

DEEP-SEA DISASTER:

**Why Woodside's Burrup Hub
project is too risky to proceed**



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(Cover page) Offshore rig,
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(Current page) Aerial
shot of turquoise ocean &
white sand near Ningaloo
Reef, © Ningaloo Aviation /
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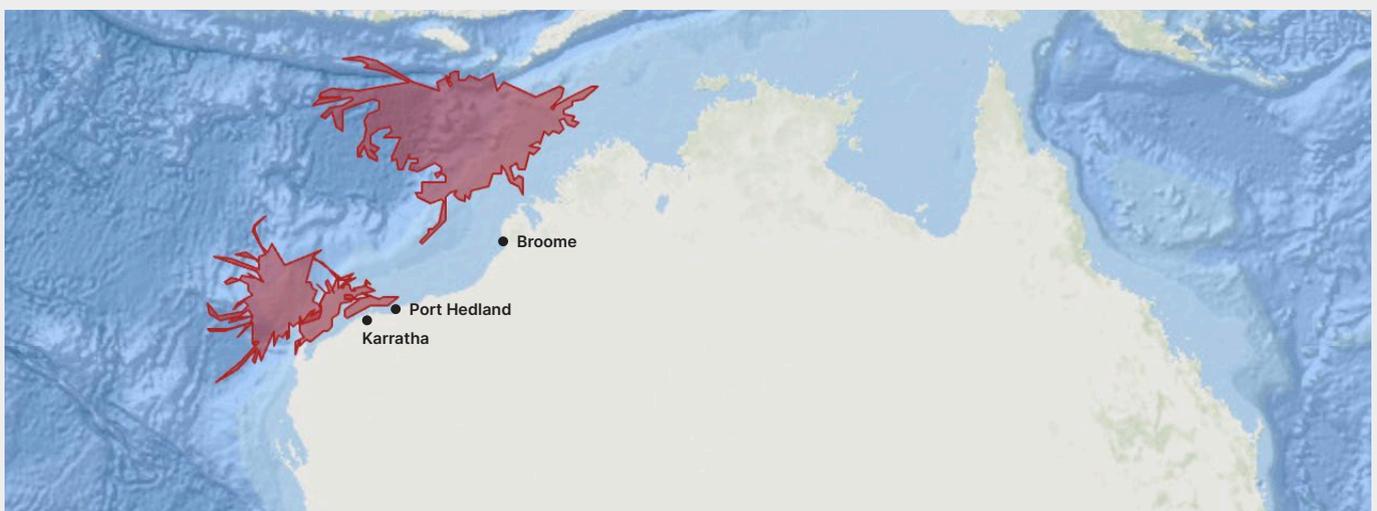
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KEY FINDINGS

1 A spill or accident at Woodside's Burrup Hub gas project could release toxic gas and condensate of a similar consistency to crude oil into World Heritage listed marine parks, with dangerous pollution reaching West Australian coastal communities and as far as Indonesia.

Woodside Energy's Burrup Hub is the largest fossil fuel project currently proposed in Australia, involving the extraction of six untapped gas fields and the drilling of 84 wells off the Western Australian coast. The Burrup Hub project includes two major gas projects - Scarborough and Browse - and the transport of this gas onshore via undersea trunklines ranging between 430km (Scarborough) and 900km (Browse) in length.

Using Woodside's own documents provided to state and federal regulators, Greenpeace has mapped Woodside's Burrup Hub offshore infrastructure and its spill and accident scenarios using Geographic Information Software (GIS) data. This mapping shows that Woodside's proposed infrastructure runs directly through or adjacent to habitats critical to threatened and migratory species as well as coral reef ecosystems. It also shows, for the first time, the full geographic extent of a worst-case gas spill or other accident on protected marine ecosystems as well as the coastlines of Western Australia, East Timor and Indonesia.



Map showing extent of worst case spill scenarios at Scarborough and Browse according to Woodside's own data

A worst case scenario well blowout, spill or vessel rupture at Woodside's projects would pollute the waters of multiple World and National-heritage listed Marine Parks. An incident at Browse would pollute the waters of Scott Reef Nature Reserve, Argo-Rowley Terrace Marine Park, Mermaid Reef Marine Park and Rowley Shoals Marine Park. An incident at Scarborough would pollute Ningaloo Marine Park (World Heritage listed), Dampier Marine Park, Montebello Marine Park, Gascoyne Marine Park and Carnarvon Canyon Marine Park.

A "credible" spill scenario at Browse could reach multiple sites along the Western Australian coast, as well as our regional neighbours East Timor and Indonesia. In assessing potential spill scenarios at their Browse site, Woodside classifies the loss of well containment (blowout) as a credible risk and detail that such a scenario could last as long as 77 days,¹ resulting in 142,154 cubic metres of unstabilised condensate being released from a well in the Torosa reservoir.² When visualised geographically, a spill of this scale would easily reach the Dampier Peninsula on the Western Australian coast, as well as East Timor and many of the more southern Indonesian islands too.³ This could be devastating for local communities and industries who depend on healthy reefs and marine ecosystems, including tourism and fisheries.

2

Woodside's Burrup Hub project is a risk to Western Australia's beautiful and unique marine environments, and poses a direct threat to vulnerable coral ecosystems already impacted by climate change, as well as endangered turtle populations.

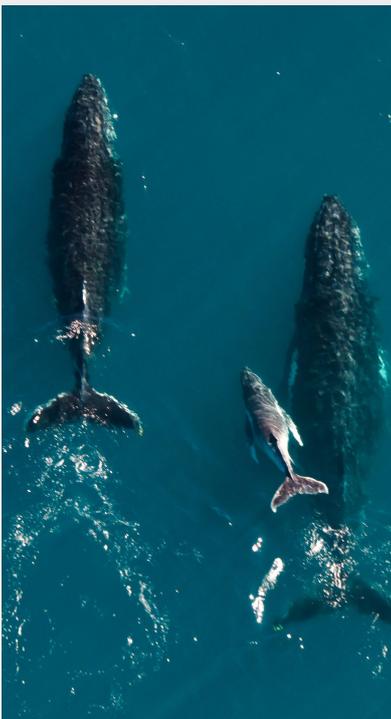
Woodside's own assessments show that, if a well blowout, spill or vessel rupture were to take place at the Burrup Hub, 54 threatened animal species are at a direct risk of being impacted.⁴ At Browse, these would be:

- Pygmy blue whales (endangered)
- Blue whale (endangered)
- Sei whale (endangered)
- Fin whale (endangered)
- Grey nurse shark (vulnerable)
- Great white shark (vulnerable)
- Whale shark (vulnerable)
- Dugong (other protected fauna)⁵
- Green turtle (vulnerable)
- Loggerhead turtle (endangered)
- Hawksbill turtle (vulnerable)⁶
- Olive ridley turtle (endangered)
- Flatback turtle (vulnerable)
- Leatherback turtle (vulnerable)
- Dusky sea snake (endangered)
- Shortfin mako (endangered)

- Longfin mako (endangered)
- Green sawfish (vulnerable)⁷
- Largetooth sawfish (vulnerable)⁸
- Short-nosed sea snake (critically endangered)
- Olive python (vulnerable)
- Northern quoll (endangered)
- Ghost bat (vulnerable)
- Greater bilby (vulnerable)
- Pilbara leaf-nosed bat (vulnerable)
- Australian lesser noddy (endangered)
- Abbott's booby (endangered)
- Eastern curlew (critically endangered)
- Curlew sandpiper (critically endangered)
- Red knot (endangered)
- Great knot (critically endangered)
- Greater sand plover (vulnerable)
- Lesser sand plover (endangered)
- Bar-tailed godwit (vulnerable)⁹
- North Siberian bar-tailed godwit (critically endangered)
- Southern giant petrel (endangered)
- Australian painted snipe (endangered)
- Australian fairy tern (vulnerable)
- Night parrot (critically endangered)

At Scarborough, in addition to many of the whale, shark, turtle, sawfish, sea snake and bird species mentioned above,¹⁰ additional threatened species impacted would be:

Aerial shot of humpback whales migrating along the Ningaloo Coastline in Western Australia, © Ningaloo Aviation / Greenpeace



- River sawfish (vulnerable)¹¹
- Leichhardt's sawfish (vulnerable)¹²
- Northern sawfish (vulnerable)¹³
- Far Eastern curlew (critically endangered)
- Painted snipe (endangered)
- Amsterdam albatross (critically endangered)
- Wandering albatross (vulnerable)
- Southern giant petrel (endangered)
- Northern giant petrel (vulnerable)
- Soft-plumaged petrel (vulnerable)
- Indian yellow nosed albatross (endangered)
- Tasmanian shy albatross (vulnerable)
- Campbell albatross (vulnerable)
- Black browed albatross (endangered)
- White capped albatross (vulnerable)

Greenpeace Australia Pacific has also undertaken two case studies of specific ecosystems and species that would be harmed by a spill or blowout at one of Woodside's Burrup Hub projects. First, in the event of blowout or spill at the Browse site, persisting entrained hydrocarbons would have measurable damaging effects on coral ecosystems at Scott Reef. This in turn would impact on the hundreds of thousands of reef fishes that scientists have identified at Scott Reef, as their existence

depends on a healthy coral reef ecosystem.¹⁴

Second, dredging and dredge spoil disposal at the Scarborough Trunkline Project Area places vulnerable and endangered sea turtles at risk. As the Scarborough Trunkline installation process will take over 5 months, Woodside will have difficulty in minimising the impacts on sea turtles even during normal operations. In the event of an accident or incident such as a vessel rupture, these impacts will be even more severe.

3

Woodside has a track record of accidents, degrading infrastructure and a haphazard approach to mitigating the impact of offshore infrastructure on marine environments, heightening the risk of the Burrup Hub to Western Australia's ocean ecosystems.

