

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED.

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 1324519 JIV report S/N: 00824

(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: 1324519 2. Type of incident* OIL SPILL/FIRE
 3. Name of Location CAWTHORNE CHANNEL 1 WELL 9
 4. Name of nearest community CAPTAINKIRI 5. State: RIVERS 6. LGA DEGEMA
 7. Type of Production facility/Installation WELL HEAD 8. Asset owner/District SWAMP 1

B. INCIDENT INFORMATION:

9. Details of incident

- a. Date of incident: 25TH JANUARY, 2015
 b. Start date/time of investigation: 28TH JANUARY, 2015 / 12:25 HOURS
28TH JANUARY,
 c. Investigation End date: 2015 Actual investigation duration, days: ONE (1) DAY
 d. Description of spill point environment

- | | | |
|--|-------------------------------------|--|
| <input type="checkbox"/> Firmed soil | <input type="checkbox"/> Loose soil | <input type="checkbox"/> Recently excavated area |
| <input type="checkbox"/> Under water | <input type="checkbox"/> Swampy | <input type="checkbox"/> Exposed pipe surface |
| <input checked="" type="checkbox"/> Well Platform (on Water) | | <input type="checkbox"/> Drill Rig |

Additional observations around the spill point: **ON ARRIVAL AT SITE, THE JOINT INVESTIGATION TEAM WAS SHOWN BY THE SPDC ASSET OWNER, THE POSITION OF AN UNKNOWN THIRD PARTY CRUDE OIL BARGE (WHICH WAS CONFISCATED BY SECURITY PERSONNEL AND TAKEN AWAY FROM SITE PRIOR TO JIV DATE) THAT WAS OBSERVED BY THE WELL 9 SLOT AS AT TIME OF INCIDENT REPORT. ON CLOSER OBSERVATION OF WELL 9**

- e. Description of leak point (tick as applicable); **THE YEAR, 2001), ITS VALVES WERE NOTICED BLACKENED DUE TO A FIRE OUTBREAK THAT OCCURRED ON INCIDENT DATE BUT HAD GONE OFF PRIOR TO JIV DATE. BURNT OIL STAINS WERE NOTICED WITHIN THE POSITION OF THE BEAN BOX COVER (LEAK POINT) WHICH HAD BEEN REMOVED AND RE-FABRICATED (AS EXPLAINED BY THE ASSET OWNER) BY UNKNOWN PERSON(S). SOME ILLEGAL ITEMS LEFT (AND OBSERVED ON SITE AT TIME OF INCIDENT) BY UNKNOWN PERSON(S) BUT RECOVERED BY THE ASSET OWNER, PRIOR TO JIV, FROM SITE (TO PREVENT FURTHER USAGE OR REMOVAL BY SUSPECTED CRUDE OIL THIEVES) WERE DISPLAYED AT THE ASSET OWNER'S OFFICE, AND COMPRISED A PEN KNIFE, BURNT HOSE, LIFTING BELT, STEEL HAMMER, RE-FABRICATED BEAN BOX COVER OR CAP WITH CRUDE THEFT CONNECTIONS, A TORCH LIGHT AND A BURNT TWINE ROPE. SOIL IMPACTED ON SWAMP AT SITE IS SILTY CLAY WITH ORGANIC MATTER.**
- | | | |
|---|--|--|
| <input type="checkbox"/> Drilled hole | <input type="checkbox"/> Hack saw cut | <input type="checkbox"/> Tear (_____) |
| <input type="checkbox"/> Complete Rupture | <input type="checkbox"/> Inward dent, | <input type="checkbox"/> Well head tampering |
| <input type="checkbox"/> Failed Weld-on illegal hot tap valve, | <input type="checkbox"/> Failed Clamp | <input type="checkbox"/> Missing Pipeline/Flowline |
| <input type="checkbox"/> Crude oil theft (illegal bunkering) point, | | <input type="checkbox"/> Third party tampering with Clamp |
| <input type="checkbox"/> Third party tampering with valve setting, | | <input type="checkbox"/> Third party tampering with flange, |
| <input type="checkbox"/> Corrosion | <input type="checkbox"/> Saver-pit over flow, | <input type="checkbox"/> Surge vessel overflow, |
| <input type="checkbox"/> Bulging Outward | <input type="checkbox"/> Flare System/Bund wall failure | <input type="checkbox"/> Accidental 3 rd party equipment of |
| impact <input type="checkbox"/> Valve Failure | <input type="checkbox"/> com unit failure | <input type="checkbox"/> Cold vent |
| <input type="checkbox"/> Relief valve failure | <input checked="" type="checkbox"/> Others (specify) BEAN BOX CAP REMOVAL BY UNKNOWN PERSON(S). | |

