

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED.

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 1037941 JIV report S/N: 0177

(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: 1037941 2. Type of incident* OIL SPILL
 3. Name of Location 28" BOMU - BONNY PIPELINE
 4. Name of nearest community BODO WEST 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: 10TH SEPTEMBER 2013
 b. Start date/time of investigation: 19TH SEPTEMBER TO 23RD SEPTEMBER 2013 AND 2ND OCTOBER TO 4TH OCTOBER 2013
 c. Investigation End date: 4TH OCTOBER 2013 Actual investigation duration, days: 8 DAYS
 d. Description of spill point environment
 Firmed soil Loose soil Recently excavated area
 Under water Swampy Exposed pipe surface
 Well Platform (on Water) Drill Rig
 e. Description of leak point (tick as applicable);
 Drilled hole Hack saw cut Tear (_____),
 Complete Rupture Inward dent, Well head tampering
 Failed Weld-on illegal hot tap valve, Failed Clamp Missing Pipeline/Flowline
 Crude oil theft (illegal bunkering) point, Third party tampering with Clamp
 Third party tampering with valve setting, Third party tampering with flange,
 Corrosion Saver-pit over flow, Surge vessel overflow,
 Bulging Outward Flare System/Bund wall failure Accidental 3rd party equipment
 impact Valve Failure com unit failure Cold vent
 Relief valve failure 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 (M)		<u>MWNA MID-BELT</u>	
Northing:	Easting:		
<u>65540.65</u>	<u>532741.83</u>		

*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 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 **NONE SEEN** [,m]
- Built up area [,m]
- Farmlands **WITHIN VICINITY** [,m]
- Fish Farm/Pond [,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? [N]

14. Was there any disruption to the investigation? [Y]

If yes give brief description:

NONE 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				

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16. Crops/Economic Trees

S/N	Type of crops	Young	Medium	Matured	Quantity	Comments
	NONE WITHIN AREA OF IMPACT					

17. Fish/Nets/Ponds

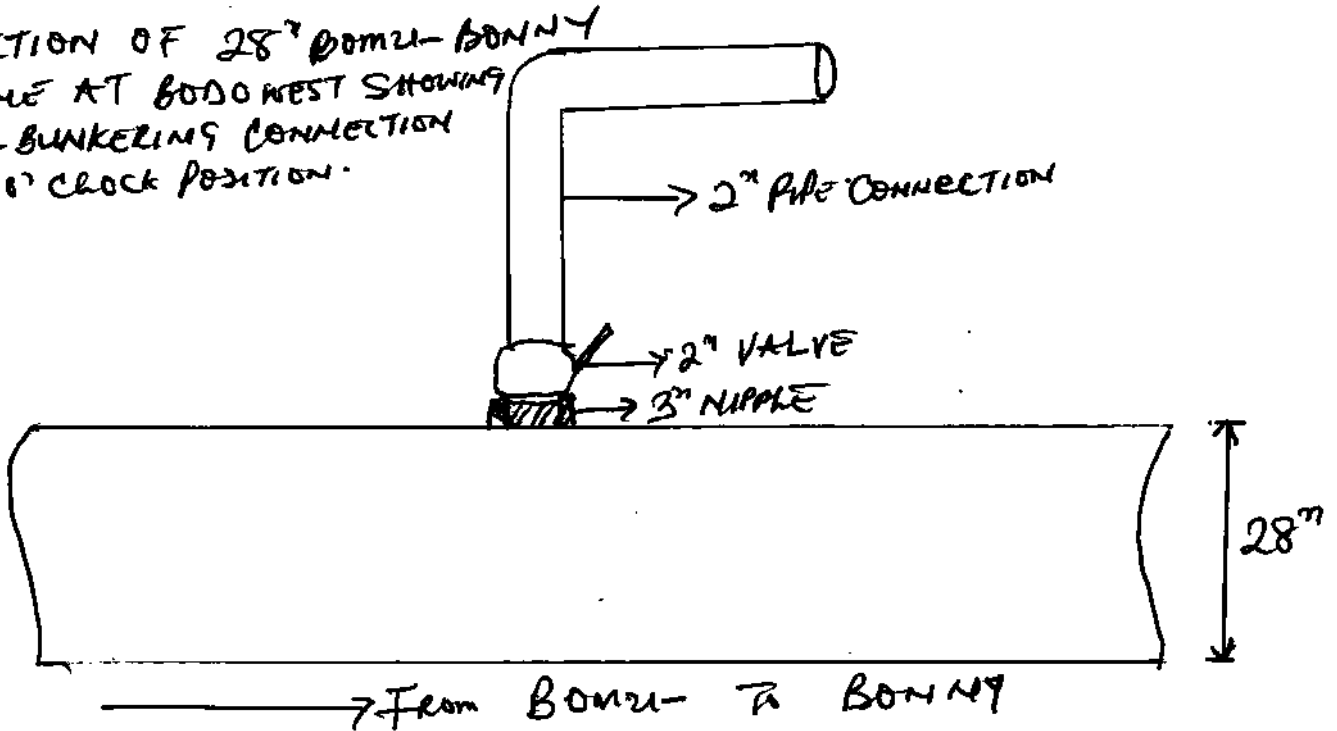
S/N	Fish/Nets/Ponds	Description	Quantity/Size	Comments
	NONE WITHIN AREA OF IMPACT			

