

**THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED.**

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 1037025 JIV report S/N: 0189

(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: 1037025 2. Type of incident\* OIL SPILL  
 3. Name of Location 20" OTUMARA - ESCRAVOS TRUNKLINE  
 4. Name of nearest community UGBORODU/UGBOEGUNGUN 5. State: DELTA 6. LGA WARRI - SOUTH WEST  
 7. Type of Production facility/Installation OIL PIPELINE 8. Asset owner/District PIPELINE

**B. INCIDENT INFORMATION:**

9. Details of incident

- a. Date of incident: 8TH SEPTEMBER, 2013  
 b. Start date/time of investigation: 11TH SEPTEMBER, 2013 AT 16:00HRS  
 c. Investigation End date: 13TH SEPT. 2013 Actual investigation duration, days: 3 DAYS

d. Description of spill point environment

- Firmed soil                       Loose soil                       Recently excavated area  
 Under water                       Swampy                       Exposed pipe surface  
 Well Platform (on Water)                       Drill Rig

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,                       Third party tampering with Clamp  
 Third party tampering with valve setting,                       Third party tampering with flange,  
 Corrosion                       Saver-pit over flow,                       Surge vessel overflow,  
 Bulging Outward                       Flare System/Bund wall failure                       Accidental 3<sup>rd</sup> party equipment  
 impact                       Valve Failure                       com unit failure                       Cold vent  
 Relief valve failure                       Others (specify) \_\_\_\_\_

f. Incident caused by:

- Third party interference (Sabotage ; crude theft ; Line theft ; Accidental 3<sup>rd</sup> party damage   
 Operational                       Others (including Mystery spills) \_\_\_\_\_

g. Spill point coordinates

| Measuring unit <u>METRES</u> |  | <u>MINNA - WEST - BELT</u> |  |
|------------------------------|--|----------------------------|--|
| Northing:                    |  | Easting:                   |  |
| SP1 - 179791.87              |  | 304321.62                  |  |
| SP2 - 179156.72              |  | 304851.56                  |  |
| SP3 - 178328.28              |  | 305554.04                  |  |
| SP4 - 180773.75              |  | 303505.17                  |  |

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

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**C. RISK ASSESSMENT**

10. Type of environment:

- Land       Swamp (NDA)       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 | [ | .m] | } NONE WITHIN THE 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  
 Others: \_\_\_\_\_

13. Any pictures or video coverage?

[N]

14. Was there any disruption to the investigation?

[Y]

If yes give brief description:

NOT APPLICABLE

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

15. Structures / Properties

| S/N | Type of Structures | Description | Size | Number | Comments |
|-----|--------------------|-------------|------|--------|----------|
|     |                    |             |      |        |          |
|     |                    |             |      |        |          |
|     |                    |             |      |        |          |
|     |                    |             |      |        |          |
|     |                    |             |      |        |          |
|     |                    |             |      |        |          |
|     |                    |             |      |        |          |
|     |                    |             |      |        |          |
|     |                    |             |      |        |          |

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|  |  |  |  |  |  |
|--|--|--|--|--|--|
|  |  |  |  |  |  |
|--|--|--|--|--|--|

16. Crops/Economic Trees

| S/N | Type of crops | Young | Medium | Matured | Quantity | Comments |
|-----|---------------|-------|--------|---------|----------|----------|
| 1   | MANGROVES     | 60    | 35     | 120     | 215      |          |
|     |               |       |        |         |          |          |
|     |               |       |        |         |          |          |
|     |               |       |        |         |          |          |