- f. Incident caused by:
 Third party interference (Sabotage); crude theft; Line theft; Accidental 3rd party damage (AS EXPLAINED BY THE ASSET OWNER) BY UNKNOWN PERSON(S). SOME ILLEGAL ITEMS LEFT (AND OBSERVED ON SITE AT TIME OF INCIDENT) BY UNKNOWN PERSON(S) BUT RECOVERED BY THE ASSET OWNER, PRIOR TO JIV, FROM SITE (TO PREVENT FURTHER USAGE OR REMOVAL BY SUSPECTED CRUDE OIL THIEVES) WERE DISPLAYED AT THE ASSET OWNER'S OFFICE, AND COMPRISED A PEN KNIFE, BURNT HOSE, LIFTING BELT, STEEL HAMMER, RE-FABRICATED BEAN BOX COVER OR CAP WITH CRUDE THEFT CONNECTIONS, A TORCH LIGHT AND A BURNT TWINE ROPE. SOIL IMPACTED ON SWAMP AT SITE IS SILTY CLAY WITH ORGANIC MATTER.
 Operational Others (including Mystery spills)

*This can be: a) Oil Spill b) Drilling fluid/Chemical c) Siltation d) construction e) Encroachment f) Fire.

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g. Spill point coordinates

Measuring unit <input checked="" type="checkbox"/> (W)		<u>Minna Mid belt</u>	
Northing:		Easting:	
<u>60485.93</u>		<u>508379.40</u>	
<u>[Signature]</u>		<u>[Signature]</u>	

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). **MANGROVE VEGETATION** [,m]

IMPACTED BY SPILL.

12. Containment measures put in place;

- Booms Trench Dyke Natural depression Pit None
 Others: _____

13. Any pictures or video coverage? [] []

14. Further response/repair initiated as at the time of JIV? [] []

If yes to item 14, give brief description:

NOT APPLICABLE

15. Was there any disruption to the investigation? [] []

If yes to item 15 give brief description:

NOT APPLICABLE

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D. TYPE/NUMBERS OF PROPERTIES, IF ANY, FOUND WITHIN THE AREA OF SPREAD OF OIL

16. Structures / Properties

S/N	Type of Structures	Description	Size	Number	Comments
NONE WITHIN AREA OF IMPACT					

17. Crops/Economic Trees

S/N	Type of crops	Young	Medium	Matured	Quantity	Comments
1.	MANGROVE VEGETATION	✓	✓	✓	WITHIN AN IMPACTED AREA OF 7.33Ha.	IMPACTED BY SPILL

