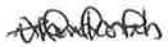


Eni Ghana

plan ms hse 019 r03 – Biodiversity Management Plan

Appendix B

Sea Turtles Biodiversity Action Plan

TITLE:			
Sea Turtles Biodiversity Action Plan (BAP)			
NOTE:			
The document is applicable to Eni Ghana Exploration and Production Limited activities.			
DATE OF ISSUE:		EFFECTIVE DATE:	
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REVISION SHEET

Rev.	Date	N. pages	Change Description	Prep.	Ver.	Appr.
05	25-09-2020	83	Address IFC comments	David Marsh	Arsenio Parrella	Giuseppe Valenti
04	12-06-2020	75	Address IFC and IESC comments and suggestions	David Marsh	Jason Sali	Jason Sali
03	02-07-2019	74	Revised to account for production operations phase	Sena Mawuyra	Murad Khan	Roberto Daniele
02	21-06-2018	96	Revised to account for change in LTE construction methodology and Gas production Phase	Serwaa Anaglate	Murad Khan	Giancarlo Ruiiu
01	31-08-2017	95	Revised BAP to account for material change to pipeline design and installation (see note below)	David Marsh	Pippa Howard	Pippa Howard
00	August 2016	93	Final issue	David Marsh and Jason Sali	Thomas Maddox and Pippa Howard	Pippa Howard

APPENDIX B – SEA TURTLE BIODIVERSITY ACTION PLAN

EXECUTIVE SUMMARY

This sea turtle Biodiversity Action Plan (BAP) has been developed by Eni Ghana for the production phase as part of its Framework Environmental, Social and Health Management Plan (ESHMP). The sea turtle BAP is one of several complementary plans to the Offshore Cape Three Points (OCTP) Project Biodiversity Management Plan (BMP). The BAP is a Company commitment and in line with the requirement of the World Bank Group¹ Performance Standard 6 (WBG PS6) when operating in critical habitat and is also recommended when operating in natural habitat. This document outlines how Eni Ghana apply the mitigation hierarchy to avoid, minimize, restore and offset any impacts to sea turtles and nesting habitat as required by WBG PS6. The first draft of this BAP was produced in August 2016, and has been regularly updated to reflect the project phase and associated impacts.

Three sea turtle species (olive ridley turtle, green turtle and leatherback) have been identified as priority biodiversity features and their nesting beaches as natural habitat. The initial biodiversity baseline surveys (2015) and the subsequent field monitoring completed by Eni Ghana (2017-2020) demonstrated the study area is a low density nesting beach for all three turtle species. During the four years of baseline and monitoring surveys a total of 40 nesting and non-nesting attempts² were recorded during approximately 440 survey days; a rate of one observation per 11 days.

The most abundant species was the olive ridley (33 observations), followed by the leatherback turtle (4 observations) and green turtle (3 observations). Monitoring was conducted throughout the year, however for efficiency, surveys were concentrated within the nesting season. Monitoring results showed that 72.5% percent of all observations occurred during the peak season (October – December). A further 25% of observations occurred with the two month period either side of the peak season (the shoulder season). Only one non-nesting observation was made during the low season. Low season monitoring was undertaken prior to and during construction activities primarily to identify and relocate any nests found to be at risk from construction activities.

Considering only the peak and shoulder seasons, observations were most frequent during the baseline season in 2015 with 19 observations over 109 survey days. The least events (two observations) were recorded in the 2017/18 season from 37 survey days. Illegal poaching affected an estimated 16% of all nests observed in 2015 by ESL Consulting and GWS. The poaching rate has remained around this level or higher (18-20%) since 2017. This poaching rate appears to have remained relatively stable, with only a minimal increase observed during the survey period.

The Project transitioned from construction to production phase in 2019. Eni Ghana anticipate that no direct operational impacts will occur to nesting turtles during the production phase as all activities will occur within the boundary of the Onshore Receiving Facility (ORF). Light spill from the ORF is avoided through distance, the use of directional lighting and vegetation screening (annual

¹ WBG Performance Standards refer to WB, IFC and MIGA Performance Standards

² This total does not include 5 incidental observations reported by community members to the survey team.

lighting assessments are conducted to confirm the continued effectiveness of these measures); no maintenance activities are planned along nesting beaches, and company vehicles are not permitted to enter the beach.

Potential indirect impacts include increase in harvesting and/or consumption of adult turtles and eggs is a key risk that nest monitoring and beach patrolling is expected to effectively minimise. Other cumulative indirect impacts linked to induced access include increased human disturbance (fishing, vehicles, sand mining); artificial illumination from the development of housing and social infrastructure; and the accumulation of debris and rubbish, especially plastic waste. All direct and indirect impacts need to be mitigated and managed by the Project (WBG PS6 GN 17 and 46). As such, these indirect threats will continue to be monitored during the ongoing nesting survey and habitat assessment. A residual impact assessment which quantifies all construction and operational impacts on sea turtles is provided in Section 6.

The current BAP outlines mitigation actions designed to mitigate the production phase impacts, and restore or compensate for losses during the construction and production phase in order to demonstrate no net loss (NNL) for sea turtles and nesting beach habitat. Mitigation actions implemented during the construction phase that are no longer applicable to the production phase are outlined in Annex 2.

Current production phase mitigation actions include beach surveillance, implementation of a bush meat action plan, delivery of staff inductions and HSE staff training on sea turtle protocols. The BAP contractor is expected to effectively manage hatcheries to protect eggs from poachers in the AoI, which can offset any residual losses by protecting nests at risk from threats. Eni will also raise the profile of biodiversity issues at the Cumulative Impact Co-Management Platform. Additional conservation actions (ACAs) which have been designed and implemented by Eni Ghana include the extension of beach surveillance/patrols³ during the shoulder and peak season (~130 days), and the ongoing delivery of community awareness and education. A local NGO, Ghana Wildlife Society (GWS), commenced the implementation of ACAs in 2017. Implementation of the ACAs will be continued during 2020 onwards, subject to restrictions imposed to prevent the spread of coronavirus.

The successful implementation of ACAs and the proposed offsets is expected to demonstrate NNL for the three sea turtle populations in the AoI and the nesting beaches. A monitoring and evaluation programme is ongoing and will inform the need for any adaptive management/corrective actions, including additional mitigation measures.

³ This mitigation type is both a minimisation measure and additional conservation action (ACA). The measure is anticipated to go beyond mitigating the project's impacts in which case additional gains are considered an ACA.

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ACRONYMS

AoI	Area of Influence
BAP	Biodiversity Action Plan
BMP	Biodiversity Management Plan
CRC	Coastal Resources Centre
ESHIA	Environmental, Social and Health Impact Assessment
ESHMP	Environmental, Social and Health Management Plan
ESL	ESL Consulting Ltd
FFI	Fauna & Flora International
FoN	Friends of the Nation
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
GNGC	Ghana National Gas Company
GPS	Global Positioning System
GWD	Ghana Wildlife Division
GWS	Ghana Wildlife Society
LTE	Land Termination End
MIGA	Multilateral Investment Guarantee Agency
NGO	Non-government organisation
NNE	Non-nesting emergence
OCTP	Offshore Cape Three Points
ORF	Onshore receiving facility
PIIM	Project Induced In-Migration
PS	Performance Standard(s)
REDO	Resource and Environment Development Organization
RMU	Regional Management Unit
SWOT	State of the World's Sea Turtles
WBG	World Bank Group

1. INTRODUCTION

1.1 Purpose

The purpose of the sea turtle Biodiversity Action Plan (BAP) is to outline the actions that will be completed in order to meet Eni Ghana's goals and objectives for sea turtles in line with applicable Project Standards. The BAP has been developed by Eni Ghana as part of its Framework Environmental, Social and Health Management Plan (ESHMP). The BAP is a requirement for the WBG PS6 when operating in critical habitat⁴ and is recommended when operating in natural habitats. The sea turtle BAP is one of several complementary plans to the Offshore Cape Three Points (OCTP) Project Biodiversity Management Plan (BMP). The scope of this document is limited to the utilization of onshore habitat (sandy beach) for nesting. Offshore aspects are addressed in the Marine Mammals and Sea Turtles protection Policy and Plan and the Marine Mammal and Sea Turtle Monitoring Programme for the OCTP Project.