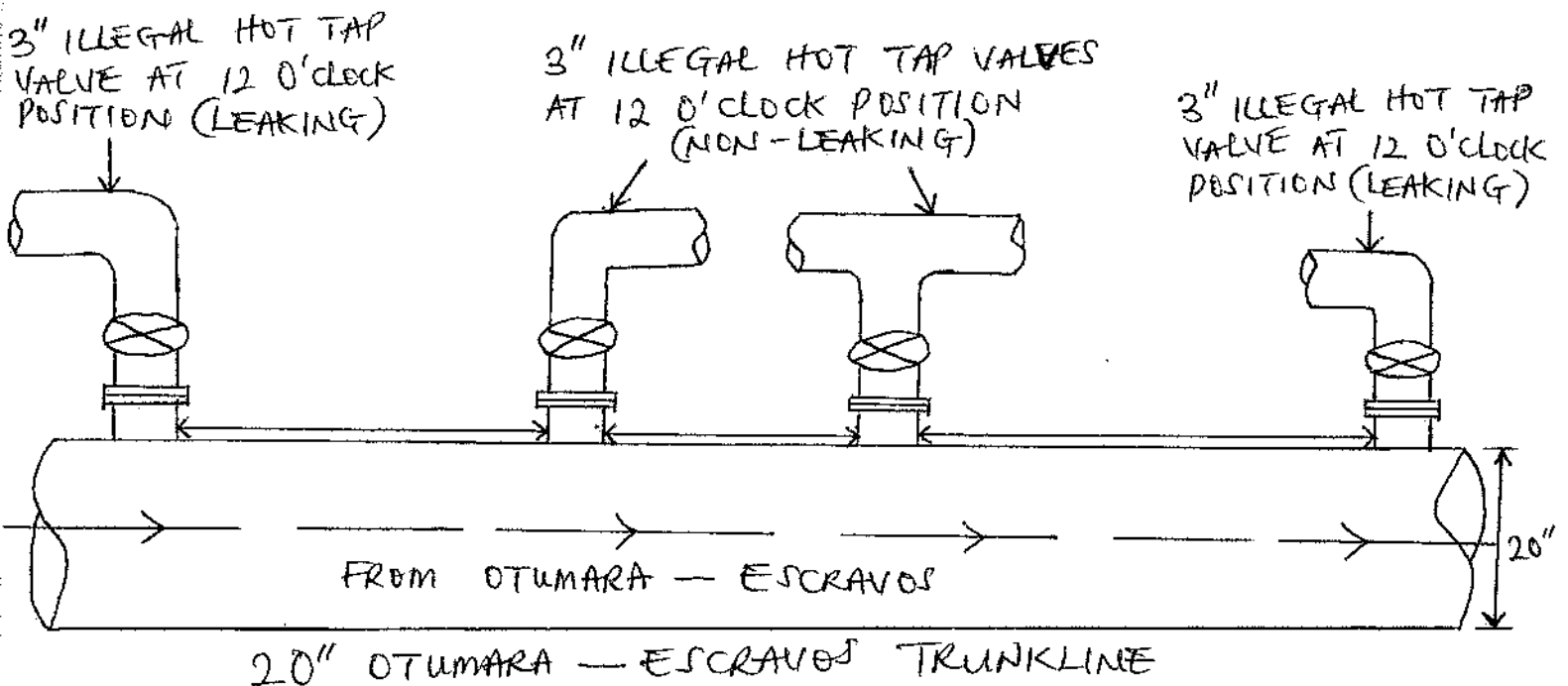
17. Fish/Nets/Ponds

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

18. 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)



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

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

MINNA - WEST - BELT

| S/N | Northing  | Easting   |
|-----|-----------|-----------|
| 1.  | 179794.96 | 304337.01 |
| 2.  | 179779.62 | 304352.41 |
| 3.  | 179784.26 | 304368.68 |
| 4.  | 179804.10 | 304355.12 |
| 5.  | 178334.41 | 305544.80 |
| 6.  | 178337.49 | 305550.95 |
| 7.  | 178319.08 | 305560.20 |
| 8.  | 178319.08 | 305563.28 |
| 9.  | 180799.27 | 303506.86 |
| 10. | 180800.31 | 303526.97 |
| 11. | 180799.26 | 303535.44 |
| 12. | 180774.28 | 303536.07 |
| 13. | 180746.97 | 303533.96 |
| 14. | 180746.76 | 303510.25 |
| 15. | 180747.19 | 303477.87 |
| 16. | 180749.51 | 303453.52 |
| 17. | 180751.00 | 303441.46 |
| 18. | 180777.03 | 303448.66 |
| 19. | 180795.23 | 303456.91 |
| 20. | 180795.23 | 303478.29 |
|     |           |           |
|     |           |           |
|     |           |           |
|     |           |           |

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**G. INCIDENT INFORMATION:**

20. Impacted Area Details

- Total calculated area of impact 4900m<sup>2</sup>
- Impact within SPDC R.O.W 4500m<sup>2</sup>
- Impact outside SPDC R.O.W 400m<sup>2</sup>

21. Volume of oil recovered before completion of JIV (V<sub>recf</sub>):

|                                   |            |         |
|-----------------------------------|------------|---------|
| Recovered oil V <sub>recf</sub> : | <u>6.2</u> | Barrels |
|-----------------------------------|------------|---------|

22. Computation of estimated residual volume on site

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

- i. Area (m<sup>2</sup>) occupied by pool of free phase oil 134m<sup>2</sup>
- ii. Average Depth (m) of pool of free phase oil 0.01m
- iii. Emulsification factor: 40%

iv. 

|   |             |         |
|---|-------------|---------|
| Estimated Volume of pool of free phase oil. V <sub>pool</sub> : | <u>5.06</u> | barrels |
|---|-------------|---------|

b. Computation of estimated volume of infiltrated oil in the soil (V<sub>inf</sub>).