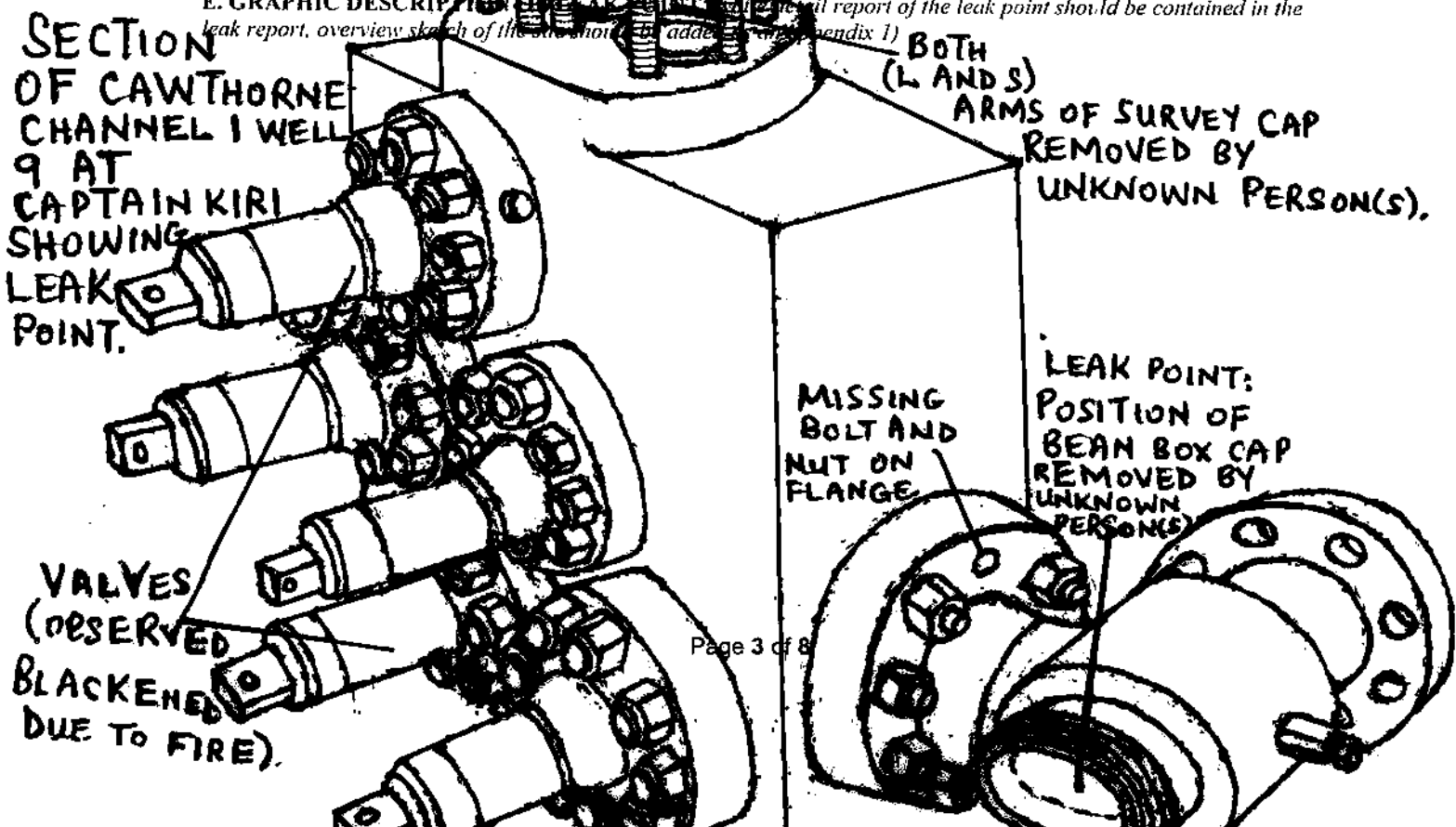
18. Fish/Nets/Ponds

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

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

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

E. GRAPHIC DESCRIPTION OF THE LEAK POINT (An overview report of the leak point should be contained in the leak report, overview sketch of the situation (add as Appendix 1))



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F: TABLE SHOWING SOME OF COORDINATES TAKEN DURING JIV FOR AREA CALCULATION