The BAP is set out as follows:

1. Introduction: outlines the purpose of the document, objectives, lender requirements and area of influence.
2. Sea turtle overview: explains the sea turtle species confirmed in the Aol, ecology, threats and summary of monitoring results to date.
3. Stakeholder engagement: summary of organisations and individuals engaged as part of the sea turtle project.
4. Construction phase impacts: a summary of the direct and indirect impacts from construction activities (this BAP also outlines in Annex 1 the list of mitigation actions that applied to the construction phase only)
5. Operational phase impacts: summary of potential impacts to sea turtle species from the production phase
6. Residual impact assessment: a detailed analysis of the predicted residual impacts on sea turtles after application of the mitigation hierarchy, based on monitoring results.
7. Mitigation strategy: outlines mitigation measures designed to address operational impacts in the framework of the mitigation hierarchy: avoid, minimise, restore and rehabilitate, and offset. Provided in tabular format.
8. Monitoring and evaluation: explains the monitoring framework including field methods, indicators, BAP targets and thresholds.
9. Integration and implementation: Resources and implementation required to implement the mitigation measures.

⁴ Eni Upstream and Technical Services and FFI, as authors of the Sea turtle Biodiversity Action Plan (BAP), acknowledge the definitions of critical habitat (CH) suggested by the World Bank Group (WBG) within Critical Habitat Assessment (CHA) of OCTP Block, Ghana, and as interpreted by the WBG according to their Performance Standard 6. These interpretations have been adhered to in the CHA according to WBG's guiding principles and recommendations.

1.2 Objectives

The over-arching goal of the BAP is to ensure adequate management, control and monitoring of project activities that pose a risk to sea turtles and nesting habitat in the Area of Influence (Aoi) in accordance with WBG PS6. In other words, reduce the potential impacts to sea turtles to as low as reasonably possible and design/implement measures that will achieve no net loss (NNL).

The overall goals of the Sea Turtles BAP are to:

- Deliver adequate management, control and monitoring of production operations activities that pose a risk to sea turtles and their nesting habitats
- Ensure that the Project does not contribute to sea turtle declines in the region and contributes to NNL for sea turtles and nesting habitat in the Aoi; and
- Undertake actions by contributing to sea turtle conservation in the region through the implementation of additional conservation actions.

Specifically, this requires action to:

1. Minimise direct impacts to sea turtles associated with the activities of Eni staff and contractor personnel
2. Minimise indirect impacts from a potential increase in poaching of turtles and eggs as a result of Project Induced Immigration (PIIM) and undertake additional conservation actions through the establishment of partnerships with local NGOs/actors
3. Consider and minimise cumulative impacts through collaboration with other large-scale developments in the district.
4. Monitoring the status of sea turtles, scale of impacts to the species and effectiveness of mitigation measures (addressed in the monitoring and evaluation section (see Section 6).

1.3 Project description and ecological context

The Offshore Cape Three Points (OCTP) project is located in the western region of Ghana. Eni Ghana is the operator of the Offshore Cape Three Points (OCTP) Project. The offshore component is located in deep water, approximately 63km off the coast of Ghana. Production is achieved via an FPSO, producing up to 85 kboe/d through 20 subsea wells (10 Oil Producers, 5 Gas Producers, 3 Gas Injectors and 2 Water Injectors). The development activities progressed and in 2017 production wells planned were drilled and linked to the production facility achieving the planned plateau production of 45 kbbl/d one year earlier than scheduled. The project includes the transportation of non-associated gas to an Onshore Receiving Facility (ORF) to be processed and linked to Ghana's national grid. The ORF is located in a mix of Modified and Natural terrestrial habitat approximately 700 m inland from the coastline. The pipeline transporting gas from the offshore facilities to the ORF makes landfall between the communities of Sanzule and Anwolakrom. The beach at the landfall location supported coconut trees and largely modified habitat is located between the beach and the ORF.

The ORF is located on the eastern fringe of the Amansuri Key Biodiversity Area and intersects beach habitat. The prevalent beach type is dissipative, in which waves dissipate energy over a wide surf

zone. The initial biodiversity baseline surveys and Critical Habitat Assessment (CHA) conducted by ERM, and the subsequent field monitoring completed by GWS has confirmed the presence of several priority biodiversity features including three sea turtle species (olive ridley, green and leatherback turtles) which are confirmed to nest within the Area of influence which extends 2.5 km either side of the pipeline.

1.4 Legislative, regulatory and policy framework

The Project must comply with all relevant laws, regulations, policies and standards relating to biodiversity. The Environmental and Social Impact Assessment (ESIA) completed in 2015 details the full legal framework within which the Project operates. All sea turtles are wholly protected under the Ghana Wildlife Conservation Regulation, 1971, L.I. 685. The First Schedule, (Series B - Reptiles) includes the order 'Chelonia' that (in older use) covers all sea turtles.

1.4.1 Lender requirements

The Project is required to comply with the Environmental & Social Safeguards of the WBG, including application of the International Finance Corporation's Performance Standards (PS), and specifically for Biodiversity and Ecosystem Service (BES) management, PS6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources (IFC, 2012).

IFC PS6 requires that clients fully exercise the mitigation hierarchy⁵. If significant residual impacts on biodiversity still remain after all feasible preventive and restorative action has been taken, specific forms of compensation (e.g. offsets) must be developed to deliver a Net Gain of biodiversity with 'Critical Habitat' affected by the Project and No Net Loss⁶ (NNL) (where feasible) of 'Natural Habitat' (IFC, 2012, 2018). Paragraphs 17-19 set out all requirements that must be met before any Project activities should take place in critical habitat (IFC, 2012, 2018).

1.4.2 Corporate framework & policies

This Project is one of the first to be aligned to the objectives of the Eni 2018 BES policy from pre-development (DEV) phase. This policy has the objective of achieving no net loss / net positive impact on natural and critical habitat respectively. The project aligns with Eni Upstream's Biodiversity and Ecosystem Service (BES) Technical Guidance (Eni BES TG013r00).

1.5 Area of Influence

The Area of Influence (AoI) was defined during the preparation of the ESHIA in 2015. For the purpose of the sea turtle mitigation and monitoring, the Project AoI, extends for approximately 2.5 km either side of the pipeline landfall location (Figure 1-1). This was considered sufficient to accommodate both direct and indirect impacts. Potential direct impacts included physical disturbance, particularly during landfall construction. Potential indirect impacts include an increase in disturbance activities along the

⁵ IFC PS6 GN 16 (2018)

⁶ No net loss, is defined in footnote 9 of IFC PS6 as "the point at which project-related impacts on biodiversity are balanced by measures taken to avoid and minimize the project's impacts, to undertake on-site restoration and finally to offset significant residual impacts, if any, on an appropriate geographic scale (e.g., local, landscape-level, national, regional).

coastal area, resulting from the expected increased migration and economic activity in the immediate coastal region. This area includes the beaches of Bakanta, Anwolakrom, Sanzule, Krisan and Elkwe communities.

