

JOINT INVESTIGATION REPORT

INCIDENT NO: 2512915 JIV report S/N: 1030205

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

A. GENERAL INFORMATION:

1. Fountain Incident Number: 2512915 2. Type of incident* OIL SPILL
 3. Name of Location 14th OKORONIA - RUMUEKPE PIPELINE
 4. Name of nearest community ULA - OKOBO 5. State: RIVERS 6. LGA AHOADA WEST
 7. Type of Production facility/Installation OIL PIPELINE
 8. Asset owner/District THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED (SPDC)/PIPELINE

B. INCIDENT INFORMATION:

9. Details of incident
 a. Date Reported: 23RD NOVEMBER, 2019
 b. Start date/time of investigation: 24TH NOVEMBER, 2019/1305HRS
 c. Investigation End date: 24TH NOVEMBER, 2019 Actual investigation duration, days: ONE (1) DAY
 d. Description of spill point environment

- | | | |
|--|--|--|
| <input type="checkbox"/> Firm soil | <input checked="" 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: THIS SPILL INCIDENT (2512915) WAS OVERLAPPED WITHIN A DISTANCE OF 10 METERS BY ANOTHER SPILL INCIDENT (2512912) HENCE BOTH INCIDENTS ARE COVERED IN THIS JIV REPORT.

e. Description of leak point (tick as applicable);

- | | | |
|---|---|--|
| <input checked="" 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"/> Wellhead 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"/> Saver-pit over flow | <input type="checkbox"/> Third party tampering with Clamp |
| <input type="checkbox"/> Third party tampering with valve setting | <input type="checkbox"/> Bulging Outward | <input type="checkbox"/> Third party tampering with flange, |
| <input type="checkbox"/> Flare System/Bund wall failure | <input type="checkbox"/> Cold vent | <input type="checkbox"/> Surge vessel overflow, |
| <input type="checkbox"/> Valve Failure. | <input type="checkbox"/> Relief valve failure | <input type="checkbox"/> Accidental 3 rd party equipment impact |
| <input type="checkbox"/> Others (specify) _____ | | |

f. Incident caused by:

- Third party interference (Sabotage ; crude theft ; Line theft ; Accidental 3rd party damage
 Operational Others (including Mystery spills) _____

*This can be: a) Oil Spill b) Drilling fluid/Chemical c) Siltation d) construction e) Encroachment f) Fire, g) non leaking Theft point removal
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g. Spill point coordinates

h. Measuring unit

WGS 84

Northing:	Easting:
LATITUDE	LONGITUDE
5.068426	6.565311
5.068488	6.565221

C. RISK ASSESSMENT.

10. Type of environment:

- Land
 Swamp
 Water
 Seasonal swamp
 Shoreline/Waterfront

i. Type of environment to which oil has spread:

- Land
 ^{SEASONAL} Swamp
 Water
 River (identify) _____

ii. Weather condition:

- Rain
 Sunny
 Dry
 Wet
 Windy
 Hot
 Cool

11. Distance to Sensitive habitat within 100m radius

- | | | | |
|--|---|-----|-----------------------------------|
| <input type="checkbox"/> Government reserved and designated protected area | [| ,m] | } NONE SEEN
WITHIN
VICINITY |
| <input type="checkbox"/> Drinking water source | [| ,m] | |
| <input type="checkbox"/> Built up area | [| ,m] | |
| <input type="checkbox"/> Farmlands | [| ,m] | |
| <input type="checkbox"/> Fish Farm/Pond | [| ,m] | |
| <input type="checkbox"/> Fishing net | [| ,m] | |
| <input type="checkbox"/> Others (specify): | [| ,m] | |

12. Containment measures put in place;

- Booms
 Trench
 Dyke
 Natural depression
 Pit
 None
- Others: _____

13. Any pictures or video coverage?

[N]

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

[N]

If yes to item 14, give brief description:

SPILL RESPONSE / LEAK REPAIR

15. Was there any disruption to the investigation?

[Y] [N]

