, the conduit will come in with a lower BSW.

Therefore, it is recommended to carry out a sand cleanout activity using coiled tubing to wash out sand restriction in the tubing section above the separation tool, shift open the SSD at 8592 ftah and produce the E3000M reservoir via the long string. In the unlikely scenario that the E3000M interval does not flow, the fall back option is to secure the E3000M interval and carry out an Acid Stimulation of the E1000M interval to restore production.(See Well Intervention decision tree in **Appendix 10**).

4. PROPOSAL SUMMARY

1. Carry out WHM checks on xmas tree valves
2. Record CITHP and CHP.
3. Carry out sand cleanout of the tubing section.
4. Retrieve the separation tool and run drift across long string to confirm HUD/ restriction cleared.
5. Verify isolation of the E5000M reservoir and ensure SSD at 8341 ftah is completely closed.
6. Open SSD at 8592 ftah to access the E3000M and install separation tool.
7. Open up well to flow and observe. If no flow proceed to N2 lift well to production.
8. If no flow after N2 lift. Secure the E3000M interval and carry out Acid Stimulation of the E1000M interval.
9. Open up well to flow and observe. If no flow proceed to N2 lift well to production.
10. Install PB Valve.
11. Hand back well to Production Operations Team.

5. WELL AND RESERVOIR DATA

Well/Sand:	Unit		UBIE003 (E3000M)
1.a)Perforated interval	Ftah	*PT/PP*	8518 – 8522
Perforated interval	Ftss		8468 – 8472
2.a)Maximum Deviation Angle and Depth	° @ Fttvd	*PG*	3.75° @ 6196
b)Derrick Floor Elevation	Ft		43.9
3.a)Present Production Rate	Bopd	*PT*	0
b)Estimated Potential	Bopd		245
c)Estimated Gain	Bopd		245
4.a)Reference Depth for Reservoir Pressures	Ftss	*RE*	8500
b)Original Reservoir Pressure	Psig		3701
c)Present Reservoir Pressure (2019 BHP)	Psig		3671
d)Present Gradient	Psi/ft		0.435
e)Bubble Point Pressure	Psig		3681
f)Specific Gravity of Oil 60/60	-		0.91
g)Oil Viscosity at Reservoir Condition	cP		1.4
h)Solution Gas-Rsi (initial condition)	Scf/Stb		567
i)Formation Volume Factor (initial condition)	-		1.185
j)Static Reservoir Temperature	° F		158
5.a) Other Wells on the same Block	-	*RE*	5L, 6L (Both closed-in)
b)Daily Production From Block (@31/07/2020)	Mbopd	*PT*	0
c)Ultimate Recovery for reservoir (@ 01/01/2020)	MMstb		29.7
d)Cumulative Production From Block (@ 01/01/2020)	MMstb		15.4
e)Cumulative Production From Well (@ 01/01/2020)	MMstb		0
f)Reserves From Well	MMstb		0.78
6.a)Original Estimated OWC in Reservoir	Ftss	*PP*	8500
b)Present Estimated OWC in Reservoir (Mbal)	Ftss		NA
c) Change in OWC From Original OWC	Ft		NA
d) Distance Between Lowest Perforation and POWC	Ftss		NA
7.a)Porosity	%	*PP*	2729
b)Shale Percent	%		8
c) Water Saturation	%		23
d) Permeability	mD		700
e) Vertical Permeability/Horizontal Permeability	Kv/Kh		NA
f) Sand Thickness as per PDL	Ftvd		94
g) Net Oil Sand	Ftvd		52
h) Net/Gross Ratio	%		92
9.a)Tubing Size/Weight	in/lbs/ft	*PT*	2-3/8″/6.4
b)Casing Size/Weight	in/lbs/ft		7″/29
10.Average Hole Size across Completion Interval	in	*PT*	9.625
11 a)Is there a barrier between lowest completion Interval and the present estimated OWC.		*PG*	No

6. POTENTIAL ESTIMATION

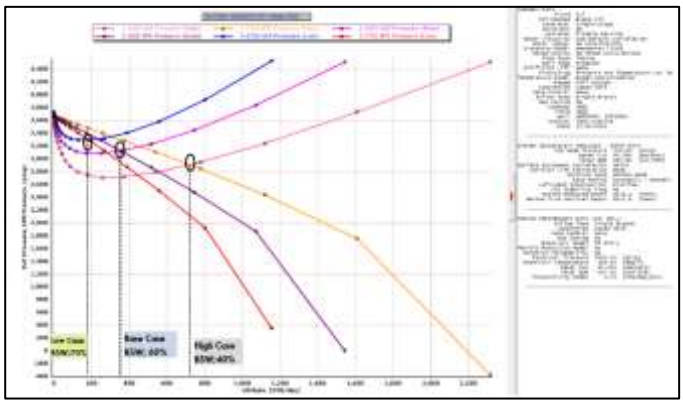
The Potential estimation for UBIE003L was carried out using the PROSPER IPM tool. The well model was calibrated with the performance of UBIE005L which was the last conduit that produced from the E3000M reservoir. Reference the signed UBIE003L Wireline Recompletion & PBV Installation proposal for detailed assumptions guiding the inflow and outflow performance modelling. For this addendum, certain updates have been included to support the previously approved estimation.

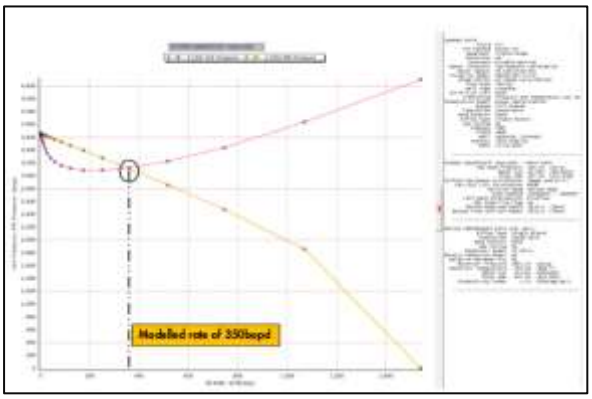
Firstly, sensitivity on starting water cut was done to provide a range of potentials expected from the proposed sand cleanout and zone change activity, using historical BSW trends observed from this interval. (See Well Potentials Table below). Secondly, a risk factor of 70% was applied to the net technical potentials based on OP20 premise on historical success rate (2013 – 2018 WRFM STOGG) performance review for similar well restoration activities. Therefore, the expected base case potential (Risked) to be unlocked by this opportunity is **245 bopd**, however the ranges from the technical evaluation are presented below.

S/No	Scenario	BSW (%)	PI (bbl/d/psi)	Oil Rate (bopd)	Risked Potential (bopd)	Remarks
1	**Low Case**	70	1.7	180	125	Increase in last BS&W seen in the reservoir – starting BS&W of 70%
2	**Base Case**	60	1.7	350	245	Last BS&W seen in the reservoir – starting BS&W of 60%.
3	**High Case**	40	1.7	720	505	Reduction in BS&W – starting BS&W of 40%.

*Potential estimated at bean 28/64".

The inflow and outflow performance plot is also captured below for the three cases in addition to the base case where the intersection point shows that the well will produce within the stable region.

