

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED.

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 1263691 JIV report S/N: 00721

(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: 1263691 2. Type of incident* OIL SPILL
 3. Name of Location OKORDIA MANIFOLD
 4. Name of nearest community IKARAMA - OKORDIA 5. State: BAYELSA 6. LGA YENAGOA
 7. Type of Production facility/Installation MANIFOLD 8. Asset owner/District PIPELINE

B. INCIDENT INFORMATION:

9. Details of incident

- a. Date of incident: 5TH OCTOBER, 2014
 b. Start date/time of investigation: 8TH OCTOBER, 2014/18:33 HOURS
 c. Investigation End date: 9TH OCTOBER 2014 Actual investigation duration, days: TWO (2) DAYS
 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 checked="" type="checkbox"/> Exposed pipe surface |
| <input type="checkbox"/> Well Platform (on Water) | | <input type="checkbox"/> Drill Rig |

Additional observations around the spill point: **THE SPILL ORIGINATED FROM A 1" PRESSURE POINT VALVE ON THE 14" EXPOSED PIPELINE WITHIN THE FENCED OKORDIA MANIFOLD. CRUDE OIL STAINS WERE OBSERVED ON THE 14" PIPELINE (AT THE POINT OF LEAK) AS AT TIME OF INVESTIGATION. THE NUTS ON THE 1" PRESSURE POINT VALVE FLANGES WERE OBSERVED LOOSE (THAT IS, TAMPERED**

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

- | | | |
|---|---|---|
| <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 checked="" 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 |
| impact <input type="checkbox"/> Valve Failure | <input type="checkbox"/> com unit failure | <input type="checkbox"/> Cold vent |
| <input type="checkbox"/> Relief valve failure | <input type="checkbox"/> Others (specify) _____ | |

WITH BY UNKNOWN PERSON(S) WHEN THE JOINT INVESTIGATION TEAM ATTEMPTED TO TIGHTEN WITH A SPANNER. SOIL IMPACTED IS LIGHT BROWN SILTY CLAY.

- 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) Situation d) construction e) Encroachment f) Fire.

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g. Spill point coordinates

Measuring unit (m) <u>Minna Mid belt</u>	
Northing:	Easting:
<u>127890.32</u>	<u>443595.96</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 (SEASONAL) 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] **CASSAVA FARMLAND IMPACTED BY SPILL.**
- Fish Farm/Pond [,m]
- Fishing net [,m]
- Others (specify). [,m]

12. Containment measures put in place;

- Booms Trench Dyke Natural depression Pit None
 Others: CELLOPHANE

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

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

If yes to item 14, give brief description:

THE NUTS ON THE 1" PRESSURE POINT VALVE FLANGES WERE PROPERLY TIGHTENED BY JOINT INVESTIGATION TEAM PERSONNEL ON SECOND DAY OF JOINT INVESTIGATION VISIT.

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

If yes to item 15 give brief description:

THE COMMUNITY REPRESENTATIVES DID NOT CONCUR WITH THE ESTABLISHED SPILL CAUSE OF SABOTAGE DURING BOTH DAYS OF JOINT INVESTIGATION VISIT, WHICH NECESSITATED A FURTHER ENGAGEMENT BY SPDC WITH GOVERNMENT REGULATORS AND COMMUNITY REPRESENTATIVES ON 13TH OCTOBER 2014 AT WHICH POINT, TECHNICAL CLARIFICATIONS WERE MADE AND ALL JIV PARTIES AGREED ON THE SPILL CAUSE AND SIGNED-OFF THE JIV REPORT.

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JOINT INVESTIGATION REPORT FOR INCIDENT NO: 1263691 JIV report S/N: 00721

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.	CASSAVA		✓		WITHIN AN AREA OF 250 M ²	WITHIN SPILL-IMPACTED REGION
2.	PALM TREES			✓	WITHIN AN AREA OF APPROXIMATELY 3 Ha.	