Woodside has tried to downplay the risks to marine wildlife, claiming in its various environmental approval applications that the risks are negligible or that the worst risks will be mitigated against.¹⁵ However, Woodside's track record of recent accidents and dangerous near-misses casts significant doubt over these claims. These include the corrosion of fourteen 24-tonne caissons at Woodside's North Rankin Complex, severe corrosion of propane pipework at Woodside's Karratha Gas Plant, a significant oil leak at one of Woodside's offshore rigs in the Cossack Field, and the degradation and the proposed ocean dumping of Woodside's Nganhurra Riser Turret Mooring in Ningaloo Reef.

Woodside's Burrup North-west Shelf Plant in Western Australia,
© Luke Sweet / Conservation Council
Western Australia / Greenpeace



Greenpeace Australia Pacific's recommendations on the Burrup Hub

For the purposes of this report, Greenpeace has modelled Woodside's own information. However, there is a risk that Woodside has underestimated the worst-case scenarios and the required response. The risks are too great to rely on Woodside's information alone - an independent assessment of a worst case scenario well blowout, spill or vessel rupture at Woodside's projects is needed. An independent assessment is also needed of whether Woodside's accident response plans are adequate to address these risks.

In Greenpeace Australia Pacific's view, the combined marine and climate impacts of Woodside's Burrup Hub project make it too risky to proceed.

EXECUTIVE SUMMARY

Woodside's Burrup Hub is the largest fossil fuel project currently proposed in Australia, involving the extraction of six untapped gas fields and the drilling of 84 wells¹⁶ off the Western Australian coast.

The Burrup Hub project includes two gas projects - Scarborough and Browse - and the transport of this gas onshore via undersea trunklines ranging between 430km (Scarborough) and 900km (Browse) in length. The gas would then be processed onshore at two existing LNG plants, Pluto and the Karratha Gas Plant (KGP), which would be expanded and extended.¹⁷

The climate footprint of the Burrup Hub project is substantial. Cumulative emissions from the Burrup Hub total 6.1 billion tonnes of CO₂ equivalent (CO₂-e) over the project's expected lifetime.¹⁸ This makes the Burrup Hub the most climate polluting fossil fuel project currently proposed in Australia.¹⁹

In addition to climate impacts, the Burrup Hub project presents numerous risks to the environment and marine wildlife. The Scarborough and Browse projects are located in proximity, sometimes close proximity, to 12 protected marine parks - including the UNESCO World Heritage sites Ningaloo Reef and Shark Bay.²⁰ The extraction process and the transport of Burrup Hub gas, as well as the construction phase of the relevant infrastructure, will take place within or adjacent to habitat critical to threatened and migratory species.

Deep-sea Disaster: Why Woodside's Burrup Hub Project Is Too Risky To Proceed examines Woodside's claims that it has adequately mitigated against the risk of blowouts, spills, and accidents, comparing these claims with recent examples that suggest a contrary reality. This includes incidents that have occurred with infrastructure that will be tied-in to the Burrup Hub.

We also challenge Woodside's claim that the risks to the surrounding marine environments are negligible. The marine impact assessment contained within this report offers a preliminary review of the effects on wildlife and environment, challenging Woodside's claim that there will not be harm to marine wildlife from the Burrup Hub project.

Using Woodside's own documents provided to state and federal regulators, Greenpeace has mapped Woodside's Burrup Hub offshore infrastructure and its spill and accident scenarios using Geographic Information Software (GIS) data. This mapping shows that Woodside's proposed infrastructure runs directly through or adjacent to habitats critical to threatened and migratory species as well as coral reef ecosystems. It also shows, for the first time, the full geographic extent of a worst-case gas spill or other accident on protected marine ecosystems as well as the coastlines of Western Australia, East Timor and Indonesia.

A worst case scenario well blowout, spill or vessel rupture at Woodside's projects would pollute the waters of multiple World and National-heritage listed Marine Parks. An incident at Browse would pollute the waters of Scott Reef Nature Reserve, Argo-Rowley Terrace Marine Park, Mermaid Reef Marine Park and Rowley Shoals Marine Park. An incident at Scarborough would pollute Ningaloo Marine Park (World Heritage listed), Dampier Marine Park, Montebello Marine Park, Gascoyne Marine Park and Carnarvon Canyon Marine Park. Woodside's own assessments show that, if a well blowout, spill or vessel rupture were to take place at the Burrup Hub, 54 threatened animal species are at a direct risk of being impacted.

Woodside has tried to downplay the risks to marine wildlife, claiming in its various environmental approval applications that the risks are negligible or that the worst risks can be mitigated against.²¹ However, Woodside's risk assessment must be evaluated against its lengthy track record of serious accidents and mishaps on its offshore drilling operations.

In June 2021, Woodside announced that a 30% cut to operating costs will take place over three years.²² Further zeroing in on maintenance, CEO Meg O'Neill was reported as saying, "a key focus area for us is maintenance which accounts for a significant portion of our production cost."²³ These cuts may compound the existing problems with Woodside's environmental practice and workplace safety as identified by Greenpeace Australia Pacific. This raises serious concerns regarding the implications of these maintenance cuts for environmental protection, particularly given this company's troubling history.

Another looming threat, particularly to Woodside's investors, is posed by the company's absorption of BHP Group's oil and gas assets in Australia; many of which themselves are ageing and are due for decommissioning over the coming years.²⁴ Woodside's acquisition of BHP's assets may yet prove a risky gamble, particularly as the company has not guaranteed payment for decommissioning and remediation costs.²⁵

INTRODUCTION

The Australian offshore oil and gas industry has a long history of spills, environmental disasters, and serious workplace injuries which have caused widespread damage and in some cases the death of workers. Dangerous issues with maintenance and unsafe operational procedures continue at Woodside, suggestive of lax attitudes to industry standards and regulations.

The potential for greater, more catastrophic disasters appears to have grown as the fossil fuel industry cuts corners and costs, scrambling to remain competitive in an increasingly modernised renewable energy market.

In Australia's oil and gas industry, one already plagued by non-compliance and poor asset maintenance, many operators appear to be racing to achieve favourable returns for investors before the political and economic tide shifts against them as the world rapidly transitions from fossil fuels to renewable energy sources.

One example was revealed last year after three workers were nearly killed while decommissioning Santos's Sinbad oil platform near Varanus Island WA. Almost crushing these workers while swinging wildly out of control, the 200-tonne-platform sent severed steel cables and debris flying towards other workers. The International Marine Contractors Association later called it a "serious incident" that had "high potential for multiple fatalities".²⁶ It was later found that numerous operations-based decisions were at fault alongside improper engineering practices.²⁷

In an interview with Nine News, the National Secretary for the Australian Workers Union (AWU), Daniel Walton stated that it was "absolutely amazing that those workers are still alive... There seems to be a race to the bottom, that is, try and cut costs in every way you possibly can to save a buck or two. And as a consequence of that - safety is jeopardised."²⁸

In regards to Woodside Petroleum, its own history of accidents and near-misses has established the operator as a key contributor to this industry-wide pattern; and as a serious

culprit responsible for poor maintenance and unsafe operational practices. While aggressive budgeting has meant competitive returns for its shareholders, this has also left dangerous voids in areas of crucial operational spending.

This report finds that not only is Woodside ill-prepared and financially averse to adequately managing its own fleet of offshore oil and gas assets, but also that the historical pattern of disregard for the environment contradicts their claims of environmental best-practice operations.

Woodside's recent accidents and dangerous near-misses detailed in this report include the corrosion of fourteen 24-tonne caissons at the North Rankin Complex, severe corrosion of propane pipework at Karratha Gas Plant, a significant oil leak at an offshore rig in the Cossack Field, the degradation and proposed ocean dumping of their Nganhurra Riser Turret Mooring in Ningaloo Reef, in addition to four serious Occupational Health and Safety (OHS) incidents between 2019-2021.

Caissons at oil and gas offshore platform, © Curraheeshutter / Can Stock Photo



Through reviewing past issues of poor maintenance and unsafe operational procedures, a clearer picture emerges that casts doubt on the environmental viability, safety, and economic competitiveness of Woodside's Burrup Hub project. This is especially so considering some of these issues have occurred with infrastructure that will be connected to the Burrup Hub - such as the North Rankin Complex and the Karratha Gas Plant.

Greenpeace Australia Pacific refutes Woodside's claims that the core drivers and sources of blowouts, spills and accidents have been sufficiently addressed and mitigated against. Using Geographic Information System (GIS) data, and in collaboration with Greenpeace International's Global Mapping Hub, Greenpeace Australia Pacific has mapped the infrastructure of Woodside's Burrup Hub alongside the known habitat of threatened and migratory species on the West Australian coastline. Our mapping demonstrates that marine wildlife will be disrupted by this project's infrastructure running through their habitat and could further be severely impacted if there are accidents. In contrast to Woodside, we hold that the risks to the surrounding marine environments from the Burrup Hub remain significant.

WHAT'S WRONG WITH WOODSIDE?

Ageing equipment, dodgy decommissioning and workplace safety

The harsh offshore marine environments in which Woodside operates are unforgiving and unpredictable. Moreover, the heavy machinery involved in operations adds yet another complexity that demands consistent operational oversight and robust safety protocols. Yet, despite numerous notices from NOPSEMA, our research has revealed there are persistent problems with corrosion and degradation, decommissioning, and serious workplace safety issues across Woodside's sites.

Woodside's history shows a brazen and dangerous pattern of avoiding expensive maintenance and decommissioning, causing accidents, and circumventing responsibility in the process.

Degradation and corrosion of Woodside's equipment

The threat posed by the degradation and corrosion of equipment used in offshore gas extraction and processing is one that cannot be downplayed. In offshore environments where equipment is constructed from various types of metals, corrosion is perhaps one of the most common and expensive issues to mitigate and combat against.²⁹

Corrosion worsens when these metals and the water they are installed in come into contact with carbon dioxide (CO₂) and hydrogen sulphide (H₂S); two gasses naturally occurring in the petroleum and gas targeted for offshore extraction.³⁰ When

exposed to water, these gasses are freely able to catalyse and can corrode steel and other alloys rather easily.³¹ Although many oil and gas operators are moving away from carbon-steel-based alloys in favour of corrosion-resistant alloys, this change comes at a great expense.³²

In trying to mitigate against corrosion on their numerous degrading oil and gas assets, Woodside has implemented cheaper post-corrosion applications and pre-treatments.³³ This has not appeared to solve the problem, as issues of serious corrosion and related safety concerns persist across many of their sites.

