

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED.

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 1074605 JIV report S/N: 0349

(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: 1074605 2. Type of incident* OIL SPILL/FIRE
 3. Name of Location 28" BOMU - BONNY PIPELINE
 4. Name of nearest community KPOR/K-DERE 5. State: RIVERS 6. LGA GOKANA
 7. Type of Production facility/Installation OIL PIPELINE 8. Asset owner/District PIPELINE

B. INCIDENT INFORMATION:

9. Details of incident

- a. Date of incident: 21ST NOVEMBER, 2013
 b. Start date/time of investigation: 23RD NOVEMBER, 2013 / 13:38 HOURS
 c. Investigation End date: 24TH NOVEMBER 2013 Actual investigation duration, days: TWO (2) DAYS
 d. Description of spill point environment 2013

- | | | |
|---|--|---|
| <input type="checkbox"/> Firmed soil | <input checked="" type="checkbox"/> Loose soil | <input checked="" type="checkbox"/> Recently excavated area |
| <input type="checkbox"/> Under water | <input checked="" type="checkbox"/> Swampy
(SEASONAL) | <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 checked="" 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 type="checkbox"/> Corrosion | <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"/> Relief valve failure | <input type="checkbox"/> Others (specify) _____ | <input type="checkbox"/> Cold vent |

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>METERS</u> <u>MINNA CALIO-BELT</u>	
Northing: <p align="center"><u>72537.13</u></p>	Easting: <p align="center"><u>534936.15</u></p>

*This can be: a) Oil Spill b) Drilling fluid/Chemical c) Siltation d) construction e) Encroachment f) Fire.

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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~~ ^{SEASONAL} 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 [,m]
- Fish Farm/Pond [,m]
- Fishing net [,m]

Others (specify). **RAFFIA PALM**

IMPACTED BY SPILL.

12. Containment measures put in place;

- Booms Trench Dyke Natural depression Pit
 Others: _____

13. Any pictures or video coverage?

[] [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
NONE WITHIN AREA OF IMPACT					

16. Crops/Economic Trees

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S/N	Type of crops	Young	Medium	Matured	Quantity	Comments
1.	RAFFIA PALM		✓	✓	NUMEROUS WITHIN THICK BUSH/VEGETATION	WITHIN IMPACTED REGION ON SEASONAL SWAMPY TERRAIN.

17. Fish/Nets/Ponds

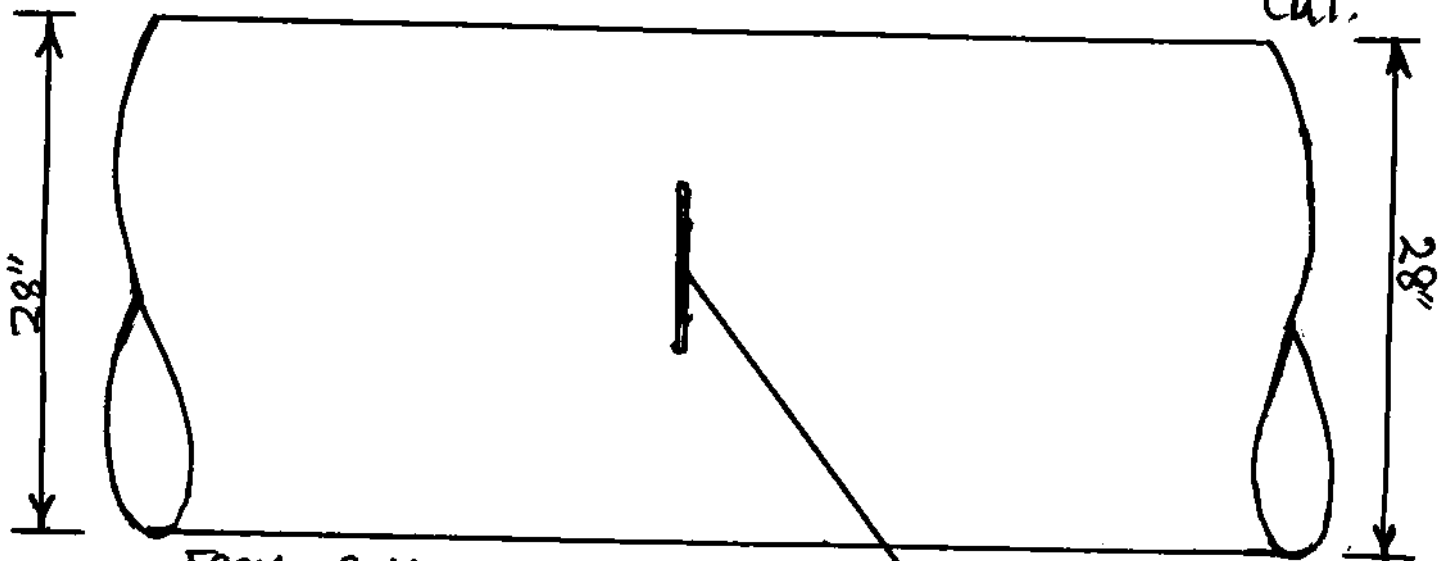
S/N	Fish/Nets/Ponds	Description	Quantity/Size	Comments
	NONE WITHIN AREA OF IMPACT			