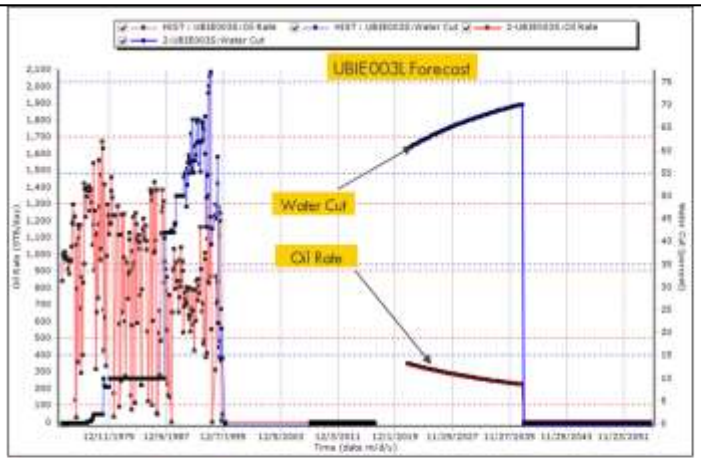




7. RESERVES ESTIMATION

Reserves estimation for UBIE003L on E3000M was carried out using material balance evaluation methodology. Good pressure and production performance history match was achieved by regression of the uncertain reservoir parameters within acceptable range. Using the prevailing surface constraints (manifold pressure), a forecast was performed on a well basis for the conduit taking into consideration the well schedule, inflow potential and lift profile of the well. This generated a BC reserves of 1.41 MMstb for this opportunity. Below is a summary of the results of the evaluation.

Interval	UBIE003L:E3000M		
Case	Low	Base	High
Initial Potential (bopd)	125	245	505
Estimated Reserves (MMstb)	0.62	1.41	2.18



Scenario	Potential (bopd)	BSW (%)
LC	125	70
BC	245	60
HC	505	40

Summary of results

Conduits	Low DUR (MMstb)	Base DUR (MMstb)	High DUR (MMstb)	Np (MMstb)	Potential (bopd)	Reserves 1P (MMstb)	Reserves 2P (MMstb)	Reserves 3P (MMstb)
UBIE003L	0.62	1.41	2.18	0	125/245/505	0.62	1.41	2.18

8. HSSE/ SPECIAL WELL/LOCATION CONDITION

Condition of wellhead	OK
Last annulus pressure measurement/Date	A-annulus 0 psig. B-Annulus 0 psig / 23rd April, 2020
MAASP	A-MAASP 1057 psig; B-MAASP 504 psig
Well integrity summary	Well is Integral. eWims Action code 0.
Any problem during last re-entry	None
Location condition	Ok. Well location is Accessible.
Flowline status	Ok
Seasonally flooded	Yes

9. RECENT PRODUCTION DATA

Well Code	Date	Bean (/64th)	Liquid Rate (bbl/d)	Oil Rate (bopd)	BSW %	GOR (Scf/bbl)	THP (psig)	Sand (pptb)
UBIE003S	1/31/1993	40	1986.27	694.92	65.01	562.44	268	6.4
UBIE003S	2/28/1993	40	2126.32	726.88	65.82	632.34	252	16
UBIE003S	3/31/1993	40	1399.63	525.93	62.42	583.65	259	9.6
UBIE003S	4/30/1993	40	1735.48	614.02	64.62	2406.68	265	3.2
UBIE003S	5/31/1993	40	3114.42	1010.77	67.55	2081.51	285	16
UBIE003S	6/30/1993	40	2487.77	1013.21	59.27	2257.75	280	9.6
UBIE003S	7/31/1993	40	1701.54	966.91	43.17	2473.39	290	6.4
UBIE003S	8/31/1993	40	2560.7	1287.8	49.71	757.03	280	9.6
UBIE003S	9/30/1993	40	2540.6	1148.07	54.81	501.86	276	6.4
UBIE003S	10/31/1993	40	3543.12	1613.38	54.46	435.35	287	16
UBIE003S	11/30/1993	40	3068.9	839.16	72.66	2181.18	290	6.4
UBIE003S	12/31/1993	40	4504.94	1162.84	74.19	2381.35	302	16
UBIE003S	1/31/1994	40	3478.42	829.58	76.15	3086.95	305	9.6
UBIE003S	2/28/1994	40	3915.71	891.21	77.24	2821.45	305	16
UBIE003S	3/31/1994	40	3804.52	2078.13	45.38	1227.28	338	9.6
UBIE003S	4/30/1994	40	3372.22	2046.54	39.31	1214.21	283	6.4
UBIE003S	9/30/1994	40	290	154	46.9	16441.56		3.2
UBIE003S	11/30/1994	40	1357.54	736.8	45.73	3093.31	145	6.4
UBIE003S	12/31/1994	40	1678.77	870.1	48.17	2536.28	290	9.6
UBIE003S	1/31/1995	40	1497.89	822.52	45.09	2611.55	290	3.2
UBIE003S	2/28/1995	40	1766.04	834.54	52.75	2573.63	290	3.2
UBIE003S	3/31/1995	40	1735.24	718.01	58.62	2563.41	256	9.6
UBIE003S	4/30/1995	40	1638.21	1276.58	22.07	1927.34	277	12.8
UBIE003S	5/31/1995	40	1392.9	1159.8	16.73	1985.28	290	3.2
UBIE003S	6/30/1995	40	1522.53	1246.37	18.14	1831.7	290	6.4
UBIE003S	7/31/1995	40	1405.03	1200.42	14.56	2154.52	290	3.2
UBIE003S	8/31/1995	40	1504.16	1294.72	13.92	2049.32	290	3.2
UBIE003S	9/30/1995	40	1087.5	852.5	21.61	2686.22	290	3.2
UBIE003S	1/31/1996	40	1398.2	1196.4	14.43	2359.08	290	3.2

10. COST ESTIMATE

	TBG Wash/ SAND C/O, N2 LIFT	
S/N	**Description**	**Cost $**
1	Mobilisation	127,070.08
2	WHM package	4,200.00
3	Slickline package Opr	2,080.00
4	Slickline package Stby	11,160.00
5	Coiled Tubing Package Opr	74,343.72
6	Coiled Tubing Package Stby	65,162.48
7	Scaffold	1,120.00
8	Accomodation	28,000.00
9	Feeding	28,000.00
10	Chemicals (salts) + Gel	27,351.10
11	Liquid Nitrogen	32,000.00
12	AGO	10,640.00
13	Demobilization	63,535.04
14	FTO/Security	50,471.40
15	WH refurbishment	0.00
16	HSE Officer	7,700.00
17	Land Logistics	13,304.58
18	OH personnel	7,000.00
	20% Contingency	110,627.68
	Total	**$663,766.07**

11. RISK AND MITIGATION

Reference UBIE003L Wireline Recompletion & PBV Installation proposal for detailed risk/mitigations and HSSE critical activities. However, these are associated risk as a result of this addendum.

RISKS	LIKELIHOOD / IMPACT	EFFECT	IMPACT ON COSTS OR REWARDS	MITIGATION
Chemical handling	Low/Low	Deployment of proprietary chemicals with potential health consequences.	Personnel safety, environemental threats HSSE Incident.	• Adhere to SHOC Card for handling chemicals. • Chemicals deployed are off the shelf chemicals used regularly on well intervention activities
Formation & Release of H2S	Low/Low	H2S can be liberated by secondary reaction of sulphide solutions.	Injury or fatality Corrosion. HSSE PS incident	• Gas testing to be carried out as required. • Personnel will be competent to manage H2S exposure. Abort operation if H2S monitor shows concentration exceeds 50ppm.
Coil Tubing & wireline stuck in hole.	Low/Medium	Possible risk of getting the CT/ tools stuck in hole during the operation.	Loss of well. Oil deferment. High cost of fishing CT.	• Use certified equipment and competent Operators. Ensure max. pull on wire/CT is limited to rating.
Corrosion and Erosion Tendency of Treatment	Low/Medium	Solvents may increase corrosion & erosion risk in the well.	Loss of well integrity. Low recovery. Loss of Production	• Corrosion inhibitors will be added to the treatment. • Tubing will be pickled & Surfactants deployed to reduce surface tension.
Flowback management	Medium/Medium	Effluents recovered during tubing wash could lead to environmental issues.	Reputation. Environmental impact	• Effluent Tanks will be provided, and evacuated through the Flow station.
Treatment Equipment Integrity	Low/Medium	Possible risk of mobilizing a faulty equipment with poor historical background of where it was previously deployed, leading to H2S Exposures and delayed intervention.	H2S Exposures and delayed well intervention.	• Ensure pre-mobilization inspections are effectively conducted and verification of historical background where equipment has been previously deployed, to confirm that it is suitable for use.
Well Kick-Off Post treatment	Medium/Medium	Post chemical treatment, interval may require kick off assistance	Increased cost of intervention. Extended execution time	• Rock in the well. • Secondly, deploy N2 Lift to kick-off well to production.
Inability to Open SSD	High/High	SSD stuck closed as a result of age and other factors making it difficult to open.	Loss of reward, higher intervention cost and NPT	• Attempt with the special opening and jarring tool. • Contingency plan : carry out tubing punch above perf depth to access E3000 Volumes.
Tool blow-out after opening SSD	Low/Medium	Tool may be blown up after opening sleeve to higher pressure.	Higher intervention/fishing cost and well integrity risk	• Equalise the pressure in the long string prior to opening sleeve. • Follow gradual opening to avoid a sharp pressure increase.