One example of these concerns materialised on June 15th, 2021, when offshore regulator NOPSEMA issued Woodside with a notice to analyse the structural integrity of fourteen 24-tonne caissons located beneath its North Rankin A Platform.³⁴ As the subsea trunklines from the proposed Browse site tie into the existing infrastructure near the North Rankin Complex, this corrosion presents a serious concern.

If one of the corroded caissons were to break off and fall into the ocean below rupturing a trunkline, the “loss of hydrocarbon (gas and condensate) from these pipelines may result in a major accident event,” according to NOPSEMA.³⁵ In Woodside’s Browse project proposal, the company deems the loss of hydrocarbon containment from the BTL (Browse Trunk Line) as ‘credible’ and further estimates that during such an event up to 850,000 cubic metres of dry gas could be released.³⁶

In a 2019 operations plan submitted to NOPSEMA for the North Rankin Complex, Woodside specifically identifies corrosion of the caissons as one of seven potential causes of structural failure for the North Rankin Platform.³⁷ The operations plan stated that, “structural damage to the platform resulting from the causes listed... could be minor or could in the most extreme situation result in total loss of the platform.”³⁸ However, despite being specifically identified as a component of concern two years prior, it appears Woodside was content to sit on its hands. In 2021, it was confirmed that the North Rankin caissons had corroded - two years after the issue was first highlighted - yet nothing was done to prevent this.

Woodside’s ageing North Rankin Complex is, however, not the only infrastructure where corrosion has presented the company with serious problems. On the 9th of July 2021, Woodside investigated corrosion that had been identified on a gas-train at the North West Shelf (NWS) project’s Karratha Gas Plant. The Karratha Gas Plant will play a key part in the Burrup Hub project, processing Browse gas. It was discovered that areas of propane pipework were also found to have corroded to half their original wall thickness prompting concerns that corrosion might be more widespread at the plant.³⁹ Although Woodside

Woodside’s Burrup North-west Shelf Plant in Western Australia, © Luke Sweet / Conservation Council Western Australia / Greenpeace



was quick to shut down numerous parts of the plant for remediation, the circumstances remain unmistakably similar to those that caused the historic Varanus Island explosion in 2008 at the Apache Energy processing facility wherein corrosion of a pipeline caused 3 pipelines to explode and ignited a fire with flames over 40 metres high.⁴⁰

Equipment degradation also occurred in 2016 when it caused a significant spill.

In 2016, somewhere in Woodside's Cossack Field, one of the company's unnamed rigs leaked 10,500 litres of oil into the Timor Sea over a two-month period. It was later found that a degraded seal on a subsea hydraulic valve control line had caused the leak.

A Woodside spokesperson maintained that the leak had "no lasting impact to the environment;"⁴¹ however, an independent post-spill environmental impact assessment does not appear to have taken place or at least is not publicly available.

Woodside's decommissioning woes

Woodside's Sustainable Development Report 2021 claims that the company "remains committed to a robust process to deliver decommissioning outcomes aligned with regulatory and societal expectations".⁴² However, two significant decommissioning incidents in the last two years alone - the Northern Endeavour and the Nganhurra Riser Turret Mooring - cast significant doubt over this claim.

The infamous and ongoing saga of Woodside's degraded Nganhurra Riser Turret Mooring (RTM) repeatedly neglected and left to deteriorate shows that the company is prepared to cut corners and costs, even at the expense of the environment. As first identified in an October 2019 NOPSEMA notice, "Woodside has failed and continues to fail to preserve the condition of the riser turret mooring".⁴³ Initially used to moor Woodside's Nganhurra Floating Production Storage and Offloading (FPSO) vessel, the degradation of this specific 83-metre-long RTM became so serious that NOPSEMA considered legal action against Woodside.⁴⁴ By the time NOPSEMA had issued the notice to Woodside in October 2019, the RTM had deteriorated to such an extent that sections of it were flooding, and it was at further risk of sinking and causing a "navigation collision hazard" for other commercial and recreational marine users.⁴⁵

Following NOPSEMA's notice, Woodside began preparing the RTM for disposal, but assessed the structure as too heavily degraded to be safely towed away; suggesting instead last year that they be allowed to sink the structure near the Ningaloo Marine Park to create an artificial reef.⁴⁶ Seemingly keen to preserve their public optics while pursuing a cheap and easy way to deal with their neglected RTM, Woodside proposed hosting a 'beach clean-up' alongside a public education drive about marine plastics; further claiming these initiatives would act to 'offset' the dumped plastic contained in the structure.⁴⁷

After considerable pushback from NOPSEMA, the Department of Agriculture, Water and Environment, and the Ningaloo Coast World Heritage Advisory Committee, these plans were abandoned and Woodside was re-tasked with disposing of the RTM in an appropriate manner.⁴⁸ As a result of documents recently obtained through a Freedom of Information request (FOI) by the Australian Conservation Foundation (ACF), new information has come to light showing how bad Woodside's RTM disposal plans would have been for the environment and human health.

The FOI documents revealed the Department of Agriculture, Water and the Environment (DAWE) had described Woodside's proposed RTM 'reef' as "present[ing] a material risk to the marine ecosystems."⁴⁹ Drawing attention to the presence of large amounts of plastic, including 65 cubic metres of polyurethane foam, and toxic fire-retardant materials containing polybrominated diphenyl ethers (PBDEs) in the RTM,⁵⁰ the DAWE outlined the catastrophic dangers to the environment narrowly avoided by this near-miss.⁵¹ The materials in the RTM are known to pose a neurotoxicological threat to both animals and humans, as PBDEs bioaccumulate up the food chain - meaning they affect each successive organism they pass through.⁵² In humans, PBDEs have been associated with causing cancer and loss of IQ.⁵³ As such, PBDEs can cause widespread lasting damage when allowed to enter any ecosystem.⁵⁴

Woodside's Burrup Hub Gas Pipelines in Western Australia, © Luke Sweet / Conservation Council Western Australia / Greenpeace



The Department of Agriculture, Water, and the Environment further found that the volume of toxins were likely underreported in Woodside's artificial-reef proposal, determining that around 295kg of materials containing PBDEs would likely contaminate over 700,000,000 tonnes of marine sediment, and could pollute the ocean for many centuries.⁵⁵

NOPSEMA has now stated that Woodside will dispose of the 2452-tonne structure onshore by early 2023.⁵⁶

Moreover, problems with apparent disregard for the environment are not isolated to Woodside's Nganhurra Riser Turret Mooring incident. In spite of Woodside's repeated claims of environmental responsibility, in June 2020 Woodside also proposed leaving 400-tonnes of plastic umbilical and pipeline coating from their Echo Yodel project on the seafloor, 140km off the coast of Dampier, WA. Woodside claimed that the plastic would take centuries to break-down, and thus the environmental impact would be low.⁵⁷

As plastics break-down in the environments they are abandoned in, smaller pieces of microplastics often find their way into the flesh and muscle tissues of various marine wildlife.⁵⁸ Consequently, in some fish, the persistent presence of microplastics has been found to inhibit ovarian maturity, and disrupt reproductive capacity.⁵⁹

Conveniently, Woodside would have allegedly saved \$160 million (AUD) in decommissioning costs.⁶⁰ Decommissioning is intended to restore the site to its original condition and involves plugging all wells, severing well casings, and cleaning and removing all infrastructure. Leaving plastics behind is not restorative.

The other decommissioning saga that remains a serious issue for Woodside, is their connection to the rusted hulking Northern Endeavour floating oil platform. Currently sitting in a heavily deteriorated state 550 km northwest of Darwin between the Laminaria and Corallina oil fields in the Timor Sea,⁶¹ the 274-metre-long Floating Production Storage and Offtake facility was sold by Woodside to Northern Oil and Gas Australia (NOGA) in April, 2016. However, prior to the sale, output from the Northern Endeavour had declined so steeply and the vessel had deteriorated so extensively that Woodside was only maintaining it "in the context of an ageing asset that was being prepared for end of field life and decommissioning."⁶²

One-man-company NOGA was naively ambitious in their pursuit of restarting production on the Northern Endeavour FPSO.⁶³ When NOGA and their contractor Upstream Production Solutions (UPS) assumed responsibility and operations for the Northern Endeavour in September 2016, they inherited a vessel with extensive problems, effectively allowing Woodside to shed its entire \$156 million decommissioning liability.⁶⁴

In October of the same year, a NOPSEMA inspection found that "extensive corrosion was present throughout the facility", and that 21 recommendations by the regulator had remained unresolved from Woodside's time as operator.⁶⁵

During this same inspection, NOPSEMA added an additional 16 recommendations to UPS's remediation to-do list. Included was the need to implement a plan to minimise the risk from corrosion.⁶⁶ By 2017, the vessel had deteriorated to such an extent that falling pieces of corroded and broken equipment had on one occasion nearly killed a worker.⁶⁷

After only a few short years in operation, the NOGA liquidated in February 2020 after production ceased on the platform in late 2019 due to serious ongoing safety concerns.⁶⁸ Following NOGA's liquidation, the company handed over The Northern Endeavour, their sole asset, to the Australian Government. At this point, it was likely that Australian taxpayers were going to foot the enormous decommissioning cost of the ageing, rusted vessel.⁶⁹

Following an intervention by resources Minister Keith Pitt,⁷⁰ and the adoption of recommendations made in a discussion paper by the Department of Industry, Science, Energy and Resources - a levy was imposed that pushed these costs back onto the oil and gas industry.⁷¹ Paying 48-cents-per-barrel, this unprecedented levy forced the industry to wholly shoulder the estimated 1 billion dollar decommissioning cost of the Northern Endeavour.⁷²