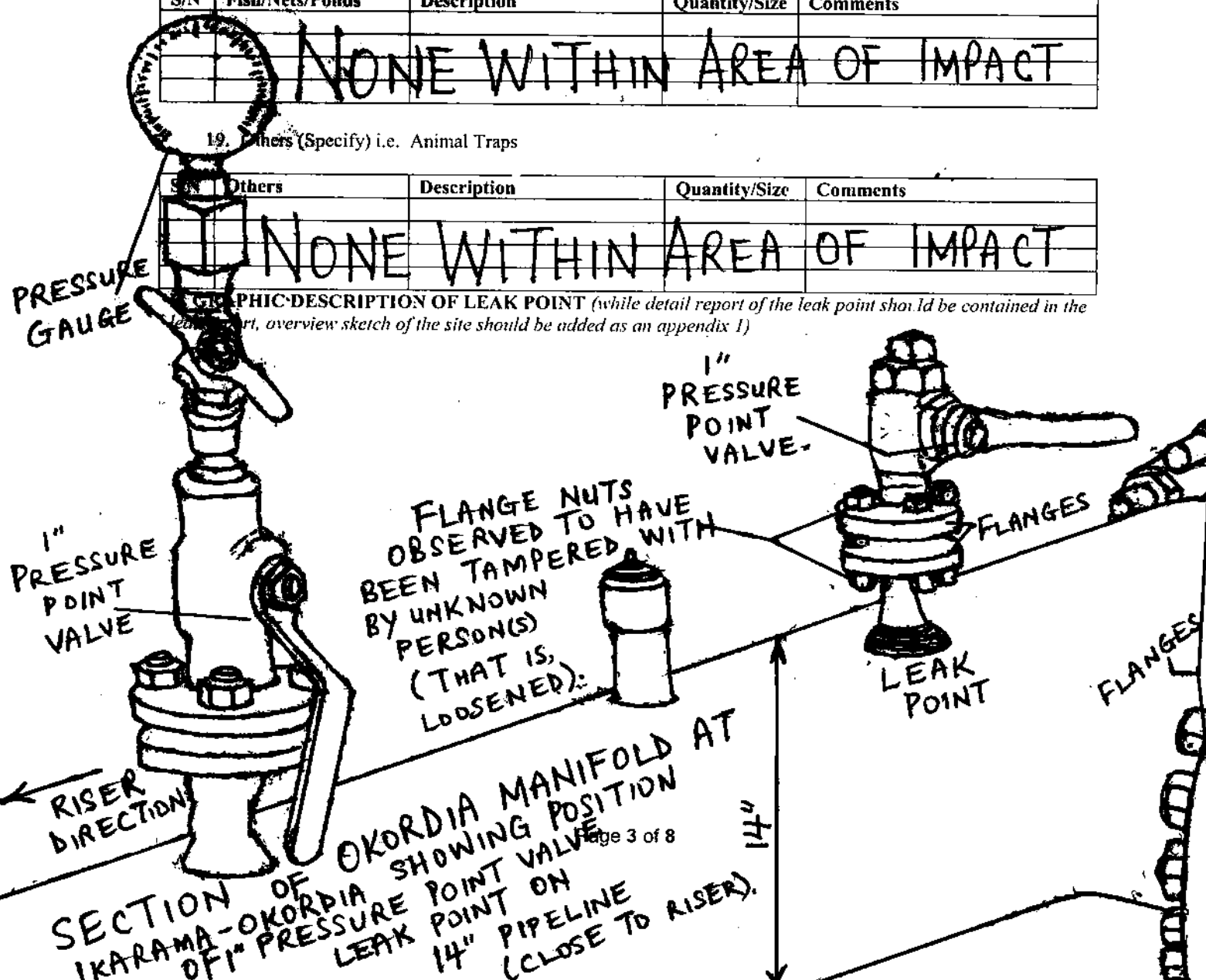
18. Fish/Nets/Ponds

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				

GRAPHIC DESCRIPTION OF LEAK POINT (while detail report of the leak point should be contained in the detail report, overview sketch of the site should be added as an appendix 1)



COORDINATE LIST OF OKORDIA MANIFOLD SPILL @ IKARAMA.						
MINNA MID BELT						
PTS	EASTINGS	NORTHINGS				
819	443602.19	127911.81				
820	443633.07	127933.22				
821	443639.25	127939.35				
822	443700.85	127933				
823	443716.19	127914.51				
824	443709.99	127902.24				
830	443564.94	127825.89				
831	443580.4	127844.27				
832	443602.05	127868.79				
833	443562.12	127908.86				
834	443552.91	127918.11				
835	443516.09	127964.33				
836	443500.64	127952.08				
837	443510.02	127995.08				
838	443540.79	127982.68				
839	443537.66	127967.33				
842	443577.67	127951.84				
843	443589.99	127951.8				
844	443586.96	127967.17				
845	443605.4	127951.75				
846	443614.58	127933.28				
847	443596.04	127917.97				
848	443596.04	127917.97				
849	443642.04	127850.22				
853	443651.25	127840.97				
854	443681.96	127810.14				
855	443604.87	127788.88				
856	443533.84	127736.87				
857	443530.73	127727.66				
858	443521.46	127718.47				
859	443314.63	127593.15				
860	443289.92	127574.79				
861	443259.07	127562.6				
862	443274.69	127630.15				
863	443160.61	127602.86				
864	443086.53	127563.15				
865	443031.03	127547.97				
866	443104.76	127483.2				
867	443414.58	128016.89				
868	443396.1	128016.95				
869	443374.54	128020.1				
8360	443416.25	127964.83				

8361	443301.5	127980.62					
8690	443304.65	128037.47					
8660	443029.89	127480.56					
8650	442987.78	127520.57					
8300	443487.69	127776.34					
8301	443376.56	127705.7			*		

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JOINT INVESTIGATION REPORT FOR INCIDENT NO: 1263691 JIV report S/N: 00721

G. INCIDENT INFORMATION:

20. Impacted Area Details

- Total calculated area of impact 7.10HA
- 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} :	NIL	Barrels
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Controlled recovery/evacuation from source with no impact to environment:

NIL	Barrels
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22. Net Estimated Spilled Volume V_{est} (bbbls)* =	1,199.56
Estimated Reported Volume** V_{rep} (bbbls) =	1,200 BARRELS.

