

JOINT INVESTIGATION REPORT

INCIDENT NO: 1832519

JIV report S/N:

Nº 0000271

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

A. GENERAL INFORMATION:

1. Spill incident Number: 1832519 2. Type of incident* Oil Spill
3. Name of Location BONNY OIL AND GAS TERMINAL EMULSION TANK (T1201K)
4. Name of nearest community BONNY 5. State: RIVERS 6. LGA BONNY
7. Type of Production facility/Installation OIL TANK
8. Asset owner/District THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED

B. INCIDENT INFORMATION:

9. Details of incident

- a. Date of incident: 30TH MARCH, 2017
b. Start date/time of investigation: 7TH APRIL, 2017
c. Investigation End date: 13TH APRIL 2017 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:

THE JOINT INVESTIGATION TEAM OBSERVED THE SPILLWAS DUE TO PROCESS UPSET AND OVERTILLING OF EMULSION TANK (T1201K) FROM STATIC HEAD OF DRAINING TANK DUE TO PUNCH COLLAGE AT BONNY OIL AND GAS TERMINAL.

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. | ☐ Saver-pit over flow | ☐ Third party tampering with Clamp |
| ☐ Third party tampering with valve setting | ☐ Bulging Outward | ☐ Third party tampering with flange. |
| ☐ Flare System/Bund wall failure | ☐ Cold vent | ☐ Surge vessel overflow. |
| ☐ Valve Failure | ☐ Relief valve failure | ☐ Accidental 3 rd party equipment impact |
| ☒ Others(specify): <u>PROCESS UPSET AND OVERTILLING OF EMULSION TANK.</u> | | |

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

WGS 84

Northing:	Easting:
4.428673	7.168969

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]	} NONE SEEN WITHIN VICINITY
☐ Drinking water source	[]	[m]	
☐ Built up area	[]	[m]	
☐ Farmlands	[]	[m]	
☐ Fish Farm/Pond	[]	[m]	
☐ Fishing net	[]	[m]	
☐ Others (specify):			

12. Containment measures put in place:

☐ Booms
 ☐ Trench
 ☐ Dyke
 ☐ Natural depression
 ☐ Pit
 ☐ None

☒ Others: WITHIN BUND AREA

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:

EMISSION TANK (TOP) WAS BOLTED, WHILE GROUNDWATER STORAGE TANK WAS CLOSED. POWER RESTORED TO CONTROL TERMINAL.

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
<u>NONE WITHIN AREA OF IMPACT</u>					

17. Crops/Economic Trees

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

18. Fishing Nets/Fish Ponds

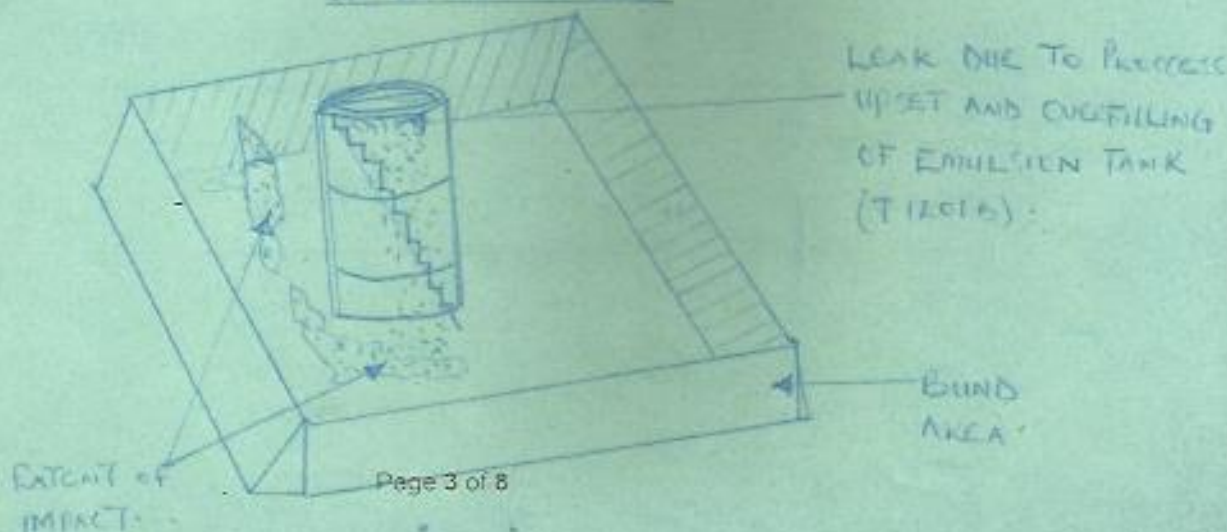
S/N	Nets/Ponds	Description	Quantity/Size	Comments
<u>NONE WITHIN AREA OF IMPACT</u>				