Although the initial sale was completely legal, the ongoing situation continues to draw widespread condemnation from industry, government, and the community about Woodside's attempted strategic jettisoning of this asset. It is hoped that the Northern Endeavour will be towed away for complete decommissioning by mid-2023.⁷³

Danger Sign near Woodside's Pluto Plant in Western Australia, © Luke Sweet / Conservation Council Western Australia / Greenpeace



Putting Woodside workers at risk

Woodside has been wracked with numerous occupational health and safety notices in recent years, showing an apparent disregard to the welfare of their workers. In July 2019, Woodside was issued with an OHS notice for their troubled North Rankin A Platform. Following a crane-related lifting incident in June 2019, a NOPSEMA inspector visited the platform and found that due to maintenance related issues the crane's functioning had been compromised.⁷⁴ In the NOPSEMA notice it further concluded that a "loss of control of suspended load resulting in a dropped object or swinging load could cause injury or death to persons near the NRA East crane."⁷⁵

Again in July 2019, during an occupational health and safety inspection on Woodside's Vincent Floating Production Storage and Offloading (FPSO) Facility, a NOPSEMA inspector found that changes to the storage location of highly flammable methanol contravened safe fire fighting practice.⁷⁶ Further it

was noted that if a fire broke out, workers on board would have to extinguish it by hand at close range - "exposing personnel to the risk of injury or death."⁷⁷

In November 2020, Woodside failed to conduct an adequate risk assessment of working at heights on its VALARIS DPS-1 drilling rig. As a result of this contravention, NOPSEMA stated that these were conditions that could have resulted in "increased exposure to potential for serious injury or death".⁷⁸

In a fourth serious incident within a three year time frame, two Woodside workers were badly injured on July 24th 2021 when a 500kg load fell on top of them, pinning one worker underneath it while knocking another unconscious - this incident occurred due to unapproved operational procedures.⁷⁹

When considering Woodside CEO Meg O'Neill's "laser-like focus on cost management",⁸⁰ alongside Woodside's worrying record on maintenance, Greenpeace Australia Pacific is concerned about the potential for compounding and cascading risks. Woodside's own Annual Report in 2021 stated that the company's injury rate had "increased to 1.74 [injuries] per million work hours"⁸¹ and that their "safety performance was disappointing".⁸² In this context, it seems remarkable that cutting operational costs has been made a priority by Woodside's leadership.⁸³

BHP merger compounds Woodside's costs

Following the recent merger with BHP Group Australia, Woodside will not only shoulder large portions of BHP's incoming decommissioning costs, but will inherit BHP's oil and gas assets too.⁸⁴ BHP's largest looming decommissioning liabilities are those presented by their various sites across Australia.

On the 30th August 2021, NOPSEMA issued BHP with a notice to fully decommission their Griffin and Stybarrow fields, following years of "limited action" across two of their fields located 68 km north-east of Exmouth, WA. Further citing the ongoing presence of numerous pieces of abandoned sunken infrastructure, including infield pipelines, umbilicals, and a 60 km long pipeline, alongside dozens of unplugged wells, NOPSEMA required these extensive and costly decommissioning tasks to be done within 5 years.⁸⁵ A similar directive was issued to BHP for wells in their Minerva field, in Victoria's Otway Basin. BHP

may face fines if the decommissioning timeline is not met.⁸⁶ As a result of the merger, Woodside will be liable for the total decommissioning costs of the Stybarrow field, alongside 90% of the costs of the Minerva field, and 45% for the Griffin field.⁸⁷

For Woodside/BHP, and ExxonMobil, the decommissioning situation in the Bass Strait appears far more serious and extensive. In May of 2021, NOPSEMA ordered Exxon & BHP to plug 180 wells, and dismantle 10 platforms “as soon as reasonably practicable.”⁸⁸ Operating since 1969, Exxon & BHP's involvement in the Bass Strait has spanned many decades, and has involved the drilling of over 400 wells, and 600 km of concrete pipeline.⁸⁹ For Woodside, this huge decommissioning push will cost \$7 billion (AUD) just in the Gippsland Basin.⁹⁰

Far from exemplary, BHP's own record of oil and gas accidents in Australian waters provides an insight into the legacy operational standards and the quality of equipment that Woodside will inherit under the merger.

Woodside's Burrup North-west Shelf Plant in Western Australia, © Luke Sweet / Conservation Council Western Australia / Greenpeace



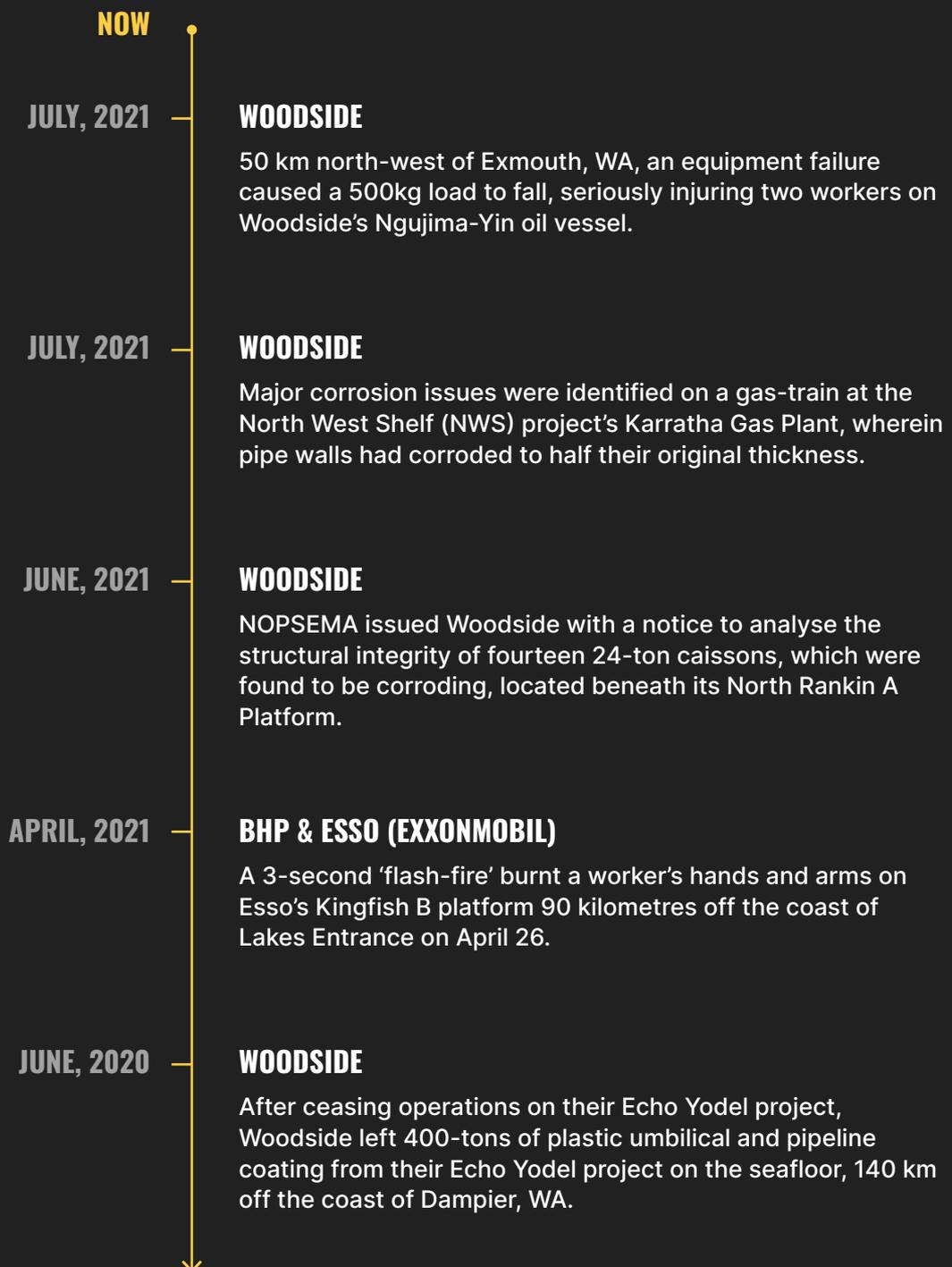
On BHP & ExxonMobil's joint venture 'Cobia' platform, 70 kilometres off the eastern Victorian coast in the Bass Strait, 750 litres of oil leaked into the sea in September 2013 and was subsequently investigated by NOPSEMA.⁹¹ Understood to be more than 30-years-old, the Cobia rig is one of many pieces of ageing infrastructure still considered a 'producing asset' by Exxon and BHP despite concerns about its age and associated corrosion related issues.⁹²

Again in the Bass Strait, in September 2015, a fire ignited at BHP and Esso's (ExxonMobil) West-Tuna platform in the battery storage room. The fire completely shut down power to the platform, and a night time helicopter evacuation was carried out in complete darkness. The fire raged out of control for 9-hours, and was fought by workers who stayed behind. The Australian Workers Union Victorian secretary, Ben Davis, said the oil rig fire raised questions about Esso's equipment maintenance program, which had been pared-back prior to the fire.⁹³

Less than 18 months later, the same BHP-Esso West-Tuna platform spilled an unknown amount of oil into the Bass Strait. A NOPSEMA investigator concluded that the spill posed a “significant threat to the environment” and added that, due to a lack of equipment and training, staff had been unable to locate the source of the spill.⁹⁴

Woodside & BHP's Serious Accidents & Incidents Timeline

The following timeline demonstrates that collectively Woodside and BHP have experienced 11 serious incidents since 2013.



FEBRUARY, 2020**WOODSIDE & NOGA**

Woodside sold on its ageing Northern Endeavor floating oil platform, drawing widespread condemnation from industry and government. The decommissioning costs for the platform totalled over \$1 billion, paid for by the government after liquidation of Northern Oil and Gas Australia (NOGA).

