

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED.

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 1136736 JIV report S/N: 0239

(Note: As practicable as possible the JIT report is to be signed in the field by all the participating parties)

A. GENERAL INFORMATION:

1. Spill incident Number: 1136736 2. Type of incident* OIL SPILL
 3. Name of Location OPUKUSHI WELL-24T FLOWLINE
 4. Name of nearest community EGBEMO ANGALABRI 5. State: BAYELSA 6. LGA EKEREMOR
 7. Type of Production facility/Installation FLOWLINE 8. Asset owner/District SWAMP WEST

B. INCIDENT INFORMATION:

9. Details of incident

- a. Date of incident: 7TH MARCH 2014
 b. Start date/time of investigation: 20TH MARCH 2014 AT 1207HRS
 c. Investigation End date: 20TH MARCH 2014 Actual investigation duration, days: 1 DAY

d. Description of spill point environment

- | | | |
|---|--|--|
| <input type="checkbox"/> Firmed soil | <input type="checkbox"/> Loose soil | <input type="checkbox"/> Recently excavated area |
| <input type="checkbox"/> Under water | <input checked="" type="checkbox"/> Swampy | <input type="checkbox"/> Exposed pipe surface |
| <input type="checkbox"/> Well Platform (on Water) | | <input type="checkbox"/> Drill Rig |
- e. Description of leak point (tick as applicable);
- | | | |
|---|---|--|
| <input type="checkbox"/> Drilled hole | <input type="checkbox"/> Hack saw cut | <input type="checkbox"/> Tear (_____), |
| <input type="checkbox"/> Complete Rupture | <input type="checkbox"/> Inward dent, | <input type="checkbox"/> Well head tampering |
| <input type="checkbox"/> Failed Weld-on illegal hot tap valve, | <input type="checkbox"/> Failed Clamp | <input type="checkbox"/> Missing Pipeline/Flowline |
| <input type="checkbox"/> Crude oil theft (illegal bunkering) point, | | <input type="checkbox"/> Third party tampering with Clamp |
| <input type="checkbox"/> Third party tampering with valve setting, | | <input type="checkbox"/> Third party tampering with flange, |
| <input checked="" type="checkbox"/> Corrosion (PIN-HOLE) | <input type="checkbox"/> Saver-pit over flow, | <input type="checkbox"/> Surge vessel overflow, |
| <input type="checkbox"/> Bulging Outward | <input type="checkbox"/> Flare System/Bund wall failure | <input type="checkbox"/> Accidental 3 rd party equipment impact |
| <input type="checkbox"/> Valve Failure | <input type="checkbox"/> com unit failure | <input type="checkbox"/> Cold vent |
| <input type="checkbox"/> Relief valve failure | <input type="checkbox"/> Others (specify) _____ | |

f. Incident caused by:

- Third party interference (Sabotage ; crude theft ; Line theft ; Accidental 3rd party damage
 Operational Others (including Mystery spills) _____

g. Spill point coordinates

Measuring unit <u>METEAS</u> <u>MUNNA (WEST-BELT)</u>	
Northing: <u>100933.4 MN</u>	Easting: <u>371411.1 ME</u>

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C. RISK ASSESSMENT

10. Type of environment:

- Land Swamp Water Seasonal swamp Shoreline/Waterfront

i. Type of environment to which oil has spread:

- Land Swamp Water River (identify) _____

ii. Weather condition

- Rain Sunny Dry Wet Windy Hot Cool

11. Distance from the nearest sensitive habitat

- Government reserved and designated protected area [,m]
- Drinking water source [,m]
- Built up area [,m]
- Farmlands [0 ,m]
- Fish Farm/Pond [0 ,m]
- Fishing net [,m]
- Others (specify).

12. Containment measures put in place;

- Booms Trench Dyke Natural depression Pit
 Others: _____

13. Any pictures or video coverage?

[Y] [N]

14. Was there any disruption to the investigation?

[Y] [N]

If yes give brief description:

NOT APPLICABLE

D. TYPE/NUMBERS OF PROPERTIES, IF ANY, FOUND WITHIN THE AREA OF SPREAD OF OIL

15. Structures / Properties

S/N	Type of Structures	Description	Size	Number	Comments
	<u>NONE WITHIN AREA OF IMPACT</u>				

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16. Crops/Economic Trees

S/N	Type of crops	Young	Medium	Matured	Quantity	Comments
1.	HARD WOOD	32	28	98	156	/
2.	PALM TREES	21	18	63	102	
3.	RAFFIA PALM	13	16	33	62	
4.	SOFT WOOD	25	26	38	89	
5.	MANGROVES	25	40	60	125	
6.	PLANTAIN	—	—	153	153	