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)

SECTION OF 28" BOMU - BONNY PIPELINE AT KPOR/K-DERE SHOWING POSITION OF HACKSAW CUT.



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

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

S/N	Northing METERS	Easting METERS
	72545.35	534933.12
	72500.20	534973.11
	72497.20	534933.04
	72547.40	534952.02
	72544.88	534972.39
	72489.85	534972.79

G. INCIDENT INFORMATION:

20. Impacted Area Details

- Total calculated area of impact 0.21Ha
- Impact within SPDC R.O.W YES
- Impact outside SPDC R.O.W YES

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

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Recovered oil V_{rec} :	<u>36</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 2,090
- ii. Average Depth (m) of pool of free phase oil 0.014
- iii. Emulsification factor: NIL

iv.

Estimated Volume of pool of free phase oil: V_{pool} :	<u>184.05</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: 1
- ii. Average Depth (m) above leaking facility i.e. pipeline/flowline: 1.9.
- iii. Soil type: SAND (MEDIUM)
- iv. P_e (effective porosity of the soil): 25%
- v. Cause of spill: THIRD PARTY INTERFERENCE
- vi. Oil type: BONNY LIGHT
- vii. Oil Residence time on site, day: 3 DAYS
- viii. Average depth of infiltration below leaking facility i.e. pipeline/flowline: 1.5m
- ix. Estimated depth of infiltration around spill point: 3.4m

Estimated Volume of infiltrated oil at spill point. $V_{inf a}$:	<u>5.35</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. E

Estimated Volume of infiltrated oil outside immediate spill point(s) region ($V_{inf c}$)

- i. Area (m^2) of soil covered by the oil: 10
- ii. Area (m^2) of the pool of free phase oil in touch with soil: NIL
- iii. Average Depth (m) below ground surface of infiltration of oil: 1.5
- iv. Soil type: SAND (MEDIUM)
- v. P_e (effective porosity of the soil): 25%

vi.

Estimated Volume of infiltrated oil. At $V_{inf c}$:	<u>23.59</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: NIL

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ii. Table of average depth of oil on water based on coloration (**Spill Factors from USCG FOG (2000 Edition))

	Thickness (mm)	Percentage coverage	Volume (m3)
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} :	NIL	Barrels
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24. Calculation of evaporated volume:

- i. Estimated Volume available for evaporation within surface area: 248.98 BARRELS
- ii. E-Factor: 25%
- iii.

Estimated Volume of evaporated oil. V_{evap} :	82.99	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_{inc} (bbls) + V_{pool} (bbls) + V_{ref} (bbls) =**
 $82.99 + NIL + 28.93 + 184.05 + 36 \approx 331.97$ **BARRELS**

Estimated Reported Volume V_{rep} (bbls) = 332 BARRELS.**

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 m^3 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

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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 24/11/2013 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

28. Appendix 1: Overview sketch of the site

Location : 28" BOMU - BONNY PIPELINE AT KPOR/K-DERE

