

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED.

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 1126447 JIV report S/N: 0232

(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: 1126447 2. Type of incident* OIL SPILL
 3. Name of Location OPUKUSHI WELL - 9T FLOWLINE
 4. Name of nearest community EGBEMO-ANGABIKI 5. State: BAYELSA 6. LGA EKEREMOR
 7. Type of Production facility/Installation FLOWLINE 8. Asset owner/District SWAMP 2

B. INCIDENT INFORMATION:

9. Details of incident

- a. Date of incident: 21ST FEBRUARY 2014
 b. Start date/time of investigation: 22ND FEBRUARY 2014 AT 1345 HRS
 c. Investigation End date: 22ND FEB. 2014 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) ACCIDENTAL FLOWLINE DAMAGE AT 3 O'CLOCK POSITION
 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> MINNA (WEST-BELT)	
Northings: <u>100992 mN</u>	Easting: <u>371544 mE</u>

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED.

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 1126447 JIV report S/N: 0232

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
- ☐ Drinking water source
- ☐ Built up area
- ☐ Farmlands
- ☐ Fish Farm/Pond
- ☐ Fishing net
- ☐ Others (specify).

[,m]
[,m]
[,m]
[,m]
[,m]
[,m]

NONE SEEN 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] ☒ [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

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED.

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 1126447 JIV report S/N:

0232

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16. Crops/Economic Trees

S/N	Type of crops	Young	Medium	Matured	Quantity	Comments
1	HARD WOOD	—	—	19	19	
2	OIL PALM	11	14	30	55	
3	RAFFIA PALM	—	20	18	38	
4	PLANTAIN	6	2	—	8	

17. Fish/Nets/Ponds

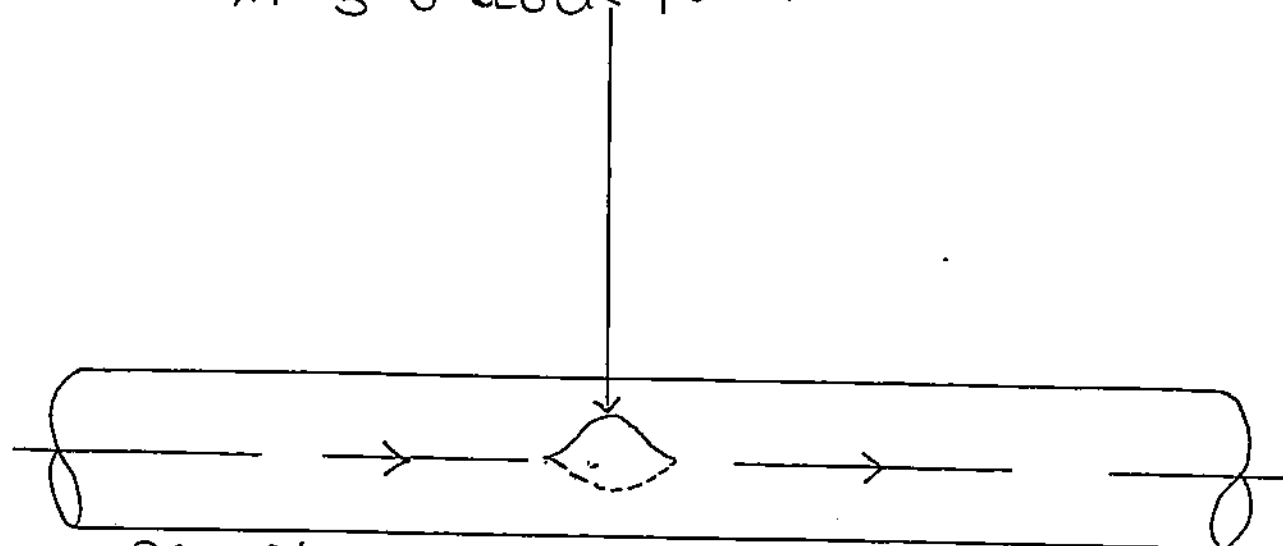
S/N	Fish/Nets/Ponds	Description	Quantity/Size	Comments
		NONE WITHIN AREA	OF IMPACT	

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)

ACCIDENTAL FLOWLINE DAMAGE (TEAR)
AT 3 O'CLOCK POSITION



OPUKUHI WELL - 9T FLOWLINE AT EGBEMO - ANGALABIRI

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED.