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If yes to item 15 give brief description:

NOT APPLICABLE

16. Was JIV delayed?

[X] [✓]

If yes to item 16 give brief description:

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

17. Structures / Properties

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

18. Crops/Economic Trees

S/N	Type of crops	Young	Medium	Matured	Quantity	Comments
NONE WITHIN AREA OF IMPACT						

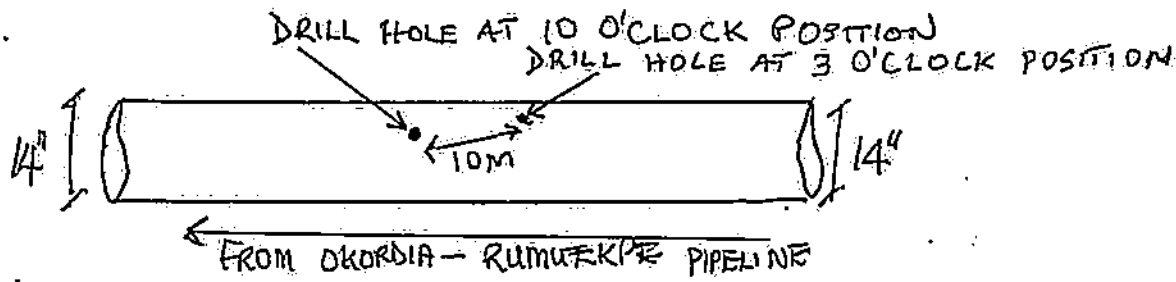
19. Fish/Nets/Ponds

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

20. 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) A SECTION OF 14" OKORDIA-RUMUWKPE PIPELINE AT ULA-OKOBO SHOWING 2 DRILL HOLES AT 3 O'CLOCK & 10 O'CLOCK POSITION BY UNKNOWN PERSON



14" Okordia-Rumukpe TL @ Ula Okobo
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PT_ID	LAT_Y	LONG_X
SP1	5.06843	6.565311
SP2	5.06849	6.565221
155	5.06851	6.56523
156	5.06853	6.56516
157	5.06858	6.56519
158	5.06848	6.56534
159	5.06844	6.56541
160	5.06844	6.56547
161	5.06838	6.56556
162	5.06831	6.56568
163	5.06839	6.56569
164	5.06854	6.56577
165	5.06856	6.56585
166	5.06865	6.5659
167	5.06873	6.56604
169	5.06845	6.56523
170	5.0684	6.56529
172	5.0683	6.56544
173	5.06814	6.56555
174	5.06812	6.56564
175	5.06814	6.56566
176	5.06873	6.566203
177	5.06806	6.565916
178	5.06815	6.565725
179	5.06828	6.565961
180	5.06848	6.566048
181	5.06869	6.566269



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G. INCIDENT INFORMATION:

a. Impacted Area Details

- Total calculated area of impact 0.32 Ha
- Impact within SPDC R.O.W. YES
- Impact outside SPDC R.O.W. YES

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

Recovered oil V_{rec} :	Barrels
<u>NIL</u>	

Controlled recovery/evacuation from source with no impact to environment:

<u>NIL</u>	Barrels
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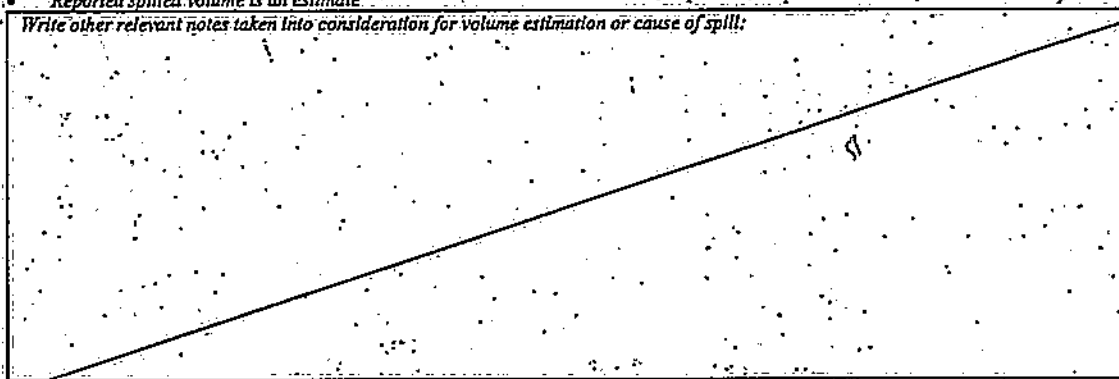
c. Net Estimated Spilled Volume V_{Est} (bbls)* =