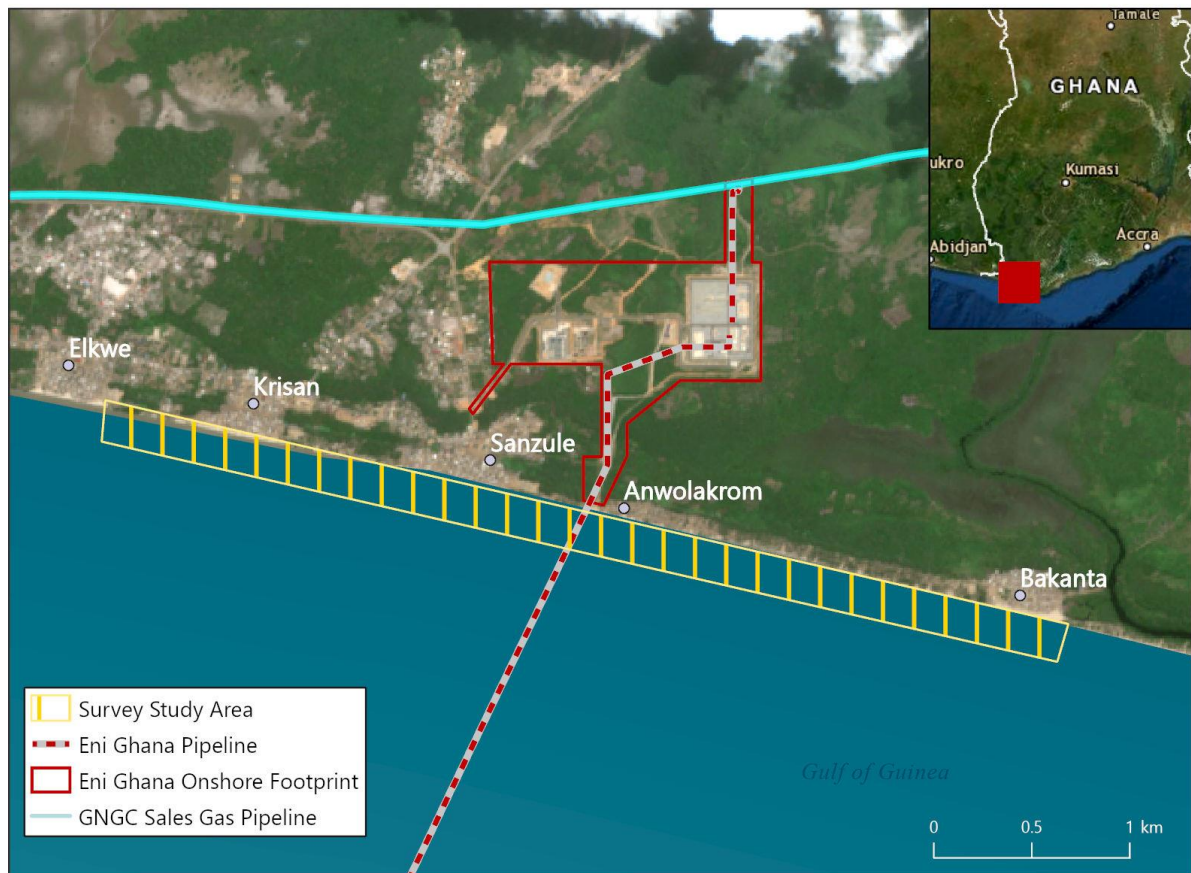


Figure 1-1 Project Area of Influence (Aoi)

2. SEA TURTLE OVERVIEW

2.1 BAP target species

The initial biodiversity baseline surveys (2015) and the subsequent field monitoring completed by Eni Ghana (2017-2019) have confirmed the presence of three threatened sea turtle species including the olive ridley turtle (*Lepidochelys olivacea*), green turtle (*Chelonia mydas*) and leatherback (*Dermochelys coriacea*) (Table 2-1). An additional two sea turtle species are known to inhabit the coastal waters in the western region of Ghana including loggerhead (*Caretta caretta*), and hawksbill turtle (*Eretmochelys imbricata*). However, neither species has been observed during monitoring completed by the project across four nesting seasons.

The three confirmed species do not meet the required threshold triggering critical habitat in accordance with WBG/IFC PS6. As such, the Project was required to design and implement mitigation and management actions in order to achieve NNL outcomes (rather than net gain).

Table 2-1 Sea turtle summary

Biodiversity feature	IUCN – Global Status ⁷	IUCN – Regional and subpop. status ⁸	Occurrence in the study area	Critical / Natural Habitat	BAP requirement (PS6 compliance)
Olive ridley (<i>Lepidochelys olivacea</i>)	VU	East Atlantic sub population (Not evaluated)	Confirmed nesting in the study area (most abundant species – 82.5% of all sightings)	Natural habitat (Beach) and associated significant biodiversity values	No net loss (NNL)
Green turtle (<i>Chelonia mydas</i>)	EN	South Atlantic subpopulation (LC)	Confirmed nesting in the study area; - 7.5% of all sightings		
Leatherback (<i>Dermochelys coriacea</i>)	VU	Southeast Atlantic sub population (DD)	Confirmed nesting in the study area; 10% of all sightings		
Hawksbill (<i>Eretmochelys imbricata</i>)	CR	North east Atlantic sub population (EN)	Not recorded during baseline surveys or subsequent monitoring	n.a.	None
Loggerhead (<i>Caretta caretta</i>)	VU	North east Atlantic sub population (EN)			

2.2 Sea turtle distribution and ecology

This section briefly describes status, known ecology and nesting behaviour of the three confirmed

⁷ IUCN Red List threat categories: Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Data Deficient (DD), Not Evaluated (NE).

⁸ Sea turtles are wide-ranging global species. The IUCN SSC Marine Turtle Specialist Group (MTSG) has divided the population into subpopulations/regional management units and is in the process of assigning threat categories to these infra-specific taxa.

species. The baseline and subsequent monitoring surveys demonstrated the study area is a low density nesting beach for all three turtle species. During the four years of monitoring only 40 nesting attempts⁹ were recorded during approximately 442 survey days. The most abundant species was the Olive ridley (33 observations), followed by the leatherback turtle (4 observations) and green turtle (3 observations).

Olive ridley turtle

The olive ridley was the most abundant species observed in the AoI during the baseline and monitoring surveys (33 observations). The species is globally listed as Vulnerable on the IUCN Red List of Threatened Species. The IUCN's Marine Turtle Specialist Group has determined that the global population of olive ridley turtles can be divided into eight regional management units (RMU). Species that inhabit Ghanaian waters are likely to belong to the East Atlantic subpopulation (Wallace et al. 2010).

Adult females migrate to tropical waters several weeks prior to the nesting season (Lutz et al. 2002). In contrast to other sea turtle species, the reproductive cycle is nearly annual (over 60% of turtles nest every year) (Márquez 1990). Solitary nesters oviposit on 14 day cycles and may use multiple beaches for oviposition. Arribada nesters display strong nesting beach fidelity, but this behaviour has not been observed in the AoI or more broadly in Ghana.

Following nesting female olive ridley turtles in other locations are known to quickly migrate back to oceanic waters (post-reproductive migrations). The species is a nomadic migrant that does not follow a consistent migration corridor from a single feeding area like other sea turtle species (Plotkin 2007).

Green turtle

The green turtle was confirmed nesting (3 observations) in the AoI during the baseline and monitoring surveys. The species is globally listed as Endangered on the IUCN Red List of Threatened Species. The IUCN's Marine Turtle Specialist Group has determined that the global population of green turtles can be divided into seventeen RMUs. Species that inhabit Ghanaian waters are likely to belong to the East and/or the South Atlantic subpopulation (Wallace et al. 2010).

Inter-nesting intervals for green turtles are likely to range from 12-15 days (Alvarro and Murphy 1999). Females of this species are unlikely to nest every year. Generally, following a reproductive season a turtle will only nest again in 2 – 4 years (Alvarro and Murphy 1999).

Leatherback turtle

The leatherback turtle was confirmed nesting (4 observations) in the AoI during the baseline and monitoring surveys. The species is globally listed as Vulnerable on the IUCN Red List of Threatened Species. The IUCN's Marine Turtle Specialist Group has determined that the global population of leatherback turtles can be divided into seven RMUs. Species that inhabit Ghanaian waters are likely to belong to the Southeast Atlantic sub population (with some potential overlap with the Northwest

⁹ An additional 5 incidental observations made by community members to the monitoring teams. These have been recorded but not included in results analysis.

Atlantic) (Wallace et al. 2010).

Inter-nesting intervals for leatherback turtles is likely to range from 9-10 days (Alvarro and Murphy 1999). Gravid females will occupy inshore waters during the inter-nesting season however outside of this period will occupy oceanic waters. Females of this species are unlikely to nest every year. Generally, following a reproductive season a turtle will only nest again in 2 – 4 years (Alvarro and Murphy 1999).

2.3 Nesting seasonality

Monitoring results by season (Table 2-2, Figure 2-1) showed that 72.5% of sea turtle nesting and non-nesting activity occurred between October and December (referred to as the “peak” nesting season)¹⁰. A further 25% of observations recorded in the 2-month period either side of these 3 months (August-September and January-February). One non-nesting event (2.5%) was in May. These monitoring results have been used to define *peak* (October, November, December), *shoulder* (January, February, August, September) and *low* (March – July) seasons in the Aol and inform the monitoring schedule. However, shifting climate conditions may be resulting in shifting nesting patterns in Ghana (Andrews Agyekumhene, *pers. comm*).

Table 2-2. Observation by nesting season within the Aol.

Season		Months covered	Number of surveys (% total)	Observations (% total)
Nesting season	Peak Nesting Season	October-December	233 (53%)	29 (72.5%)
	Shoulder Season	August, September, January, February	152 (34%)	10 (25%)
Low Season		March-July	57 (13%)	1 (2.5%)

¹⁰ Note: monitoring effort varied across the year to balance the need for efficient surveying. Surveys were concentrated on the nesting season when observations were more likely to be recorded. In the peak season, monitoring was undertaken up to every day whilst in the low season monitoring was limited to two days per month. Low season monitoring was also supplemented by nightly surveys prior to and during construction activities primarily to identify and relocate any nests found to be at risk from construction activities. Analysis of survey effort is incorporated into section 6.