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

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

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)*

SECTIONAL VIEW OF BONNY OIL AND GAS TERMINAL EMULSION TANK (T1201B) AT
BONNY SHOWING OPERATIONAL SPILL PROCESS UPSET AND OUTFILLING
OF EMULSION TANK



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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)

S/N	Northing	Easting
	4.428796	7.169219
	4.42857	7.16885
	4.428428	7.168948
	4.428713	7.168545
	4.42807	7.16885
	4.428891	7.168951
	4.42876	7.16909
	4.429084	7.168347
	4.428716	7.168531
	4.428801	7.169229
	4.428418	7.168948

ESTIMATION OF OIL SPILL VOLUME

FID 1832519 OF BONNY OIL AND GAS TERMINAL EMULSION (T1201B) TANK JIV OIL SPILL ESTIMATED VOLUME CALC

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

Impacted Area Details

Total Calculated Area of Impact

1,300.00 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)

bbbls

Estimated Recovered oil (Net) V_{rec}

0.00 bbbls

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

150.00 m²

ii Average depth of pool of free phase oil

0.030 m

iii Emulsification factor (If applicable, else 0%)

30 %

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

3.15 m³

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

19.81 bbbls

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

1 Volume of infiltrated oil at spill point ($V_{inf,s}$)

i Total area covered by the oil (infiltration)

2.00 m²

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

0.800 m

iii Soil type

Laterite

iv P_s (effective porosity of the soil)

20 %

v Cause of spill

Operational

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

Incident Date	JIV Date	Days on Site
3/10/2017 11:45	4/7/2017 11:00	8
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	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 Medium

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

0.007 m

ix Total depth below ground surface of infiltration of oil

0.807 m

Estimated Volume of infiltrated oil, $V_{inf,s}$

0.32 m³

Estimated Volume of infiltrated oil, $V_{inf,s}$

2.03 bbbls

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

Laterite

iv P_s (effective porosity of the soil)

20 %

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

0.007 m

vi Total depth below ground surface of infiltration of oil

0.007 m

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

0.00 m³

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

0.00 bbbls

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

i Total Area covered by the oil (infiltration)

1,000.00 m²

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

m²

iii Soil type

Laterite

iv P_e (effective porosity of the soil)

20%

v Average depth below ground surface of infiltration of oil

0.007 m

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

1.46 m³

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

9.19 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)

150.00 m²

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

0.00 m²

iii Average depth below ground surface of infiltration of oil

0.002 m

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

0.03 m³

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

0.17 bbls

Estimated Total Volume of infiltrated oil, V_{inf}

1.81 m³

Estimated Total Volume of infiltrated oil, V_{inf}

11.39 bbls

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

i Total area of oil on open water

0.00 m²

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

Link to Colorize Visual Aid

Spill Factors from USCG FOG (2000 Edition)

	Thickness (mm)	Percentage coverage (%)	Volume (m3)
Barely Visible	0.00004		0.0000
Silvery	0.00006		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 m³

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?

Yes

ii Estimated volume available for evaporation

31.20 bbls

iii E-factor

25%

Estimated Volume of evaporated oil, V_{evap}

10.40 bbls

Net Total Estimated Spilled Volume, V_{Est}

41.60 bbls

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G. INCIDENT INFORMATION:

a. Impacted Area Details

- Total calculated area of impact 0.13 HA
- Impact within R.O.W YES
- Impact outside R.O.W NO

b. 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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c. Net Estimated Spilled Volume V_{est} (bbls)* -

41.60 BARRELS

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

42 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:

NOT APPLICABLE

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 = 4.5 bbl ----- Reported volume = 5 bbl
Calculated volume = 0.55 bbl ----- Reported volume = 0.6 bbl
Calculated volume = 0.01 bbl ----- Reported volume = 0.1 bbl

Wherever this estimation tool is not applicable please refer to paragraph 6. c) Deviations of the JIV procedure to use appropriate steps for volume estimation; record the calculation on 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 JIT therefore recommend that the site be closed out | ☐ |
| ii. Investigation of the incident site showed that there is residual impact on site requiring further works | ☐ |

