Hurricane Dorian's impact on oil storage facilities

Grand Bahama, The Bahamas

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Cover photo: Equinor's South Riding Point oil storage facility on Grand Bahama Island in the aftermath of 2019 Hurricane Dorian (© Margherita Fanchiotti, UNEP/OCHA Joint Environment Unit)

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*The **United Nations Disaster Assessment and Coordination (UNDAC)** is part of the international emergency response system for sudden-onset emergencies. UNDAC is designed to help the United Nations and governments of disaster-affected countries during the first phase of a sudden-onset emergency.*

*The **European Union Civil Protection Mechanism (UCPM)** aims to strengthen cooperation between the EU Member States and 6 Participating States in the field of civil protection, with a view to improving prevention, preparedness and response to disasters. When the scale of an emergency overwhelms the response capabilities of a country, it can request assistance via the Mechanism. Through the Mechanism, the European Commission plays a key role in coordinating the response to disasters in Europe and beyond and contributes to at least 75% of the transport and/or operational costs of deployments.*

Executive summary

On 1 September 2019, Hurricane Dorian made landfall as a Category 5 hurricane on Abaco Islands, The Bahamas, before moving over Grand Bahama Island, The Bahamas. As of 29 October, the official death toll stood at 67, expected to rise given that over 200 people were still missing. The hurricane left a trail of devastation, with destroyed buildings, uprooted trees and significant disruption to basic services on both islands. An inland spill of crude oil, with approximate length and width of 7 and 3 miles respectively, occurred as a result of the hurricane's impact on Equinor's South Riding Point oil storage facility on Grand Bahama Island.

At the request of the Ministry of the Environment through the Bahamas Environment, Science and Technology (BEST) Commission, an environmental emergency response team was dispatched to Grand Bahama Island between 21 and 29 September as part of the United Nations Disaster Assessment and Coordination (UNDAC) supportto the government-led response to Hurricane Dorian. The team comprised one representative from the BEST Commission, an environmental expert from the UNEP/OCHA Joint Environment Unit (JEU), two oil spill experts mobilized by the JEU through the European Union Civil Protection Mechanism (UCPM) and a UCPM liaison officer. The experts worked very closely with the United States Coast Guard (USCG) also deployed to the island.

The main objective of the mission was to provide technical advice to national authorities to understand the oil spill impacts, assess existing capacities, identify required follow-up actions and deliver recommendations on how to enhance emergency response efforts both for the current situation and any future events.

The mission outcomes showed that the inland spill contaminated the surface layer of soil and the vegetation in the area nearest to the facility, and vegetation only in the farthest areas. Yet, the nearby wetlands did not appear to have been contaminated at the time of the survey. The team concluded that there was no evidence of the presence of oil at sea. The incident highlighted the opportunity to strengthen existing capacities and enhance readiness for any similar events in the future.

Based on the findings of the mission, the following measures ought to be considered for implementation by the Government of The Bahamas:

<u>Clean-up and waste management</u>

Short-term

1. Appointment of a dedicated National On-Scene Coordinator, who can remain on site, to monitor clean-up activities and waste management. The Coordinator should streamline constant communication with nearby communities to track the recovery process as accurately as possible. This should be formally delegated to an international/assisting agency if it cannot be staffed by the Government of The Bahamas *(Ministry of the Environment).*
2. Agreement between the operator and the Ministry of the Environment on the endpoints of the clean-up (how clean is clean enough?) *(Ministry of the Environment).*
3. Minimization of waste volumes, including by exploring opportunities for reusing and recycling of oiled soil and vegetation (e.g., for concrete and/or asphalt production) *(Ministry of the Environment).*

Medium-term

4. Reforestation and revegetation of the impacted area, taking into consideration the rehabilitation requirements *(Ministry of the Environment).*

Management of future similar events (including spills at sea)

Short-term

5. Periodic surveys of the contingency plans put in place by the operators of oil storage facilities in the country *(Ministry with responsibilities for the Port Department, in liaison with the Ministry of the Environment).*
6. Periodic surveys and maintenance of any government-owned clean-up resources, as well as periodic review of those that can be made available by pre-identified partners as outlined in The Bahamas National Oil Spill Contingency Plan *(Ministry of the Environment).*
7. Periodic training and simulation exercises with the involvement of all key national stakeholders and the private sector to be ready for any future similar event *(Ministry with responsibilities for the Port Department, in liaison with the National Emergency Management Agency, the Ministry of the Environment and any other relevant parties).*
8. Any use of dispersants should be closely monitored, given the relatively shallow nature of Bahamian waters *(Ministry with responsibilities for the Port Department).*

Medium-term

9. Risk assessment of harbours and sea lanes *(Ministry with responsibilities for the Port Department, in liaison with the Ministry of the Environment).*
10. Pre-identification of temporary disposal sites for waste generated by oil spill accidents *(Ministry of the Environment).*
11. Survey of any Vessels of Opportunity (i.e., vessels engaged in commercial activities that could be hired to support response efforts as needed, also promoting local economy) *(Ministry with responsibilities for the Port Department).*
12. Establish procedures that require polluters to advertise and adjudicate monetary claims to help other businesses and individuals impacted by the polluters' spills *(Ministry of the Environment).*
13. Implement public affairs planning requirements to include social media and open houses to keep the general public apprised on claims, the status of the clean-up, long term recovery/remediation efforts, etc. *(Ministry of the Environment)*.
14. Establish procedures for assessing potential cultural resources at risk (e.g. Taino/Lucayan sites & artefacts) before specific clean-up techniques are implemented by the operator *(Ministry of the Environment).*

Long-term

15. Development of Standard Operating Procedures to implement The Bahamas National Oil Spill Contingency Plan, as well as of local and harbour plans *(Ministry with responsibilities for the Port Department).*
16. Include considerations on hazardous and noxious substances (HNS) incidents in The Bahamas National Oil Spill Contingency Plan and any related national environmental policies *(Ministry with responsibilities for the Port Department and Ministry of the Environment).*
17. Consider ratifying the HNS Protocol of the International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC) *Ministry with responsibilities for the Port Department).*
18. Establish a program to ensure long-term financial remedy for damages to natural resources. *(Ministry of the Environment).*

List of abbreviations, acronyms and glossary of terms

BEST	Bahamas Environment, Science and Technology
CARPHA	Caribbean Public Health Agency
CCA	The Clean Caribbean & Americas
CDEMA	Caribbean Disaster Emergency Management Agency
DEHS	Department of Environmental Health Support
ECHO	European Commission's Directorate-General for Civil Protection and Humanitarian Aid
HNS	Hazardous Noxious Substance
IMDG	International Maritime Dangerous Goods
IMO	International Maritime Organization
IPIECA	International Petroleum Industry Environmental Conservation Association
ITOPF	International Tanker Owners Pollution Federation Limited
JEU	UNEP/OCHA Joint Environment Unit
MSB	Swedish Civil Contingencies Agency
NCP	National Oil Spill Contingency Plan of the Commonwealth of The Bahamas
NEMA	National Emergency Management Agency
NGO	Non-Governmental Organization
NOSCAT	National Maritime Policy Steering Committee
OCHA	(UN) Office for the Coordination of Humanitarian Affairs
OPRC	Oil Pollution Preparedness and Response Code
OSRL	Oil Spill Response Limited
PAHO	Pan American Health Organization
PMAC	Port Managers Association of the Caribbean
POSOW	Preparedness for Oil-polluted Shoreline cleanup and Oiled Wildlife interventions
PPE	Personal Protective Equipment
RNAT	Rapid Needs Assessment Team
UCPM	(European) Union Civil Protection Mechanism
UN	United Nations
UNDAC	United Nations Disaster Assessment and Coordination
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
USCG	United States Coast Guard
WFP	World Food Programme

1. Mission background and scope

On 1 September 2019 at 12:45 PM EST, Hurricane Dorian made landfall as a Category 5 hurricane at Elbow Cay, Abaco Islands, The Bahamas, with wind speeds of 185 mph. Starting on 2 September at 2:00 PM EST, Dorian moved over Grand Bahama Island, The Bahamas. An all-clear was issued on 4 September.

As of 29 October, the official death count stood at 67, expected to rise given that over 200 people were still missing. The hurricane left a trail of devastation, with destroyed buildings, uprooted trees and significant disruptions to basic services on both islands. Grand Bahama hosts two oil storage facilities: Equinor's South Riding Point, which was heavily impacted, and Buckeye Bahamas Hub, which reported no damage. An inland spill of crude oil, with approximate length and width of 7 and 3 miles respectively in the northeast direction, was reported as a result of Dorian's impact on Equinor's facility.

The National Emergency Management Agency (NEMA) is in charge of overall emergency management and established an Emergency Operations Centre (EOC) in Nassau, with satellite EOC's on Abaco and Grand Bahama Islands led by the local government representation[1]. Coordination is channeled through a set of Emergency Support Functions (ESFs) representing key sectors. Among these, the Ministry of the Environment is leading work on environmental and hazmat risks under the related ESF.