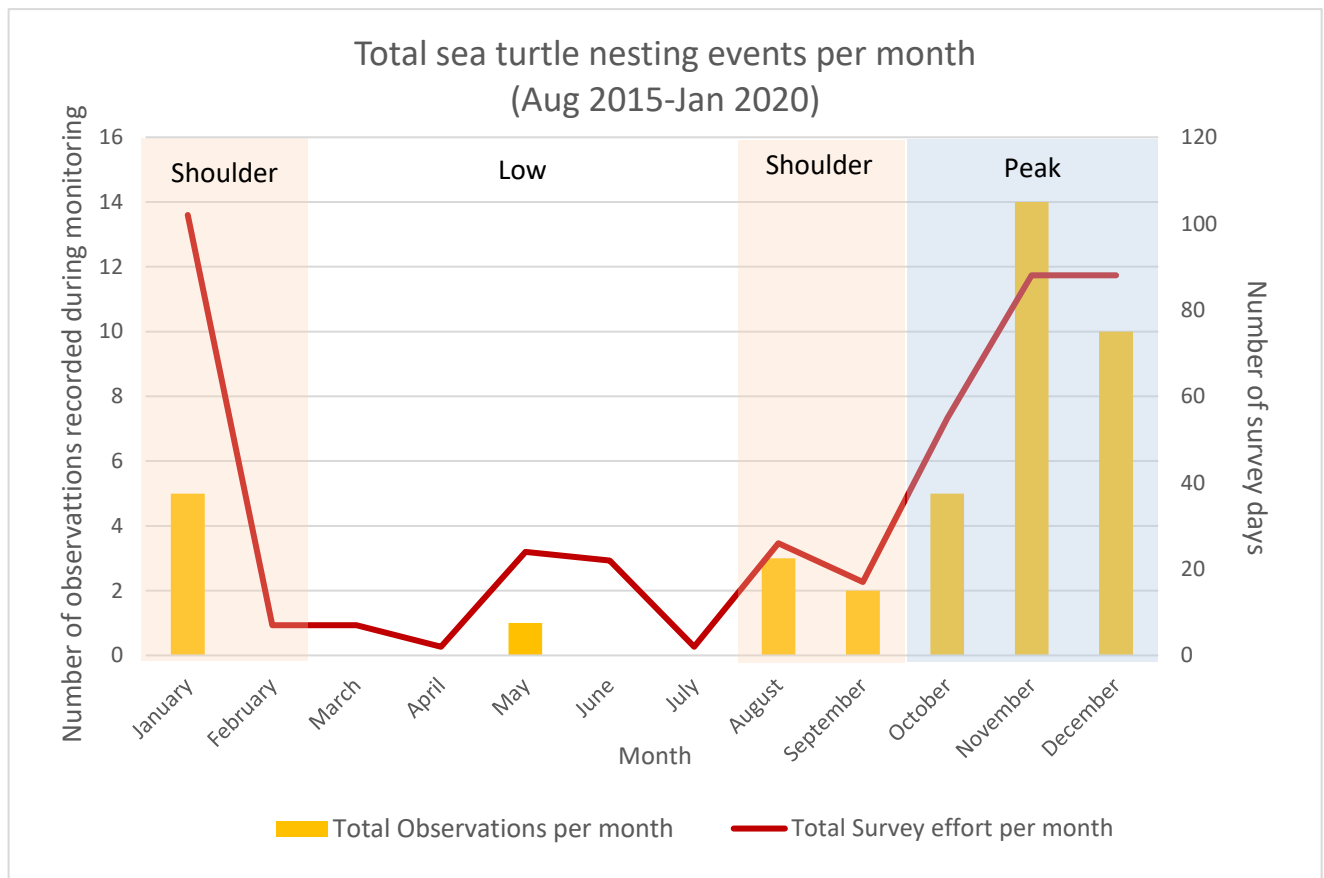


Figure 2-1 Cumulative sea turtle nesting events per month recorded between August 2015 and January 2020 (not including incidental observations)

2.4 Overview of onshore sea turtle surveys

Desktop, baseline and ongoing monitoring surveys have been performed since 2015 in the AoI. There was limited published scientific data on sea turtle activity available for the Project area prior to the commencement of the ESHIA. A brief timeline of activities and summary of findings is provided below:

- In 2015, as part of the ESHIA - OCTP Phase 2 desktop and field surveys were completed to determine the likelihood of occurrence of sea turtle species in the AoI. The ESHIA was supplemented by the Appendix E: Sea turtle Report prepared by ESL Consulting (ESL). The desktop assessment established that five species of turtles were potentially present in the region. Field observations confirmed that the Project area is a suitable nesting site for sea turtles. The beach featured a gentle slope and the back beach was characterized by 'mainly coconut trees with no dense grass underneath'. Interviews with the local community indicated that olive ridley, leatherback and green turtles had been seen nesting in the area. The interviews indicated that sea turtle sightings in the area take place throughout the year, though mostly between October and December.
- In 2015, a preconstruction turtle survey was undertaken between 24 November and 1

December 2015 for Eni Ghana by ESL consulting. An appropriate study area was delineated and has been subsequently maintained to enable the direct comparison of results. The survey team encountered four olive ridley nesting activities (three nests and one non-nesting emergence). No nesting activity was observed in the direct area of disturbance of the pipeline landfall works (taken to be a 300 m buffer around the pipeline). ESL undertook a habitat assessment to provide a baseline for beach characteristics (see results in Table 8-4). In addition, GWS independently completed nesting surveys in the study area during the 2015-2016 nesting season. This data has been incorporated into the baseline database and Project understanding. All baseline data was collected during the peak and shoulder season – collectively referred to as the nesting season.

- In 2016, FFI, ESL and ERM undertook field work in the AoI between 8 and 12 March 2016. The field visit took place in order to verify impacts, confirm habitat suitability, assess non-project threats, and to assess the capacity of local NGOs to implement any community- based monitoring programme that may be required. The survey was undertaken outside of the nesting season. FFI/ESL assessed the existing levels of artificial illumination within the AoI. The results of this assessment are provided in Table 8-4. The assessment of the capacity and engagement with NGO stakeholders undertaken during the field visit is included in Annex 1.
- From May 2017 – January 2020, GWS were engaged by Eni Ghana to undertake sea turtle beach nesting surveys in the AoI. In the 2017/18 nesting season, GWS recorded two nesting activities (and 4 additional incidental observations reported by the community volunteers outside of the survey period) during 39 survey days¹¹. In 2018/19, GWS recorded 9 emergences (and one incidental observation) during 97 survey days. In 2019/20, GWS recorded 9 nesting activities during 140 survey days. The results of these surveys and the baseline surveys completed in 2015 are illustrated in Figure 2-2.
- GWS also assisted with the design and construction of three hatcheries, completed community awareness and undertook a sea turtle bush meat survey.
- From May 2020, ESL Consulting has been engaged to undertake sea turtle nesting surveys and assist with the implementation of additional conservation actions. Sea turtle monitoring and patrols will commence in August (start of the shoulder season) as per the monitoring and evaluation schedule.

¹¹ Due to delays in contracting with GWS, monitoring during the peak nesting season did not commence until December 22nd, missing the majority of the peak season.