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: ☐

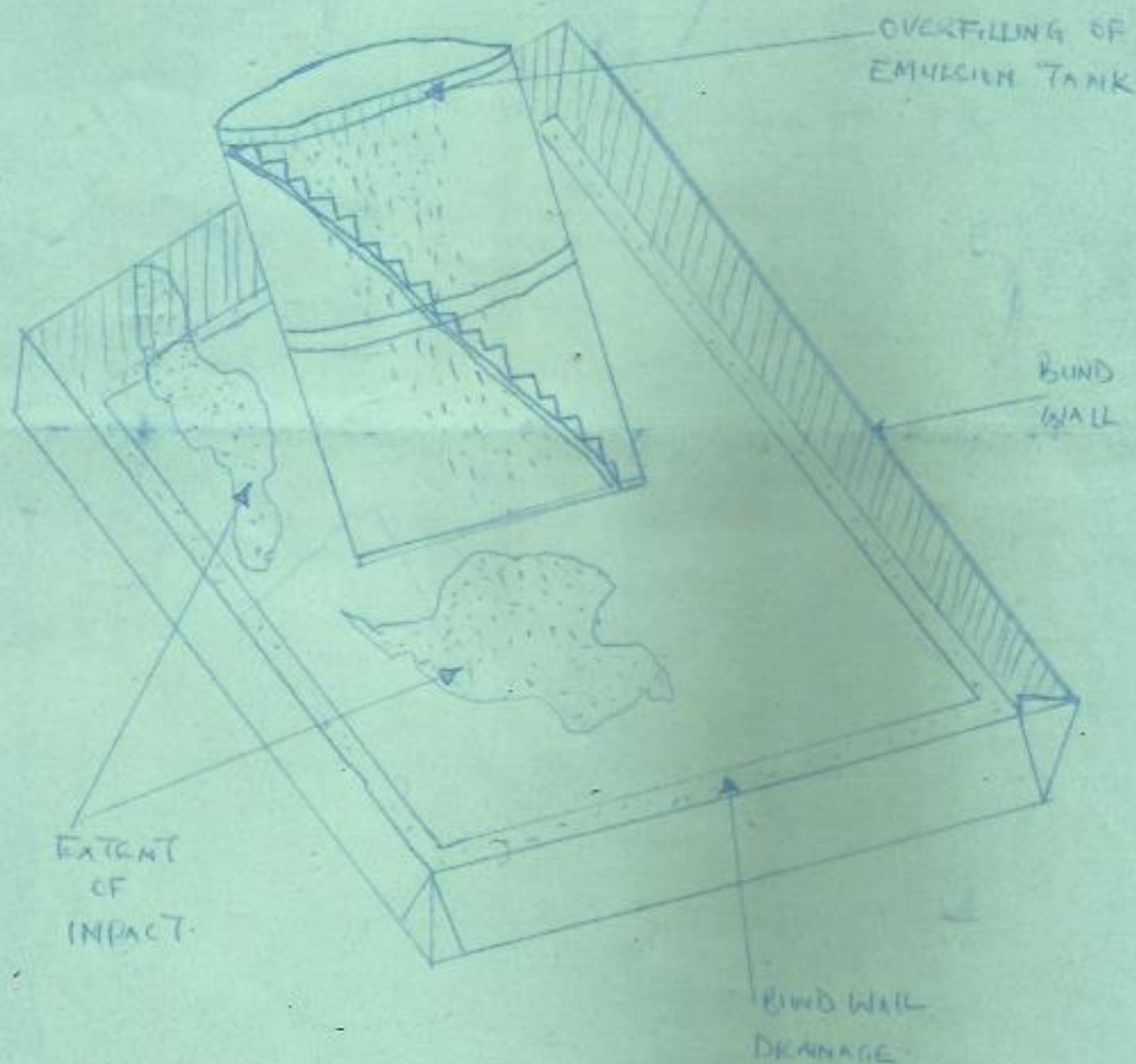
Tick as applicable

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f. Appendix I: Overview sketch of the site

Location: BONNY OIL AND GAS TERMINAL EMULSION TANK (T1201K) AT BONNY.

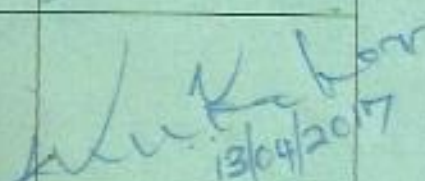
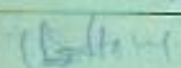
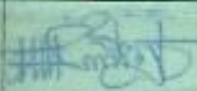
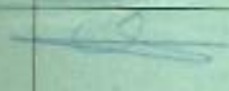


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g. SIGNATORIES: JOINT INVESTIGATION TEAM MEMBERS

Having read through the JIT report, the following representatives append their respective signatures in agreement with the content therein:

S/N	Name	Members present	Designation	Signature/Date and Time
1		DEPARTMENT OF PETROLEUM RESOURCES (DPR)		
2	KOMS ABAM	NATIONAL OIL SPILL DETECTION AND RESPONSE AGENCY (NOSDRA)	SES	 13/04/2017
3	IBITURU DASSO	STATE MIN. OF ENVIRONMENT	SSO	 13/4/2017
4	SIDNEY SIMON ALLWON	HOST COMMUNITY REPRESENTATIVE	BEA	 13/04/2017
5	CHINEDUM OJI	ASSET OWNER REPRESENTATIVE	SE led	 13/04/17