12. REFERENCES

A. UBIE003L Wireline Recompletion & PBV Installation proposal, 2018

13. LIST OF APPENDICES

Appendix 1: Ubie 003 Well Status Diagram (Current Status)

Appendix 2: Ubie 003S Well Performance Plot

Appendix 3: Ubie 003L Petrophysical Data layout

Appendix 4: Ubie E3000 Hydrocarbon Distribution Plot

Appendix 5: Ubie E3000 Top Structure Map

Appendix 6: Ubie E3000 Structural Cross-Section

Appendix 7: Ubie 003L H2S Prediction and Souring Potential

Appendix 8: Water Cut Diagnostics Plot for UBIE003S on E3000M

Appendix 9: Pore Pressure Prediction for Ubie 003L on E3000M Reservoir (See Addendum)

Appendix 10: Well Intevention Decision Tree.

Appendix 11: Emergency Response Data and Contact

Appendix 1: Ubie 003 Well Status Diagram (Current Status)

STATUS :- *COMPLETION AS COMPLETED* | ***WELL : UBIE-3***

CASING TO 10821FT, TD AT 11348

SIZE	GRADE	WT.	DEPTH	CEMENT	SG
24"	N80	26	494		
10-3/4	N80	23	2518	1500 sxs Poz SG 162 Rec	
	J55	23	3509	W/360 sxs Poz 12% $CaCl_2$	
	N80	23	7632	TOC = SURFACE	
	N80	23	10321		
				1200 sxs CLASS CT	
				SG 1.90 TOC =	
				9137 (CST)	

WELLHEAD

ITEM	TYPE	SIZE (INS)	WP (PSI)
GATE VALVE			
XMAS TREE	DSB	6" x 2-9/16" x 2-1/16"	5000 W/CLP
ADAPTER FLANGE			
TUBING HANGER	DCB	6" x 2-7/8" x 2-3/8" HCS W/CLP	
TUBING HEAD	DCB	10" x 6"	3000 x 5000
RISER SPOOL			
CSG. H. HOUSING	WF	10-3/4" x 10"	3000
CSG. H. SPOOL			
SEAL BUSHING	'X'	10" x 7"	ENERGISED

TUBING

STRING	SIZE	WT	GRADE	TYPE
LS	2-3/8	4.7	N-80	EU
SS	2-3/8	4.6	N-80	NU

DEVIATION

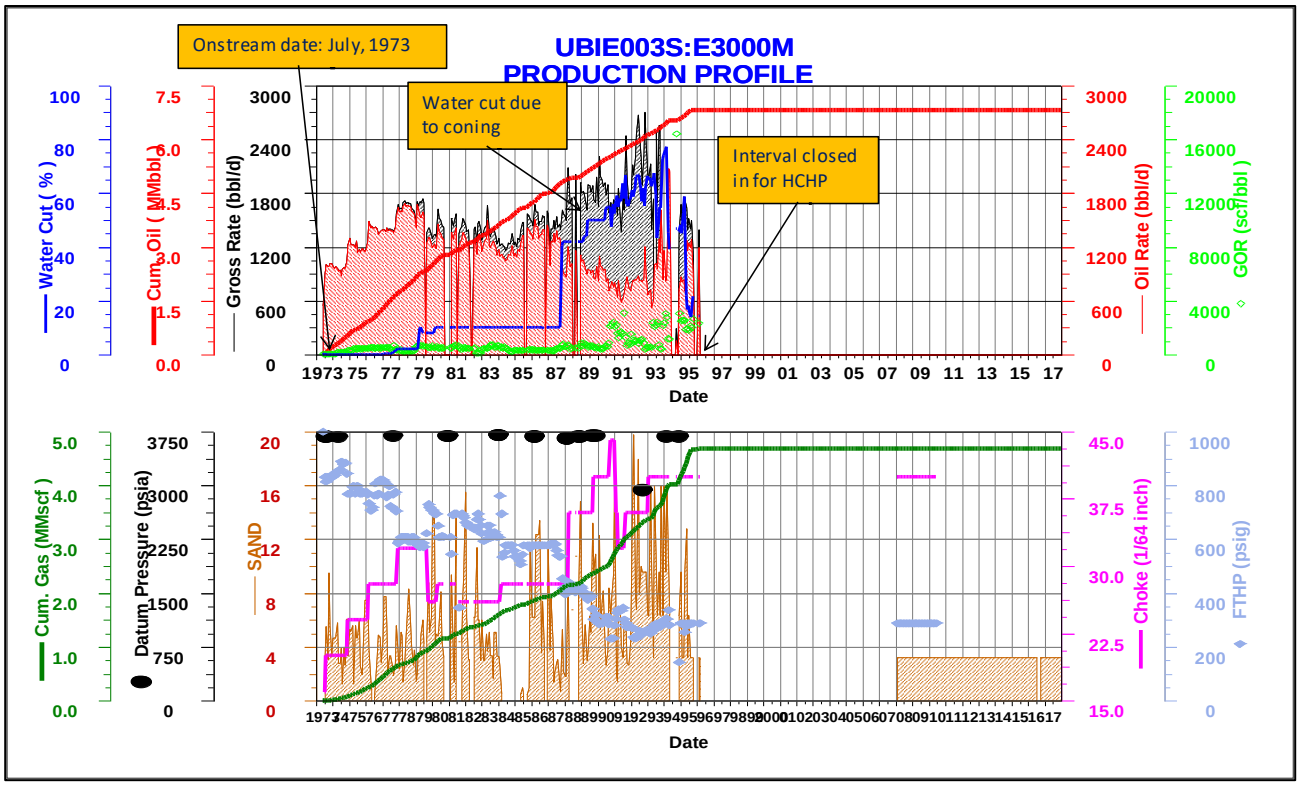
MAX 3° AT 7678 FT
DFE 43.5 FT
ORDF-TCHH 18.9 FT

HOLE	OPEN HOLE PLUGS	ACTIVITY	MAX.SG	RESERVOIR	DATE
14-3/4" - 3504		DRILLED	1.12	ALL	7/78
		IC	1.01	D9.0/G2.1	30/1/81
9-5/8" - 10740	NONE				

