

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED.

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 1021225 JIV report S/N: 0176

(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: 1021225 2. Type of incident* Oil Spill
 3. Name of Location 24" CANTHORNE CHANNEL LOOP LINE TIE-IN MANIFOLD
 4. Name of nearest community LOMATOKU 5. State: RIVERS 6. LGA BONNY
 7. Type of Production facility/Installation MANIFOLD 8. Asset owner/District PIPELINE

B. INCIDENT INFORMATION:

9. Details of incident

- a. Date of incident: 1st AUGUST 2013
 b. Start date/time of investigation: 1st AUGUST 2013: 13:00 Hours
 c. Investigation End date: 1st AUGUST 2013 Actual investigation duration, days: ONE DAY

d. Description of spill point environment

- Firmed soil Loose soil Recently excavated area
 Under water Swampy Exposed pipe surface
 Well Platform (on Water) MANIFOLD PLATFORM Drill Rig

e. Description of leak point (tick as applicable), Oil Water

- 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) MISSING PRESSURE GAUGE WITH FLANGE

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>Mining Mid Belt</u>	
Northing:	Easting:
<u>60958.54mN</u>	<u>510915.20mE</u>

C. RISK ASSESSMENT

10. Type of environment:

- Land Swamp Water Seasonal swamp Shoreline/Waterfront

i. Type of environment to which oil has spread: NOT APPLICABLE

- 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). MANGROVE

12. Containment measures put in place;

- Booms Trench Dyke Natural depression Pit
 Others: NO OIL SEEN AS AT TIME OF JOINT INVESTIGATION VISIT.

13. Any pictures or video coverage? [N]

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

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>NO IMPACT FOUND</u>			
		<u>AS TIME OF JOINT INVESTIGATION VISIT</u>			

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16. Crops/Economic Trees

S/N	Type of crops	Young	Medium	Matured	Quantity	Comments
	NO IMPACT FOUND AS AT TIME OF					
	JOINT INVESTIGATION VISIT					

17. Fish/Nets/Ponds

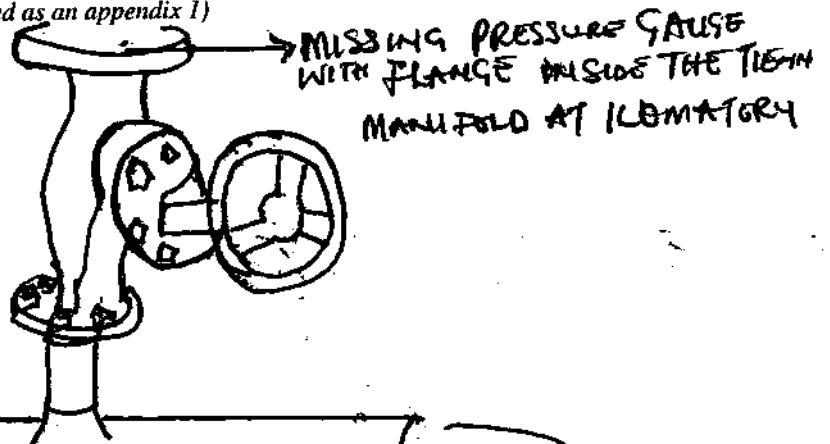
S/N	Fish/Nets/Ponds	Description	Quantity/Size	Comments
	NO IMPACT FOUND AS AT TIME			
	OF JOINT INVESTIGATION VISIT			

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

S/N	Others	Description	Quantity/Size	Comments
	NO IMPACT FOUND AS AT TIME			
	OF JOINT INVESTIGATION VISIT			

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)

24" CANTHORNE CHANNEL LOOP LINE TIE-IN MANIFOLD AT ILOMATORY SHOWING MISSING PRESSURE GAUGE WITH FLANGE.



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G. INCIDENT INFORMATION:

20. Impacted Area Details

- Total calculated area of impact NIL
- Impact within SPDC R.O.W NIL
- Impact outside SPDC R.O.W NIL

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

Recovered oil V_{rec} :	<u>NIL</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 _____
- ii. Average Depth (m) of pool of free phase oil _____
- iii. Emulsification factor: _____
- iv. Estimated Volume of pool of free phase oil. V_{pool} APPLICABLE barrels

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: _____ 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: _____

x.

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

Estimated Volume of infiltrated oil. At V _{inf} :		barrels
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~~NOT APPLICABLE~~

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

24. Calculation of evaporated volume:

- i. Estimated Volume available for evaporation within surface area: NOT APPLICABLE
- ii. E-Factor: _____
- iii.

Estimated Volume of evaporated oil. V _{evap} :	<u>Nil</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_{rec} (bbls) =
SEE APPENDIX 1 ATTACHED

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

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

27. REPRESENTATIVES

This report was filled, agreed and signed on the <u>15/08/2013</u> by joint investigation representatives from
<ul style="list-style-type: none">• Host Community: <input checked="" type="checkbox"/>• Department of Petroleum Resources [DPR]: <input type="checkbox"/>• National Oil Spill Detection and Response Agency [NOSDRA]: <input checked="" type="checkbox"/>• State Ministry of Environment [SME]: <input checked="" type="checkbox"/>• Nigeria Police Force [NPF]: <input checked="" type="checkbox"/>• Shell Petroleum Development Company [SPDC]: <input checked="" type="checkbox"/>• Signatories agree with reported findings: <input checked="" type="checkbox"/>• Separate DPR form has been filled out with same findings <input type="checkbox"/>
Tick as applicable

Appendix 1

Notes from the JIV to Cawthorne Channel Tie-in Manifold at Ilomatoru

Incident date: 6th August 2013

Date of the JIV

15 th August 2013	JIV team mobilized to site and JIV was successfully conducted. The JIV team agreed that the incident was caused by Third party interference. JIV form was signed by the regulators and community reps.
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Cause of spill

- The incident was agreed to have been caused due to Third party interference (missing pressure gauge with flange).

Area of impact

- On the day (15th August 2013) of investigation no residual impact was observed on site. The team assumed that the impact could have been washed away by the tidal influence because spill point was on top of water platform.

Volume spilled

No residual impact was observed on site at time of investigation, as most of the oil spilled could not be seen in the environment; hence direct assessment method as contained in our standard JIV report could not be used.

Assumptions for the calculation of spilled volume was done based on the equation:

- The pressure differential Δp ($p - p_a$) at spill point is up to 40788.65 kg force per $m^2 = 4\text{bar}$.
- Bonny light is the crude in the line and the density (ρ_{liq}) is 850 kg per m^3
- Time (T) from the start to the end of the oil leakage was 10800sec.
- Surface area of the holes (A_0) on the line is taken to be $0.0005m^2$ (as was measured on site).
- Standard discharge coefficient (C_d) is taken as 0.62
- The fraction (f) of oil in the pipe during the incident is taken as 80%
- Using the spill formula:

$$AoTCd \sqrt{\frac{2(p - p_a)}{\rho_{liq}}} f$$

Taking into consideration the % of oil in the line, the time that the spill was seen and the time the stations were shut in, total volume spilled is estimated to be **165.04** barrels approximately **166** barrels.

Therefore estimated spilled volume is 166 barrels

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28. Appendix 1: Overview sketch of the site