<u>68.54 BARRELS</u>	
Estimated Reported Volume** V_{RM} (bbls) =	<u>69 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 volume estimation or cause of spill:



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 (m^3) \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.

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ESTIMATION OF OIL SPILL VOLUME

FID: 2512915 FOR 14" OKORDIA - RUMUEKPE PIPELINE AT ULA-OKOBO JIV SPILL VOLUME ESTIMATION

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

Impacted Area Details

Total Calculated Area of Impact 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) bbls

Estimated Recovered oil (Net), V_{rec} 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 m²
 ii Average depth of pool of free phase oil m
 iii Emulsification factor (If applicable, else 0%) %

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

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

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

i 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
 iv P_e (effective porosity of the soil) %

v Cause of spill

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

Incident Date	JIV Date	Days on Site
11/23/2019 11:00	11/24/2019 13:25	1
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.

Oil 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

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

ix Total depth below ground surface of infiltration of oil m

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

Estimated Volume of infiltrated oil, $V_{inf a}$ 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
 iv P_e (effective porosity of the soil) %

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

vi Total depth below ground surface of infiltration of oil m

Estimated Volume of infiltrated oil, $V_{inf b}$ m³

Estimated Volume of infiltrated oil, $V_{inf b}$ bbls

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

i Total Area covered by the oil (infiltration) m²

ii Total Area of the pool of free phase oil in touch with soil m²

iii Soil type

iv P_e (effective porosity of the soil) %

v Average depth below ground surface of infiltration of oil m

3 Estimated Volume of infiltrated oil, V_{inf c} m³

Estimated Volume of infiltrated oil, V_{inf c} bbls

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

i Total Area covered by the oil (infiltration) 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 m

Estimated Volume of infiltrated oil, V_{inf d} m³

Estimated Volume of infiltrated oil, V_{inf d} bbls

Estimated Total Volume of infiltrated oil, V_{inf} m³

Estimated Total Volume of infiltrated oil, V_{inf} bbls

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

i Total area of oil on open water m²

ii Table of average depth of oil on water based on coloration

[Link to Coverage Visual Aid](#)

Spill Factors from USCG FOG (2000 Edition)			
	Thickness (mm)	Percentage coverage (%)	Volume (m3)
Barely Visible	0.00004		0.0000
Silvery	0.00008		0.0000
Slight Color	0.00015		0.0000
Bright Color	0.0003		0.0000
Dull	0.001		0.0000
Dark	0.002		0.0000
Black oil	0.1		0.0000
Emulsion (30% Oil)	1		0.0000
Percent Total:		0%	0.0000

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

Estimated Volume of oil on open water, V_{wat} 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?

ii Estimated volume available for evaporation bbls

iii E-factor %

Estimated Volume of evaporated oil, V_{evap} bbls

Net Total Estimated Spilled Volume, V_{Est} bbls

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d. General Status of the site

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

e. Representatives

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

- Host Community:
- Department of Petroleum Resources [DPR]:
- National Oil Spill Detection and Response Agency [NOSDRA]:
- State Ministry of Environment [SME]:
- Shell Petroleum Development Company [SPDC]:
- Separate DPR form has been filled out with same findings