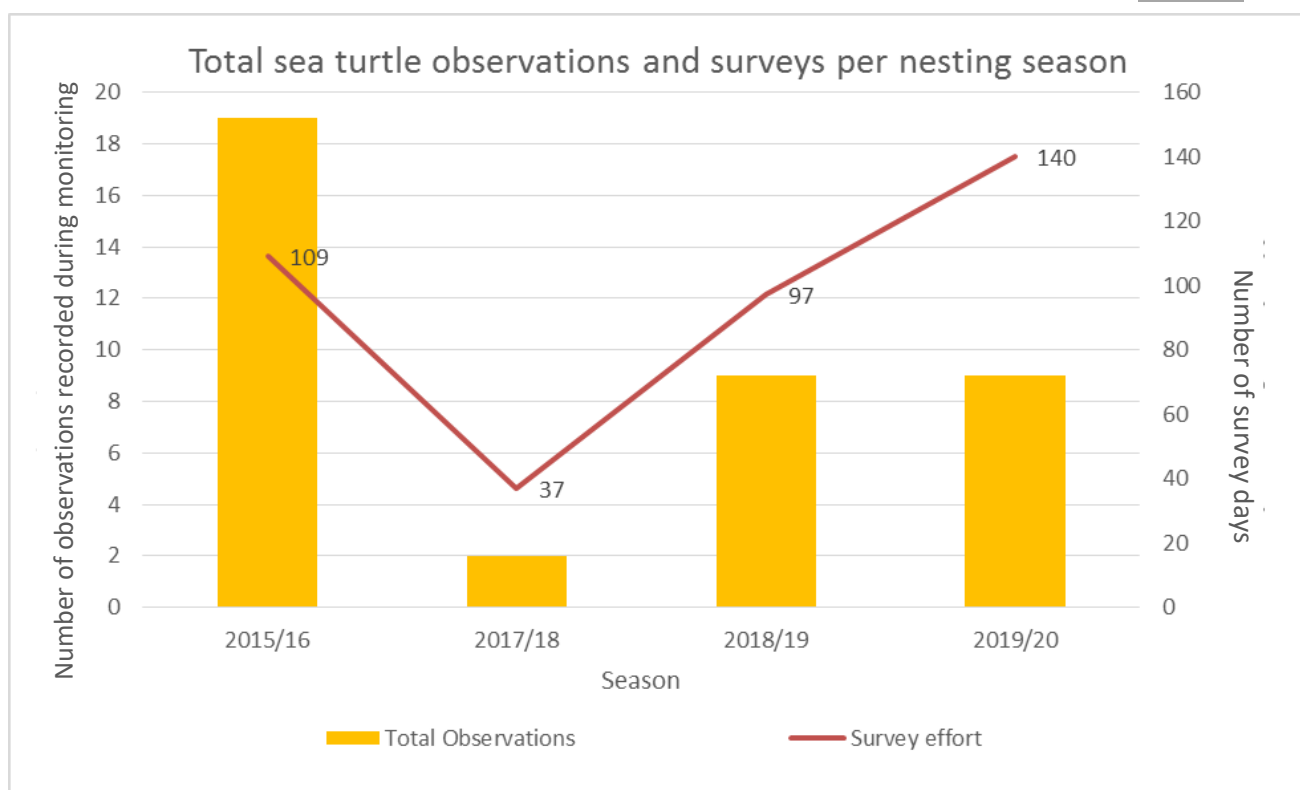


Figure 2-2 Total sea turtle nesting events recorded per year (*The total includes all nesting attempts both nests and non-nesting emergencies. The total excludes incidental sightings from community members/volunteers.)

2.4.1 Survey limitations

The following limitations and challenges were experienced during data collection and analysis:

- The baseline field survey within the Aoi was completed over seven days during one peak nesting season. Although this data was supplemented by secondary data collected independently by GWS, additional baseline survey effort would have strengthened the results analysis¹². Monitoring was not conducted over multiple seasons as recommended by IFC PS6 guidance (GN6, para 9). This restricted the information on seasonality and abundance/population size. This is compounded by the low frequency of observations, meaning that there are few data points to work with. However, some statistical analysis of change during the construction phase (2017-2019) was still possible (see Section 6).
- Limited data was collected on the poaching rate and existing poaching situation during the preconstruction baseline survey. A longer baseline period would have provided a longer sample size on which to base the baseline poaching rate.
- Moreover, since poaching of sea turtles and their eggs is an illegal activity, those involved in the activity may respond to the presence of monitoring staff through moving to other

¹² The State of the World's Sea Turtles (SWOT) Minimum Data Standards for Nesting Beach Monitoring recommends completing nesting surveys over a two-week period (and longer, if possible) within the period of highest density nesting.

locations (displacement) or through utilising times when surveyors were absent from the beach.

2.5 Summary of primary threats in the region

The primary threats to the survival of the global sea turtle population are mostly anthropogenic (IUCN 2006). Field work completed during the baseline surveys and subsequent monitoring surveys has identified the following general threats to sea turtles and beach habitat in the Aol:

- Harvest of nesting sea turtles (females) and eggs is the largest threat to the long term survival of the sea turtle species in the Aol. Illegal poaching of sea turtles occurs in the Aol. Harvesting was occurring prior to the construction phase at approximately 16% of all nests observed in 2015 by ESL and GWS. The poaching rate has remained around this level or higher (18-20%) since 2017. In addition to the poaching and evidence of poaching directly observed along the beach, GWS discovered 13 sea turtle carapace in the Krisan dump site in October 2017. A bush meat survey was completed by GWS in March 2020. 31 poachers were interviewed in the communities. The majority were fishermen (70%) who complained that fishing catches had declined and they harvested sea turtles in order to subsidize their income. 94% of those interviewed knew that poaching was illegal. No evidence suggests that Eni staff or contractors have been involved in poaching since construction commenced.
- Artificial illumination on nesting beaches by local communities and beach resorts was observed during the baseline survey. The ORF was situated approximately 700 m behind the beach and shielded by natural vegetation and did not illuminate the beach.
- Sand mining was regularly observed in the Aol during the survey period and field visit. Sand mining can diminish the beach profile, degrades nesting habitat and can directly disturb nests. Small scale sand mining and block moulding were observed in all communities in the Aol.
- Vehicle traffic was observed on the beach and/or back beach during the baseline and monitoring surveys. Vehicles can crush or entrap hatchlings as a result of a collapse of airspace. Vehicles including motorcycles were observed driving on the beach during low tide.
- Beach seine fishing was observed within the Aol. This fishing method can entangle sea turtles swimming close to shore. Significant mortality may occur as a result of fishermen who kill turtles for meat. Turtles caught by fisherman are harvested in the Aol and broader region.
- General rubbish such as plastic bottles was prevalent throughout the Aol. Debris (e.g., rope, fishing line, fishing nets, plastic, and Styrofoam), recreational and work equipment and other obstacles have the potential to entrap, entangle, and impede nesting turtles and their hatchlings.

3. STAKEHOLDER ENGAGEMENT

Eni Ghana has previously engaged with local stakeholders, governmental and non-government organisations (NGOs) and all affected or interested members of the public in proximity to the project. Eni Ghana through the BAP contractor maintains contact with the local communities at the start of the nesting season and local community members are engaged to assist with the monitoring activities. Eni Ghana is an active participant in a regional Cumulative Impact Co-Management Platform. This platform includes relevant industry and government departments and meets biannually.

Important stakeholders that have relevance to the biodiversity features in particular the sea turtles are outlined in Table 3.1. A new round of local stakeholder engagements will be undertaken by ESL in November 2020 within the AoI (pending Covid restrictions). Informal discussions at each coastal community are planned.

Table 3-1 Relevant stakeholders in sea turtle conservation

Stakeholder	Relevance to sea turtle BAP
Ghana Wildlife Society (GWS) Mr. Bernard Azane Eholade (representative of Ghana Wildlife Society in the area and Tourist Officer)	GWS has an ongoing sea turtle conservation programme, which includes research and conservation. GWS has been conducting sea turtle conservation since 2002 and actively worked in the Jomoro District (west of the AoI) between 2005 and 2008. It currently operates three hatcheries, one each at Beyin, Anorchie (started in October 2015) and Krisan, (started in August 2015). The Beyin hatchery was no longer operational however the Krisan hatchery was still active and contained one relocated nest during the preconstruction survey (Nov 2015). This hatchery is suitable for relocations in the AoI (in accordance with the translocation protocol) however will require some modifications in order to improve emergence success as per requirements outlined in Annex 1. GWS currently has a 15 member (six in the AoI) sea turtle taskforce that conducts beach patrols in the Ellembelle District. There are taskforce members in all the communities along the beach areas where they operate, including Krisan and Bakanta; within the AoI. The taskforce is reliant on donor funding and was revived in August 2015 with a grant from IUCN which concluded in October 2016. The taskforce remains active. Members of the Taskforce conduct monitoring patrols along designated beaches and are provided with some equipment including clothing and torches as required. The sea turtle taskforce conducts dawn and dusk patrols along designated beaches to determine nesting activities and deter poaching activity during the peak nesting season (GWS consider the peak season to be late August to February). The beach to be patrolled by each volunteer usually starts from the community where the volunteer lives and ends at the next community from where another volunteer also begins. Walks are conducted at high tide since, according to the volunteers, that is when they see turtles. Time of patrol therefore varies each day. During the low season volunteers may patrol the beach once a week or if GWS is notified of nesting activity
Friends of the Nation (FoN) Programme - Hen Mpoano	Friends of the Nation (FoN) were Ghanaian partners for the Coastal Resources Centre (CRC) project from 2009 to 2014 with the slogan Hen Mpoano (Our Coast). Their project worked with coastal communities in the Western region to ensure inclusive and integrated management of Ghana's coastal and marine ecosystems. Their work in the Western Region

