

JOINT INVESTIGATION REPORT

INCIDENT NO: 1575121 JIV report S/N: N° 0000139

(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: 1575121 2. Type of incident* OIL SPILL
3. Name of Location 28" BOMU - BONNY TRANS NIGER PIPELINE
4. Name of nearest community ANYAMINIMA - OLOMA 5. State: RIVERS 6. LGA BONNY
7. Type of Production facility/Installation OIL PIPELINE
8. Asset owner/District THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED

B. INCIDENT INFORMATION:

9. Details of incident
a. Date of incident: 15TH FEBRUARY, 2016
b. Start date/time of investigation: 16TH FEBRUARY 2016 AND
c. Investigation End date: 5TH MARCH 2016 Actual investigation duration, days: TWO DAYS
d. Description of spill point environment
 Firm soil Loose soil Recently excavated area
 Under water Swampy Exposed pipe surface
 Well Platform (on Water) Drill Rig

Additional observations around the spill point:

NOT APPLICABLE.

- 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 checked="" type="checkbox"/> Failed Weld-on illegal hot tap valve | <input type="checkbox"/> Failed Clamp, | <input type="checkbox"/> Missing Pipeline/Flowline |
| <input checked="" 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.

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g. Spill point coordinates

h. Measuring unit

Northings: LATITUDE <div style="text-align: center; font-size: 1.2em;">4.46339</div>	Eastings: LONGITUDE <div style="text-align: center; font-size: 1.2em;">7.18722</div>
<hr/>	<hr/>
<hr/>	<hr/>
<hr/>	<hr/>

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

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

12. Containment measures put in place;

- Booms
 Trench
 Dyke
 Natural depression
 Pit
 None
 Others: _____

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

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

If yes to item 14, give brief description:

RECOVERY WORK ONGOING WHILE TEMPORARY
 REPAIR WORK COMPLETED.

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

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If yes to item 15 give brief description:

NOT APPLICABLE

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
	NONE WITHIN AREA OF IMPACT					

18. Fishing Nets/Fish Ponds

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

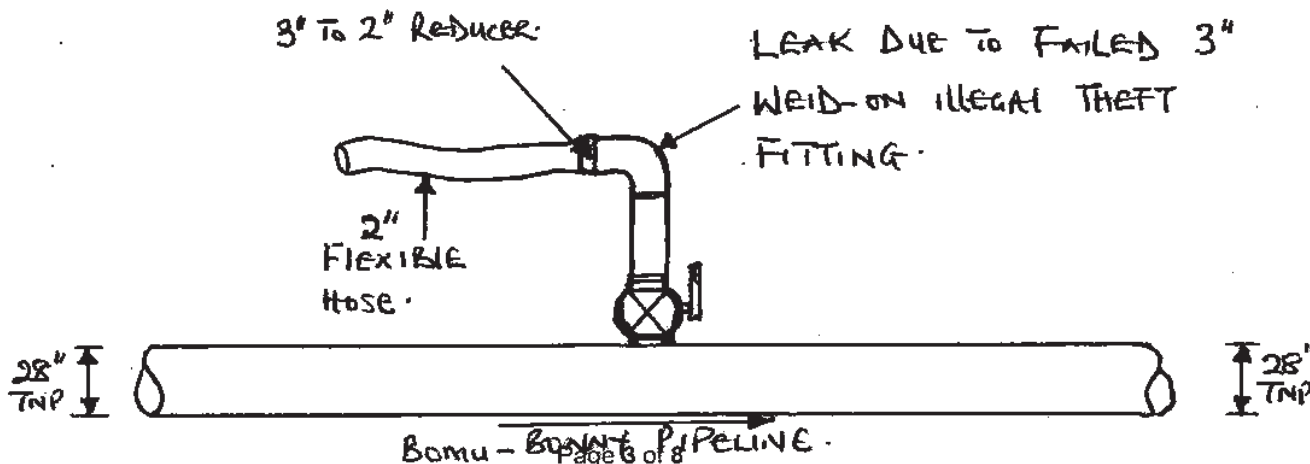
19. Others (Specify) i.e. Animal Traps

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

E. GRAPHIC DESCRIPTION OF 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)

SECTION OF 28" BOMU - BONNY TRANS NIGER PIPELINE AT ANYAMINIMA -

OKOMA. SHOWING:- A FAILED WELD ON ILLEGAL THEFT POINT.