17. Fish/Nets/Ponds

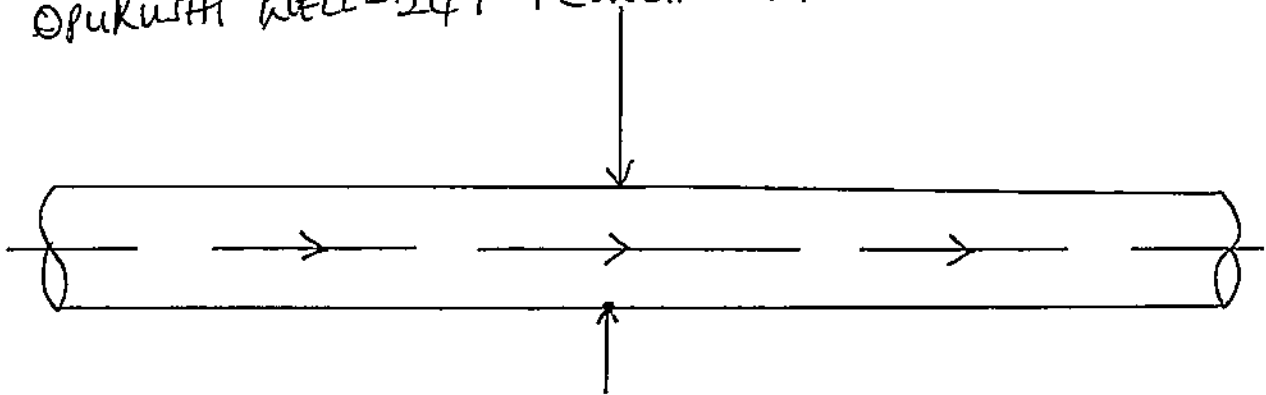
S/N	Fish/Nets/Ponds	Description	Quantity/Size	Comments
1.	FISH POND	CRUDE IMPACTED PONDS	3	CRUDE IMPACTED FISH PONDS

18. Others (Specify) i.e. Animal Traps

S/N	Others	Description	Quantity/Size	Comments
		NONE WITHIN AREA OF IMPACT		

E. GRAPHIC DESCRIPTION OF LEAK POINT (while detail report of the leak point should be contained in the leak report, overview sketch of the site should be added as an appendix 1)

OPUKWU WELL-24T FLOWLINE AT EGBEMO-ANGALABIRI



PIN-HOLE LEAK AT 6 O'CLOCK POSITION (LEAKING)

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F: TABLE SHOWING SOME OF COORDINATES TAKEN DURING JIV FOR AREA CALCULATION

19. Impacted area boundary Coordinates (If more, Print and attach as an appendix)

MINNA (WEST - BELT)

S/N	Northing (m)	Easting (m)
1.	101004.34	371549.61
2.	101001.25	371540.37
3.	101007.86	371524.95
4.	100998.11	371506.48
5.	100988.84	371478.77
6.	101001.31	371574.26
7.	100942.43	371300.17
8.	100939.45	371349.47
9.	100948.75	371392.58
10.	100948.78	371411.07
11.	100916.06	371315.68
12.	100888.62	371364.43
13.	100931.22	371457.03
14.	100952.33	371543.39
15.	100978.52	371564.03
16.	100992.33	371580.37
17.	101003.29	371592.14
18.	101006.78	371584.98
S.P	100933.4	371411.1

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G. INCIDENT INFORMATION:

20. Impacted Area Details

- Total calculated area of impact 1.194 Ha
- Impact within SPDC R.O.W YES
- Impact outside SPDC R.O.W YES

21. Volume of oil recovered before completion of JIV (V_{rec}):

Recovered oil V_{rec} :	<u>15.96</u>	Barrels
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22. Computation of estimated residual volume on site

a. Computation of estimated volume of pool of free phase oil (on land or confined water body).

- i. Area (m^2) occupied by pool of free phase oil 0.854 Ha
- ii. Average Depth (m) of pool of free phase oil 0.002 m
- iii. Emulsification factor: 40%

iv.

Estimated Volume of pool of free phase oil. V_{pool} :	<u>64.46</u>	barrels
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b. Computation of estimated volume of infiltrated oil in the soil (V_{inf}).

1. Estimated Volume of infiltrated oil at spill point ($V_{inf a}$)

- i. Area* (m^2) of soil covered by the oil: _____
- ii. Average Depth (m) above leaking facility i.e. pipeline/flowline: _____
- iii. Soil type: _____ iv. P_e (effective porosity of the soil): _____
- v. Cause of spill: _____ Oil type: _____
- vii. Oil Residence time on site, day: _____
- viii. Average depth of infiltration below leaking facility i.e. pipeline/flowline: _____
- ix. Estimated depth of infiltration around spill point: _____

x.