OCTOBER, 2019**WOODSIDE**

Woodside's allowed its 83-metre-long Nganhurra Riser Turret Mooring (RTM) to become heavily degraded and then suggested sinking the infrastructure, containing highly toxic materials, in Ningaloo Reef.

FEBRUARY, 2017**BHP & ESSO (EXXONMOBIL)**

45 km off the Gippsland coast in Victoria, the joint-venture West-Tuna platform in the Bass Strait spills an unknown amount of oil, posing a "significant threat to the environment" according to a NOPSEMA investigator.

APRIL, 2016**WOODSIDE**

Cossack Field in the Timor Sea, 125 km off the coast of WA, 10,500 litres of oil leaked over a two month period from an unnamed Woodside rig in the Cossack Field.

SEPTEMBER, 2015**BHP & ESSO (EXXONMOBIL)**

45 km off Victoria's Gippsland coast in the Bass Strait at 1am a fire ignited in the West-Tuna platform's battery storage room, raging out of control for 9 hours.

SEPTEMBER, 2013**BHP & ESSO (EXXONMOBIL)**

70 kilometres off the eastern Victorian coast, on BHP & ExxonMobil's joint venture 'Cobia' platform, 750-litres of oil leaked into the sea.

POTENTIAL RISKS OF THE BURRUP HUB PROJECT

Learning from Recent Accidents

An examination of oil and gas accidents in Australia's recent history reveals that there is significant potential for a disaster to happen at Woodside's Burrup Hub. In addition to Woodside and BHP's accidents detailed above, other companies' accidents are also important to consider given geographical and geological similarities with the Burrup Hub project as well as similarities with the extraction, transport and processing infrastructure used.

There are close to a dozen loss of control scenarios detailed in Woodside's project proposals for both Browse and Scarborough. Scenarios that may result in an unplanned hydrocarbon release include, but are not limited to those that occur during: drilling, installation and commissioning, FPU (floating production unit) operations, extraction, processing, export, and decommissioning.⁹⁵ Alongside these potential sources are others that are more difficult to account for. These include personnel error, extreme weather, and a lack of oversight and/or maintenance.

Well blowouts are the most common cause of large-scale offshore gas and oil rig spills, explosions and disasters over the industry's history - and are the most environmentally damaging.⁹⁶ Blowouts occur when pressure control systems fail, causing an uncontrolled release of hydrocarbons such as crude oil, gas or condensate. This potential catastrophe can be compounded further if a spark or ignition source ignites the spill, causing combustion and in some cases explosion.⁹⁷

Ranging in severity, some blowouts may spill only nominal amounts of oil and gas resulting in minor disturbance; whereas others, such as the Deepwater Horizon incident of April

2010 have been disastrous beyond belief. Killing 11 workers and injuring many others, the Deepwater Horizon blowout is estimated to have spilled more than 4 million barrels of crude oil into the Gulf of Mexico;⁹⁸ irreversibly destroying multiple marine ecosystems for generations to come.⁹⁹

In Australia, although we are fortunate to have not yet encountered a mass spill event at the scale of Deepwater Horizon, historic spills such as the Montara well blowout and explosion in 2009 gave Australians a glimpse of the malpractice that was endemic to certain well operators;¹⁰⁰ while further revealing multiple industry-borne regulatory failures.¹⁰¹ Gushing 2,500 barrels of oil per day into the Timor Sea for 74 days,¹⁰² the environmental and economic reverberations of the Montara blowout were severe and are still being felt by our regional neighbours. Seaweed farmers in Indonesia are still impacted 12 years on, as their seaweed farms never fully recovered from the spill.¹⁰³ A three-day expedition by the Worldwide Fund for Nature (WWF) during the oil spill “recorded hundreds of dolphins and sea birds in the oil slick area, as well as sea snakes and threatened hawksbill and flatback turtles.”¹⁰⁴ Fish collected for an impact assessment conducted by Curtin University researchers showed “increased liver size and occasionally, increased oxidative DNA damage” for up to a year and beyond after the spill.¹⁰⁵ Impact assessments on marine megafauna, sea snakes and seabirds were also undertaken but often produced inconclusive results due to a lack of baseline population data against which to compare, as well as the time passed between the well being plugged and the commencement of these impact studies (often months later).¹⁰⁶

U.S. Coast Guard Responds to Deepwater Horizon Explosion, © U.S. Coast Guards



A federal inquiry revealed that the spill was caused by a combination of poor decisions and human error, a situation exacerbated by the relaxing of offshore regulations in 2004 which allowed for self-regulation by well operators and fostered a working environment in which human-induced errors became commonplace.¹⁰⁷

Large scale blowouts like Deepwater Horizon and Montara drew widespread attention to the regulatory issues of the global offshore oil and gas industry and re-ignited public scrutiny of effects posed by blow-outs on marine environments.

There are significant similarities between the Montara project and Woodside’s proposed Burrup Hub project - in particular Browse. Browse comprises three gas fields with a huge volume of resources proposed for extraction. This means that due consideration must be paid to the likelihood of a blowout or alternative accident resulting in a spill.

On Woodside’s own estimation, the hydrocarbon resources contained in these three gas fields account for 13.9 trillion cubic feet (tcf) of dry gas, and 390 million barrels of condensate.¹⁰⁸

In assessing potential spill scenarios at their Browse site,

Woodside classifies the loss of well containment (blowout) as a credible risk and detail that such a scenario could last as long as 77 days,¹⁰⁹ resulting in 142,154 cubic metres (over 142 million litres) of unstabilised condensate being released from a well in the Torosa reservoir.¹¹⁰

When modelled, Woodside estimate that amounts of entrained condensate greater than their ecotoxicological threshold could persist up to 863 kilometres from the spill source.¹¹¹ In such an event, this could mean toxic levels of condensate hydrocarbons entrained in ocean water at concentrations of up to 25,000 parts per billion in depths to 20 metres below sea level.¹¹² When visualised geographically, a spill of this scale would easily reach the Dampier Peninsula on the Western Australian coast, East Timor and many of the more southern Indonesian islands too.¹¹³ Further, it would pollute the waters of Scott Reef Nature Reserve, Argo-Rowley Terrace Marine Park, Mermaid Reef Marine Park and Rowley Shoals Marine Park, impacting 39 threatened species (including 8 critically endangered species) as well as coral reef ecosystems that are found in these areas.

While incredibly damaging, blowouts are only one of a number of scenarios that may result in unplanned hydrocarbon spills. In respect to Woodside’s proposed Scarborough trunkline and associated processing infrastructure, the risk of a well blowout is lower than with the Browse development. Woodside states that this is because the Scarborough reservoirs “contain no or only trace liquid hydrocarbons, which means there is no credible risk of hydrocarbon spill due to well blowout and only from fuel or non-process LOC [loss of control]”¹¹⁴ However, there are ten alternative ‘credible’ loss of control scenarios detailed in Woodside’s project proposals for both Browse and Scarborough, in addition to well blowouts.¹¹⁵

Oil Spill Aftermath in the Bangladesh Sundarbans, © Syed Zakir Hossain / Greenpeace



If a worst case scenario spill or vessel rupture were to occur at Scarborough, the waters of Ningaloo Marine Park (World Heritage listed), Dampier Marine Park, Montebello Marine Park, Gascoyne Marine Park and Carnarvon Canyon Marine Park would all be polluted.

This would impact 42 threatened species that are found in these areas, of which 10 are critically endangered. The spill would reach the coastline of Western Australia around Ningaloo, Exmouth, Onslow, Gnoorea, Dampier, Burrup, Cleaverville and Point Samson.¹¹⁶

Woodside have detailed its various mitigation and containment strategies against surface and subsurface well blowouts and spill scenarios. However, given Woodside’s historical record of serious maintenance issues and accidents, and its worrying approach to decommissioning across various sites, these strategies must be viewed with a critical eye. Neither the associated risks, nor the potential causes of a non-process loss of control or blowout can be dismissed.

The following timeline of Western Australian oil and gas well accidents, including several major incidents on Woodside rigs, and their associated causes chronicles the most significant and damaging examples of blowouts, maintenance related equipment failures, malpractice and personnel related safety accidents in the last 15 years. Non - Woodside and BHP incidents have been included to show the full range of incidents that occur in offshore oil and gas extraction and transport, and that are at risk of occurring with the Burrup Hub project.

Timeline of Western Australian gas accidents

June 3rd, 2008

Varanus Island, WA. A ruptured gas pipeline ignites and causes an explosion at Apache Energy’s gas processing facility.

At approximately 1:30pm on June 3rd, 2008, a pressure rupture occurred onshore at one of the facility’s gas pipelines. This pipeline, which had corroded from its original 11 mm thickness down to only 1.5 mm, was found to be the source of a failure that sparked an ignition causing an adjacent pipeline to explode. Creating an 8 by 30 metre crater, the explosion sent rocks and debris weighing up to 17 kgs flying into the air.¹¹⁷

Less than an hour later, two more pipelines exploded allegedly creating 40 m high flames.¹¹⁸ No deaths or injuries were recorded, and all non-essential personnel were evacuated. The explosion is estimated to have cost the WA economy \$3 billion, and led to a 30% decrease in the state’s energy supply with delays to supply lasting many weeks during WA’s winter.

A NOPSEMA (then NOPSA) report found that Apache had failed to do any maintenance on the pipelines for 16 years; and, as a result the anti-corrosion coating and cathodic protection system were thus rendered ineffective.¹¹⁹ Despite this finding, after two years of legal proceedings against Apache Northwest Pty Ltd and its co-licencees, Kufpec Australia Pty Ltd and Tap (Harriet) Pty Ltd, the WA government’s case was discontinued due to legal errors and technicalities.¹²⁰

August 21st, 2009

Timor Sea, WA. PTT Exploration and Production’s (PTTEP) West Atlas rig in the Montara oil field suffers a massive blowout and subsequent uncontrolled fire.

