

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED.

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 989481 JIV report S/N: 0142

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

A. GENERAL INFORMATION:

1. Spill incident Number: 989481 2. Type of incident* OIL SPILL
 3. Name of Location 28" BOMU - BENNY TRANS NIGER 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/BODO SWAMP

B. INCIDENT INFORMATION:

9. Details of incident

- a. Date of incident: 9TH JUNE, 2013
 b. Start date/time of investigation: 10TH JUNE, 2013
 c. Investigation End date: 13TH JUNE 2013 Actual investigation duration, days: FOUR (4) 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 <u>(METERS)</u> <u>(MUNA MID - BET)</u>	
Northing:	Easting:
<u>63740.33</u>	<u>501591.52</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 [,m]
 - Fish Farm/Pond [,m]
 - Fishing net [,m]
 - Others (specify). [,m]
- } NONE SEEN
} WITHIN VICINITY.

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
					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

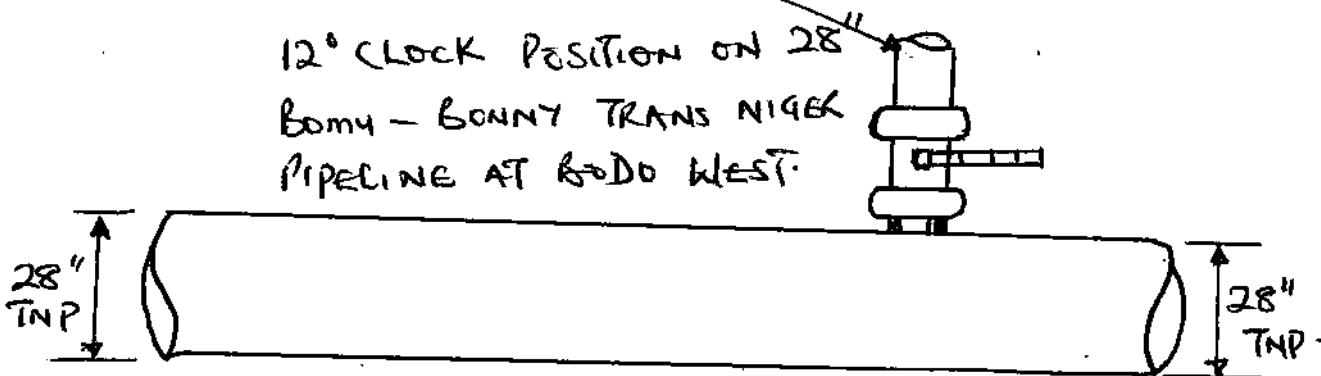
S/N	Others	Description	Quantity/Size	Comments
NONE WITHIN AREA OF IMPACT.				

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)

SECTIONAL VIEW OF 28" BOMU - BONNY TRANS NIGER PIPELINE.

SHOWING 3" BALL VALVE NIPPLE BUNKERING FITTINGS.

LEAKING 3" NIPPLE WITH BALL VALVE
BUNKERING FITTING INSTALLED AT
12° CLOCK POSITION ON 28"
BOMU - BONNY TRANS NIGER
PIPELINE AT BODO WEST.