To complement national efforts, two Regional Needs Assessment Teams (RNATs) led by the Caribbean Disaster Emergency Management Agency (CDEMA) were pre-positioned in Nassau as of 31 August. The teams consisted of 18 members from CDEMA Participating States, the Caribbean Public Health Agency (CARPHA), Global Affairs Canada, the Pan American Health Organization (PAHO), the Port Managers Association of the Caribbean (PMAC), the private sector, the World Food Programme (WFP) and the United Nations Office for the Coordination of Humanitarian Affairs (OCHA).

Surge staff from OCHA Regional Office as well as a United Nations Disaster Assessment and Coordination (UNDAC) team was subsequently dispatched in the immediate aftermath of the event to support the government-led response. The UNDAC team embedded an environmental expert from the United Nations Environment Programme (UNEP)/OCHA Joint Environment Unit (JEU) deployed to The Bahamas from 8 to 27 September to rapidly identify and advise on acute environmental risks on Abaco and Grand Bahama Islands.

At the request of the Ministry of the Environment through the Bahamas Environment, Science and Technology (BEST) Commission, an environment team comprising one representative from the BEST Commission, the UNDAC environment lead, two oil spill experts mobilized by the JEU through the European Union Civil Protection Mechanism (UCPM) and a UCPM liaison officer was deployed to Grand Bahama Island between 21 and 29 September to provide technical advice on the environmental impacts of the oil spill, in close collaboration with local authorities and the United States Coast Guard.

1.1 Context

Hurricane Dorian severely impacted Equinor oil storage facility on Grand Bahama Island. Operations at the terminal were shut down on 31 August as a precautionary measure in view of the hurricane warning.

[1] MapAction. The Bahamas: Hurricane Dorian. Coordination sites. https://maps.mapaction.org/dataset/13275a57-719b-4c7f-bebf-bd5d0858d3e6/resource/33a13f7a-bbbc-4e3a-8266-36d28e07d1f1/download/ma058_coordination_sites-300dpi.pdf

On 5 September, Equinor reported[2] that the facility had sustained damage based on findings from preliminary aerial assessment. On the same day, the operator also informed that oil spill response resources had been mobilized.

An inland spill of crude oil in the North-East direction was confirmed and noticeable from photo evidence made available by PAHO after an aerial assessment conducted on 4 September further to the all-clear (Figures 1 and 2).

Figures 1 (above) and 2 (below): Inland spill of crude oil from Equinor oil storage facility as of 4 September 2019 (© PAHO)

Several unconfirmed reports of oil spills at sea were circulating on international media prior to the mission, with the operator maintaining that no oil was leaking from the terminal based on results of their assessments. In particular, an area with potential oil in open water was reportedly proven to be seaweed, while the suspected presence of oil in another location 70-80 km North-East of the facility did not appear to be linked to the spilling from the site, according to a statement issued by Equinor on 12 September[3].

[2] https://equinor.com/en/news/2019-09-05-bahamas.html
[3] https://www.equinor.com/en/news/2019-09-12-oil-spill-recovery-bahamas.html

1.2 Mission objective

The objective of the environmental mission to Grand Bahama in response to the Equinor oil spill was to:

- Conduct a scoping mission to understand oil spill impacts and advise on required follow-up actions (short-, medium- and long-term);
- Provide technical recommendations to the Government on proposed methodologies for developing response, clean-up, remediation and restoration plans to mitigate human health, wildlife and environmental impacts;
- Provide recommendations towards enhancing ongoing emergency response efforts and strengthening capacities as required;
- Identify any outstanding expertise or equipment needs to address any immediate risks and impacts to humans and the environment as necessary;
- Communicate rapidly and regularly all findings to national authorities, as well as the Joint Environment Unit, emphasizing the possible need for additional specialized expertise and/or additional equipment as required.

The mission took place from 21 to 29 September 2019 on Grand Bahama Island. It was conducted in close collaboration with relevant local, national and regional authorities, as well as other international emergency responders. The environment team was deployed as part of the UNDAC support to government-led response efforts in The Bahamas.

2. Key activities and findings

2.1 Key activities

On 23 September, the environment team met with the Minister of the Environment as well as with representatives from the BEST Commission and the Department of Environmental Health Support (DEHS) in Nassau. On the same day, the team participated as observers in a meeting between the Ministry of the Environment and Equinor. As a result of these meetings, the team was able to obtain a more detailed picture of the situation, of the interventions that were being carried out by the operator for clean-up and of the habitats that had suffered the greatest contamination.

From 24 September, the team moved to Grand Bahama, where liaison with the local coordination structure, including regional and other international responders (notably CDEMA and the United States Coast Guard) was ensured. In particular, the United States Coast Guard had been patrolling the area over the previous weeks and worked very closely with the team on the environmental findings.

The team visited the oil storage facility on two occasions: for a preliminary site survey on 24 September and for an aerial assessment by helicopter in collaboration with DEHS and the United States Coast Guard on 26 September. On both occasions, the team interacted extensively with representatives from the company.

Still on 26 September, the team visited Sanitation Services, the only landfill located on Grand Bahama Island and the proposed final destination for the soil contaminated by the spill. During the visit, the team interviewed the site manager.

To inform the mission findings, the team reviewed the national legislation on oil contamination (notably the National Oil Spill Contingency Plan of the Commonwealth of The Bahamas (NCP), The Bahamas National Requirements and the Bahamas National Maritime Policy), as well as the documentation made available by the operator to the Ministry of the Environment.

2.2 Key findings

The main findings of the mission are provided below and classified according to the following categories:

- Dynamic of the event;
- Presence of oil at sea;
- Receiving environment; and
- Clean-up and waste management.

2.2.1 Dynamic of the event

The operator reported that, out of the ten tanks at the oil storage facility, one was under repair and without the dome prior to the event, while five other domes were blown away by the hurricane. The passage of Dorian over Grand Bahama led to a wind spill of crude oil inland resulting from two of the five tanks which lost-their domes. These two tanks (tanks n.6 and n.10) were full at the time of occurrence, while the others were empty.

As a result, crude oil was wind-spilled from the two full tanks along the hurricane's northeast direction, impacting mainly inland areas, with a length of about 7 miles and an approximate width of 3 miles. Plumes of oil sprayed over the nearby vegetation were already visible from the first aerial assessments conducted on 4 September after the all-clear was issued. Photo evidence also shows that the East side of the plant experienced flooding (Figure 3). The flood trace was mapped by the European Commission's Copernicus Emergency Management Service based on an analysis of satellite images (Annex 5). The spill contaminated both the surface layer of soil (estimated at 5 cm) and vegetation in the area nearest to the plant, and vegetation only in the farthest areas (Figure 4).

Figure 3: Aerial assessment of the facility, showing the plume of oil along the northeast direction as well as flooding on the East side of the plant (© PAHO)

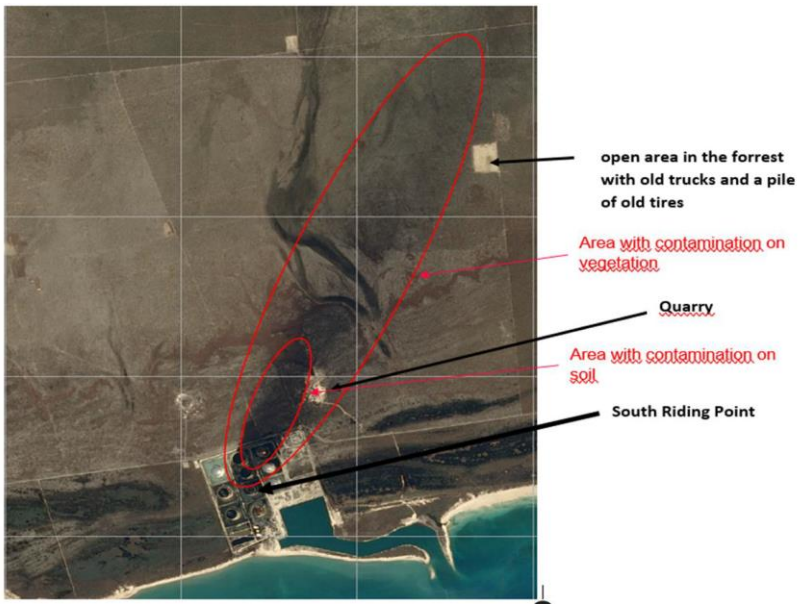


Figure 4: Extent of oil contamination inland (© Equinor)

The distinction between the impacted and non-impacted areas is very clear: a straight line could be drawn. This means that the blowing of the tank domes and consequent spilling of oil most likely occurred within a very short period of time (in the order of a few minutes), but with intense violence.