20. Impacted area boundary Coordinates (If more, Print and attach as an appendix)

MINNA MID BELT

S/N	Northing (m)	Easting (m)
	60321.97	508207.25
	60346.56	508201.13
	60358.88	508185.75
	60536.75	508330.99
	60683.98	508442.28
	60733.07	508473.21
	60435.19	508423.28
	60444.71	508275.32
	60300.48	508201.04
	60254.31	508244.11
	60201.96	508308.74
	60167.37	508409.03
	60122.11	508299.33
	60134.46	508268.52
	60162.21	508216.17
	60263.82	508102.32
	60330.35	508068.25
	60802.63	508536.83
	60784.11	508647.95
	60735.96	508749.82
	60628.54	508681.29
	60541.49	50860.91
	60439.63	508542.38
	60321.09	508375.69

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G. INCIDENT INFORMATION:

20. Impacted Area Details

- Total calculated area of impact OIL STAINS ON LAND = 7.33HA
OIL STAINS ON WATER = 4.73HA
OIL SHEEN ON WATER = 2.93HA } / 14.99HA
- 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>NIL</u>	Barrels
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Controlled recovery/evacuation from source with no impact to environment:

<u>NIL</u>	Barrels
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22. Net Estimated Spilled Volume V_{est} (bbls)* =	<u>69.29</u>
Estimated Reported Volume** V_{rep} (bbls) =	<u>70 BARRELS</u>

***Notes:**

- Volume estimation was done using an excel based tool. (see attached for details on the calculation)
- Reported spilled volume is an estimate

Write other relevant notes taken into consideration for estimating the spilled in the box below:

IN CONSIDERATION OF THE FIRE INCIDENT ACCOMPANYING THE SPILL, THE NET ESTIMATED SPILLED VOLUME (IN TOTAL) IS INCLUSIVE OF THE ESTIMATED SPILLED VOLUME CONSUMED BY FIRE, AS EXPLAINED IN THE ATTACHED SPILLED VOLUME ESTIMATION DETAILS.

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.

ESTIMATION OF OIL SPILL VOLUME

A OIL SPILLED ONSHORE/OFFSHORE (Leak stopped at source)

Impacted Area Details

Total Calculated Area of Impact

149,900.00 m²

i Impact within SPDC R.O.W

m²

ii Impact outside SPDC R.O.W

m²

1 Volume of oil recovered before completion of JIV (V_{rec})

i Estimated Recovered oil (Net)

m³

Estimated Recovered oil (Net) V_{rec} 0.00 bbls

2 Computation of estimated residual volume on site

a Computation of volume of free phase oil (on land or confined water body)

i Total area occupied by pool of free phase oil

3,200.00 m²

ii Average depth of pool of free phase oil

0.002 m

iii Emulsification factor (if applicable, else 0%)

70 %

Estimated Volume of pool of free phase oil, V_{pool} 1.92 m³

Estimated Volume of pool of free phase oil, V_{pool} 12.08 bbls

b Computation of estimated volume of infiltrated oil in the soil (V_{inf})

1 Volume of infiltrated oil at spill point (V_{inf a})

i Total area covered by the oil (infiltration)

m²

ii Average depth of infiltration above leaking facility i.e. pipeline/flowline

m

iii Soil type

Silty or sandy clay

iv P_e (effective porosity of the soil)

12 %

v Cause of spill

Third party interference

vi Calculation of days for infiltration below the leaking point on pipeline or flowline

Incident Date	JIV Date	Days on Site
1/25/2015 3:20	1/28/2015 12:45	3
If 'cause of spill' is operational, use 1 week as worst case scenario except where 'days on site' exceeds 7.		7

Infiltration of oil types in various soil types vs time.			
Soil type	Approximate time to reach 1m depth below ground level		
	Sand	Loam	Clay
Bonny Medium	3 weeks	3 years	> 10 years
Bonny Light	2 days	2 months	> 10 years

vii Oil type

Bonny Light

viii Average depth of infiltration below leaking facility i.e. pipeline/flowline

0.001 m

ix Total depth below ground surface of infiltration of oil

0.001 m

Estimated Volume of infiltrated oil, V_{inf a} 0.00 m³

Estimated Volume of infiltrated oil, V_{inf a} 0.00 bbls

2 Volume of infiltrated oil at second spill point [if applicable] (V_{inf b})

i Total area covered by the oil (infiltration)

m²

ii Average depth of infiltration above leaking facility i.e. pipeline/flowline

m

iii Soil type

- Select -

iv P_e (effective porosity of the soil)