Estimated Volume of infiltrated oil at spill point. $V_{inf a}$:	<u>NIL</u>	barrels
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2. Estimated Volume of infiltrated oil at second spill point [if applicable] ($V_{inf b}$)

- i. Area* (m^2) of soil covered by the oil: _____
- ii. Average Depth (m) above leaking facility i.e. pipeline/flowline: _____
- iii. Soil type: _____ iv. P_e (effective porosity of the soil): _____
- v. Cause of spill: _____ vi. Oil type: _____
- vii. Oil Residence time on site, day: _____
- viii. Average depth of infiltration below leaking facility i.e. pipeline/flowline: _____
- ix. Estimated depth of infiltration around spill point: _____

Estimated Volume of infiltrated oil at spill point. $V_{inf b}$:	<u>NIL</u>	barrels
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3. Estimated Volume of infiltrated oil outside immediate spill point(s) region ($V_{inf c}$)

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- i. Area (m²) of soil covered by the oil: 0.34 Ha ' 0239
- ii. Area (m²) of the pool of free phase oil in touch with soil: NOT APPLICABLE
- iii. Average Depth (m) below ground surface of infiltration of oil: 0.0036m
- iv. Soil type: CLAY
- v. P_c (effective porosity of the soil): 8%

vi. Estimated Volume of infiltrated oil. At V_{inf} :	<u>6.09</u>	barrels
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23. Computation of estimated volume of oil on open water based on standard coloration.

- i. Total area of oil on open water: NOT APPLICABLE
- ii. Table of average depth of oil on water based on coloration (****Spill Factors from USCG FOG (2000 Edition)**)

	Thickness (mm)	Percentage coverage	Volume (m ³)
Barely Visible	0.00004	NOT APPLICABLE	
Silvery	0.00008		
Slight Color	0.00015		
Bright Color	0.0003		
Dull	0.001		
Dark	0.002		
Black oil	0.1		
Emulsion (30% Oil)	1		

iii.	Percent Total 100%	Estimated Volume of oil on open water. V_{wat} :	<u>NIL</u>	Barrels
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24. Calculation of evaporated volume:

- i. Estimated Volume available for evaporation within surface area: 86.51 BBLs

- ii. E-Factor: 25%

iii.	Estimated Volume of evaporated oil. V_{evap} :	<u>28.84</u>	Barrels
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Evaporation Factors (E-Factor) for SPDC Crude oil			
Oil Type	Days on site	Bonny Light	Bonny Medium
Oil Residence time	< 1 day	10%	5%
	1-7 days	25%	15%
	> 7 days	40%	25%

25. Net Estimated Spilled Volume V_{Est}(bbls) = V_{evap}(bbls) + V_{wat}(bbls) + V_{inf}(bbls) + V_{pool}(bbls) + V_{recd}(bbls) = <u>28.84 + 6.09 + 64.46 + 15.96 = 115.35 BBLs</u> 	
Estimated Reported Volume** V_{rep}(bbls) = <u>116 BBLs</u>	

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Calculation of the respective estimated volume is to be done on site as far as practicable using the new spill volume estimation software on site; Conversion of m³ to barrels is Volume (m³) x 6.29; **Round up estimated volume to next whole number using the following rules:

- Any spill volume in excess of 1 bbl is rounded up to the next whole number.
- Any spill volume in less than 1 bbl is rounded up to the next 0.1 bbl.

Examples: Calculated volume = 15.3 bbl ----- Reported volume = 16 bbl
Calculated volume = 0.35 bbl ----- Reported volume = 0.4 bbl
Calculated volume = 0.01 bbl ----- Reported volume = 0.1 bbl.

Wherever this estimation tool is not applicable please refer to paragraph 6c (Deviations) of the JIV procedure to use appropriate steps for column estimation; record the calculation in a plain sheet of paper and attach to the JIV report.

26. GENERAL STATUS OF THE SITE

A. Joint investigation of the incident site found that there is no residual impact after the initial response and therefore recommend that the site be closed out

B. Investigation of the incident site showed that there is residual impact on site requiring further works

27. REPRESENTATIVES

This report was filled, agreed and signed on the 20/03/2014 by joint investigation representatives from

- Host Community:
- Department of Petroleum Resources [DPR]:
- National Oil Spill Detection and Response Agency [NOSDRA]:
- State Ministry of Environment [SME]:
- Nigeria Police Force [NPF]:
- Shell Petroleum Development Company [SPDC]:
- Signatories agree with reported findings:
- Separate DPR form has been filled out with same findings

Tick as applicable

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28. Appendix 1: Overview sketch of the site