Gushing upwards of 2,500 barrels of oil per day for 74 days and covering an approximate area of 90,000 square kilometres in the Timor Sea,¹²¹ the Montara blowout became known as the worst offshore spill in Australian history.¹²² The cause of the blowout was due to a combination of malpractice alongside a multitude of other human-errors that combined to create a serious catastrophe.¹²³

The 2010 final report of the Montara Commission of Inquiry further found that, “the way that PTT Exploration and Production [Australia] operated the Montara Oilfield did not come within a ‘bulls roar’ of sensible oilfield practice. The Blowout was not a reflection of one unfortunate incident, or of bad luck. What happened with the H1 Well was an accident waiting to happen; the company’s systems and processes were so deficient and its key personnel so lacking in basic competence, that the Blowout can properly be said to have been an event waiting to occur.”¹²⁴

Included in a separate briefing made to the Parliament of Australia in December 2018, it is noted that, “It would seem there is a need for a broader regulatory system for compensation of pollution damage covering offshore oil exploration and production...”¹²⁵

The effects of the Montara spill were not only devastating to Australian marine life, but to various coastal communities and marine environments in Timor and Indonesia too.¹²⁶ With many still burdened by the overwhelming economic and health consequences, their hardship has been compounded further by yet unpaid compensation payments.¹²⁷

In 2011, **Woodside Petroleum** was issued with a ‘please explain’ from federal Environment Minister Tony Burke after it sidestepped federal government scrutiny and began drilling off the Kimberley coast in a joint venture with PTTEP - the company responsible for the Montara spill.¹²⁸

April, 2016

Cossack Field in the Timor Sea, 125 km off the coast of WA. An unnamed rig in Woodside Petroleum’s Cossack Field on the North West Shelf leaks over a 2 month period between February and April.

A Woodside rig in the North West Shelf leaked over 10,500 litres of oil unnoticed into the ocean somewhere in Woodside’s Cossack Field. The source of the 175-litre-per-day-leak was later found to be a degraded seal on a subsea hydraulic control line located on the rig.¹²⁹

July 24th, 2021

As first reported by The Guardian, the initial public mention of the spill was a reference to a 10,500 litre spill in NOPSEMA’s annual offshore performance report released in May, 2017. The report failed to mention when exactly the spill took place, or who was specifically responsible.¹³⁰ A spokesperson for Woodside claimed there was “no lasting impact to the environment”¹³¹

50 km north-west of Exmouth, WA. An equipment failure causes a 500kg load to fall, seriously injuring two workers on Woodside Petroleum’s Ngujima-Yin oil vessel.

At Woodside’s Ngujima-Yin oil vessel, a piping spool was being moved with chains suspended from an overhead trolley when it overran the end of the beam due to unapproved modifications to the beam’s end stops, seriously injuring two workers.¹³²

Despite notifying NOPSEMA of one injured worker who was pinned under the fallen equipment, Woodside failed to notify the regulatory body of a second worker who was knocked unconscious by a falling chain block.¹³³ At least one of the workers had to be transferred onshore for medical treatment.¹³⁴

December 2nd, 2021

475 km off the coast of Broome, WA. A fire shuts down Shell’s Prelude floating gas factory.

Following a small fire in an enclosure housing batteries on Shell’s Prelude floating gas factory, a general platform alarm sounded and prompted more than 200 crew to gather in the ship’s mess at around 10:45pm.

An hour after the alarm sounded, the Prelude was plunged into darkness due to a ship-wide black out. Shortly after the black out, with only emergency lighting available, and no ventilation, air-conditioning, water, or communications the ‘abandon platform’ alarm sounded. An unnamed crew member was quoted as saying “That creates a lot of fear... That means we’re going to the lifeboats, we’re getting off.”¹³⁵ After a short period, the crew were further instructed not to abandon ship.

Following nine hours in the mess hall, without proper functioning toilets or ventilation, the crew were released.¹³⁶ Suffering from heat-exhaustion, multiple crew members were taken to the ship’s hospital and all non-essential workers were evacuated. It took over 2 and a half days before proper power was restored to the ship.

During the prior year, the Prelude factory had remained shut for 11 months following a string of incidents that NOPSEMA

described as “dangerous occurrences” that resulted in the “loss of hydrocarbon containment.”¹³⁷

Following the fire and the chaos that ensued, Brad Gandy of the Australian Workers Union WA branch stated that “what happened on the Prelude under Shell’s watch earlier this month is unforgivable,”

and that, “this is not the first time similar failures have occurred on the Prelude and clearly Shell has not learned from its past mistakes.”¹³⁸

March 20th, 2022

Varanus Island, WA. Santos spills 25,000 litres of light-oil-condensate during the loading of a tanker.

During the loading of light-oil-condensate onto a Santos oil tanker, an oil sheen was noticed and operations were stopped. Santos identified the source of the leak as a damaged hose link that connects the island’s oil pipelines to tankers. According to an anonymous source, not only had the loading hose had been damaged during an incorrect operating procedure many years prior, but Santos had been made aware of the weakened hose and took no action.¹³⁹

A June 2019 environmental approval submission by Santos identified 51 species of threatened fauna that appear in the surrounding habitat.¹⁴⁰ These species included numerous sharks, turtles, birds, and whales.¹⁴¹

Each of these events outlines various instances where major oil and gas operators failed to protect the environment and the safety of their employees and contractors. These events serve as warnings of what could happen at Woodside’s Burrup Hub project - particularly as Woodside is one of the industry’s worst offenders when it comes to equipment failure.



Burning Oil from Oil Rig Disaster, © Daniel Beltrá / Greenpeace

PRELIMINARY MARINE IMPACT ASSESSMENT OF BLOWOUTS, RUPTURES, & OTHER SPILLS

This section of the report provides an initial assessment of marine impacts considering both a potential condensate spill at Woodside's Browse site, and a potential marine diesel oil spill at their Scarborough site. For each site, a case study species has been identified that demonstrates the vulnerabilities of marine wildlife when exposed to hydrocarbons.

Hard corals and the Browse project

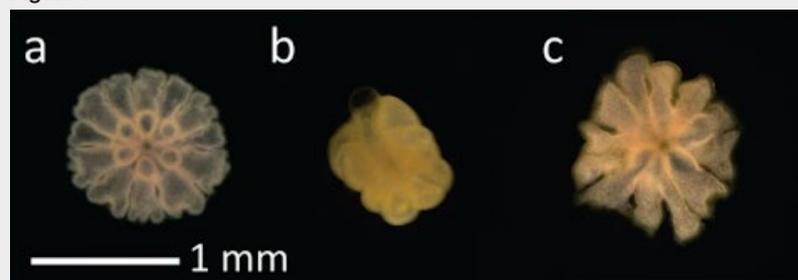
One consequence of the Montara blowout in 2009 was the body of environmental toxicology research that developed following the spill, some of which can be used to forecast the impacts of a Burrup Hub blowout or spill on nearby coral reefs.¹⁴²

Woodside's own assessments show that, if an unplanned release of hydrocarbons (such as a well blowout) were to take place at Browse, 39 threatened animal species are at a direct risk of being impacted.¹⁴³ One threatened ecosystem that would be impacted is the hard-coral species, *Acropora tenuis*, widely abundant on Scott's Reef.¹⁴⁴ Representing a unique marine ecosystem perched above Woodside's Torosa gas reservoir, Scott's Reef supports a variety of hard corals that sustain life on the reef.

Acting as the foundational building blocks of all reefs, calcium-carbonate secreting hard-corals such as *Acropora tenuis* are integral to the strength and longevity of all reef ecosystems.¹⁴⁵ Any further loss to hard coral species already struggling under the weight of successive bleaching events,¹⁴⁶ is a risk too great to leave to chance. Scientists have identified hundreds of thousands of reef fishes at Scott Reef that rely on the corals for food and shelter.¹⁴⁷ Coral reefs support the populations of approximately one quarter of all known marine fish species worldwide - the existence and survival of these reef fishes depends on healthy coral reef ecosystems.¹⁴⁸

Woodside purports to account for the widespread disturbance of *Acropora tenuis* in the event of a spill in its plans, and recognises the effects of spilled hydrocarbons on other species of coral too. However, academic research that resulted from the Montara blowout provides a more realistic picture of what is likely to happen to the corals of the Scott's Reef in the event of a blowout or spill. As observed during 12 laboratory studies on the effects of gasoline, crude oil, fuel oil and lubricants on the development and growth of corals, coral larvae exhibited "normal settlement and metamorphosis behaviour" when exposed to low levels of condensate, yet became "increasingly inhibited at higher condensate concentrations".¹⁴⁹ The photomicrographs below (Figure 1) show the extent of disruption in juvenile coral polyps when exposed to varying levels of condensate.

Figure 1



This study shows that in the event of spill or blowout at Woodside's Browse site, any persisting entrained hydrocarbons would certainly have measurable damaging effects on the larval cycle of hard coral *Acropora tenuis*.

Figure 1, (a) shows a normal juvenile coral polyp, & (b) & (c) show polyps of the same age when exposed to varying levels of condensates.

Negri et al, 2016. 'Acute ecotoxicology of natural oil and gas condensate to coral reef larvae - Figure 1'¹⁵⁰

As such, any lasting effects to these integral ecosystem building corals could drastically reduce Scott's reef's ability to sustain and regulate the ocean and marine life around it.

Moreover, when considering the conclusions of this academic research in contrast to Woodside’s 2016 claim that its 10,500 litre oil spill in the Cossack Field had “no lasting impact to the environment”;¹⁵¹ it is unclear how Woodside arrived at this conclusion and how they substantiated this claim.

Flatback and green turtles and the Scarborough project

Flatback and Green Turtles, two threatened turtle species, are known to nest, internest and forage in Western Australian waters in close proximity to Woodside’s Scarborough project. The Scarborough Trunkline cuts through known foraging, nesting and inter-nesting habitat of Flatback and Green Turtles, as identified in Woodside’s own draft Environmental Impact Statement (Figure 2; Figure 3) - in particular around Barrow Island Marine Park, Montebello Marine Park and Dampier Marine Park.