As informed by Equinor, the type of crude oil stored at the facility is DOBA. It must be noted that the DOBA crude oil has a relative density of 0.923 (at 15 °C), a viscosity of 290 cSt at 40 °C and a pour point of -6 °C (Annex 6). This means that the product is liquid at ambient temperature and has a medium density and viscosity. The product is therefore fluid even if it does not tend to penetrate the soil easily. It must, however, be considered that, over the time elapsed since its spill, it tends to undergo a weathering process that makes it more viscous and difficult to eliminate from contaminated surfaces.

Up until the completion of the mission, it was not possible for the operator to estimate the amount of crude oil that was spilled. The first estimates were disclosed on 9 October and subsequently revised downwards on 25 October[4], from 119,000 to 55,000 barrels. Overall, the estimation of real quantities is challenging for the following reasons:

- The operator did not have a pre-event baseline record of quantities of oil in the impacted tanks;
- Temperature changes leading to volume changes make it challenging to estimate the amount that is left or that has been spilled;
- Storm water is likely to have entered the tanks and stratify under the crude oil, altering the real level of oil. When the pumps are operational again, crude oil can be transferred to the undamaged tanks and only then the actual quantity of crude oil that is left can be measured.

2.2.2 Presence of oil at sea

Two site surveys, as well as the observation of different aerial and satellite images made available by different sources, support the statement with reasonable certainty that there is no evidence of the presence of crude oil at sea originating from Equinor's South Riding Point oil storage facility. Results from a site survey and aerial assessment conducted by the team between 24 and 26 September also did not

[4] https://www.equinor.com/en/where-we-are/bahamas.html

reveal the presence of crude oil along the coast and in the wetlands surrounding the facility (Figures 5, 6 and 7). Limited amounts of crude oil may, however, have reached the north coast of the island due to the runoff of oil caused by inland flooding.

Figures 6 (left) and 7 (right): Site survey along the beach near the facility on 24 September, which showed no evidence of oil that could have been spilled at sea. Little droplets of oil were found on the beach due to the vortex created by the storm

Figure 8: Helicopter view of the shoreline to the East of the oil storage facility and of the surrounding wetlands that appeared free of crude oil

Figure 9: The containment basin around the tanks forms a closed system without drainage of rain water. This is confirmed by the presence of water and crude oil inside the basin

Finally, among the many unconfirmed reports of oil at sea in the press which were not accompanied by factual information on their location, observation of oil along the east coast of Abaco was reported from aerial images. Overall, no vessel back-tracking was carried out to confirm the origin of any potential spill at sea. Should the presence of hydrocarbons in that location be confirmed, any findings would need to be supported by sampling to compare the oil found at sea with that stored in tanks n.6 and n.10 (fingerprinting). Given that no signs of contamination were found along the shoreline next to the facility, the origin of this spill - if confirmed - could be on Abaco Islands, close to the area where the patches were observed.

2.2.3 Receiving environment

The receiving environment is predominantly characterized by a forest of Caribbean Pines (*Pinus caribaea var. bahamensis*), also known as Yellow Pines, with Sabal palmetto (*Cocothrinax argenta*) dominating the ground flora.

Figure 10: Pineland contaminated by crude oil

According to the Bahamas National Trust[5], other species which can be found in the Bahamian pine forest include *Bletia purpurea*, Pineyard Pink Orchid, *Andorpogon glomeratus*, also known as Bushy Beard Grass, and *Pteridium aquilinum*, Southern Bracken Fern. Shrubs which populate the area include Wild guava (*Tetrazygia bicolor*), Five-finger or Chicken's foot (*Tabebuia bahamense*) and Snowberry (*Chiococca the alba*). The Scale leafed love vine (*Cassytha filiformis*) winds its way through understory and around Poisonwood (*Metopium toxiferum*).

Grand Bahama Island hosts three national protected areas: the Lucayan National Park, the Peterson Cay National Park and the Rand Nature Centre. All these areas are located at a significant distance from the location of the inland spill.

[5] http://bnt.bs/wp-content/uploads/2016/03/pineforest-l.pdf

Oil can easily be absorbed by the tree trunks, with risk of fire. For this reason, the Forestry Unit was involved in monitoring the response. Wildfires are common and several were observed along the roads at the time of the mission, while moving into the dry season.

In terms of fauna, the pine forest hosts several species of birds. At the time of the mission, only three birds had reportedly been impacted by the spill (cormorant, egret and catbird). A veterinary facility designated to host any affected wildlife had been identified.

The area experiences tidal waves of 3 to 5 feet. The water table is shallow. Agricultural farms and fishing areas are located near the facility to the east and south respectively.

2.2.4 Clean-up and waste management

Equinor has been carrying out clean-up operations since 8 September. Free oil is collected using 13 vacuum trucks and oil skimmers (Figures 10 and 11). As of 24 September, 6000 barrels of oil had been recovered and stored in pond n. 3, which has a total capacity of 12,000 m^3. The pond was reportedly less than 1/3 full at the time of the mission.

Figure 10 (left) and 11 (right): Collection of crude oil is carried out using vacuum trucks (left) and oil skimmers (right)

The operator's waste management plan proposes the export of the oil sludge to the United States under the provisions of the Basel Convention for incineration, pending approval from the Ministry of the Environment. This will require an estimation of the quantities and typology of waste, as well as the agreement of the recipient party to accept the waste.

For contaminated soil, its removal had just started at the time of the mission (see Figures 12 and 13 below). According to the operator's waste management plan, the entire level of soil (10-15 cm) covering the limestone base - the latter reportedly not permeable to oil - is planned for removal through bulldozers. The estimated final volume of contaminated soil is 500-1,000 m^3 piled. This soil is temporarily stocked in a dedicated pit created at the facility, with the objective of pre-treating it on site before it is sent to its final destination. The proposed destination is the only landfill located on Grand Bahama Island (Sanitation Services), subject to authorization from the authorities.

The landfill is a private facility, reportedly licensed by the Grand Bahama Port Authority and audited by DEHS. The facility reportedly has a Special Waste Management Plan as described in Equinor's waste management plan, following United States regulation. As informed by the landfill site manager, they appear to have previous experience in managing this type of waste and already collaborate with Buckeye

Bahamas Hub, the other oil storage facility on Grand Bahama Island. The final destination of the oiled soil would be the landfill itself, to be used for the top cover. The staff at the landfill facility does not have any experience in reusing/recycling. At the time of the mission, the site manager was not able to provide information on the quantities that the landfill could receive and be capable of disposing, also due to the uncertainty over actual waste figures.

Figure 12: Removal of contaminated soil with bulldozers

Figure 13: Oiled soil accumulation, removed with bulldozers

It must be noted that no information was received on the treatment and amount of water that entered the damaged tanks during the hurricane, which could be of considerable volume.

3. Recommendations

Key recommendations from the mission have been clustered around the following two main areas:

- Clean-up and waste management; and
- Management of future similar events (including spills at sea).

3.1 Clean-up and waste management

The key recommendations on the management of the waste generated as a direct consequence of the oil spill in terms of minimization, segregation and opportunities for reusing/recycling are provided below against their timeline.

Overall, any considerations relating to the management of the waste generated by the spill should be linked to a comprehensive hurricane disaster waste management plan, whose development is led by DEHS. The Disaster Waste Management Guidelines, jointly published by UNEP, OCHA and the Swedish Civil Contingencies Agency (MSB), provides comprehensive guidance on disaster waste management[6].

Further advice can be drawn from the Oil Spill Waste Management Manual published by the Preparedness for Oil-polluted Shoreline cleanup and Oiled Wildlife interventions (POSOW)[7] and the Technical Information Paper on Disposal of Oil and Debris published by the International Limited (ITOPF)[8].

Short-term

Recommendation n. 1: Appointment of a dedicated National On-Scene Coordinator, who can remain on site, to monitor clean-up activities and waste management. The Coordinator should streamline constant communication with nearby communities to track the recovery process as accurately as possible. This should be formally delegated to an international/assisting agency if it cannot be staffed by the Government of The Bahamas *(Ministry of the Environment).*

The team considers advisable that a representative of The Government of The Bahamas is appointed as the focal point to monitor and provide oversight on ongoing clean-up activities and waste management. An Emergency Committee, comprising different government agencies responsible for various aspects relating to clean-up and waste management could be established and led by the appointed focal point.

Recommendation n. 2: Agreement between the operator and the Ministry of the Environment on the endpoints of the clean-up (how clean is clean enough?) *(Ministry of the Environment).*

The Emergency Committee could work with the operator to establish the criteria to declare the end the emergency. These criteria will depend on factors such as future land use (e.g., reforestation) and the possibility that oil residues could reach the water table, among others. An optimal balance between the need for clean-up and the minimization of waste generation should be found.