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 1126447 JIV report S/N: 0232

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 (WEST - BELT)

S/N	Northing (m)	Easting (m)
1.	100987	371550
2.	100983	371544
3.	100964	371553
4.	100956	371563
5.	100965	371577
6.	100969	371579
7.	100978	371588
8.	100979	371560
9.	100990	371542
10.	100992	371537
11.	100971	371491
12.	100965	371489
13.	100997	371534
14.	100994	371536
15.	100996	371539
16.	101000	371538
17.	100987	371534
18.	100999	371537
19.	100984	371556
20.	100980	371575

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED.

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 1126447 JIV report S/N: 0232

G. INCIDENT INFORMATION:

20. Impacted Area Details

- Total calculated area of impact 1018 m²
- Impact within SPDC R.O.W 714 m²
- Impact outside SPDC R.O.W 304 m²

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 (m²) occupied by pool of free phase oil 384 m²
- ii. Average Depth (m) of pool of free phase oil 0.01 m
- iii. Emulsification factor: 30 %
- iv.

Estimated Volume of pool of free phase oil. V_{pool} :	<u>16.91</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* (m²) of soil covered by the oil: 4 m²
- ii. Average Depth (m) above leaking facility i.e. pipeline/flowline: 0.3 m
- iii. Soil type: LATERITE iv. P_e (effective porosity of the soil): 20 %
- v. Cause of spill: OPERATIONAL vi. Oil type: BONNY MEDIUM
- vii. Oil Residence time on site, day: 1 DAY
- viii. Average depth of infiltration below leaking facility i.e. pipeline/flowline: 0.0064 m
- ix. Estimated depth of infiltration around spill point: 0.3064 m

X.	Estimated Volume of infiltrated oil at spill point. $V_{inf a}$:	1.54	barrels
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2. Estimated Volume of infiltrated oil at second spill point [if applicable] ($V_{inf b}$)

- i. Area* (m²) of soil covered by the oil: APPLICABLE
- ii. Average Depth (m) above leaking facility i.e. pipeline/flowline: APPLICABLE
- iii. Soil type: APPLICABLE iv. P_e (effective porosity of the soil): APPLICABLE
- v. Cause of spill: APPLICABLE vi. Oil type: APPLICABLE
- vii. Oil Residence time on site, days: APPLICABLE
- viii. Average depth of infiltration below leaking facility i.e. pipeline/flowline: APPLICABLE
- ix. Estimated depth of infiltration around spill point: APPLICABLE

Estimated Volume of infiltrated oil at spill point. $V_{inf,b}$:	NIL	barrels
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3. Estimated Volume of infiltrated oil outside immediate spill point(s) region ($V_{inf c}$)

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED.

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 1126447 JIV report S/N: 0232

- i. Area (m²) of soil covered by the oil: 630m²
- ii. Area (m²) of the pool of free phase oil in touch with soil: NOT APPLICABLE
- iii. Average Depth (m) below ground surface of infiltration of oil: 0.0009m
- iv. Soil type: LATERITE
- v. P_e (effective porosity of the soil): 20 %
- vi.

Estimated Volume of infiltrated oil. At V_{inf} :	<u>0.72</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
- 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		
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} :	<u>NIL</u>
	Barrels

24. Calculation of evaporated volume:

- i. Estimated Volume available for evaporation within surface area: 19.17 BBLs
- ii. E-Factor: 15 %
- iii.

Estimated Volume of evaporated oil. V_{evap} :	<u>3.38</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_{rej} (bbls) = $3.38 + 2.27 + 16.91 = 22.56$ BBLs

Estimated Reported Volume V_{rep} (bbls) = 23 BBLs**

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JOINT INVESTIGATION REPORT FOR INCIDENT NO: 1126447 JIV report S/N: 0232

*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 ☐

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 22/02/2014 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