***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 ADHERENCE TO THE WORK INSTRUCTIONS FOR JOINT INVESTIGATION OF OIL SPILL INCIDENTS (JIV PROCEDURE) WHICH REQUIRES DEDUCTION OF YET-TO-BE RECOVERED SPILL VOLUMES IN SITUATIONS WHERE A NEW SPILL IS SUPERIMPOSED ON AN EXISTING SPILL, THE UNRECOVERED SPILL VOLUME ESTIMATE OF 20 BARRELS WAS DEDUCTED TO ARRIVE AT THE ESTIMATED REPORTED VOLUME ABOVE. APPROXIMATELY 96% RECOVERY WAS MADE OF THE PREVIOUS INCIDENT (ID 1194724) BEFORE THE PRESENT SPILL OCCURRED.

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) 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 71,009.00 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) 0.00 bbls

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 54,150.00 m²
 ii Average depth of pool of free phase oil 0.003 m
 iii Emulsification factor (If applicable, else 0%) 0%

Estimated Volume of pool of free phase oil, V_{pool} **182.48 m³**
Estimated Volume of pool of free phase oil, V_{pool} **1,021.81 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 - Select -
 iv P_e (effective porosity of the soil) 0%

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
10/5/2014 10:00	10/9/2014 16:05	4
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		
Oil type	Sand	Loam	Clay
Bonny Medium	3 weeks	3 years	> 10 years
Bonny Light	2 days	2 months	> 10 years

vii Oil type Bonny Medium

viii Average depth of infiltration below leaking facility i.e. pipeline/flowline 0.000 m

ix Total depth below ground surface of infiltration of oil 0.000 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 ($V_{inf c}$)

- i Total Area covered by the oil (infiltration) 16,859.00 m²
- ii Total Area of the pool of free phase oil in touch with soil 1,050.00 m²
- iii Soil type Silty or sandy clay
- iv P_a (effective porosity of the soil) 12%
- v Average depth below ground surface of infiltration of oil 0.001 m

Estimated Volume of infiltrated oil, $V_{inf c}$	2.36 m ³
Estimated Volume of infiltrated oil, $V_{inf c}$	14.81 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 0.001 m

Estimated Volume of infiltrated oil, $V_{inf d}$	0.00 m ³
Estimated Volume of infiltrated oil, $V_{inf d}$	0.00 bbls

Estimated Total Volume of infiltrated oil, V_{inf}	2.36 m ³
Estimated Total Volume of infiltrated oil, V_{inf}	14.81 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)		Link to Coverage Visual Aid	
	Thickness (mm)	Percentage coverage (%)	Volume (m ³)
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}	0.00 m ³
Estimated Volume of oil on open water, V_{wat}	0.00 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 1,036.62 bbls
- iii E-factor 15%

Estimated Volume of evaporated oil, V_{evap}	182.93 bbls
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Net Total Estimated Spilled Volume, V_{Est}	1,219.56 bbls
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NOTE: The present spill incident was overlapped by the immediate past spill incident at same location (ID 1194724) where out of an estimated spill volume of 629 barrels, 548 barrels was recovered while some spill was consumed by fire. The unrecovered spill volume estimate of 20 barrels is hereby deducted from the net cumulative estimate of 1,219.56 barrels to arrive at the actual net spill volume estimate for the present incident; thus, 1,219.56 - 20 = 1,199.56 barrels.

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JOINT INVESTIGATION REPORT FOR INCIDENT NO: 1263691 JIV report S/N: 00721

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

<p>This report was filled, agreed and signed by the following joint investigation representatives:</p> <ul style="list-style-type: none">• Host Community: <input checked="" type="checkbox"/>• Department of Petroleum Resources [DPR]: <input checked="" 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"/>• <i>Signatories agree with reported findings:</i> <input checked="" type="checkbox"/>• <i>Separate DPR form has been filled out with same findings</i> <input checked="" type="checkbox"/> <p style="text-align: right;"><i>Tick as applicable</i></p>

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JOINT INVESTIGATION REPORT FOR INCIDENT NO: 1263691 JIV report S/N: 00721

25. Appendix 1: Overview sketch of the site