Figure 2 - Biologically important areas for Flatback turtles

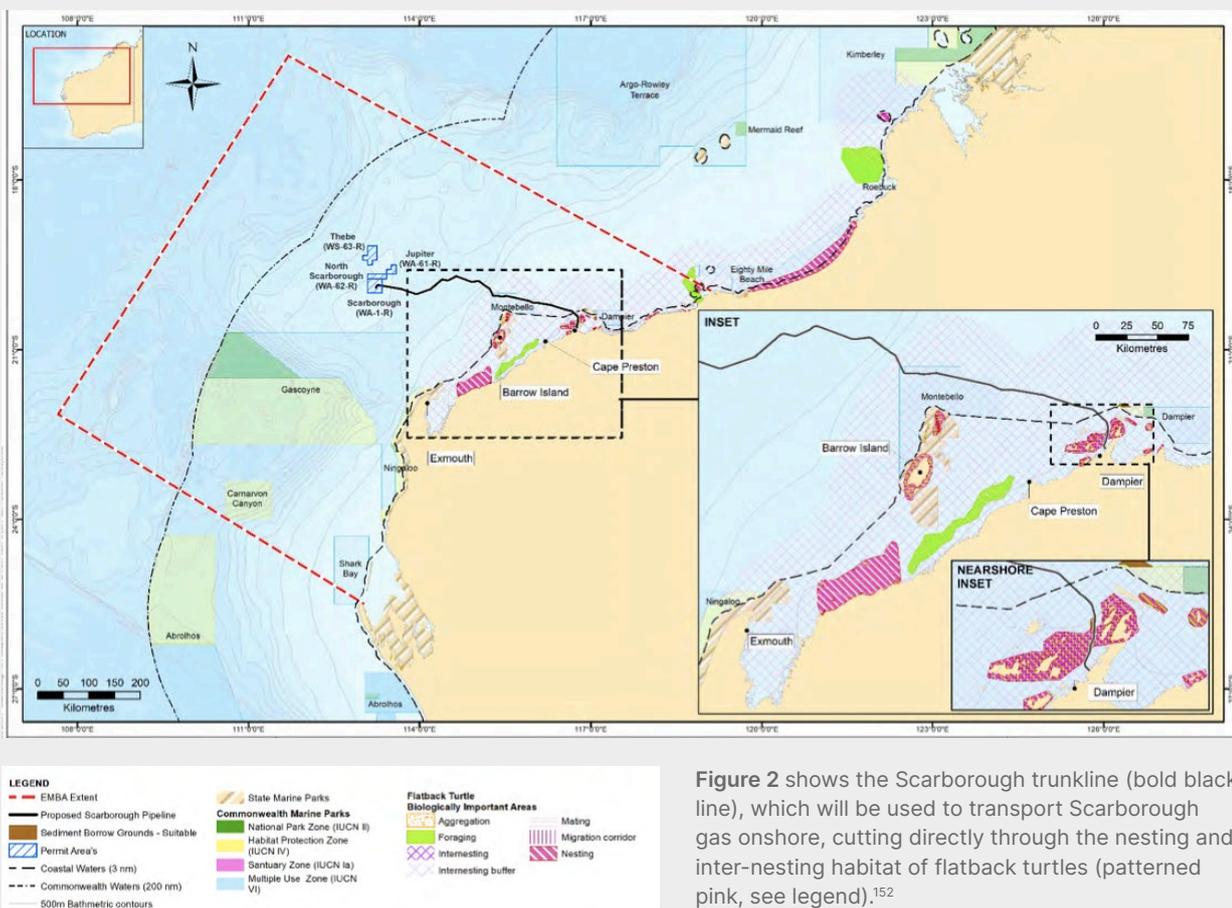


Figure 2 shows the Scarborough trunkline (bold black line), which will be used to transport Scarborough gas onshore, cutting directly through the nesting and inter-nesting habitat of flatback turtles (patterned pink, see legend).¹⁵²

Figure 3 - Biologically important areas for Green turtles

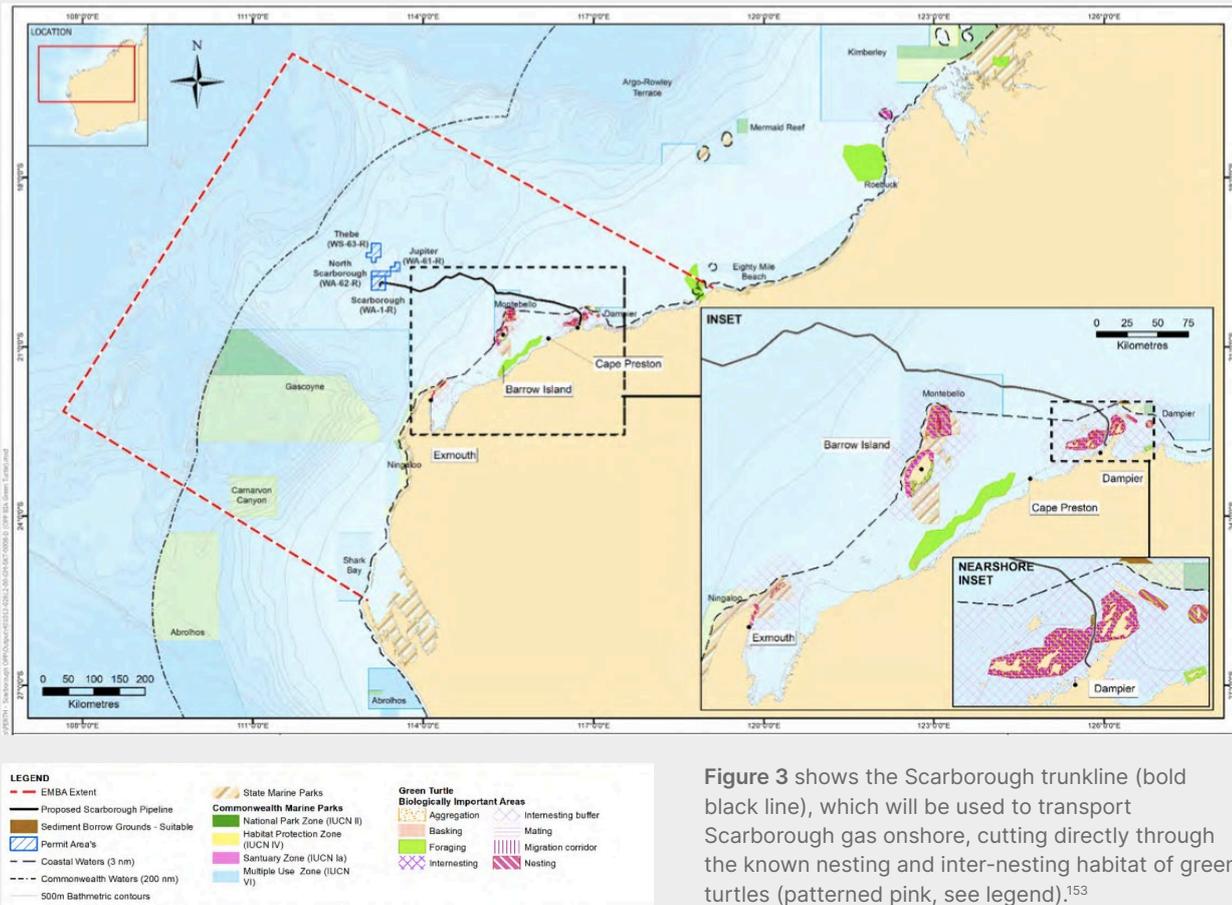


Figure 3 shows the Scarborough trunkline (bold black line), which will be used to transport Scarborough gas onshore, cutting directly through the known nesting and inter-nesting habitat of green turtles (patterned pink, see legend).¹⁵³

In a response to Chevron’s proposed Gorgon gas project, the Environmental Protection Agency of Queensland submitted a report to the Environmental Protection Authority of Western Australia concerning the potential impacts of its Barrow Island Gorgon gas plant on threatened sea turtles.¹⁵⁴ Among other impacts, the response paper outlined that dredging and spoil dumping in the vicinity of Barrow Island “will cause a reduction in available foraging grounds available for the locally foraging green, hawksbill, loggerhead and flatback turtles.”¹⁵⁵ Dredging has negative impacts on water quality, presenting an ecotoxicological threat as it displaces seafloor sediments into the water column.¹⁵⁶ This sedimentation “can be expected to kill seagrass and other food sources dependent on photosynthesis, lasting possibly a few years after dredging.”¹⁵⁷ This can lead to indirect mortality for sea turtles as seagrass and the benthic invertebrate that eat it (such as seapens) are one of sea turtles’ main food sources.¹⁵⁸

The response paper to Chevron’s Gorgon gas project is of relevance to Woodside’s Burrup Hub - in particular its Scarborough site - due to Scarborough’s geographical proximity to Barrow Island and other nearby foraging, nesting and interesting grounds for threatened sea turtles. As Woodside’s

own project proposal for Scarborough states, “a total of six conservation significant marine reptile species (or habitat) may occur in both the Trunkline Project Area and Borrow Ground Project Area; five marine turtles and one seasnake”¹⁵⁹ The proposal continues, “overlapping the Trunkline Project Area and Borrow Grounds Project Area are Biologically Important Areas for interesting hawksbill, flatback, loggerhead and green turtles, and habitat critical for interesting hawksbill, flatback and green turtles”¹⁶⁰

Woodside plans to dredge a 2.5-3.5 metre deep and 430 km long trench in order to lay its Scarborough Trunkline in the seabed.¹⁶¹ It also plans to ‘backfill’ the trench where the water depth is shallower than 40 metres, which corresponds to all areas of the trunkline that are 50 km or less offshore.¹⁶² Dredged material will be disposed of at existing offshore ‘spoil grounds’ within the region, and backfill material will be sourced from pre-identified offshore ‘borrow grounds’¹⁶³ Dredging, spoil disposal and backfill all cause sediment dispersal, leading to the changes in water quality and ecotoxicity described above. Woodside estimates that a total of 12.9 square kilometres of seabed will be disturbed during these trunkline installation activities.¹⁶⁴

Woodside downplays the impact of trunkline installation activities on foraging, nesting and interesting sea turtles. In regards to effects on foraging,

Posidonia oceanica seagrass with a school of fish underwater in the Mediterranean sea,
© Damedias / Adobe Stock



Woodside admits that “all seagrasses found in the area may be impacted by trunkline dredging, spoil disposal and backfill activities”, but it claims that “recovery [of seagrass] within five years is highly likely”¹⁶⁵ It does not provide an assessment of the impacts on sea turtles from five years of forced habitat change and reduced food availability.