Tick as applicable

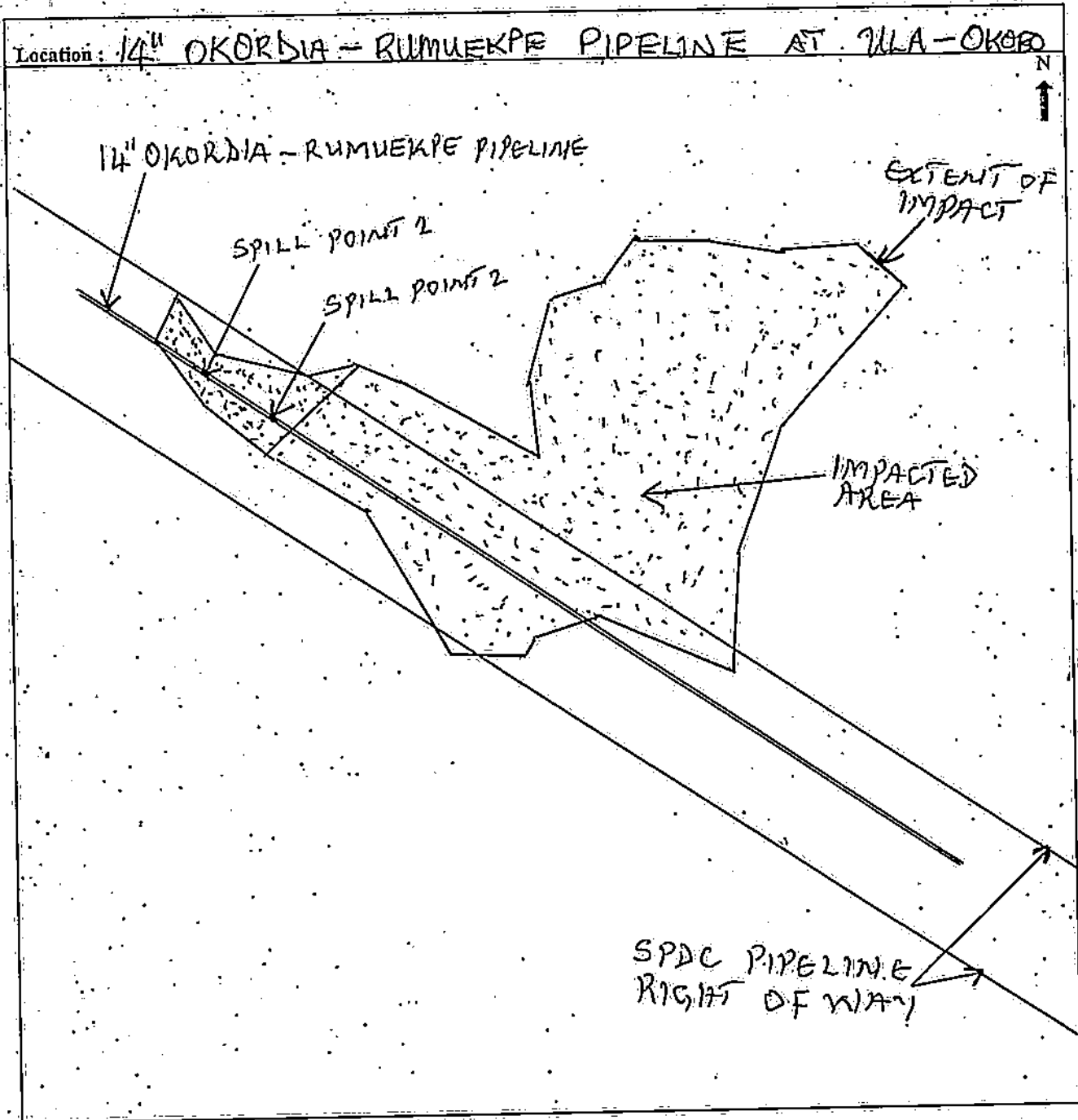
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f. Appendix d: Overview sketch of the site



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