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)

A SECTION OF 28" BOMU-BONNY PIPELINE AT BODO WEST SHOWING ILLEGAL BUNKERING CONNECTION AT 12 O'CLOCK POSITION.



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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 MID-BELT

S/N	Northing (M)	Easting (M)
W/566	65 552.95	532 735.68
W/567	65 546.79	532 744.92
W/568	65 540.64	532 747.99
W/569	65 534.51	532 741.81
W/565	65 537.60	532 732.57
W/573	65 540.67	532 729.50
W/574	65 543.78	532 711.01
W/576	65 546.86	532 704.85
W/577	65 549.95	532 695.61
W/578	65 556.08	532 698.70
W/579	65 549.88	532 732.59

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G. INCIDENT INFORMATION:

20. Impacted Area Details

- Total calculated area of impact 0.05 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>1,300.00</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 300
- ii. Average Depth (m) of pool of free phase oil 0.001
- iii. Emulsification factor: NIL

iv.

Estimated Volume of pool of free phase oil. V_{pool} :	<u>1.89</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: 20 m^2
- ii. Average Depth (m) above leaking facility i.e. pipeline/flowline: 1.5m
- iii. Soil type: CLAY iv. P_c (effective porosity of the soil): 8%
- v. Cause of spill: THIRD PARTY INTERFERENCE Oil type: BONNY LIGHT
- vii. Oil Residence time on site, day: NINE (9) DAYS
- viii. Average depth of infiltration below leaking facility i.e. pipeline/flowline: 0.0025m
- ix. Estimated depth of infiltration around spill point: 1.5025m

x.

Estimated Volume of infiltrated oil at spill point. $V_{inf a}$:	<u>15.12</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: NOT
- ii. Average Depth (m) above leaking facility i.e. pipeline/flowline: _____
- iii. Soil type: _____ iv. P_c (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: APPLICABLE

Estimated Volume of infiltrated oil at spill point. $V_{inf b}$:		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: 180
- ii. Area (m²) of the pool of free phase oil in touch with soil: 300
- iii. Average Depth (m) below ground surface of infiltration of oil: 0.0025
- iv. Soil type: Clay
- v. P_e (effective porosity of the soil): 8%

vi. Estimated Volume of infiltrated oil. At V _{inf} :	<u>0.6</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
- 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	
Silvery	0.00008		
Slight Color	0.00015		
Bright Color	0.0003		
Dull	0.001	APPLICABLE	
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: 17.60 BARRELS
- ii. E-Factor: 40%

iii.	Estimated Volume of evaporated oil. V _{evap} :	<u>11.74</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_{net}(bbls) = V_{evap}(bbls) + V_{wat}(bbls) + V_{inf}(bbls) + V_{pool}(bbls) + V_{recf}(bbls) =
11.74 + NIL + 15.72 + 1.89 + 1,300 =
1329.34 ≈ 1,330 BARRELS

Estimated Reported Volume V_{rep}(bbls) =**
1,330 BARRELS

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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 volume 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 <input type="checkbox"/>
B. Investigation of the incident site showed that there is residual impact on site requiring further works <input checked="" type="checkbox"/>

27. REPRESENTATIVES

This report was filled, agreed and signed on the 29/10/2013 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" Bonny-Bonny Pipeline at Bodo West