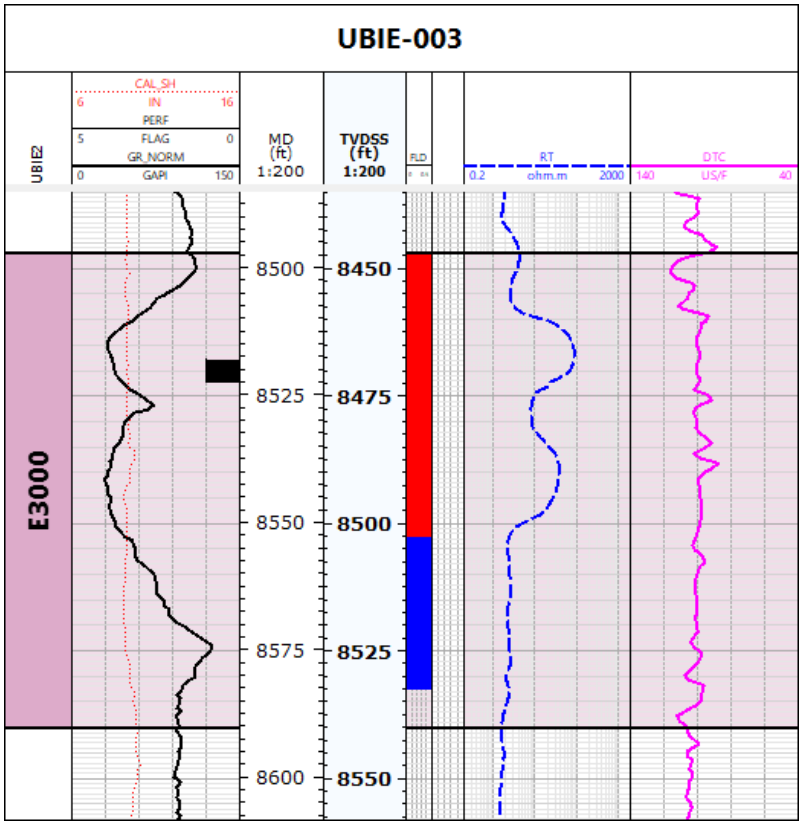
SAND	PERFORATIONS	DEPTH (FT)	STR	DESCRIPTION
			S	X-OVER 2-3/8" HCS_P x 2-7/8" HCSp
		8095		OTIS 'XA' SLEEVE 2-3/8" EU
				SNAP LATCH SEAL NIPPLE, 2-3/8" NU
		8156		BAKER A-5 PACKER SIZE 47 - C2
				X-OVER 2-3/8" HCS_B x 2-7/8" EUp
E1.0	8289 - 8293 FT (SCON)			
		8341	L	OTIS 'XA' SLEEVE 2-3/8" EU
				X-OVER 2-3/8" HCS_B x 2-7/8" EUp
			S	SNAP LATCH SEAL NIPPLE, 2-3/8" NU
		8359		BAKER A-5 PACKER SIZE 47 - C2
			S	OTIS 'XN' NIPPLE, 2-3/8" NU
		8405	S	BOTTOM PERF. PRODUCTION TUBE 2-3/8" NU
		8509-8529		STEEL BLAST JOINT 2-7/8" EU X 20"
E3.0	8518 - 8522 FT (SCON)	8592	L	OTIS 'XA' SLEEVE, 2-3/8" EU
				OTIS 'XN' NIPPLE, 2-3/8" NU
		8657		
			L	MODEL 'G' LOC SEAL ASSY (81-32) + 4 SEALS UNITS
		8700		BAKER MODEL 'DB' PACKER SIZE 84-32
		8739	I	NO-GO COLLAR 2-7/8" EU
E5.0	8846 - 8852 (SCON)			
		10657		TOP PLUG

LOGS DLT/GR/SP/MSFL. FDC/CNL,CST ??/CBLCNL/GR | **TD = 10740 FT** | AUTHOR: PEAE, SPDC NIGERIA | PREPARED BY: PEAE | DATE: 04/2020

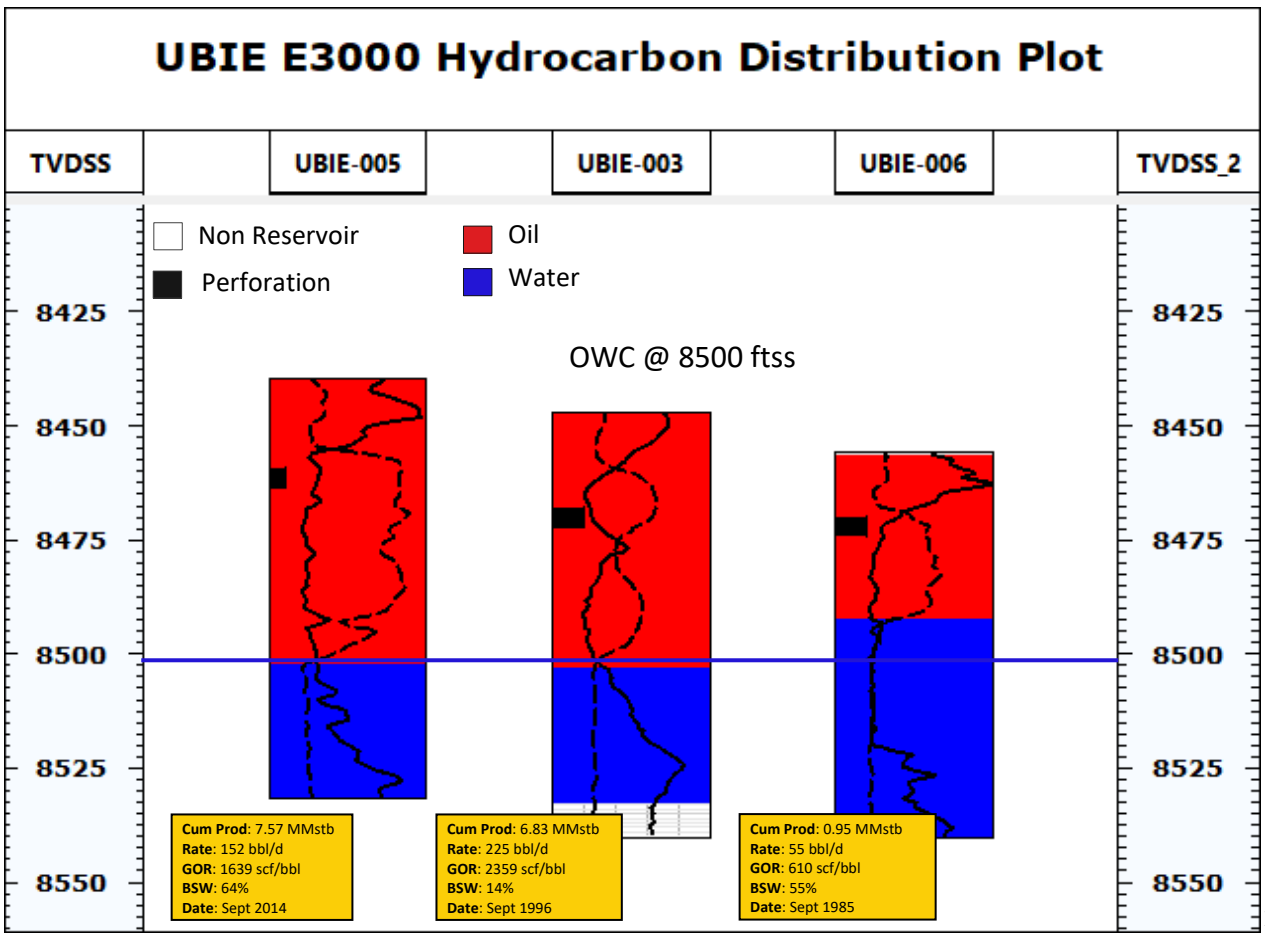
Appendix 2: Ubie 003S (E3000M) Performance Plot (OFM)