Recommendation n. 3: Minimization of waste volumes, including by exploring opportunities for reusing and recycling of oiled soil and vegetation (e.g., for concrete and/or asphalt production) *(Ministry of the Environment).*

This will require:

- An evaluation of the real oil sludge volumes. The volumes calculated so far might be lower than those that will have to be dealt with at the end of the operations; this is because overall quantities were still unknown at the time of the mission and the quantity of storm water that entered the damaged tanks

[6] https://www.unocha.org/sites/dms/Documents/DWMG.pdf
[7] http://www.posow.org/documentation/wasteweb.pdf
[8] https://www.itopf.org/fileadmin/data/Documents/TIPS%20TAPS/TIP_9_Disposal_of_Oil_and_Debris.pdf

during the hurricane had not been estimated. Water would be stratified under the oil in the tanks given its higher density.

- An agreed approach on the minimal quantities of soil that should be removed to ensure a suitable level of clean-up while minimizing the generation of waste. At the time of the mission, oiled soil was being collected with the help of heavy equipment (predominantly, bulldozers) for a thickness of removed material of about 10-15 cm. The experts have observed that the soil is contaminated only up to the first 5 cm. It may be, therefore, advisable to use lighter equipment capable of removing only the surface layer. The process will be longer but the damage to the environment will be reduced; furthermore, if all the soil is removed, leaving the underlying limestone on the surface, the forest habitat may not be able to recover adequately.

- Exploring opportunities for reusing/recycling some of the waste materials generated by the spill. The feasibility of reusing some of the waste products as construction materials (concrete or asphalt) could be investigated. The team identified three construction companies located on the island and follow-up with them could be pursued to explore any possibilities in this regard. This will depend on existing capacities and on the features the material must have (e.g., grain size, chemical and mineral characteristics, etc.). In the case of asphalt, the soil could be used as the inert part to build asphalt roads. In the case of concrete, the soil could be used to produce cement (the so-called Alternative Raw Material - ARM), while oiled vegetation could possibly be used as fuel mass (the so-called Alternative Solid Fuel - ASF).

Medium-term

Recommendation n. 4: Reforestation and revegetation of the impacted area, taking into consideration the rehabilitation requirements *(Ministry of the Environment).*

It is advised that, at the end of the clean-up operations, a reforestation program of the pineland – alongside other plants that would bind and process potentially contaminated layers – is carried out under the coordination of the Ministry of the Environment (Forestry Unit), to help this specific habitat to recover from the damage suffered as a consequence of the spill. Moreover, communication with communities and the public on cleanup operations would remedy this process, and would improve the monitoring of reforestation efforts.

3.2 Management of future similar events (including spills at sea)

The mission's key recommendations on how to strengthen management of any future similar events (including spills at sea) are provided below against their timeline, based on the gaps identified during the mission and the areas or items that would be convenient to revise, enhance or update.

Further advice can be drawn from ITOPF manual on Leadership, Command and Management of Oil Spills[9], ITOPF manual on Contingency Planning for Marine Oil Spills[10], Transport Canada's Emergency Response Guidebook[11], and IPIECA's manual on Oil Spill Preparedness and Response[12].

[9] http://www.itopf.org/knowledge-resources/documents-guides/document/tip-10-leadership-command-management-of-oil-spills/
[10] http://www.itopf.org/knowledge-resources/documents-guides/document/tip-16-contingency-planning-for-marine-oil-spills/
[11] https://www.tc.gc.ca/eng/canutec/guide-menu-227.htm
[12] http://www.ipieca.org/resources/good-practice/oil-spill-preparedness-and-response-an-introduction/

Short-term

Recommendation n. 5: Periodic surveys of the contingency plans put in place by the operators of oil storage facilities in the country *(Ministry with responsibilities for the Port Department, in liaison with the Ministry of the Environment).*

The NCP requires that oil companies as well as companies located nearby or in any way related with maritime operations at ports have a contingency plan in place against maritime pollution. The team recommends that periodical surveys of these plans as well as the inspection of any documents or files associated with these plans (e.g., records of exercises, maintenance of equipment, training of the personnel involved in related tasks in addition to any other related matter) be conducted by the Port Authority, Harbour Master or any other related entity adequately trained for the purpose.

Recommendation n. 6: Periodic surveys and maintenance of any government-owned clean-up resources, as well as periodic review of those that can be made available by pre-identified partners as outlined in The Bahamas National Oil Spill Contingency Plan *(Ministry of the Environment).*

In the event of an incident, equipment and expertise may be provided by the Clean Caribbean & Americas (CCA), Oil Spill Response Limited (OSRL) from Southampton, United Kingdom, and the United States Coast Guard (in view of the agreements in place with the Royal Bahamas Defence Force). While available regional and international support is of great quality and professionalism, it is advisable to conduct periodic surveys and maintenance of any government-owned equipment, to enhance as required so as to reduce the time needed for mobilization and any other constraints linked to international assistance. Considerations should be made about the type of material, the compatibility between different brands, any auxiliary equipment that is required to operate core equipment, recovery capacities, the feasibility of deployment at short notice and the overall technical characteristics of the available resources.

Recommendation n. 7: Periodic training and simulation exercises with the involvement of all key national stakeholders and the private sector to be ready for any future similar event *(Ministry with responsibilities for the Port Department, in liaison with the National Emergency Management Agency, the Ministry of the Environment and any other relevant parties).*

Periodic testing of the NCP should be pursued through training and simulation exercises involving all relevant stakeholders. A mix of table-top and field exercises could be conducted on a regular basis to ensure an adequate level of preparedness. It is also recommended that a contact list of focal points of the different agencies that are part of the National Maritime Policy Steering Committee (NOSCAT) is maintained and periodically tested to ensure a rapid and efficient communication system is in place in the event of an emergency.

Recommendation n. 8: Any use of dispersants should be closely monitored, given the relatively shallow nature of Bahamian waters *(Ministry with responsibilities for the Port Department).*

Given the nature of Bahamian marine areas, it is recommended that any use of dispersants be closely monitored. A feasibility study on the use of dispersants could be conducted by specialists to inform any monitoring activities based on a proper survey of the local marine environment and its characteristics.

Medium-term

Recommendation n. 9: Risk assessment of harbours and sea lanes *(Ministry with responsibilities for the Port Department, in liaison with the Ministry of the Environment).*

It is advisable to conduct a study of the maritime traffic bound for Bahamian ports and other related sea lanes in the Economic Exclusive Zone, to assess any risks related to maritime accidents. Furthermore, the NCP does not consider contamination in ports. Experience shows that this is where a considerable number of maritime accidents takes place. It is, therefore, recommended to carry out a risk assessment study of harbours, analyzing the characteristics of all ports, the size of the entrance channels and capacities to allocate some equipment in proximity to the ports to determine any capabilities to contain potential spills within the ports themselves (which is usually high in the event of Tier 1 or Tier 2 incidents) so as to reduce any environmental impacts associated with the spill, as well as the time of response and recovery costs.

Recommendation n. 10: Pre-identification of temporary disposal sites for waste generated by oil spill accidents *(Ministry of the Environment).*

In the event of a major spill at sea, a great quantity of waste could be generated. Experience from past events shows that up to sixty tons of waste of all types could be generated for one ton of oil spilled when the product reaches the shore side. It is, thus, advisable to act to minimize volumes as well as to pre-identify temporary disposal sites as part of the NCP.

Recommendation n. 11: Survey of any Vessels of Opportunity (i.e., vessels engaged in commercial activities that could be hired to support response efforts as needed, also promoting local economy) *(Ministry with responsibilities for the Port Department).*

In case of a major incident, the amount of equipment, vessels and trained personnel required to respond may be substantial. In view of this, it is recommended to make a survey of Vessels of Opportunity that could support clean-up efforts in the event of an emergency. This would typically include trawlers, fishing boats, harbour tugs, auxiliary ships for harbour operations and small oil tankers. Support from commercial vessels have proved its effectiveness in major incidents in the past, with the advantage that these would be managed and staffed by their own crew. The survey should record the vessel's main characteristics, capabilities and base port.

Recommendation n. 12: Establish procedures that require polluters to advertise and adjudicate monetary claims to help other businesses and individuals impacted by the polluters' spills *(Ministry of the Environment).*

Claim types could include: Removal Costs, Property Damage, Loss of Profits and Earning Capacity, Loss of Government Revenue, Cost of Increased Public Services and Subsistence Loss.

Recommendation n. 13: Implement public affairs planning requirements to include social media and open houses to keep the general public apprised on claims, the status of the clean-up, long term recovery/remediation efforts, etc. *(Ministry of the Environment)*.

Effective external communication is essential for a successful response - even if the clean-up is tactically sound - to a significant pollution event. Public affairs play a key role during high-profile responses since they offer timely, accurate, and consistent information to the community on any threats to public health and the environment, as well as on the status of ongoing response efforts.