NAME	EAST	NORTH	REMARKS
SP	532629.376	64693.07	SPILL POINT
713	532731.103	64699.036	IMPACT EXTENT
714	532015.454	64386.977	IMPACT EXTENT
715	532033.975	64402.302	IMPACT EXTENT
716	531966.217	64433.138	IMPACT EXTENT
717	531969.466	64528.354	IMPACT EXTENT
718	532019.026	64666.492	IMPACT EXTENT
719	532133.432	64872.094	IMPACT EXTENT
720	532229.312	65059.298	IMPACT EXTENT
721	532275.703	65148.295	IMPACT EXTENT
722	532353.03	65301.743	IMPACT EXTENT
723	532421.104	65452.135	IMPACT EXTENT
724	532489.145	65584.098	IMPACT EXTENT
725	532538.715	65728.379	IMPACT EXTENT
726	532566.702	65869.627	IMPACT EXTENT
727	532489.839	65980.342	IMPACT EXTENT
728	532354.38	66072.729	IMPACT EXTENT
729	532123.274	66109.994	IMPACT EXTENT
730	531827.342	66092.084	IMPACT EXTENT
731	531565.381	66110.976	IMPACT EXTENT
732	531414.354	66114.314	IMPACT EXTENT
733	531201.861	66219.126	IMPACT EXTENT
734	530983.633	66566.612	IMPACT EXTENT
735	530968.668	66818.517	IMPACT EXTENT
736	531320.323	66974.55	IMPACT EXTENT
737	532307.523	67473.492	IMPACT EXTENT
738	532575.638	67451.519	IMPACT EXTENT
739	533083.882	67266.329	IMPACT EXTENT
740	533342.757	67247.448	IMPACT EXTENT
741	533530.692	67201.045	IMPACT EXTENT
742	533561.402	67136.487	IMPACT EXTENT
743	533539.81	67127.31	IMPACT EXTENT
746	532274	64929.1	IMPACT EXTENT
747	532245.42	64885.45	IMPACT EXTENT
748	532160.974	64758.394	IMPACT EXTENT
749	532148.586	64724.627	IMPACT EXTENT
750	532731.24	64724.82	IMPACT EXTENT
751	532727.27	64688.31	IMPACT EXTENT
752	532727.27	64672.83	IMPACT EXTENT
753	532687.58	64666.08	IMPACT EXTENT
754	532646.31	64664.49	IMPACT EXTENT
755	532611.38	64661.71	IMPACT EXTENT
756	532600.27	64670.05	IMPACT EXTENT
763	532731.84	64781.68	IMPACT EXTENT
764	532743.95	64821.41	IMPACT EXTENT
765	532718.41	64883.3	IMPACT EXTENT
766	532667.15	64893.13	IMPACT EXTENT
767	532620.18	64906.88	IMPACT EXTENT
768	532546.5	64908.84	IMPACT EXTENT

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769	532475.77	64925.54	IMPACT EXTENT
770	532378.51	64925.54	IMPACT EXTENT
771	532304.83	64939.3	IMPACT EXTENT
772	532513.1	64641.64	IMPACT EXTENT
773	532443.35	64654.41	IMPACT EXTENT
774	532401.11	64642.62	IMPACT EXTENT
775	532295.99	64638.69	IMPACT EXTENT
100	532329.45	65031.51	IMPACT EXTENT
101	532427.35	65322.56	IMPACT EXTENT
102	532599.33	65611.48	IMPACT EXTENT
103	532646.6	65788.75	IMPACT EXTENT
104	532657.54	65905.17	IMPACT EXTENT
105	532607.27	66035.35	IMPACT EXTENT
106	532427.35	66186.16	IMPACT EXTENT
107	532226.27	66244.37	IMPACT EXTENT
108	532001.37	66247.01	IMPACT EXTENT
109	531863.79	66215.26	IMPACT EXTENT
110	531794.99	66183.51	IMPACT EXTENT
111	531612.43	66138.53	IMPACT EXTENT
112	531464.26	66117.37	IMPACT EXTENT
113	531387.54	66090.91	IMPACT EXTENT
114	531310.28	66151.5	IMPACT EXTENT
115	531172.69	66286.44	IMPACT EXTENT
116	531013.94	66572.19	IMPACT EXTENT
117	530976.9	66730.94	IMPACT EXTENT
118	531019.23	66812.96	IMPACT EXTENT
119	531051.14	66404.23	IMPACT EXTENT
120	530936.84	66730.2	IMPACT EXTENT
121	531158.5	66936.74	IMPACT EXTENT
122	531674.45	67052.5	IMPACT EXTENT
123	531965.48	67168.25	IMPACT EXTENT
124	532084.54	67307.16	IMPACT EXTENT
125	532177.15	67426.22	IMPACT EXTENT
126	532633.55	67446.07	IMPACT EXTENT
127	532851.83	67310.48	IMPACT EXTENT
128	533410.77	67151.72	IMPACT EXTENT
129	533225.56	67191.4	IMPACT EXTENT
130	533116.42	67194.71	IMPACT EXTENT
131	532871.68	67244.32	IMPACT EXTENT
132	532696.39	67343.54	IMPACT EXTENT
133	532617.02	67436.14	IMPACT EXTENT
134	532481.42	67436.14	IMPACT EXTENT
135	532441.73	67455.99	IMPACT EXTENT
136	532243.29	67439.45	IMPACT EXTENT
137	532167.22	67383.23	IMPACT EXTENT
138	532008.47	67088.88	IMPACT EXTENT
139	531889.41	67019.43	IMPACT EXTENT
140	531690.97	66966.51	IMPACT EXTENT
141	531297.4	66890.44	IMPACT EXTENT
142	531115.5	66867.29	IMPACT EXTENT