0 %

v Average depth of infiltration below leaking facility i.e. pipeline/flowline

0.000 m

vi Total depth below ground surface of infiltration of oil

0.000 m

Estimated Volume of Infiltrated oil, V_{inf b} 0.00 m³

Estimated Volume of Infiltrated oil, V_{inf b} 0.00 bbls

3 Volume of infiltrated oil outside immediate spill point(s) region (V_{inc})

- i Total Area covered by the oil (infiltration) 19,500.00 m²
- ii Total Area of the pool of free phase oil in touch with soil m²
- iii Soil type Silty or sandy clay ▼
- iv P_e (effective porosity of the soil) 12 %
- v Average depth below ground surface of infiltration of oil 0.001 m

Estimated Volume of infiltrated oil, V_{inc} 1.92 m³
Estimated Volume of infiltrated oil, V_{inc} 12.10 bbls

4 Volume of infiltrated oil outside immediate spill point(s) region (superficial impact, V_{ind})

- i Total Area covered by the oil (infiltration) 50,600.00 m²
- ii Total Area of the pool of free phase oil in touch with soil m²
- iii Average depth below ground surface of infiltration of oil 0.001 m

Estimated Volume of infiltrated oil, V_{ind} 3.33 m³
Estimated Volume of infiltrated oil, V_{ind} 20.93 bbls

Estimated Total Volume of infiltrated oil, V_{int} 5.25 m³
Estimated Total Volume of infiltrated oil, V_{int} 33.03 bbls

c Computation of volume of oil on open water based on standard coloration

- i Total area of oil on open water 76,600.00 m²
- ii Table of average depth of oil on water based on coloration

[Link to Coverage Visual](#)

Spill Factors from USCG FOG (2000 Edition)

	Thickness (mm)	Percentage coverage (%)	Volume (m3)
Barely Visible	0.00004	80%	0.0025
Silvery	0.00008		0.0000
Slight Color	0.00015		0.0000
Bright Color	0.0003	15%	0.0034
Dull	0.003		0.0000
Dark	0.002	5%	0.0077
Black oil	0.1		0.0000
Emulsion (30% Oil)	1		0.0000
Percent Total:		100%	0.0136

Estimated Volume of oil on open water, V_{wat} 0.01 m³
Estimated Volume of oil on open water, V_{wat} 0.09 bbls

3 Calculation of evaporated volume

Evaporation Factors (E-Factor) for SPDC Crude oil		
Residence time of spilled oil (days on site)	Oil type	
	Bonny Light	Bonny Medium
< 1 day	10%	5%
1-7 days	25%	15%
> 7 days	40%	25%

- i Was oil recovery before JIV completion done before JIV date? No ▼
- ii Estimated volume available for evaporation 45.19 bbls
- iii E-factor 25 %

Estimated Volume of evaporated oil, V_{evap} 15.06 bbls

Net Total Estimated Spilled Volume, V_{Est} 60.25 bbls

NOTE: The spill incident was accompanied by a fire incident, hence an estimate (taken as 20% of the computed spilled volume available for evaporation) is hereby made for the spilled volume consumed by fire. Thus, 20% x 45.19 = 9.04 barrels. Therefore, the total spilled volume (including that burnt by fire) = net estimated spilled volume (without fire) + estimated spilled volume consumed by fire = 60.25 + 9.04 = 69.29 barrels.

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23. GENERAL STATUS OF THE SITE

A. Joint investigation of the incident site found that there is no residual impact after the initial response and JIT 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"/>

24. REPRESENTATIVES

This report was filed, agreed and signed by the following joint investigation representatives:

- 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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25. Appendix 1: Overview sketch of the site