Recommendation n. 14: Establish procedures for assessing potential cultural resources at risk (e.g. Taino/Lucayan sites) before specific clean-up techniques are implemented by the operator *(Ministry of the Environment).*

Cultural resources include all artefacts, human remains, hunting and fishing grounds, sacred religious and ceremonial sites, cemeteries, and cave/rock art. Objectives for creating a culturally sensitive assessment process could include: inviting cultural reps/descendants to participate, meeting all governmental requirements regarding resource protection, avoiding irreparable harm to historic, cultural, or archaeological resources and establishing a functional group to address all cultural resource needs

Long-term

Recommendation n. 15: Development of Standard Operating Procedures to implement The Bahamas National Oil Spill Contingency Plan, as well as of local and harbour plans *(Ministry with responsibilities for the Port Department).*

The NCP has been redacted in line with best practices in the sector and refers to all the essential elements that the OPRC and other international references outline for a structured national contingency plan. However, it is recommended to develop standard operating procedures (SOPs) to implement the plan. The SOPs should be clear and concise, defining roles and responsibilities of every party to the plan. They should be tested in a simulation exercise before final endorsement and be strictly followed during emergencies. It is also recommended that the NCP is adapted to local and harbour contingency plans.

Recommendation n. 16: Include considerations on hazardous and noxious substances (HNS) incidents in The Bahamas National Oil Spill Contingency Plan and any related national environmental policies *(Ministry with responsibilities for the Port Department and Ministry of the Environment).*

As a matter of national policy, the incidents involving HNS are not comprised in the scope of the NCP. However, the transport by sea of these substances is rising, as evidenced in the International Maritime Dangerous Goods Code (IMDG). This leads to an increased generation of new, mixed products, which are increasingly dangerous from an environmental point of view. The risks associated with incidents involving these types of substances, combined with the risk of fire or explosion, point to the necessity of incorporating measures to cope with such accidents in the NCP.

Recommendation n. 17: Consider ratifying the HNS Protocol of the International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC) (*Ministry with responsibilities for the Port Department).*

The Government of The Bahamas is part of the OPRC, but not of the 2000 Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances (commonly referred to as the HNS Protocol). The HNS Protocol addresses any occurrence or series of occurrences having the same origin, including fire or explosion, which result or may result in a discharge, release or

emission of HNS and which pose or may pose a threat to the marine environment, or to the coastline or related interests of one or more States, and which requires emergency action or immediate response. It is advisable to consider the ratification of this protocol.

Recommendation n. 18: Establish a program to ensure long-term financial remedy for damages to natural resources *(Ministry of the Environment)*.

Natural resources include land, fish, wildlife, biota, air, water, ground water, drinking water supplies, and other such resources belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by the Government of the Bahamas. Qualifying activities would include: assessments, restoration projects and compensation to the public for the lost use of the affected resource. Potential programs to model include the UK Premium guidelines (Pollution Response in Emergencies: Marine Impact Assessment and Monitoring), European Union GRACE Integrated Oil Spill Response Actions and Environmental Effects, and the U.S. National Oceanic and Atmospheric Administration's (NOAA) Natural Resource Damage Assessment (NRDA) program.

4. Conclusions

In conclusion, the mission found that ongoing efforts for the management of waste generated by the inland spill of crude oil should aim to minimize the quantities of waste produced while ensuring adequate clean-up. There appeared to be no evidence of the presence of oil at sea, nor of contamination of nearby wetlands.

While national legislation addressing oil contamination is in place, the incident showed the potential to strengthen national monitoring and oversight mechanisms and to develop standard operational procedures for the implementation of existing policies and plans so as to enhance readiness in the event of future similar incidents.

References

Transport Canada. 2016. Emergency Response Guidebook.

IPIECA. 2019. Oil spill preparedness and response: An introduction.

IPIECA. 2018. Guidelines on implementing spill impact mitigation assessment (SIMA).

POSOW Manuals (www.posow.org)

- Oiled Shoreline Assessment
- Oiled Shoreline Cleanup
- Oil spill waste management
- Oiled Wildlife Response
- Fishermen's support in oil spill response

ITOPF Manuals (www.itopf.com)

- ITOPF Handbook Manual
- Aerial observation of marine oil spills
- Use of dispersants to treat oil spills
- Recognition of oil on shorelines
- Clean-up of oil from shorelines
- Disposal of oil and debris
- Effects of oil pollution on the marine environment
- Leadership, command & management of oil spills
- Sampling and monitoring of marine oil spills
- Contingency planning for marine oil spills
- Response to Marine Chemical Incidents

Useful links

Environmental Emergencies Centre, www.eecentre.org

Environment and Humanitarian Action Connect, www.ehaconnect.org

ITOPF, www.itopf.com

IMO, www.imo.org

IPIECA, http://www.ipieca.org/about-us/

Transport Canada, https://www.tc.gc.ca

POSOW, www.posow.org

Annexes

Annex 1.	Request for assistance
Annex 2.	Terms of Reference
Annex 3.	Team composition
Annex 4.	List of consulted stakeholders
Annex 5.	Copernicus flood trace map
Annex 6.	Safety Data Sheet of DOBA crude oil

THE BAHAMAS ENVIRONMENT, SCIENCE AND TECHNOLOGY COMMISSION
Ministry of the Environment

REF: MTE/BEST/ SENT VIA EMAIL

September 19, 2019

Ms. Margherita Fanchiotti
United Nations Environment Programme

Dear Ms. Fanchiotti,

RE: REQUEST FOR TECHNICAL ASSISTANCE

Please note that assistance relative to an oil spill expert is requested from UNEP. It is understood that 1 week can be provided although 2 weeks would have been useful. We are also open to having two persons identified such that focus could be directed at multiple task given the timeline. Assistance in the following areas would be desired

- Perform a rapid environmental assessment of oil spill impacts and identify required follow-up actions (short-, medium- and long-term);
- Provide technical recommendations to the gov on the proposed methodologies for the clean up and restoration plans to mitigate human health, wildlife impacts and environmental impacts
- Provide recommendations towards enhancing ongoing emergency response efforts and strengthening capacities as required;
- Identify any outstanding expertise or equipment needs to address any immediate risks and impacts to humans and the environment as necessary;
- Communicate rapidly and regularly all findings to Ministry of Environment, as well as the Joint Environment Unit, emphasizing the possible need for additional specialized expertise and/or additional equipment as required.

Please advise if the identified needs above can be provided and inclusive of the agreed TOR. Additionally, please note that this request of assistance is done with the understanding that the assistance is offered at no cost to the GOB. Please advise

Sincerely,

Mrs. Rochelle W. Newbold
Director
The BEST Commission,
Ministry of the Environment and Housing
Ground Floor, Charlotte House
Charlotte and Shirley Streets
P.O. Box N-7132
Nassau, The Bahamas

Cc: Janice Miller Permanent Secretary, Ministry of Environment and Housing

OIL SPILL EXPERTS

2019 HURRICANE DORIAN, BAHAMAS

TERMS OF REFERENCE

UN Environment/OCHA Joint Unit[1]

On 1st September at 12:45pm EST, Hurricane Dorian made landfall as a category 5 hurricane at Elbow Cay, Abaco Islands (population of 17,200). Starting from 2nd September, it moved over Grand Bahama (population of 51,000). An all-clear was issued on 4th September. Dorian caused widespread damage across Abaco and Grand Bahama Islands. Grand Bahama hosts two oil storage facilities: Equinor's South Riding Point, which has been heavily impacted, and Buckeye Bahamas Hub.

The National Emergency Management Agency (NEMA) is in charge of response and has established an Emergency Operations Centre (EOC) in Nassau, with satellite EOC's on Abaco and Grand Bahama islands led by the local government representation. Coordination is channeled through a set of Emergency Support Functions (ESF) representing key sectors. The Department of Environmental Health Support (DEHS) is leading the hazmat ESF.

The United Nations Office for the Coordination of Humanitarian Affairs (OCHA) has surged a team to support the government-led response on coordination and assessments, including on environment. One staff from the UN Environment/OCHA Joint Unit is currently deployed.

To complement the ongoing response, the UN Environment/OCHA Joint Unit (JEU) is looking for two oil spill experts to provide technical advice to national and local authorities for identifying and assessing any environmental and human health risks and impacts resulting from Hurricane Dorian's effect on Grand Bahama island and its two oil storage facilities.

Responsibilities

In liaison with national and local authorities and under the overall guidance of the UNDAC Team Leader and the UNDAC Environment Focal Point, the oil spill experts are expected to:

• Advise national and local authorities on any environmental and human health impacts and risks deriving from spilling at the two oil storage facilities located on the island;
• Provide technical advice to national authorities for responding to and recovering from ongoing spills, including by identifying priorities for action and supporting the development of response, clean-up, remediation and recovery plans to mitigate environmental damage;
• Identify any outstanding expertise or equipment needs to address any immediate risks and impacts.
▪ Provide advice, guidance and training to national and local authorities on the environmental assessment of oil spill impacts if requested and as required.

