

RENA

Remediation by Enhanced Natural Attenuation of POL Polluted Sites

A case study - UNOCI, Ivory Coast

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GLOBAL SERVICE CENTRE

1. PURPOSE

2. REMEDIATION PROCESS AND MATERIALS

3. RESULTS

4. BENEFITS

5. VIDEO









REMEDIATION PROCESS AND MATERIALS



REMEDIATION PROCESS

- 1. Initial contamination level: TPH in soil > 90000 ppm
- 2. Treatment & TPH reduction: TPH in soil < 1000 ppm
- 3. Re-vegetation

MATERIALS

- Contaminated Soil
- Chicken Extract
- Surfactant / NOSAM (Natural Occurring Surface Active Material)
- RemScan Handheld Instrument
- XRF handheld analyser
- Concrete Mixer

TPH. Total Petroleum Hydrocarbon. The amount of carbon chains in an environmental media.



PRACTICAL APPROACH





RESULTS



RESULTS: AK CAMP LOCATION

Samples		Oil concentration (mg/kg) Analytical Method: Infrared	Key Elements (mg/kg) Analytical Method: XRF					
Date	Description	ТРН	Р	S	Cl	K	Ca	Fe
8/12/2016	Clean soil	400 to 1,400	3,058	ND	ND	ND	ND	37,517
8/12/2016	Highly contaminated soil	97,000	2,250	7,120	ND	1,887	3,744	15,568
8/12/2016	Mixed contaminated soil	22,000 to 65,000	7,828	1,149	590	6,873	1,980	26,685
8/12/2016	NOSAM	17,000 (high concentration)	ND	4,01	841	340,504	ND	690
8/12/2016	Chicken extract	11,000 (with leaves)	40,810	85,33	4,662	377,98	38,241	1,425
9/12/2016	Treated soil	6,000	5,643	1,936	468	8,014	264	36,997
10/12/2016	Treated soil	2,560	ND	838	ND	3,961	138	26,362
11/12/2016	Treated soil	4,000	2,659	786	ND	2,975	ND	24,435
12/12/2016	Treated soil	500	3,169	958	322	4,600	996	24,092
13/12/2016	Treated soil	6,000	2,659	786	ND	2,975	ND	24,435
14/12/2016	Treated soil	2,400	3,169	958	322	4,600	996	24,092
15/12/2016	Treated soil	1,890	1,036					24,018
16/12/2016	Treated soil	3,400		> 90% TPH REDUCTION				



Normalized difference vegetation index (NDVI)



Change map resulting from the difference of NDVI values (base line 2015-2018).

High values of change (Reddish color) are located close to the Pavillon area, and PDU yard (black arrows). While, very low values (Blue color) indicate an opposite change corresponding to the buildings and warehouses built in Semptember 2015 (yellow arrow).

CHANGE 26 feb 2015 - 18 Feb 2018 High : 0.22 Low : 0.04

17 Jan 2018



BENEFITS

BENEFITS AND LEARNING

- Effectively and efficiently remediated 1200 tons of oil-contaminated soil saving ~ \$550/ton
- Established a repeatable, natural method that is appropriate for the local conditions
- Concurrently building the case for proactive pollution prevention







DFS vision on Environment

We strive to deploy responsible missions that achieve maximum efficiency in their use of natural resources and operate at minimum risk to people, societies and ecosystems; contributing to a positive impact on these wherever possible.

Thank you

Discussion

For more information on technical environmental issues, please contact: environmental@un.org