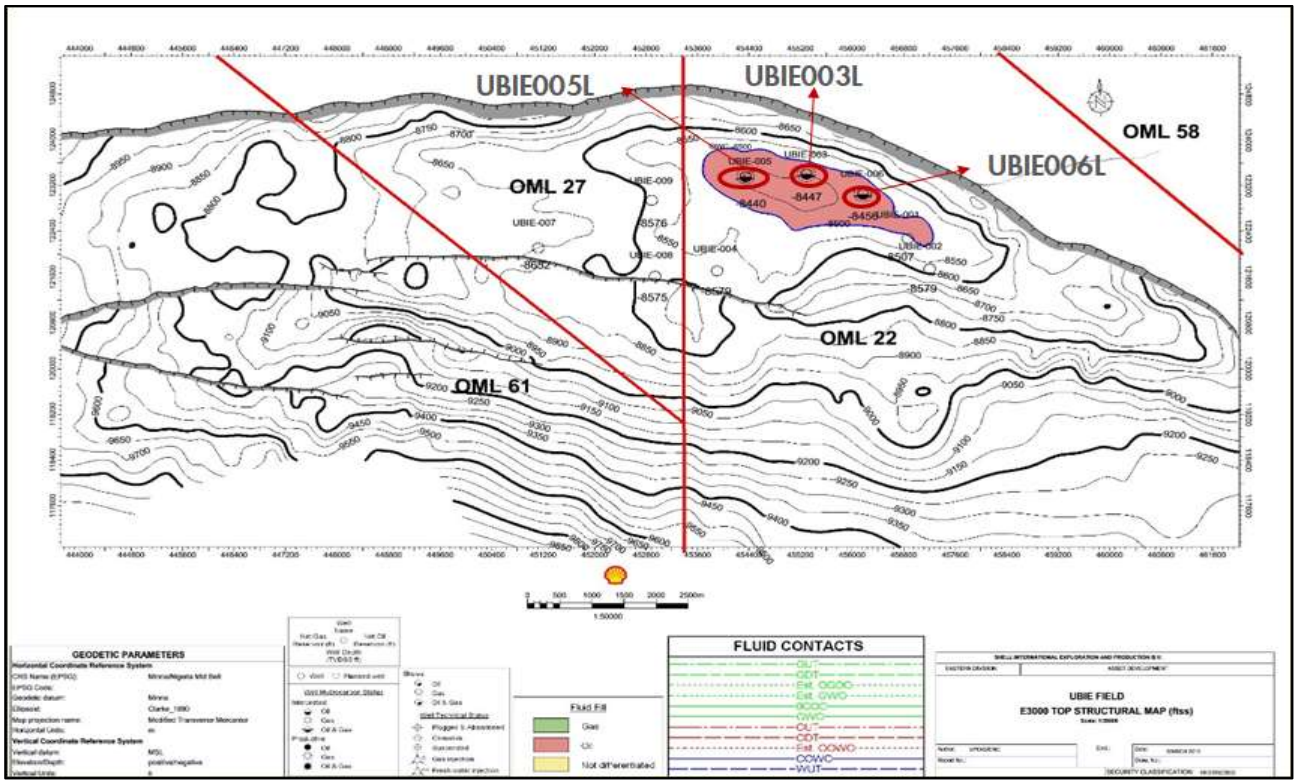
Appendix 3: Ubie 003L Petrophysical Data Layout



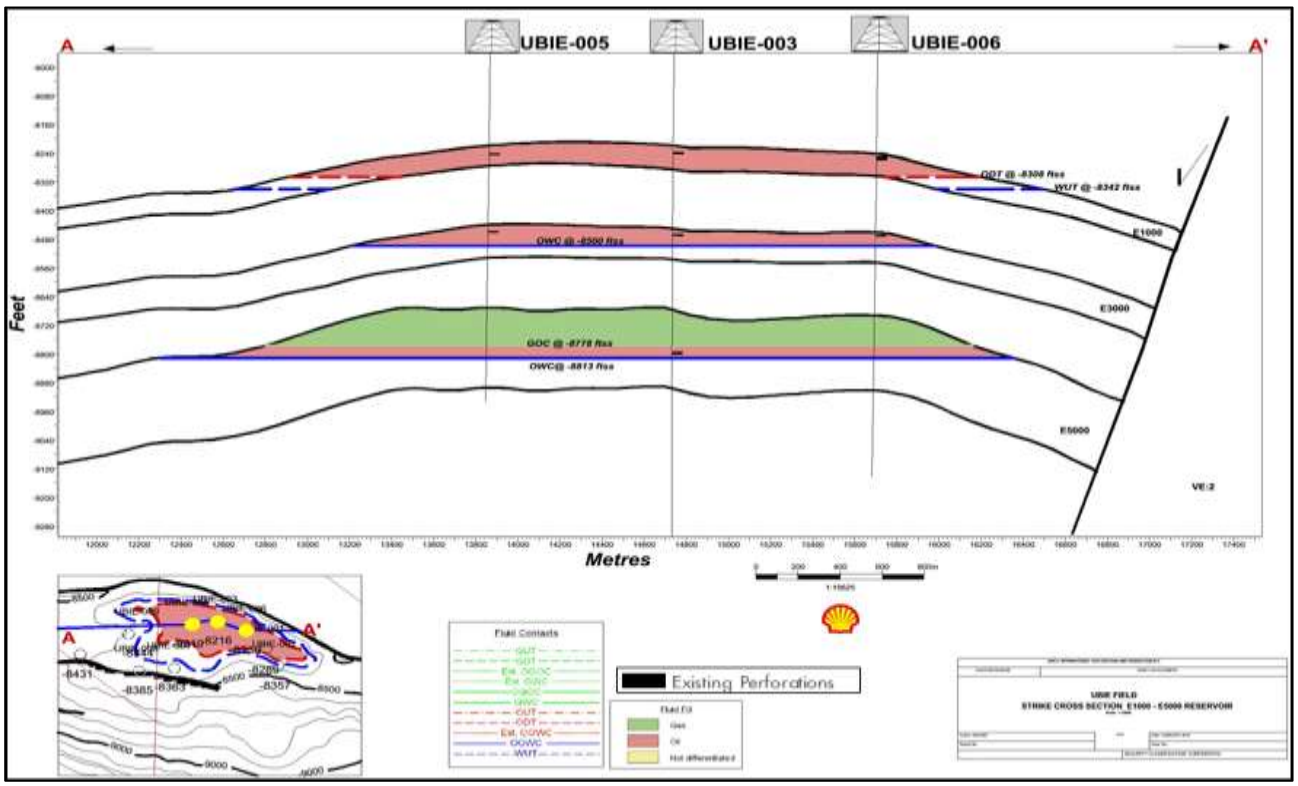
Appendix 4: Ubie E3000 Hydrocarbon Distribution Plot



Appendix 5: Ubie E3000 Top Structure Map



Appendix 6: Ubie E3000 Reservoir Cross Section



Appendix 7: Ubie 003L H_2S Prediction and Souring Potential

UBIE003L H_2S Prediction on E3000M Reservoir

- Ubie 3 is completed as a TSM oil producer on the E1000, E3000 and E5000 sands.
- The interval (UBIE003L) is proposed for sand clean-out of the long string and zone change to the E3000M reservoir.

PVT Report and Production History

- There is PVT report for the E3000M reservoir from UBIE003L but the fluid compositional analysis was not carried out, hence analogues were taken from the shallower E1000M and deeper E3000M reservoirs. (See snapshot of PVT report on the next slide).
- No H2S has been produced from the reservoir to date.