(Our Coast)	has been instrumental in spreading the message of nature conservation (including sea turtles) to local communities. They are based in Takoradi and occasionally conduct education programmes and mangrove restoration in the AoI. FoN have 23 permanent staff but focus on building capacity in coastal communities through a community-selected representative who reports to FoN (including a representative for Sanzule).
Resource and Environment Development Organization (REDO)	REDO is the first NGO to have conducted extensive sea turtle conservation work in Ghana, primarily on the eastern part of Ghana's coastline. Associates of REDO also work for ESL and could therefore offer training assistance to the staff of the NGOs.
Ghana Wildlife Division (GWD) of the Forestry Commission	The GWD is mandated to deal with all issues relating to the conservation of sea turtles in Ghana. GWD is a public agency that is embedded within the Forestry Commission of Ghana which is responsible for the regulation of utilization of forest and wildlife resources, the conservation and management of those resources and the coordination of policies related to them. Note: all sea turtles are fully protected in Ghana GWD is responsible for the management of all wildlife in the country and administers protected areas including 16 Wildlife-Protected Areas (PAs), five coastal Ramsar Sites and the Accra and Kumasi Zoos. The organisation is also responsible for administering permits, which allow organisations to undertake monitoring, and management of sea turtles.
Local fisherman	Fishermen encountered sea turtles at sea when fishing. Interviews indicated that turtles did on occasion destroy their fishing nets when entangled in the net and allowed their catch to escape. Respondents reported that recently the occurrence of turtles was very rare. The ESL/ERM fish catch survey team observed a sea turtle (green or olive ridley) being released from a beach seining catch. This may suggest that some fishermen are aware of the existing laws governing the protection of sea-turtles.
Beyin Beach Resort (located west of the village of Beyin, between Bakanta and Atuabo).	Local resort with beachfront access. Eight nests were recorded in front of the Beyin Beach Resort. These nests were relocated from the wild by egg collectors and community volunteers to areas in front of the beach resorts and enclosed in wooden boxes.
Tenak Beach Resort (located east of the village of Beyin, between Bakanta and Atuabo).	Local resort with beachfront access. Two nests were located in front of the Tenak Beach Resort. These nests were relocated from the wild by egg collectors and community volunteers to areas in front of the beach resorts and enclosed in wooden boxes.
Local community	Interviews completed in 2015 and 2019 indicated that some community members perceived sea turtles as a source of meat. In 2019, 31 local community members were interviewed to provide information for the bush meat survey. Sea turtles were mentioned by respondents as being important because they provide food, income when sold, tourism and bring fish. Chief fisherman and task force members stated that many community members were not aware that it was illegal to harvest turtles and/or eggs. It was suggested by local community members that clear and continuous education may be effective at reducing the incidents of poaching. At the start of every peak nesting season local community leaders are informed of the monitoring programme for the following season.

IUCN Member	Andrews Agyekumhene is the Ghana member of the IUCN SSC Marine Turtle Specialist Group who will lead the sea turtle surveys and implementation of the ACAs.
Ghana Oil & Gas Cumulative Impact Co-Management Platform.	Eni Ghana participates in the following forum. Biannual meetings have occurred since 2019. However, sea turtle conservation has not been discussed up until now.

4. CONSTRUCTION IMPACTS

Construction activities commenced in the Area of Influence in 2016 and concluded in early 2019. Sea turtles nesting was affected by the construction of the pipeline landfall along the coast which linked the offshore fields to the Onshore Receiving Facility (ORF). Mitigation measures were designed and implemented to reduce or eliminate as far as possible, the following project impacts:

- **Direct physical loss** of nesting beach during pipeline landfall construction and operational phase
- **Disturbance and/or mortality** of sea turtles or nests as a result of physical collisions or entrapment, the effect of vibrations and noise pollution from construction vehicles and machinery
- **Artificial illumination** affecting nesting beaches; lights may disorientate nesting females and/or hatchlings reducing nesting success and emergence survival.
- **Harvesting** of adult and juvenile turtles by the project workforce
- **Indirect and cumulative impacts** (especially increase in harvesting of adults and eggs linked in increased activity of third parties along the nesting beach).

The first draft sea turtle BAP (completed in 2016) assessed construction impacts and outlined a range of mitigation measures. All mitigation measures undertaken by the Project are captured in the Commitment register (Annex 1). This version of the BAP has been updated to reflect the project operational activities (project description) during the production phase (commencing 26 September 2019).

The residual impact assessment (Section 6) provides a quantitative estimate impacts during construction phase (after mitigation), based on an analysis of monitoring results, and a pre-mitigation estimate of future impacts during the operational phase.

5. OPERATIONAL IMPACTS

This section provides a summary and discussion of potential impacts to relevant sea turtle species from the operation (i.e. production phase) of the onshore pipeline and ORF. No activities will take place on the beach during the production phase. This includes maintenance activities; none of which will require access to the nesting beach. Furthermore, project vehicles are only restricted to inside ORF during the production phase. Therefore, Eni Ghana anticipate that the risk of direct operational impacts to nesting turtles will be significantly reduced during the production operations phase.

5.1 Indirect, project induced in-migration and cumulative impacts

Indirect impacts (sometimes called secondary impacts) are impacts triggered in response to the presence of the project, rather than being directly caused by the project's own operations (BBOP 2018). Project Induced In-Migration (PIIM) is a form of indirect impact which occurs when people are attracted to the Project location in search of economic opportunities. The increase in population can subsequently increase pressures on sea turtles directly (particularly through nest predation) as well as increased exploitation of other natural resources which can affect sea turtle populations, such as

fish and building sand. In-migration is further increased by the presence of other developments in the region i.e. cumulative impacts, and in extreme cases may require a dedicated management and mitigation plan (for example, Rovuma LNG project). Other developments and activities in the Amansuri coastal region are shown in Figure 5 1.



Figure 5-1 Overview map identifying other major oil and gas developments and activities in the study area and extending to the west. Recent industrial facilities include A. The Ghana gas accommodation camp; B. The Ghana gas batching plant (left) and processing facility (right); C. Quantum gas facility, and; D. The Ghana Gas Export pipeline (red). Other industrial projects nearby also include the Nzema Gold Mine located in Nkroful (approximately 4km North of Esiama) (image source: Google Earth)

Social assessments completed by Eni Ghana have shown that the influx of people into the four villages nearest to the ORF, has been negligible during the production phase. However, GWS anecdotally reported an increase in human disturbance/presence along the beach during nesting surveys, potentially interfering in nesting success in the study area. Sea turtle harvesting was occurring prior to the commencement of the Project at approximately 16% of all nests observed by ESL and GWS during the baseline in 2015¹³. The poaching rate then rose to 20% of all nesting observations in 2017 (1 in 5 nests) and 18% in 2018 (2 in 11 nests). In addition to the poaching and evidence of poaching directly observed along the beach, GWS discovered 13 sea turtle carapace in the Krisan dump site in October 2017¹⁴. These observations suggest, that irrespective of population, human disturbance and direct harvesting for meat and eggs remains the most significant threat to the small population of sea turtles that nest in this part of the Amansuri region.

In addition to the measured increase in poaching rates, indirect impacts may increase the threats highlighted in Section 2.5 including increased human presence on nesting beaches (foot traffic, vehicles (especially motorcycles), sand mining, and beach fishing). Artificial illumination from increased housing and social infrastructure along nesting beaches and the degradation of beach habitat by the accumulation of beach debris and general rubbish such as plastic bottles are other

¹³ In addition, nesting data collected by local NGO, Wildseas, in an adjacent area demonstrated a very similar poaching rate.

¹⁴ These were not included in the nesting poaching rate as may have been males captured as fishing bycatch and not from the study area.

predictable consequences of industrial development.

Section 7 outlines several mitigation measures that address poaching in the broader community including education and raising community awareness and beach surveillance/patrols at night during the peak nesting season.

5.2 Harvesting of adult turtles and eggs by the workforce

The project will engage workers during the production operations phase. The permanent accommodation camp will house about 45 workers who are involved in the operation of the onshore facilities. In the absence of mitigation measures these employees have the potential to exacerbate threats outlined in Section 2.5 in particular the harvest of nesting females and the collection of sea turtle eggs.

Section 7 outlines several mitigation measures that address poaching including prohibiting the collection and consumption of bush meat by personnel, design and implementation of a bush meat plan and beach patrols at night during the peak nesting season. Records held by Eni Ghana show that 4 training events and 4 Bushmeat Assessment inspections have been performed during the construction phase. To date, no Eni workers or contractors have been recorded in breach of the bushmeat management plan.

5.3 Artificial illumination on nesting beaches

Artificial illumination along nesting beaches is known to disrupt turtle nesting and disorientate hatchlings emerging from the nest. The ORF is located approximately 700m from the coastline and light spill reaching the beach, is mitigated by directional lighting and thicket vegetation.

Low lighting levels within the coastal communities in the AoI was observed during the 2016 baseline. The number and intensity of lighting in communities are likely to increase if the communities expand. A significant increase in artificial illumination may adversely impact nesting/hatchling success and influence the results observed in the AoI i.e. data used to explain changes.