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143	531089.04	66857.38	IMPACT EXTENT
144	53099.9	66440	IMPACT EXTENT
145	53108245	66440.66	IMPACT EXTENT
146	531967.52	67152.12	IMPACT EXTENT
147	532473.47	67483.26	IMPACT EXTENT
148	531705.97	66968.07	IMPACT EXTENT
149	531082.61	66432.34	IMPACT EXTENT
150	532092.24	64575.38	IMPACT EXTENT

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G. INCIDENT INFORMATION:

20. Impacted Area Details

- Total calculated area of impact 60.59 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>ON GOING</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 9840 m^2
- ii. Average Depth (m) of pool of free phase oil 0.808 m
- iii. Emulsification factor: 30%

iv.

Estimated Volume of pool of free phase oil. V_{pool} :	<u>346.60</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: 1.10 m
- iii. Soil type: CLAY iv. P_e (effective porosity of the soil): 8%
- v. Cause of spill: THIRD PARTY vi. Oil type: BUNNY MEDIUM
- vii. Oil Residence time on site, day: FOURTH DAY
- viii. Average depth of infiltration below leaking facility i.e. pipeline/flowline: 0.0011 m
- ix. Estimated depth of infiltration around spill point: 1.1011 m

x.

Estimated Volume of infiltrated oil at spill point. $V_{inf a}$:	<u>11.08</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: NIL
- ii. Average Depth (m) above leaking facility i.e. pipeline/flowline: NIL
- iii. Soil type: NIL iv. P_e (effective porosity of the soil): NIL
- v. Cause of spill: NIL vi. Oil type: NIL
- vii. Oil Residence time on site, day: NIL
- viii. Average depth of infiltration below leaking facility i.e. pipeline/flowline: NIL
- ix. Estimated depth of infiltration around spill point: NIL

Estimated Volume of infiltrated oil at spill point. $V_{inf b}$:	<u>NOT APPLICABLE</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: 128,540.00m²
- ii. Area (m²) of the pool of free phase oil in touch with soil: NIL
- iii. Average Depth (m) below ground surface of infiltration of oil: 0.0011m
- iv. Soil type: CLAY
- v. P_e (effective porosity of the soil): 8%
- vi.

Estimated Volume of infiltrated oil. At V _{inf} :	<u>70.88</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: 467,500.00m²
- 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		
Silvery	0.00008		
Slight Color	0.00015		
Bright Color	0.0003	20%	0.0281
Dull	0.001	70%	0.3275
Dark	0.002	10%	0.0935
Black oil	0.1		
Emulsion (30% Oil)	1		
Percent Total		100%	<u>0.4486m³</u>

- iii.

Estimated Volume of oil on open water. V _{wat} :	<u>2.82</u>	Barrels
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24. Calculation of evaporated volume:

- i. Estimated Volume available for evaporation within surface area: 431.39 BARRELS
- ii. E-Factor: 15%
- iii.

Estimated Volume of evaporated oil. V _{evap} :	<u>76.13</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%

<p>25. Net Estimated Spilled Volume V_{Est}(bbls) = V_{evap}(bbls) + V_{wat}(bbls) + V_{inf}(bbls) + V_{pool}(bbls) + V_{refl}(bbls) = <u>76.13 + 2.82 + 81.97 + 346.60 + NIL</u> <u>= 507.52 BARRELS</u></p> <p>Estimated Reported Volume** V_{rep}(bbls)= <u>508 BARRELS.</u></p>

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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 <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 13 / 06 / 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

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28. Appendix 1: Overview sketch of the site

Location: 28* Bomu - BONNY TRANS NIGER PIPELINE AT BODO WEST