[1] For more information on the Joint Environment Unit: http://ochaonline.un.org/ochaunep

Expected Actions

In close collaboration with relevant national and local authorities as well as international emergency responders:

- Conduct a scoping mission to understand oil spill impacts and advise on required follow-up actions (short-, medium- and long-term);
- Provide technical recommendations to the Government on proposed methodologies for developing response, clean-up, remediation and restoration plans to mitigate human health, wildlife and environmental impacts;
- Provide recommendations towards enhancing ongoing emergency response efforts and strengthening capacities as required;
- Identify any outstanding expertise or equipment needs to address any immediate risks and impacts to humans and the environment as necessary;
- Communicate rapidly and regularly all findings to national authorities, as well as the Joint Environment Unit, emphasizing the possible need for additional specialized expertise and/or additional equipment as required.

Note: Contact with media, including interviews, should only be undertaken in agreement with the Government of The Bahamas and the UNDAC Team Leader.

Education and work experience

▪ Solid background in environmental management, chemical engineering or related field, with a focus on oil spill management.
▪ Ability to perform rapid environmental assessments and to distinguish immediate, medium-term and long-term priority actions;
▪ Familiarity with the emergency response/humanitarian architecture;
▪ Ability to coordinate with international and national agencies involved in disaster response;
▪ Familiarity with management of operational support functions including telecommunications, logistics and basic field security;
▪ High motivation, coupled with an ability to improvise effectively in rapidly changing situations with minimal guidance and support;
▪ Team skills required for working in a multi-disciplinary, multi-national team in field conditions of hardship, with an ability to assume authority as and when needed;
▪ Availability for short-notice mobilization (within 48 hours) and to stay in the field for up to 2 weeks;
▪ Fluency in the English language;
▪ Knowledge of MS Windows and MS Office and ability to operate standard IT and communications equipment;
▪ Availability for additional follow-up, collaboration and editing of mission report after the official mission deadline;
▪ Completed training course on Environment and Emergencies (of stand-by partner, UNDAC system, JEU response partner and/or other organization) is an asset.

Team composition – Grand Bahama oil spill

Name	Organization	Role
Sydnei Cartwright	The Bahamas Environment, Science and Technology (BEST) Commission, Ministry of the Environment	National expert
Lushan Hannah	United States Coast Guard	Commanding Officer Pacific Strike Team, EOC Freeport Coordination
Margherita Fanchiotti	UNEP/OCHA Joint Environment Unit (JEU)	UNDAC environment lead
Esther El Haddad	European Commission Directorate-General for Civil Protection and Humanitarian Aid Operations	UCPM liaison officer
Luigi Alcaro	Italian Institute for Environmental Protection and Research (ISPRA)	Oil spill expert, mobilized by the JEU through the UCPM
Pablo Pedrosa	Spanish Ministry of Infrastructures and Transport, General Directorate of Merchant Marine	Oil spill expert, mobilized by the JEU through the UCPM

List of main stakeholders consulted – Grand Bahama oil spill

Name	Organization	Role
Romauld Ferreira	Ministry of the Environment and Housing	Minister of the Environment
Janice Miller	Ministry of the Environment and Housing	Permanent Secretary
Rochelle Newbold	BEST Commission, Ministry of the Environment	Director
Melony McKenzie	DEHS, Ministry of the Environment	Director
Katherine Forbes-Smith	Government of The Bahamas	President of the Senate, NEMA's Grand Bahama Coordinator
Lucius Lake	CDEMA	EOC Freeport Coordination
Dennis Marcelle	CDEMA	EOC Freeport Coordination
Nick Benson	Equinor	Emergency response coordination
Christine Wigand	Equinor	Communication
Lou Carroll	Sanitation Services	General Manager

List of identified construction companies operating on Grand Bahama

- Freeport Construction
- Bahamas Hot Mix
- Waugh Construction

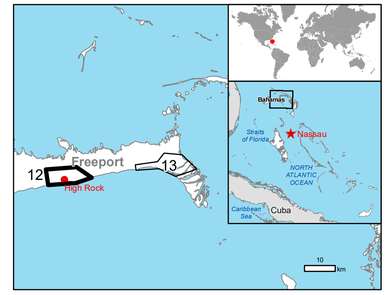
GLIDE number: TC-2019-000099-BHS
Int. Charter call ID: 714

Activation ID: EMSR385
Product N.: 12HIGHROCK, v3

High Rock - BAHAMAS

Tropical Cyclone - Situation as of 06/09/2019

Grading - Overview map 01



Cartographic Information

1:24000

Full color A1, 200 dpi resolution

0 0,5 1 2 km

N

Grid: WGS 1984 UTM Zone 17N map coordinate system
Tick marks: WGS 84 geographical coordinate system

Legend

Crisis Information
- Flooded Area (05/09/2019 15:51 UTC)
- Chemical spill
- Flood trace

Built Up Grading
- Destroyed
- Damaged
- Possibly damaged

Transportation Grading
- Road, Destroyed
- Road, Damaged
- Road, Possibly damaged
- Road, No visible damage

Facilities Grading
- Heavy industrial plant, Destroyed
- Heavy industrial plant, Damaged

General Information
- Area of Interest
- Image Footprint
- Not Analysed

Placenames
- Placename

Hydrography
- Coastline
- Open Water

Consequences within the AOI

	Unit of measurement	Destroyed	Damaged	Possibly damaged	Total affected	Total in AOI
Flooded area	ha					26.8
Food traces	ha					310.5
Chemical spill	ha					26.5
Road blocks	No.					10
Estimated population	Number of inhabitants				660	663
Settlements	Residential	No. 175	44	1	220	221
Transportation	Secondary Road	km 0.2	1.5	1.2	2.9	14.7
	Local Road	km 1.9	8.6	3.5	12.0	14.6
	Cart Track	km 0.9	8.6	1.6	11.2	54.3
Facilities	Chemical plant construction and heavy industrial plant	No. 20	14	0	34	34

Map Information

The tropical cyclone Dorian-19 made landfall in Bahamas on 1 September 2019 as a category 5 hurricane. It affected mainly the Great Abaco and Grand Bahama islands (northern Bahamas) with sustained maximum winds of 295 km / h. It brought heavy rains which produced spreaded flooding, power outages and destructions to infrastructure elements (roads, airports, ports), houses and administrative buildings. Authorities reports 76,000 people affected, also injured and dead. The assessment of the damage is ongoing. The ERCC has triggered the EMS COPERNICUS with the aim to provide first estimate products as well as grading maps over the affected areas.

The present map shows the damage grade assessment in the area of High Rock. The thematic layer has been derived from two post-event satellite images by means of visual interpretation."Not analysed" indicates an area that could not be analysed in any of the post-event images. The background image is from 06/09/2019. The estimated geometric accuracy (RMSE) is 2.5 m or better, from native positional accuracy of the background satellite image.

Relevant date records (UTC)

Event	01/09/2019 18:00	Situation as of	06/09/2019 15:44
Activation	01/09/2019 08:12	Map production	10/09/2019

Data sources

Pre-event image: Pléiades-1A/B © CNES (2019), distributed by Airbus DS (acquired on 15/08/2019 at 16:00 UTC, GSD 0.5 m, approx. 0.4% cloud coverage in AoI, 13.6° off-nadir angle), provided by International Charter (call ID 714), all rights reserved.
Post-event image: Pléiades-1A/B © CNES (2019), distributed by Airbus DS (acquired on 06/09/2019 at 15:44 UTC, GSD 0.5 m, approx. 32.6% cloud coverage in AoI, 33.9° off-nadir angle), provided by International Charter (call ID 714), all rights reserved.
Pléiades-1A/B © CNES (2019), distributed by Airbus DS (acquired on 05/09/2019 at 15:51 UTC, GSD 0.5 m, approx. 44.7% cloud coverage in AoI, 36.5° off-nadir angle), provided by International Charter (call ID 714), all rights reserved.

Base vector layers: OpenStreetMap © OpenStreetMap contributors, Wikimapia.org, GeoNames 2015,
Inset maps: JRC 2013, Natural Earth 2012, GeoNames 2013.

Disclaimer

Products elaborated in this Copernicus EMS Rapid Mapping activity are realized to the best of our ability, within a very short time frame, optimising the available data and information. All geographic information has limitations due to scale, resolution, date and interpretation of the original sources. No liability concerning the contents or the use thereof is assumed by the producer and by the European Union.

Delivery formats are Layered Geospatial PDF, GeoJPEG and vector (ESRI shapefiles, Google Earth KML, GeoJSON).

Map produced by SERTIT released by e-GEOS (ODO).

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Copernicus Europe's eyes on Earth

SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: **CHAD DOBA SWEET HEAVY CRUDE**
Product Description: Petroleum Crude Oil
Product Code: 945232-60
Intended Use: Crude oil

COMPANY IDENTIFICATION

Supplier:
EXXONMOBIL REFINING & SUPPLY
BUSINESS COORDINATION CENTRE
HERMESLAAN 2
1831 MACHELEN, BEL
Belgium

MSDS Internet Address www.msds.exxonmobil.com
E-Mail sds.bnl@exxonmobil.com

This SDS meets the EU Safety Data Sheet requirements for this material, with the following exceptions: 1) Supplier address and relevant telephone numbers refer to an ExxonMobil Europe coordination center, but the actual supply may come from another affiliate of ExxonMobil in Europe; and 2) No country specific information is included.