A lighting assessment as part of the habitat assessment will be undertaken in 2020 (and every 2 years as required) to monitor the extent and intensity of light sources within in the AoI.

6. RESIDUAL IMPACT ASSESSMENT

6.1 Overview

Field data recorded during the sea turtle preconstruction survey baseline (2015) and construction period monitoring surveys (2017-2020) has demonstrated the study area is a low density nesting beach for all three confirmed sea turtle species (Olive ridley turtle (*Lepidochelys olivacea*), green turtle (*Chelonia mydas*) and leatherback (*Dermochelys coriacea*)). Over the four years of baseline and monitoring surveys a total of 39 nesting attempts (including 15 events recorded by GWS in 2015/2016)¹⁵ were recorded during approximately 439 survey days. The most abundant species was the olive ridley (32 observations), followed by the leatherback turtle (4 observations) and green turtle (3 observations).

Field data has been used to estimate the residual impacts on the sea turtle species. Mitigation measures were applied during the development (i.e. construction) and are reflected in the results of post construction monitoring activities. The following metrics have been considered to estimate losses and/or gains in nesting beach habitat and on nesting females and hatchlings:

- Sea turtle abundance. The metric used: *Survey effort per nesting observation recorded in the study area in the shoulder and peak seasons (August – Jan) per year*
- Sea turtle diversity. The metric used: *Number of sea turtle species recorded nesting in the study area per year*
- Nesting success. The metric used: *Percentage (%) of nesting events per year compared to total number of crawls*
- Extent of beach habitat suitable for nesting. The metric used: *Length of beach habitat (km)*
- Poaching rate. The metric used: *Percentage (%) and number of poached nests and adult nesting females recorded in the study area per year*

These metrics utilise field data collected in the study area between 2015 and 2020 which is consistent with the Minimum Data Standards for Nesting Beach Monitoring developed by the State of the World's Sea Turtles (SWOT) Scientific Advisory Board (2011).

The following challenges were encountered whilst analysing the data and completing the residual impact assessment:

- Low frequency of nesting females were recorded throughout the baseline and monitoring survey which translates to fewer data points to analyse in order to detect small changes in the local population and determine the significance of trends and changes. This is the reality of the field data.
- Variations in the seasonality/timing and monitoring effort between and within nesting seasons. For this reason, the metric used to compare changes in abundance factored in survey effort undertaken during each peak/shoulder season.

¹⁵ This total includes incidental observations made by community members.

- Only one season of baseline data was collected during a 7 day period. Additional nesting data from the study area has been provided by GWS to strengthen the projects understanding of the 2015/2016 peak nesting season. No data is available prior to this to understand multi season trends.
- There are natural variations between nesting seasons especially for green and leatherback turtles which do not nest every year. Additional future survey effort will continue to improve understanding these natural variations versus anthropogenic threats (project and non- project related) in the study area.
- The lifecycle of the nesting turtle population; their movements between nesting events, and the stresses and threats they face that may affect frequency in which they return to their nesting beach.

The key results of the residual impact estimate are summarised in Table 6-1. Full details and explanations are outlined in the following sections.

Based on information available to date, no significant direct residual impacts have been observed on the extent or condition of the physical nesting beach habitat, sea turtle species diversity observed and/or direct physical injury/mortality/entrapment of nesting females as a result of Project activities in proximity of the landfall area.

Table 6-1 Summary of residual impacts on sea turtles in the AoI

Description	Loss-gain metric	Overview	Residual impact (Y/N)
Sea turtle abundance	<i>Total number of observations per shoulder and peak season</i> <i>Standardised Observation Rate (SOR): Number of surveys (survey effort) per turtle observation recorded in the study area during the shoulder/peak season (August – Feb)</i> <i>Estimated population level per season</i>	Ongoing monitoring confirms the study area is a low-density nesting beach. Measured abundance (total sea turtle observations) has declined significantly from 19 in the 2015/16 (baseline) season to an annual average of 6.77 individuals over the 3 season construction monitoring period (2017-2020). There is no statistical evidence that this is an ongoing trend. This may suggest a temporary decrease in the number of nesting females using the study area since the baseline season (2015/2016). An increase was recorded in the SOR between the baseline results (5.7 surveys/observation) and the construction period (13.7 surveys/observation). This increase, although substantial, is statistically insignificant. Estimated population has declined over the 3 seasons in which data has been collected since the baseline, although the lower range has remained consistent. No significant negative trend was observed across any of the three statistical parameters. This suggests that the decline is temporary, due to chance variation or other unknown causal factor.	Minor residual impact to be confirmed with additional data (Ongoing situation to be monitored)
Sea turtle diversity	<i>Sea turtle species recorded nesting in the study area per year</i>	At present, data collected from nesting surveys do not indicate that there is any change since preconstruction in the diversity of sea turtle species utilising the study area.	No
Disturbance of	<i>% of nesting events per</i>	No adults or nests were reported as directly disturbed during the construction/development	Minor temporary

Description	Loss-gain metric	Overview	Residual impact (Y/N)
nests and/or nesting adults (Nesting success)	<i>year compared to total number of crawls</i>	phase by monitoring. The success of nesting activities in the study area decreased between 2017 and 2018 compared to the baseline (2015/2016 season). This may indicate increased disturbance in the study area during the construction period. Increased construction personnel or construction lighting on the beach (2018/2019) may have reduced nesting success during this period. Data from the 2019/2020 season shows nesting success increased for the most recent nesting season after the completion of the development/construction phase.	residual impact during the construction phase
Nesting habitat	<i>Extent of beach habitat suitable for sea turtle nesting (km)</i>	There is minimal/no change in the extent of beach habitat that has the potential to support nesting sea turtles in the study area.	No
Poaching of nesting adults and eggs	<i>Percentage (%) and number of poached nests and adult nesting females recorded in the study area per nesting season</i>	The harvest of females and eggs is the most concerning threat for the long-term viability of the three sea turtle species in the study area and broader coastal region. The poaching, as well the nesting, events were very few for the three seasons following the development/construction phase; the estimated poaching rate was above the baseline rate, though its statistical significance is poor, in year 2017-2018 in particular. Noting furthermore that only a relatively small number of poaching events have occurred (four poached females/nests between 2017-2020). The poaching increase may be an indirect impact of the broader development occurring in the area and Eni's contribution.	Potential indirect impact (Ongoing situation to be monitored)

6.2 Sea turtle abundance

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In response to this threat Eni Ghana have implemented beach patrols during the peak nesting seasons (as a minimisation measure and Additional Conservation Action (ACA)). Only limited beach patrols were undertaken during the peak and shoulder nesting season in 2017/2018 (37 days) and more were organised in 2018/2019 (97 days) which coincided with one poaching event only. In 2019/20, GWS completed 140 patrol days (unfortunately the poaching events increased to two, even with the presence of beach patrols on this occasion). Beach patrols/monitoring also reported that two females were rescued from poachers and returned to the water.

Surveys conducted by Eni in 2019 have not indicated increased population within the villages neighbouring the ORF, although the number of fisherman active on the beach at night has increased (GWS monitoring reports). In conclusion, poaching remains a direct threat to sea turtles, both during nesting and at while at sea. The support for continued patrolling and community awareness activities remain effective means of practically reducing losses that are independent of the Eni Ghana's activities.

6.3 Loss and gain calculations

Losses and gains are calculated as the difference between: (1) the amount of biodiversity that would exist with a change in management (i.e., with project development and implementation of an offset/ACA) and (2) the amount of biodiversity that would exist if the baseline poaching rate continued through time and no development/mitigation occurred (Maron *et al.*, 2013). The likely losses as a result of the Project are presented in Table 6-2 (only residual impacts have been included in the table).

The precautionary principle has been applied whilst determining the project residual impact on nesting sea turtles and eggs. This has built a safety buffer into the NNL calculations and as such an arbitrary multiplier has not need been applied to the calculation. The following assumptions are embedded in the assessment:

- Background survival rate of nesting females each year was set at 100% (noting the annual survival rates for female nesters is ~85-92%).
- Nesting participation rate per season was set at 100% for the loss calculation (note: 60% of olive ridley females are expected to nest each year and green and leatherback females nest every 2-4 years)
- Hatchling survival rate to adults is estimated at between 1 out of 1,000 hatchlings and 1 out of 10,000 hatchlings). This assessment has used the higher estimate – 1 out of 1,000 hatchlings
- Additional hatchlings which have been protected in the managed hatcheries will contribute to NNL however an estimate has not been included in the gains below (this will be revised each year with actual monitoring data) from the field).
- All calculations have been rounded up to whole numbers.