Souring Potential

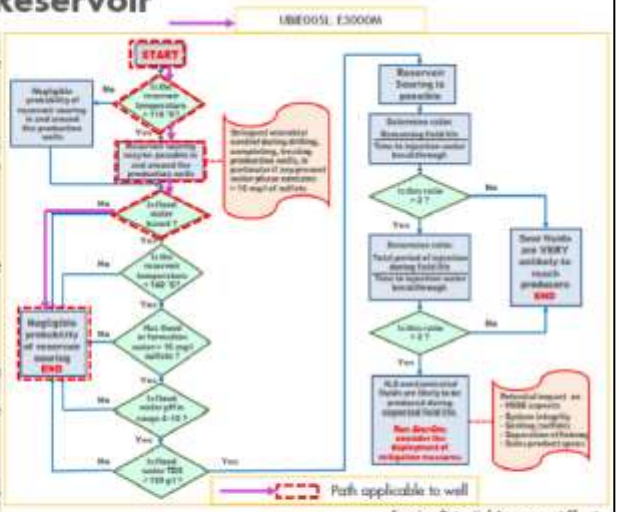
- The consequence of H_2S is loss of life and material integrity. However, available PVT data in the do not indicate H_2S presence.
  - The maximum reservoir temperature for the target sand (158°F) is 70°C (below 110°C).
  - There is no water injection in Ubie field that can lead to reservoir souring.
  - There are no secondary or tertiary recovery processes being practiced in the field.
- Also, due to these reasons the souring tendency of the reservoir is minimal (refer to the souring potential chart in attachment1).
- The fresh-saline water interface in UBE003 is ~5870ftss, which is about 2577ftss away from the reservoir. The possibility of fresh water migration into this reservoir (E3000M) is low.

External Risks

- There is a risk of the equipment (e.g. CT, Tanks) to be used in this operation, introducing some H_2S based on residue from their previous operations reacting with the acid to be used now.

Mitigations

- Check and Confirm that previous use of the equipment would not intentionally give rise to H_2S after contacting HCL.
- H_2S Gas monitors will be utilized during Well Intervention execution to alert the crew of any latent threats.
- Appropriate PPE's to be worn as mitigation. Abort operation if H2S monitor shows concentration >50 ppm.



Souring Potential Assessment Chart

Date	14th July 2020	
Prepared by	Imaobong Bassey (PG)/ Ekiah Muzan (PT)/ Taro Onaolo (PT)/ Dike Ahunanya (PP)/ Basil Ogbunude (RE)	
Approved by	Tamunotonye Biambo (PT TA2)	Tammy Biambo
Approved by	Ubong Etuk (PG TA2)	Etuk, Ubong A.

PVT Analysis Result for Ubie E1000 Reservoir

- PVT samples were taken directly from UBIE003L on E3000M reservoir in 1984, but the gas and fluid compositional analysis was not carried out.
- PVT data from shallower E1000M (1994) and deeper E5000M (1995) reservoir have been used as analogue.
- The molecular composition of reservoir fluid (E1000) and reservoir fluid analysis (E5000M) indicates no H2S present as seen in the tables below.
- No H2S production has been recorded till date from Ubie field.

PVT Analysis from UBIE005L on E1000M Reservoir

FLOPETROL
SERVICES FOR THE OIL INDUSTRY

WELL : UBIE 5 COMPANY : SHELL - BP
FORMATION : E1.00 STATE :
FIELD : UBIE COUNTRY : NIGERIA

TABLE VII

MOLECULAR COMPOSITION OF RESERVOIR FLUID

Components	Molecular %
Nitrogen	0.05
Carbon Dioxide	0.16
Methane	53.56
Ethane	2.70
Propane	0.31
Iso Butane	0.08
Normal Butane	0.09
Iso Pentane	0.07
Normal Pentane	0.04
Hexanes	0.20
Heptanes+	42.70
Total	100.00 %
Molecular Weight	195.0
Heptanes+ Mol.Wt.	349

Density of P Heptanes plus in Stock Tank Oil = 0.8155 g/cm³ at 60°F

PVT analysis from UBIE004S on E5000M Reservoir

client : SHELL PETROLEUM DEV. COY. page : 9
well : UBIE 34S / E5.000M report no : pvt95005 sampling date : 17/11/95

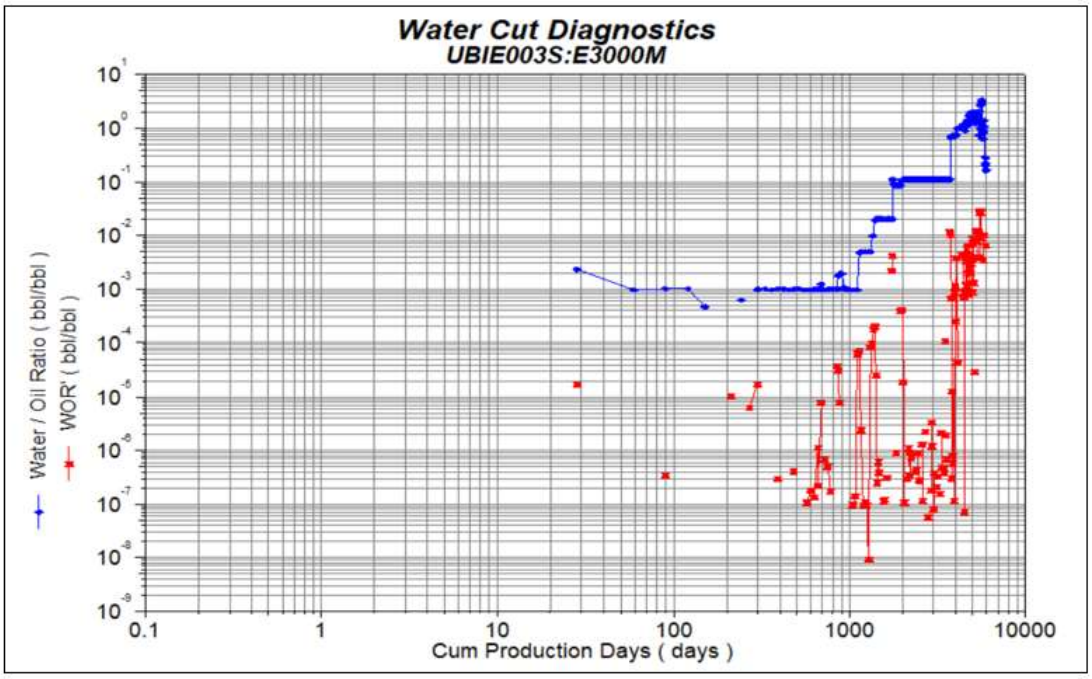
RESERVOIR FLUID ANALYSIS

1. COMPOSITION (mole per cent)

		FLASHED LIQUID	FLASHED GAS	RESERVOIR FLUID
Non-hydrocarbons				
Nitrogen	N_2	0.00	0.01	0.01
Carbon Dioxide	CO_2	0.00	0.25	0.24
Hydrogen Sulphide	H_2S	0.00	0.00	0.00
Hydrocarbons				
Methane	C_1	0.00	86.73	48.55
Ethane	C_2	1.09	7.39	4.62
Propane	C_3	1.58	2.47	1.99
i_Butane	iC_4	0.73	0.69	0.70
n_Butane	nC_4	2.30	1.26	1.68
i_Pentane	iC_5	1.14	0.35	0.70
n_Pentane	nC_5	1.81	0.42	1.03
Hexanes	C_6	3.39	0.15	1.57
Heptanes	C_7	16.41	0.09	7.27
Octanes	C_8	34.96	0.06	15.42
Nonanes	C_9	10.83	0.03	4.78
Decanes	C_{10}	3.13	0.00	1.38
Undecanes	C_{11}	2.84	0.00	1.25
Dodecanes	C_{12}	2.18	0.00	0.96
Tridecanes	C_{13}	1.88	0.00	0.83
Tetradecanes	C_{14}	1.30	0.00	0.57
Pentadecanes	C_{15}	1.18	0.00	0.52
Hexadecanes	C_{16}	0.72	0.00	0.32
Heptadecanes	C_{17}	0.65	0.00	0.29
Octadecanes	C_{18}	0.56	0.00	0.25
Nonadecanes	C_{19}	0.43	0.00	0.19
Eicosanes plus	C_{20}	11.08	0.00	4.88
Total		100.00	100.00	100.00
Molar Ratio		0.4402	0.5598	1.0000
2. PHASE PROPERTIES				
Molar Mass fluid		176.25	19.39	88.43
Density Fluid : g/cm3		0.875		
Mole percent Heptanes plus		88.15	0.18	38.90
Molar Mass Heptanes plus		189.96	109.56	189.73
Mole percent Eicosanes plus		11.08		4.88
Molar Mass Eicosanes plus		643.28		643.28
Density Eicosanes plus : g/cm3		0.955		
Relative Density : air=1			0.669	