SECTION 2 HAZARDS IDENTIFICATION

This material is dangerous according to regulatory guidelines (see (M)SDS Section 15).

CLASSIFICATION: | R10 | Carc. Cat. 2; R45 | Xn; R48/21/22 | R66 | R67 | N; R51/53 |

PHYSICAL / CHEMICAL HAZARDS

Flammable. Material can release vapours that readily form flammable mixtures. Vapour accumulation could flash and/or explode if ignited. Material can accumulate static charges which may cause an ignition.

HEALTH HAZARDS

May cause cancer. Harmful: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed. Repeated exposure may cause skin dryness or cracking. Vapours may cause drowsiness and dizziness. Under conditions of poor personal hygiene and prolonged repeated contact, some polycyclic aromatic compounds (PACs) have been suspected as a cause of skin cancer in humans. Hydrogen sulphide, a highly toxic gas, may be present. Signs and symptoms of overexposure to hydrogen sulphide include respiratory and eye irritation, dizziness, nausea, coughing, a sensation of dryness and pain in the nose, and loss of consciousness. Odour does not provide a reliable indicator of the presence of hazardous levels in the atmosphere. Excessive exposure may result in eye, skin, or respiratory irritation. Aliphatic hydrocarbon gases

may build up in confined spaces and may cause dizziness, light-headedness, headache, nausea and loss of co-ordination. Continued inhalation may result in narcosis, unconsciousness, and possibly lead to death. May cause central nervous system depression. High-pressure injection under skin may cause serious damage.

ENVIRONMENTAL HAZARDS

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 3 – COMPOSITION / INFORMATION ON INGREDIENTS

This material is regulated as a complex substance.

Reportable hazardous substance(s) or complex substance(s) complying with the classification criteria and/or with an exposure limit (OEL)

Name	CAS#	EC#	Registration#	Concentration*	Symbols/Risk Phrases
PETROLEUM CRUDE OIL	8002-05-9	232-298-5	NE	100 %	R10, T;Carc. Cat. 2;R45, Xn;R48/21, Xn;R48/22, R66, R67, N;R51/53, Note H

Reportable Hazardous Constituent(s) Contained in Complex Substance(s) complying with the classification criteria and/or with an exposure limit (OEL)

Name	CAS#	EC#	Concentration*	Symbols/Risk Phrases
NAPHTHALENE	91-20-3	202-049-5	< 0.5%	Xn;R22, Xn;Carc. Cat. 3;R40, N;R50/53

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

Note: See (M)SDS Section 16 for full text of the R-Phrases. See (M)SDS Section 16 for full text of hazard statements.

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation. Immediately remove from further exposure. Get immediate medical assistance. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. Give supplemental oxygen, if available. If breathing has stopped, assist ventilation with a mechanical device.

SKIN CONTACT

Wash contact areas with soap and water. Remove contaminated clothing. Launder contaminated clothing

before reuse. Remove contaminated clothing. Dry wipe exposed skin and cleanse with waterless hand cleaner and follow by washing thoroughly with soap and water. For those providing assistance, avoid further skin contact to yourself or others. Wear impervious gloves. Launder contaminated clothing separately before reuse. Discard contaminated articles that cannot be laundered. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury. For hot product: Immediately immerse in or flush affected area with large amounts of cold water to dissipate heat. Cover with clean cotton sheeting or gauze and get prompt medical attention.

EYE CONTACT

Flush thoroughly with water for at least 15 minutes. Get medical assistance.

INGESTION

Seek medical attention.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight streams of water

FIRE FIGHTING

Fire Fighting Instructions: FLAMMABLE. Evacuate area. If a leak or spill has not ignited, use water spray to disperse the vapours and to protect personnel attempting to stop a leak. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply. Fire-fighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: FLAMMABLE. Vapour is flammable and heavier than air. Vapour may travel across the ground and reach remote ignition sources, causing a flashback fire danger. Exposure to fire can generate toxic fumes. Hazardous material. Firefighters should consider protective equipment indicated in Section 8.

Hazardous Combustion Products: Hydrogen sulphide, Smoke, Fume, Sulphur oxides, Incomplete combustion products, Oxides of carbon

FLAMMABILITY PROPERTIES

Flash Point [Method]: 37C (99F) - 47C (117F) [ASTM D-56]
Flammable Limits (Approximate volume % in air): LEL: N/D UEL: N/D
Autoignition Temperature: N/D

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

PROTECTIVE MEASURES

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if required, due to toxicity or flammability of the material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders. For emergency responders: Respiratory protection: half-face or full-face respirator with filter(s) for organic vapor and, when applicable, H2S, or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Chemical goggles are recommended if splashes or contact with eyes is possible. Work gloves that are resistant to aromatic hydrocarbons are recommended. If contact with hot product is possible or anticipated, gloves should be heat-resistant and thermally insulated. Note: gloves made of PVA are not water-resistant, and are not suitable for emergency use. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic and, if necessary, heat resistant and thermal insulated material is recommended.

SPILL MANAGEMENT

Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do so without risk. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Prevent entry into waterways, sewer, basements or confined areas. A vapour-suppressing foam may be used to reduce vapour. Use clean non-sparking tools to collect absorbed material. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Large Spills: Water spray may reduce vapour, but may not prevent ignition in enclosed spaces. Small Spills: Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. If liquid is too viscous for pumping, shovel it up into a suitable container for recycle or disposal.

Water Spill: Stop leak if you can do so without risk. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. If permitted by regulatory authorities, the use of suitable dispersants should be considered where permitted in local oil spill contingency plans.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Remove debris in path of spill prior to oiling and remove contaminated debris from shoreline and water surface. Dispose of according to local regulations. Use booms as a barrier to protect shorelines. Use containment booms when the ambient temperature is below the flash point of the material. Large Spills: Dyke far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Avoid all personal contact. Prevent exposure to ignition sources, for example use non-sparking tools and explosion-proof equipment. Potentially toxic/irritating fumes/vapour may be evolved from heated or agitated material. Use only with adequate ventilation. Harmful amounts of H2S may be present. Prevent small spills

and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

Static Accumulator: This material is a static accumulator. A liquid is typically considered a nonconductive, static accumulator if its conductivity is below 100 pS/m (100x10E-12 Siemens per meter) and is considered a semiconductive, static accumulator if its conductivity is below 10,000 pS/m. Whether a liquid is nonconductive or semiconductive, the precautions are the same. A number of factors, for example liquid temperature, presence of contaminants, anti-static additives and filtration can greatly influence the conductivity of a liquid.

STORAGE

Ample fire water supply should be available. A fixed sprinkler/deluge system is recommended. The container choice, for example storage vessel, may effect static accumulation and dissipation. Keep container closed. Handle containers with care. Open slowly in order to control possible pressure release. Store in a cool, well-ventilated area. Outside or detached storage preferred. Storage containers should be earthed and bonded. Fixed storage containers, transfer containers and associated equipment should be earthed and bonded to prevent accumulation of static charge.

SPECIFIC END USES: Section 1 informs about identified end-uses. No industrial or sector specific guidance available.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

Substance Name	Form	Limit/Standard			Note	Source
NAPHTHALENE		STEL	15 ppm		Skin	ACGIH
NAPHTHALENE		TWA	10 ppm		Skin	ACGIH
Hydrogen sulphide		STEL	14 mg/m3	10 ppm		ExxonMobil
Hydrogen sulphide		TWA	7 mg/m3	5 ppm		ExxonMobil
Hydrogen sulphide		STEL	5 ppm			ACGIH
Hydrogen sulphide		TWA	1 ppm			ACGIH

Note: Information about recommended monitoring procedures can be obtained from the relevant agency(ies)/institute(s):

UK Health and Safety Executive (HSE)

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

Use explosion-proof ventilation equipment to stay below exposure limits.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

Positive-pressure, air-supplied respirator in areas where H2S vapours may accumulate is recommended. European Committee for Standardization (CEN) standards EN 136, 140 and 405 provide respirator masks and EN 149 and 143 provide filter recommendations.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapour warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

Chemical resistant gloves are recommended. If contact with forearms is likely wear gauntlet style gloves. Nitrile, Viton, CEN standards EN 420 and EN 374 provide general requirements and lists of glove types.

