

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED.

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 1088800 JIV report S/N: 0448

(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: 1088800 2. Type of incident* OIL SPILL
 3. Name of Location 20" OTUMARA - ESCRAVOS PIPELINE
 4. Name of nearest community ADJUDABO 5. State: DELTA 6. LGA WARRI SOUTH-WEST
 7. Type of Production facility/Installation OIL PIPELINE 8. Asset owner/District PIPELINE

B. INCIDENT INFORMATION:

9. Details of incident

- a. Date of incident: 16TH DECEMBER 2013
 b. Start date/time of investigation: 14TH DECEMBER 2013 AT 1409HRS
 c. Investigation End date: 17TH DEC. 2013 Actual investigation duration, days: 1 DAY
 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>MUNNA (WEST BELT)</u>	
Northing:	Easting:
SPILL POINT 1: <u>174143 MN</u>	<u>309091 ME</u>
SPILL POINT 2: <u>172337 MN</u>	<u>308623 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 [,m]
- Fish Farm/Pond [,m]
- Fishing net [,m]
- Others (specify). [,m]

NONE WITHIN THE VICINITY

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:

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	PALM TREES	15	25	10	50	
	/	/	/	/	/	/
	/	/	/	/	/	/
	/	/	/	/	/	/

17. Fish/Nets/Ponds

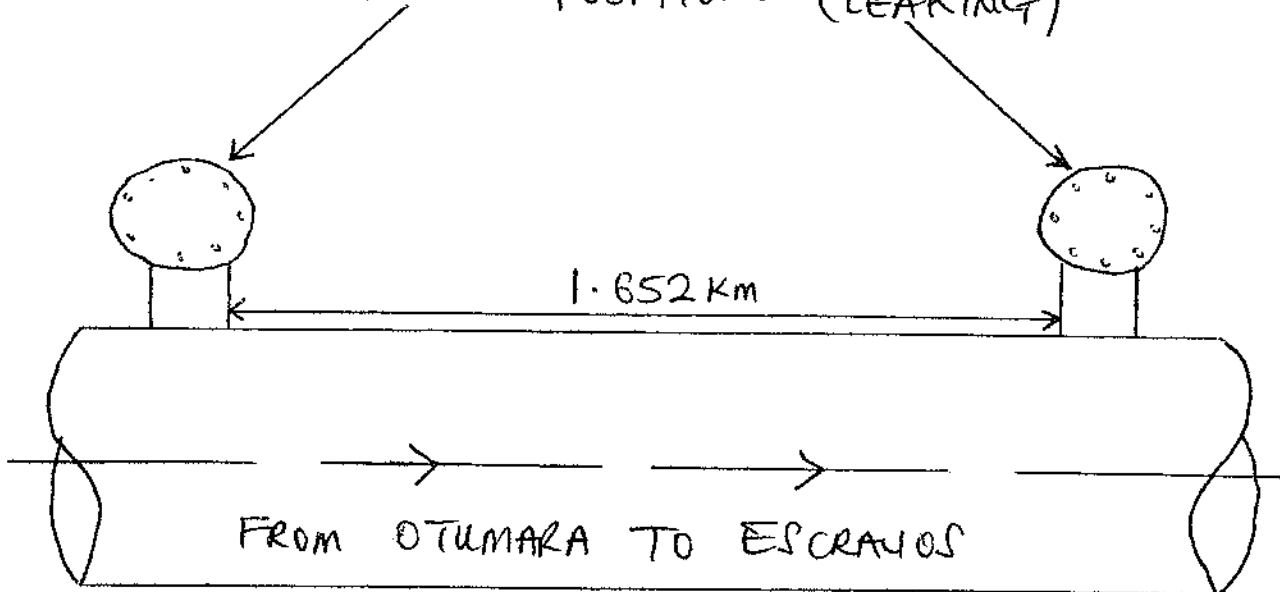
S/N	Fish/Nets/Ponds	Description	Quantity/Size	Comments
	NONE WITHIN AREA OF IMPACT			

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)

4" WELD-ON ILLEGAL HOT-TAP FLANGES AT 12 O'CLOCK POSITIONS (LEAKING)



20" OTUMARA-ESCRAVOS PIPELINE AT ADJUWAIBU

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)

MINNA (WEST BELT)

S/N	Northing (m)	Easting (m)
	174008	309060.7
	174014.2	309051.5
	174143.2	309088.3
	174155.5	309097.5
	174195.4	309106.7
	174192.4	309109.8
	172327.5	308613.5
	172401.3	308644.1
	172410.5	308628.8
	172315.8	308631.2

G. INCIDENT INFORMATION:

20. Impacted Area Details

- Total calculated area of impact 2900 m²
- Impact within SPDC R.O.W 2600 m²
- Impact outside SPDC R.O.W 300 m²

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

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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 2350 m^2
- ii. Average Depth (m) of pool of free phase oil 0.003 m
- iii. Emulsification factor: 30 %

iv.

Estimated Volume of pool of free phase oil. V_{pool} :	<u>31.04</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: _____ 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. $V_{inf a}$:	<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. 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: 550 m^2
- ii. Area (m^2) of the pool of free phase oil in touch with soil: NOT APPLICABLE
- iii. Average Depth (m) below ground surface of infiltration of oil: 0.02 m
- iv. Soil type: LATERITE
- v. P_e (effective porosity of the soil): 20 %

vi.

Estimated Volume of infiltrated oil. At $V_{inf c}$:	<u>13.84</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

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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		
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		

NOT APPLICABLE

	Percent Total	100%
iii. 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: 44.88 BBLs
- ii. E-Factor: 15%

iii. Estimated Volume of evaporated oil. V_{evap} :	<u>7.92</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_{recl} (bbls) = 7.92 + 13.84 + 31.04 = 52.79 BBLs**

Estimated Reported Volume V_{rep} (bbls) = 53 BBLs**

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 $Volume (m3) \times 6.29$; **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 17/12/2013 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: 20" OTUMARA - ESORAU PIPELINE AT ADJUDAIBO

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