1. Estimated Volume of infiltrated oil at spill point (V<sub>inf a</sub>)

- i. Area\* (m<sup>2</sup>) of soil covered by the oil: 30m<sup>2</sup>
- ii. Average Depth (m) above leaking facility i.e. pipeline/flowline: 0.3m
- iii. Soil type: CLAY      iv. P<sub>c</sub> (effective porosity of the soil): 8%
- v. Cause of spill: SABOTAGE      vi. Oil type: BONNY MEDIUM
- vii. Oil Residence time on site, day: 3 DAYS
- viii. Average depth of infiltration below leaking facility i.e. pipeline/flowline: 0.0008m
- ix. Estimated depth of infiltration around spill point: 0.3008m

x. 

|  |             |         |
|--|-------------|---------|
| Estimated Volume of infiltrated oil at spill point. V <sub>inf a</sub> : | <u>4.54</u> | barrels |
|--|-------------|---------|

2. Estimated Volume of infiltrated oil at second spill point [if applicable] (V<sub>inf b</sub>)

- i. Area\* (m<sup>2</sup>) of soil covered by the oil: 4m<sup>2</sup>
- ii. Average Depth (m) above leaking facility i.e. pipeline/flowline: 0.2m
- iii. Soil type: CLAY      iv. P<sub>c</sub> (effective porosity of the soil): 8%
- v. Cause of spill: SABOTAGE      vi. Oil type: BONNY MEDIUM
- vii. Oil Residence time on site, day: 3 DAYS
- viii. Average depth of infiltration below leaking facility i.e. pipeline/flowline: 0.0008m
- ix. Estimated depth of infiltration around spill point: 0.2008m

|  |             |         |
|--|-------------|---------|
| Estimated Volume of infiltrated oil at spill point. V <sub>inf b</sub> : | <u>0.40</u> | barrels |
|--|-------------|---------|

3. Estimated Volume of infiltrated oil outside immediate spill point(s) region (V<sub>inf c</sub>)

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- i. Area (m<sup>2</sup>) of soil covered by the oil: 362 m<sup>2</sup> 0189
- ii. Area (m<sup>2</sup>) of the pool of free phase oil in touch with soil: NOT APPLICABLE
- iii. Average Depth (m) below ground surface of infiltration of oil: 0.0008m
- iv. Soil type: CLAY
- v. P<sub>e</sub> (effective porosity of the soil): 8%
- vi. 

|  |      |         |
|--|------|---------|
| Estimated Volume of infiltrated oil. At V <sub>int</sub> : | 0.15 | barrels |
|--|------|---------|

23. Computation of estimated volume of oil on open water based on standard coloration.

- i. Total area of oil on open water: 4370 m<sup>2</sup>
- ii. Table of average depth of oil on water based on coloration \*\*Spill Factors from USCG FOG (2000 Edition)

|                    | Thickness<br>(mm) | Percentage<br>coverage | Volume (m <sup>3</sup> ) |
|--------------------|-------------------|------------------------|--------------------------|
| Barely Visible     | 0.00004           |                        |                          |
| Silvery            | 0.00008           |                        |                          |
| Slight Color       | 0.00015           |                        |                          |
| Bright Color       | 0.0003            | 15%                    | 0.0002                   |
| Dull               | 0.001             |                        |                          |
| Dark               | 0.002             | 15%                    | 0.0013                   |
| Black oil          | 0.1               | 45%                    | 0.1967                   |
| Emulsion (30% Oil) | 1                 | 25%                    | 0.3278                   |

- iii. 

|   |         |
|---|---------|
| Percent Total   | 100%    |
| Estimated Volume of oil on open water. V <sub>wat</sub> : | 3.31    |
|   | Barrels |

24. Calculation of evaporated volume:

- i. Estimated Volume available for evaporation within surface area: 19.66 BBLs
- ii. E-Factor: 15%
- iii. 

|   |      |         |
|---|------|---------|
| Estimated Volume of evaporated oil. V <sub>evap</sub> : | 3.47 | Barrels |
|---|------|---------|

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

25. **Net Estimated Spilled Volume**  $V_{\text{net}}(\text{bbls}) = V_{\text{evap}}(\text{bbls}) + V_{\text{wat}}(\text{bbls}) + V_{\text{inf}}(\text{bbls}) + V_{\text{pool}}(\text{bbls}) + V_{\text{recl}}(\text{bbls}) =$  23.13 BBLs

**Estimated Reported Volume**  $V_{\text{rep}}(\text{bbls}) =$  24 BBLs

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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<sup>3</sup> to barrels is Volume (m<sup>3</sup>) 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.

26. GENERAL STATUS OF THE SITE

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

27. REPRESENTATIVES

This report was filled, agreed and signed on the 13/09/2013 by joint investigation representatives from

- 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

NOTE: TWO OUT OF THE FOUR ILLEGAL HOT TAP POINTS WERE NOT LEAKING ON SPDC RIGHT OF WAY. THOUGH, THERE WERE IMPACT ON ADJACENT THIRD PARTY AREAS AS A RESULT OF ILLEGAL BUNKERING AND ILLEGAL LOCAL REFINERIES ACTIVITY

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28. Appendix 1: Overview sketch of the site