Eye Protection: Chemical goggles are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

Chemical / oil resistant clothing if contact with material is likely.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

See Sections 6, 7, 12, 13.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

GENERAL INFORMATION

Physical State: Liquid
Colour: Black
Odour: Petroleum/Solvent
Odour Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 C): 0.923
Flash Point [Method]: 37C (99F) - 47C (117F) [ASTM D-56]
Flammable Limits (Approximate volume % in air): LEL: N/D UEL: N/D
Autoignition Temperature: N/D
Boiling Point / Range: > 18C (64F)
Vapour Density (Air = 1): N/D
Vapour Pressure: < 13.3 kPa (100 mm Hg) at 20℃
Evaporation Rate (n-butyl acetate = 1): N/D
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): N/D
Solubility in Water: Negligible
Viscosity: 290 cSt (290 mm2/sec) at 40℃ | 25 cSt (25 mm2/sec) at 100C
Explosive Properties: N/D
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A
Pour Point: -6℃ (21℉)

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Avoid heat, sparks, open flames and other ignition sources.

MATERIALS TO AVOID: Strong oxidisers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

ACUTE TOXICITY

Route of Exposure	Conclusion / Remarks
Inhalation	
Toxicity: Data available.	Not determined. Based on test data for structurally similar

	materials.
Irritation: Data available.	Elevated temperatures or mechanical action may form vapours, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs. Based on test data for structurally similar materials.
Ingestion	
Toxicity (Rat): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Skin	
Toxicity (Rabbit): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation (Rabbit): Data available.	May dry the skin leading to discomfort and dermatitis. Based on test data for structurally similar materials.
Eye	
Irritation (Rabbit): Data available.	Irritating and will injure eye tissue. Based on test data for structurally similar materials.

CHRONIC/OTHER EFFECTS

For the product itself:

Vapour/aerosol concentrations above recommended exposure levels are irritating to the eyes and respiratory tract, may cause headaches, dizziness, anaesthesia, drowsiness, unconsciousness and other central nervous system effects including death. May cause central nervous system disorder (e.g., narcosis involving a loss of coordination, weakness, fatigue, mental confusion and blurred vision) and/or damage.
Crude oil: Contains polycyclic aromatic compounds (PACs). Prolonged and / or repeated exposure by skin or inhalation of certain PACs may cause cancer of the skin, lung, and of other sites of the body. In animal studies, some crudes produced skin tumors in mice, while other crudes produced no tumors. Developmental studies of crude oil in lab animals showed reduced fetal weight and increased fetal resorptions at maternally toxic levels. Repeated dermal exposure to crude oils in rats resulted in toxicity to the blood, liver, thymus, and bone morrow.

Contains:

HYDROGEN SULPHIDE: Chronic health effects due to repeated exposures to low levels of H2S have not been established. High level (700 ppm) acute exposure can result in sudden death. High concentrations will lead to cardiopulmonary arrest due to nervous system toxicity and pulmonary edema. Lower levels (150 ppm) may overwhelm sense of smell, eliminating warning of exposure. Symptoms of overexposure to H2S include headache, fatigue, insomnia, irritability, and gastrointestinal problems. Repeated exposures to approximately 25 ppm will irritate mucous membranes and the respiratory system and have been implicated in some eye damage. NAPHTHALENE: Exposure to high concentrations of naphthalene may cause destruction of red blood cells, anemia, and cataracts. Naphthalene caused cancer in laboratory animal studies, but the relevance of these findings to humans is uncertain.

Additional information is available by request.

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

MOBILITY

More volatile component -- Highly volatile, will partition rapidly to air. Not expected to partition to sediment and wastewater solids.
Less volatile component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Low molecular wt. component -- Expected to be inherently biodegradable
High molecular wt. component -- Expected to be persistent.

Photolysis:

More water soluble component -- Expected to degrade at a moderate rate in water when exposed to sunlight.

Atmospheric Oxidation:

More volatile component -- Expected to degrade rapidly in air

BIOACCUMULATION POTENTIAL

Components -- Has the potential to bioaccumulate.

ECOLOGICAL DATA

Component	Acute Aquatic Toxicity
NAPHTHALENE	L(E)C50 >0.1 - 1 mg/L

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

European Waste Code: 05 01 05*

NOTE: These codes are assigned based upon the most common uses for this material and may not reflect contaminants resulting from actual use. Waste producers need to assess the actual process used when generating the waste and its contaminants in order to assign the proper waste disposal code(s).

This material is considered as hazardous waste pursuant to Directive 91/689/EEC on hazardous waste, and subject to the provisions of that Directive unless Article 1(5) of that Directive applies.

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and

can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (ADR/RID)

Proper Shipping Name: PETROLEUM CRUDE OIL
Hazard Class: 3
Classification Code: F1
UN Number: 1267
Packing Group: I
Label(s) / Mark(s): 3, EHS
Hazard ID Number: 33
Hazchem EAC: 3WE
Transport Document Name: UN1267, PETROLEUM CRUDE OIL, 3, PG I

INLAND WATERWAYS (ADNR/ADN)

Proper Shipping Name: PETROLEUM CRUDE OIL
Proper Shipping Name Suffix: vp50 > 175 kPa
Hazard Class: 3
Hazard ID Number: 33
UN or ID Number: 1267
Packing Group: I
Label(s) / Mark(s): 3 (CMR, N2), EHS
Transport Document Name: UN1267, PETROLEUM CRUDE OIL, vp50 > 175 kPa, 3 (CMR, N2), PG I

SEA (IMDG)

Proper Shipping Name: PETROLEUM CRUDE OIL
Hazard Class & Division: 3
UN Number: 1267
Packing Group: I
Marine Pollutant: Yes
Label(s): 3
EMS Number: F-E, S-E
Transport Document Name: UN1267, PETROLEUM CRUDE OIL, 3, PG I, (37℃ c.c.), MARINE POLLUTANT

AIR (IATA)

Proper Shipping Name: PETROLEUM CRUDE OIL
Hazard Class & Division: 3
UN Number: 1267
Packing Group: I
Label(s) / Mark(s): 3
Transport Document Name: UN1267, PETROLEUM CRUDE OIL, 3, PG I

SECTION 15 REGULATORY INFORMATION

REACH Information: A Chemical Safety Assessment has not been carried out for the substance(s) that make up this

material or for the material itself.

Material is dangerous as defined by the EU Dangerous Substances/Preparations Directives.

CLASSIFICATION: Flammable. Category 2 Carcinogen. Harmful. Dangerous for the environment.

EU LABELING:

Symbol: T, N

Dangerous for the environment.

Nature of Special Risk: R10; Flammable. R45; May cause cancer. R48/21/22; Harmful: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed. R66; Repeated exposure may cause skin dryness or cracking. R67; Vapours may cause drowsiness and dizziness. R51/53; Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Advice: S36; Wear suitable protective clothing. S45; In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). S53; Avoid exposure - obtain special instructions before use. S61; Avoid release to the environment. Refer to special instructions/safety data sheets. S62; If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

Contains: PETROLEUM CRUDE OIL

REGULATORY STATUS AND APPLICABLE LAWS AND REGULATIONS

Complies with the following national/regional chemical inventory requirements: IECSC, TSCA, EINECS, PICCS, AICS, ENCS, DSL, KECI

Applicable EU Directives and Regulations:
EU Directive:

1907/2006 [... on the Registration, Evaluation, Authorisation and Restriction of Chemicals ... and amendments thereto]

92/85/EEC [...pregnant workers...recently given birth or...breastfeeding directive]

94/33/EC [...on the protection of young people at work]

This product is subject to the provisions of the EU Marketing and Use Directive (Directive 76/769/EEC) and is restricted to professional users.

850/2004/EC [...on prohibiting and restricting persistent organic pollutants ... and amendments thereto]

96/82/EC as extended by 2003/105/EC [... on the control of major-accident hazards involving dangerous substances]. Product contains a substance that falls within the criteria defined in Annex I. Refer to Directive for details

of requirements taking into account the volume of product stored on site.
2004/37/EC [... on the protection of workers from the risks related to carcinogens or mutagens...].
98/24/EC [... on the protection of workers from the risk related to chemical agents at work ...]. Refer to Directive for details of requirements.

SECTION 16 OTHER INFORMATION

KEY TO THE RISK CODES CONTAINED IN SECTION 2 AND 3 OF THIS DOCUMENT (for information only):
R10; Flammable.
R22; Harmful if swallowed.
R40; Limited evidence of a carcinogenic effect.
R45; May cause cancer.
R48/21; Harmful: danger of serious damage to health by prolonged exposure in contact with skin.
R48/22; Harmful: danger of serious damage to health by prolonged exposure if swallowed.
R50/53; Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R51/53; Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R66; Repeated exposure may cause skin dryness or cracking.
R67; Vapours may cause drowsiness and dizziness.

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
Safety Data Sheet updated in accordance with the provisions of REACH (EC) No 1907/2006.

THIS SDS COVERS THE FOLLOWING MATERIALS: CRUDE OIL SWEET ("Sweet" applied SPE definition for oils containing sulfur compounds < 1%)

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MHC: 0, 0, 0, 2, 1, 1 PPEC: DVF

DGN: 7063076 (1011064)

ANNEX

Annex not required for this material.