RESTRICTED

Appendix 8: Water Cut Diagnostics Plot for UBIE003S on E3000M



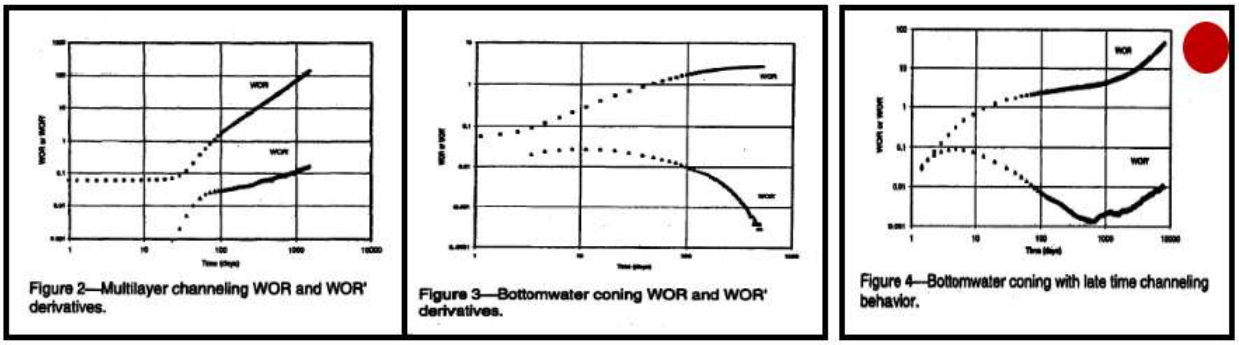


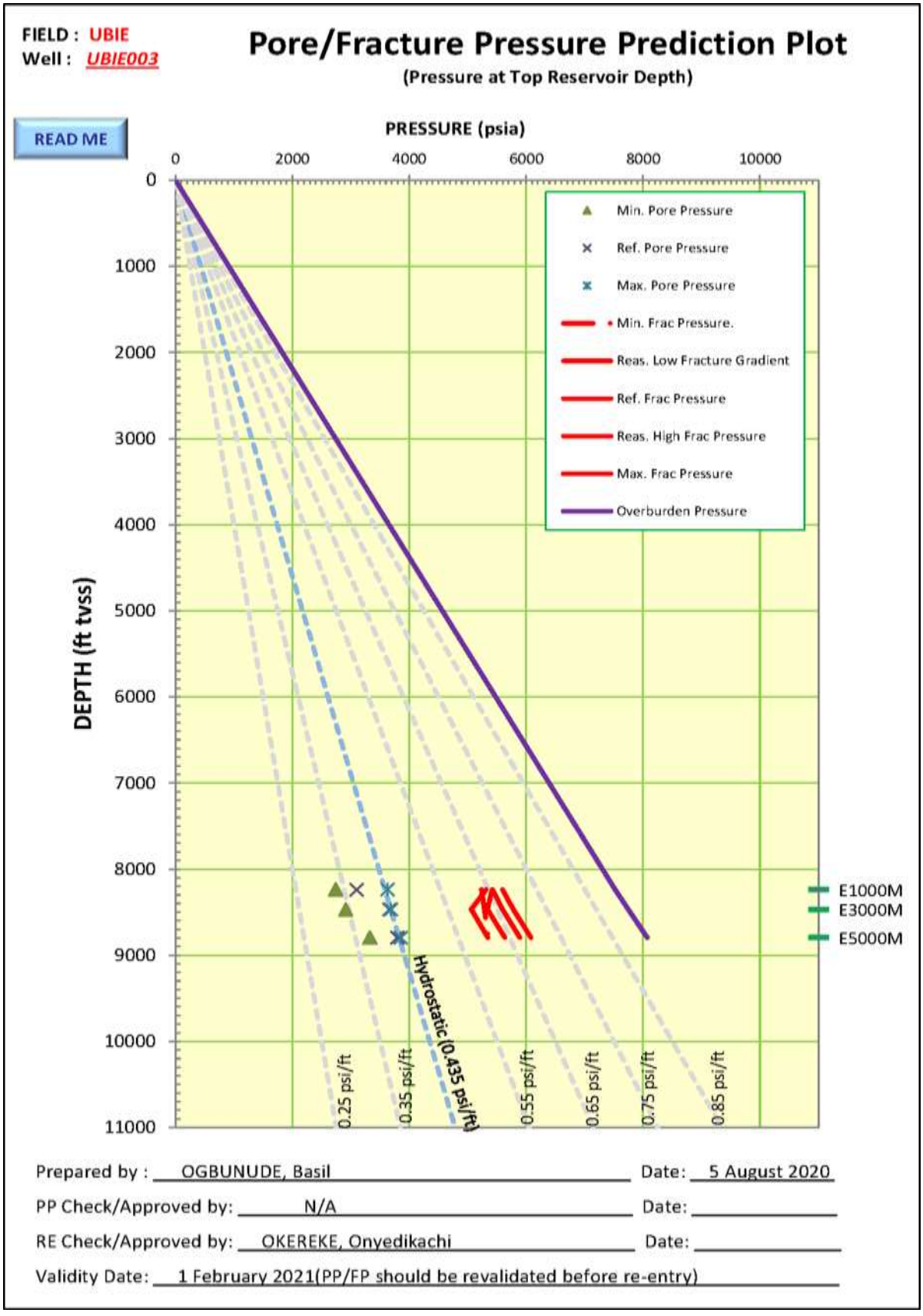
Figure 2—Multilayer channeling WOR and WOR' derivatives.

Figure 3—Bottomwater coning WOR and WOR' derivatives.