ESTIMATION OF OIL SPILL VOLUME

FID =1575121 AT 28° BOMU BONNY TRANS NIGER PIPELINE AT ANYAMINIMA - OLOMA JIV VOLUME CALCULATION REPORT

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

Impacted Area Details

Total Calculated Area of Impact

35,600.00	m ²
	m ²
	m ²

i Impact within SPDC R.O.W

ii Impact outside SPDC R.O.W

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

i Estimated Recovered oil (Net)

3.00	bbbls
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Estimated Recovered oil (Net) V_{rec}	3.00 bbbls
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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

2,151.00	m ²
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ii Average depth of pool of free phase oil

0.002	m
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iii Emulsification factor (if applicable, else 0%)

30	%
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Estimated Volume of pool of free phase oil, V_{pool}

3.01	m ³
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Estimated Volume of pool of free phase oil, V_{pool}	18.94 bbbls
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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)

2.00	m ²
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ii Average depth of infiltration above leaking facility i.e. pipeline/flowline

0.100	m
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iii Soil type

Silty or sandy clay	▼
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iv P_e (effective porosity of the soil)

12	%
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v Cause of spill

Third party interference	▼
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vi Calculation of days for infiltration below the leaking point on pipeline or flowline

Incident Date	JIV Date	Days on Site
2/15/2016 13:40	2/16/2016 14:45	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.			
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	▼
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viii Average depth of infiltration below leaking facility i.e. pipeline/flowline

0.000	m
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ix Total depth below ground surface of infiltration of oil

0.100	m
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Estimated Volume of infiltrated oil, V_{inf a}

0.02	m ³
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Estimated Volume of infiltrated oil, V_{inf a}	0.15 bbbls
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2 Volume of infiltrated oil at second spill point [if applicable] (V_{inf b})

i Total area covered by the oil (infiltration)

	m ²
--	----------------

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

0.000	m
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vi Total depth below ground surface of infiltration of oil

0.000	m
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Estimated Volume of infiltrated oil, V_{inf b}

0.00	m ³
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Estimated Volume of infiltrated oil, V_{inf b}	0.00 bbbls
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3 Volume of infiltrated oil outside immediate spill point(s) region (V_{inf c})

i Total Area covered by the oil (infiltration)

23,047.00	m ²
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ii Total Area of the pool of free phase oil in touch with soil

	m ²
--	----------------

iii Soil type

iv P_e (effective porosity of the soil) %

v Average depth below ground surface of infiltration of oil m

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	40%	0.0042
Dark	0.002	60%	0.0125
Black oil	0.1		0.0000
Emulsion (30% Oil)	1		0.0000
Percent Total:		100%	0.0168

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

Impacted Area Details

Total Calculated Area of Impact	35,600.00 m ²
i Impact within SPDC R.O.W	m ²
ii Impact outside SPDC R.O.W	m ²

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

i Estimated Recovered oil (Net)	3.00 bbls
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Estimated Recovered oil (Net) V_{rec,1}	3.00 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	2,151.00 m ²
ii Average depth of pool of free phase oil	0.002 m
iii Emulsification factor (If applicable, else 0%)	30 %

Estimated Volume of pool of free phase oil, V_{pool}	3.01 m³
---	---------------------------

Estimated Volume of pool of free phase oil, V_{pool}	18.94 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)	2.00 m ²
ii Average depth of infiltration above leaking facility i.e. pipeline/flowline	0.100 m
iii Soil type	Silty or sandy clay
iv P _e (effective porosity of the soil)	12 %

v Cause of spill	Third party interference
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vi Calculation of days for infiltration below the leaking point on pipeline or flowline

Incident Date	JIV Date	Days on Site
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Infiltration of oil types in various soil types vs time.			
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Oil type	Sand	Loam	Clay
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Bonny Light	2 days	2 months	> 10 years

vii Oil type	Bonny Light
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viii Average depth of infiltration below leaking facility i.e. pipeline/flowline	0.000 m
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ix Total depth below ground surface of infiltration of oil	0.100 m
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Estimated Volume of infiltrated oil, V_{inf,a}	0.02 m³
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Estimated Volume of infiltrated oil, V_{inf,a}	0.16 bbls
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2 Volume of infiltrated oil at second spill point [if applicable] (V_{inf,b})

i Total area covered by the oil (infiltration)	m ²
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 Average depth of infiltration below leaking facility i.e. pipeline/flowline	0.000 m
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vi Total depth below ground surface of infiltration of oil	0.000 m
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Estimated Volume of infiltrated oil, V_{inf,b}	0.00 m³
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Estimated Volume of infiltrated oil, V_{inf,b}	0.00 bbls
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3 Volume of infiltrated oil outside immediate spill point(s) region (V_{inf,c})

i Total Area covered by the oil (infiltration)	23,047.00 m ²
ii Total Area of the pool of free phase oil in touch with soil	m ²

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G. INCIDENT INFORMATION:

a. Impacted Area Details

- Total calculated area of impact 3.56Ha
- Impact within R.O.W YES
- Impact outside R.O.W YES

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

Recovered oil V_{rec} :	3	Barrels
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Controlled recovery/evacuation from source with no impact to environment:

NIL	Barrels
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c. Net Estimated Spilled Volume V_{est} (bbls)* =

34.95 BARRELS

Estimated Reported Volume V_{reg} (bbls) =** **35 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:

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 volume estimation; record the calculation in a plain sheet of paper and attach to the JIV report.

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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 JIV 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]:**
- **Asset Owner:**
- *Signatories agree with reported findings:*
- *Separate DPR form has been filled out with same findings*

Tick as applicable

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f. Appendix 1: Overview sketch of the site