The impacts on nesting and interesting sea turtles are also downplayed, with Woodside claiming that the numbers of interesting green and flatback turtles in the Trunkline Project Area are “unlikely to comprise a significant portion of the Western Australian population”¹⁶⁶ The company does not provide a quantification of what it considers to be a ‘significant portion’ of the green and flatback turtle population, nor how many interesting turtles it deems reasonable to disturb.

Another cause for concern is when Woodside plans to undertake its installation activities for the Scarborough Trunkline. Its own sediment dispersion modelling shows that concentrations of sediment will be higher (with worse ecotoxicological effects) when installation and backfill takes place in winter - this is

due to changes in wind and tide over the winter months which bring sediment further inshore and 'trap' it there.¹⁶⁷ However, elsewhere in its project proposal, Woodside assesses that the light pollution from dredging and pipelay vessels can "potentially" have behavioural impacts on sea turtles within 1.8 km and 1.5 km from each of these vessels, respectively, and is "likely" to have behavioural impacts on turtles within 0.6 km and 0.5 km of these vessels.

Light pollution disorients sea turtles, in particular nesting females and hatchlings.¹⁶⁸ The Scarborough Trunkline Area and the Borrow Grounds Project Area are only 5 kms and 12 kms away, respectively, from the islands of the Dampier Archipelago where green, flatback and hawksbill turtles are known to nest and internest, sometimes in high numbers.¹⁶⁹ If dredging and backfill were to take place in the summer months, higher numbers of nesting females and hatchlings may be impacted by this light pollution.

In addition to light pollution, suction dredging has been a proven and direct cause of turtle mortality, as turtles come into contact with the dredging equipment and suffer life threatening injuries.¹⁷⁰

This is a well established phenomenon according to stranding records on the Western Australian coastline, as turtles killed by dredging equipment "have extensive and characteristic injuries".¹⁷¹ The Environment Protection Agency QLD response paper to Chevron's Gorgon gas project states that the "death of turtles can be expected with dredging operations off the mid east coast beaches of Barrow Island because of the proximity to the large flatback nesting population and the presumed mixed foraging population of green, hawksbill, loggerhead and flatback turtles".¹⁷² Woodside's Scarborough Trunkline will be installed using this same suction dredging equipment.¹⁷³ Again, depending on when the dredging activities occur, higher numbers of internesting flatback and green turtles may be killed in this way.

Woodside is likely to have difficulty minimising the impact of dredging activities on sea turtles, as these activities are estimated to take 21.5 weeks or over 5 months in total to complete (Figure 4). These activities will therefore overlap with the peak nesting and emergence behaviour of green, flatback and hawksbill turtles (Figure 5). If the bulk of the dredging and spoil disposal activities are timetabled to take place in the winter months to avoid impacting nesting sea turtles, then this will worsen the effects of sedimentation on foraging sea turtles described above.

Figure 4 shows Woodside's timeline for trunkline installation and stabilisation activities within 20 km of land.

Figure 5 shows the nesting and emergence activity for green, hawksbill and flatback turtles, spanning from mid-August to the end of April.

Figure 4 - Trunkline installation and stabilisation activities within 20km of land

| Activity | Estimated duration | Location | Vessels |
|--|--------------------|--|---------------------|
| Hydrographic, geophysical and geotechnical surveys | 2 months | Trunkline Project Area and Borrow Ground Project Area | Survey vessels |
| Pre-lay trenching and spoil disposal | 8 weeks | Trunkline Project Area (KP 32.7 – KP 54) | Dredging vessel |
| Pipelay | 3.5 weeks | Trunkline Project Area | Pipelay vessel |
| Pre and post-lay span rectification | 2 weeks | Trunkline Project Area (KP 32.7 – KP 54) | Construction Vessel |
| Post-lay dredging and backfill | 8 weeks | Trunkline Project Area (KP 32.7 – KP 54) and Borrow Ground Project Area (cycling between the two project areas over approximately 7 hours with the majority spent in the Trunkline Project Area) | Dredging vessel |

Figure 5 - Peak activity of nesting females and emerging hatchings of green, flatback and hawksbill turtles in the NWS region

| Species | Activity | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun |
|-----------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Green | Nesting | | | | | | | | | | | | |
| | Emergence | | | | | | | | | | | | |
| Hawksbill | Nesting | | | | * | * | * | * | | | | | |
| | Emergence | | | | | | * | * | * | | | | |
| Flatback | Nesting | | | | | | * | * | * | * | | | |
| | Emergence | | | | | | | | * | * | * | * | |

*Peak nesting reported for Rosemary Island (Whiting, 2018), peak hatchling emergence based on ~two month incubation (Commonwealth of Australia, 2017)

Turtle Hatchling near Ningaloo Reef, © Lewis Burnett / Greenpeace



Greater scrutiny is therefore required as to why Woodside's Scarborough project proposal assesses the impacts on endangered and vulnerable sea turtles to be 'acceptable'.¹⁷⁴ Moreover, these are only the impacts on sea turtles from routine operations.

If the pipelay vessel installing the Scarborough Trunkline were to experience a tank rupture - a scenario Woodside deems 'credible' - then 2000 cubic metres (or 2 million litres) of marine diesel oil (MDO) would spill into turtle habitat.¹⁷⁵

Woodside's own data shows that if the pipelay vessel ruptured, sea turtles would be injured and killed as they would inhale toxic petroleum vapours on the surface of the water causing lung damage, emphysema, pneumonia or neurological impairment, or hydrocarbons would accumulate on the shoreline where sea turtles breed and nest.¹⁷⁶ Marine diesel oil could also stick to the turtles' bodies, "irritating mucous membranes in the nose, throat and eyes, leading to inflammation and infection".¹⁷⁷

CONCLUSION

Woodside's Burrup Hub Project presents a myriad of challenges and risks to the environment, taxpayers and shareholders, and Woodside's own workers too. In both its Scarborough and Browse project proposals, Woodside has downplayed the significant risk of blowouts, spills and accidents.

This is evidenced by its historical neglect of past projects, and the current ongoing issues of poor maintenance at their North Rankin A Platform and the Karratha gas plant - both facilities connected to the broader Burrup Hub network.

When considered together, Woodside's track-record of poor maintenance, operational failure and damaging decommissioning, represent a serious threat that is far too great to be worn by the marine environment in the likelihood of a blowout, spill or accident.

Moreover, while cuts to maintenance procedures and staffing may boost the bottom line in the short term, in the longer term they may correlate with a higher incidence or severity of accidents, in turn increasing the likelihood of an expensive environmental catastrophe.

It may only be a matter of time before Australians are once again faced with the reality of a serious environmental catastrophe as the gas industry is rife with environmental carelessness and systemic safety concerns, and when further considering the increasing prevalence of gas projects marked for approval and expansion nationwide.

Further scrutiny of Woodside's operations must be prioritised by shareholders, and the public given the opportunity to assess the environmental impacts of the Burrup Hub project through independent and transparent research, lest marine wildlife suffer under the consequences of the company's failures.

For the purposes of this report, Greenpeace has modelled Woodside's own information. However, there is a risk that Woodside has underestimated the worst-case scenarios and the required response. The risks are too great to rely on Woodside's information alone - an independent assessment of a worst case scenario well blowout, spill or vessel rupture at Woodside's projects is needed. An independent assessment is

also needed of whether Woodside's accident response plans are adequate to address these risks. In Greenpeace Australia Pacific's view, the combined marine and climate impacts of Woodside's Burrup Hub project make it too risky to proceed.

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This report contains certain "forward looking statements", including those containing words such as "will", "could", "may", "likely", "believe" and other similar expressions. Any forward-looking statements, opinions and estimates provided in this report are based on assumptions and contingencies which are subject to change without notice and involve risks and uncertainties. Any forward-looking statements are a general guide only, not a guarantee of future performance and must not be relied upon. GPAP assumes no obligation to update these forward-looking statements for any reason.

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5. Dugongs are vulnerable worldwide, according to the IUCN.
6. Hawksbill turtles are critically endangered worldwide, according to the IUCN.
7. Green sawfish are critically endangered worldwide, according to the IUCN.
8. Largetooth sawfish are critically endangered worldwide, according to the IUCN.
9. The Bar-tailed Godwit is listed as vulnerable under the state listing in the NT and VIC. There is no WA listing for this species.
10. River sawfish are critically endangered worldwide, according to the IUCN.
11. Leichhardt's sawfish are critically endangered worldwide, according to the IUCN.
12. Northern sawfish are critically endangered worldwide, according to the IUCN.
13. Sei whale, fin whale, blue whale, pygmy blue whale, whale shark, great white shark, grey nurse shark, loggerhead turtle, hawksbill turtle, green turtle, olive ridley turtle, flatback turtle, leatherback turtle, short nosed seasnake, green sawfish, largetooth sawfish, Eastern curlew, red knot, great knot, greater sand plover, lesser sandplover, bar-tailed godwit, North Siberian bar-tailed godwit, Southern giant petrel, Australian painted snipe, Australian fairy tern and curlew sandpiper are threatened species that would be impacted by a blowout, spill or accident at either Browse or Scarborough.
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