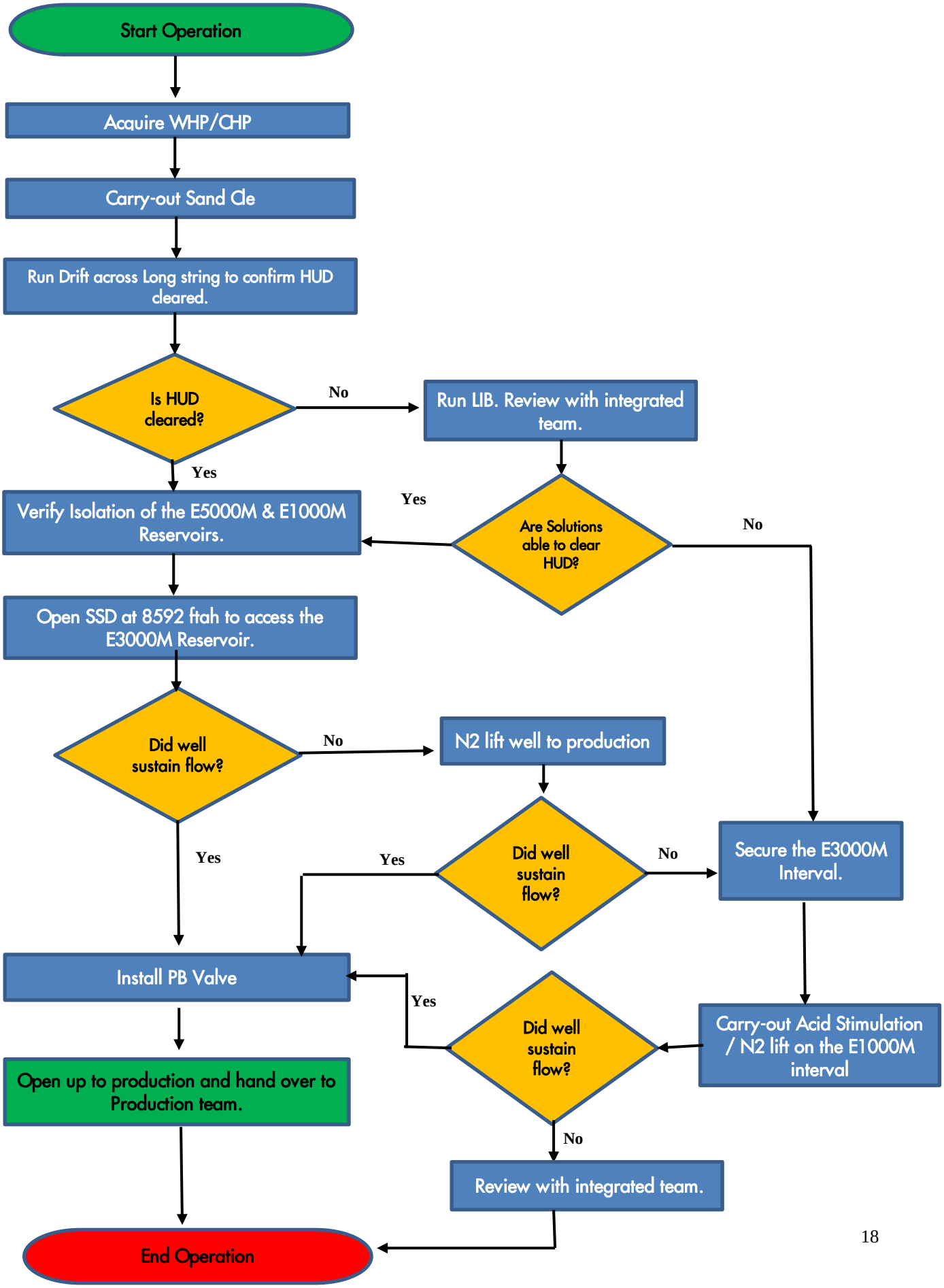
Figure 4—Bottomwater coning with late time channeling behavior.

Diagnosis Result : Bottom water coning with late time channeling

Appendix 9: Pore Pressure Prediction for Ubie 003L on E3000M



Appendix 10: Well Intervention Decision Tree



Appendix 11: Emergency Response Data & Contact

Emergency Data Set Content			Data Owners /Accountable Discipline	Names	Email
People Contacts and Procedures	1	Duty roaster (weekend duty/leave plan)	Development – Planning Weekend duty Coordination	Akpovine Otughwor Eric Ezenobi	Akopovine.otughwor@shell.com Eric.C.Ezenobi@shell.com
	2	Emergency response contact details: Subsurface team, operations team, wells, OU and external emergency responders.	Soku/ Nun River Node FMT PT PP PG RE WRFM CWI Asset Engr.	Jonathan Mude Eelah Muzan Dike Ahunanya Imaobong Bassey Basil Ogbunude Esther Briggs Olugbenga Jimba	J.Mude@shell.com Eelah.Moro@shell.com Dike.Ahunanya@shell.com Imaobong.bassey@shell.com B.Ogbunude@shell.com Esther.Briggs@shell.com Olugbenga.Jimba@shell.com
	3	UBIE003L Zone Change & Unsecuring Proposal	Soku/ Nun River Node FMT PT PP PG RE WRFM CWI Asset Engr.	Jonathan Mude Eelah Muzan Dike Ahunanya Imaobong Bassey Basil Ogbunude Esther Briggs Olugbenga Jimba	J.Mude@shell.com Eelah.Moro@shell.com Dike.Ahunanya@shell.com Imaobong.bassey@shell.com B.Ogbunude@shell.com Esther.Briggs@shell.com Olugbenga.Jimba@shell.com
	4	Well tops and fluid fill interpretation	PG/PP	Imaobong Bassey/ Dike Ahunanya	imaobong.bassey@shell.com Dike.Ahunanya@shell.com
	5	Subsurface map	PG	Imaobong Bassey	Imaobong.bassey@shell.com
	6	Pore pressure prediction	RE/PP	Basil Ogbunude/ Dike Ahunanya	B.Ogbunude@shell.com Dike.Ahunanya@shell.com
	7	Intervention work scope	PT/WE	Eelah Muzan /Conrad Ibekwe	
	8	Correlation Panel	PG	Imaobong Bassey	Imaobong.bassey@shell.com
	9	Cross section through the STOG well.	PG	Imaobong Bassey	Imaobong.bassey@shell.com
	10	Petrophysical logs for well & nearby wells	PP	Dike Ahunanya	Dike.Ahunanya@shell.com
	11	Worst Case Discharge	PT	Eelah Muzan	Eelah.Moro@shell.com
	12	Well Status Diagram	PT	Eelah Muzan	Eelah.Moro@shell.com
Overall responsible focal point for Duty and Emergency Response Files					
Name		Arnold Obomanu			
Contact Details		a.obomanu@shell.com / +2348070221066			

Emergency Data Set Content			Update Timing	Medium/Location	Data Owners /Accountable Discipline
People contacts and Procedures	1	Duty roaster (weekend duty/ leave plan)	Annually/after staff rotations	Electronic/SharePoint and ERO Portal	Development - Planning
	2	Emergency response contact details: Subsurface team, operations team, wells, OU and external emergency responders.	After staff rotations	Electronic/ ERO Portal	ERT
	3	Communication Protocol	No special communication protocol is required. This is a conventional operation that will be executed by in-house experts/ERO Portal		ERT
	4	UBIE003L Zone Change & Unsecuring Proposal	Dependent on availability of new information	Electronic/ Sirus Catalog UBIE003L Zone Change & PB Valve Proposal Addendum	PG/ PP/ RE/PT/WE
	5	Well tops and fluid fill interpretation		Electronic/CDS, ERO Portal	PG/PP
	6	Subsurface map		Electronic/UBIE003L Zone Change & PB Valve Proposal Addendum, ERO Portal and Sirus Catalog	PG
	7	Pore pressure prediction	6 months prior to activity	Electronic/UBIE003L Zone Change & PB Valve Proposal Addenduml	RE/PP
	8	Intervention work scope	Dependent on availability of new information	Electronic/UBIE003L Zone Change & PB Valve Proposal Addendum and Sirus Catalog	PT/WE
	9	Correlation Panel			PG
	10	Cross section through the Workover well.			PG
	11	Petrophysical logs for well & nearby wells	Not Applicable	Electronic/RECALL, Hardcopy/Log Room	PP
	12	Worst Case Discharge	When Pore pressure prediction is updated prior to activity	Electronic/ UBIE003L Zone Change & PB Valve Proposal Addenduml and Share point	PT
	13	Well Status Diagram	Dependent on availability of new information	Electronic/EDM, Sirus Catalog &UBIE003L Zone Change & PB Valve Proposal Addendum	PT

Overall responsible focal point for Duty and Emergency Response Files	
Name	Arnold Obomanu
Contact Details	a.obomanu@shell.com / +2348070221066