Table 6-2 Assessment of residual impact to sea turtles as a result of the project (NNL calculations)

Impacts	Description	Loss calculations
Decline in Sea turtle nesting abundance	The decline in emergence rate observed does not correlate with the timing of activities causing impact (lighting on the coast) and was not statistically significant when standardised by survey effort during the full construction period. The potential for reductions in sea turtle abundance as a consequence of disturbance or direct poaching of turtles/nests are provided below to avoid double counting.	No clear evidence that the abundance has changed significantly as a result of project activities. Onshore disturbance is assessed below.
Disturbance of nests and/or nesting adults (Nesting success)	Only a minor temporary reduction in the successful nesting rate was recorded during the 2017/2018 and 2018/2019 seasons. The nesting rate bounced back in 2019/2020 and exceeded the baseline rate. Overall, the successful nesting rate from between 2017 – 2020 the successful nesting rate was 55% (11 out of 20). This is equivalent to the preconstruction baseline rate (53%).	Only temporary reduction in nesting rate for 2 seasons.
Poaching of nesting adults and eggs	Four poaching events were recorded between 2017-2020, which equates to 20% of all nesting events during and post construction phase. The difference between 20% and the baseline 16% poaching rate over 20 nesting observations recorded between 2017-2020 = 1 nesting event. This means the removal of one mature female from the local nesting population in the four year period. <i>Over the 20 year project lifespan at the current recorded nesting and poaching rates = 1 female turtle and the reproductive output of that individual = 210 hatchlings x 20 years = 4,200 hatchlings.</i> <i>4,200 hatchlings may equate to between 0.42 and 5 adults surviving to adulthood¹⁶ = 0.21 – 3 mature nesting females</i> <i>On average female olive ridleys become sexually mature at 14 years which means that second generation nesting females are likely to nest in the study area within the project lifespan. Calculations: Turtle 1 = 210 hatchlings x</i>	Loss per year: 1 nesting female ~210 hatchlings per year¹⁷ Projected loss over project lifespan with mitigation (~20 years): 1 nesting female 3 nesting females (2nd generation) 1 nesting females (3rd generation) ~5,460 hatchlings TOTAL = 1 + 3 + 1 = 5 nesting

¹⁶ Estimates of between 1 in a 1,000 and 1, 10,000 hatchlings will survive to reach adulthood (<https://www.seeturtles.org/baby-turtles> and <https://oceanservice.noaa.gov/news/june15/sea-turtles.html>)

¹⁷ 1 female turtles x 105 average clutch size x 2.5 nests/female/season¹⁷ x 80% hatching success rate = ~210 hatchlings per turtle per future nesting season which are lost.

	<i>6 years = 1,260 hatchlings) = 1,260 hatchlings with potential to reach maturity in the project lifespan = 0.12 – 2 adults = 0.06 – 1 nesting female.</i>	females
	TOTAL LOSS for the Project lifespan (calculated using data collected between 2015 – 2020).	5 nesting females

6.4 NNL requirements

In order to achieve NNL, Eni Ghana will need to prevent the loss of nesting females or contribute to additional nesting females with a net outcome of 5 nesting females. Under the current low nesting rate this would equate to a reduction of the overall poaching rate to 13 % poaching rate over the next 20 years. If one nesting female was protected each year for the first five years of the Project this could mean an additional 3 mature nesting females within 20 years (see Box 1 for calculations). This would mean a net increase of 8 nesting females above the baseline poaching rate. There is also the potential that some hatchlings from these protected individuals may reach sexual maturity and return to nest within the 20 year project lifespan (not included in calculations).

The protection of nests in the managed hatcheries will also increase the number of successful hatchling emergences which would otherwise not have occurred under a ‘no project’ scenario. No forward estimate has been provided however this will be quantified at the end of each nesting season and added to the NNL contribution.

The lower poaching rate recorded during the 2018/2019 season of 11% (1 out of 9 nesting events) suggest that a reduction of one poaching event each year in the next five years is feasible. These calculations will be refined at the end of each nesting season.

Box 1 Calculations for the number of hatchlings produced by protected females

These calculations are based on the scenario that one additional female turtle is protected per year for the next 5 years

Turtle 1 = 210 hatchlings per year x 20 year project lifespan x 1/3 annual nesting rate = 1,400

Turtle 2 = 210 hatchlings per year x 19 year project lifespan x 1/3 annual nesting rate = 1,330

Turtle 3 = 210 hatchlings per year x 18 year project lifespan x 1/3 annual nesting rate = 1,260

Turtle 4 = 210 hatchlings per year x 17 year project lifespan x 1/3 annual nesting rate = 1,190

Turtle 5 = 210 hatchlings per year x 16 year project lifespan x 1/3 annual nesting rate = 1,120

Total = ~6,300 hatchlings

6,300 hatchlings may equate to between 0.63 and 6.3 adults surviving to adulthood¹⁸ = **0.32 – 3.2 mature nesting females**

¹⁸ Estimates of between 1 in a 1,000 and 1, 10,000 hatchlings will survive to reach adulthood (<https://www.seeturtles.org/baby-turtles> and <https://oceanservice.noaa.gov/news/june15/sea-turtles.html>)

7. MITIGATION STRATEGY

This section outlines how Eni Ghana apply the mitigation hierarchy as required by IFC PS6 when operating in Natural and/or Critical Habitat¹⁹. The mitigation hierarchy is a planning framework involving a series of steps (Figure 7-1) designed to assist developers to plan and take action to limit the adverse impacts of development projects including direct, indirect and cumulative impacts. The mitigation hierarchy stipulates a strict order of preference of types of actions (avoid, minimise, restore and offset) to achieve Net Gain or NNL outcomes for Natural and Critical Habitat, respectively.

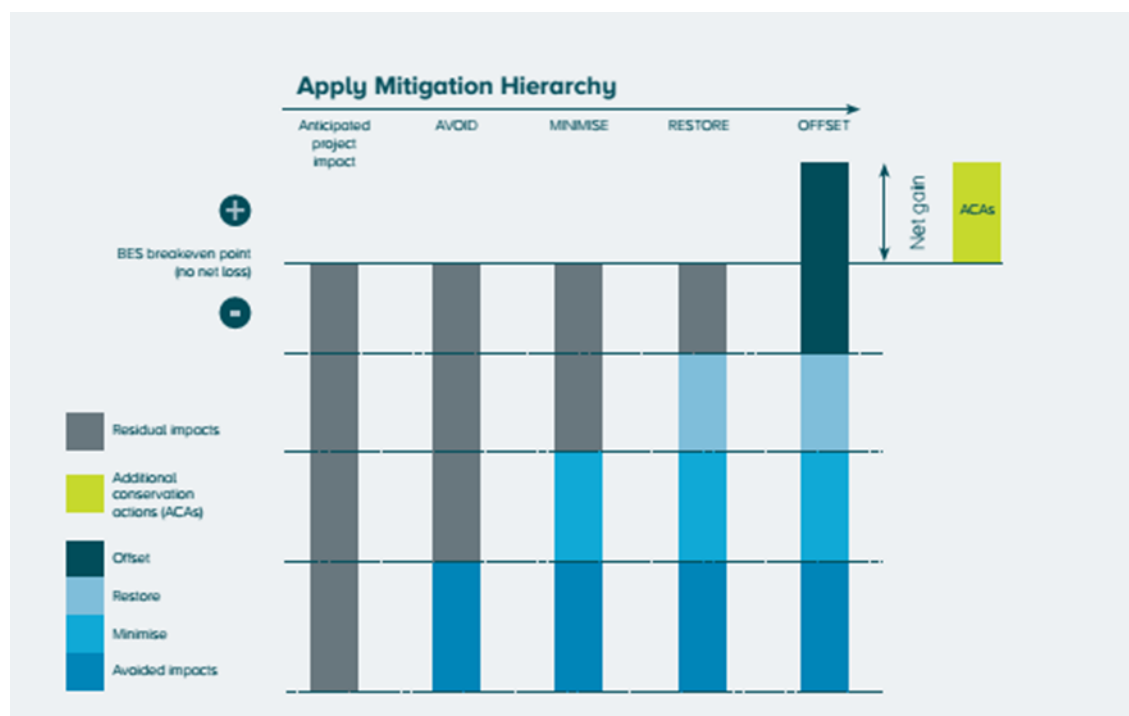


Figure 7-1 Diagram of the Mitigation Hierarchy (Fauna & Flora International (FFI), 2017)

7.1 BAP objectives

The over-arching goal of the BAP is to achieve NNL for the three confirmed sea turtles and nesting habitat. This will be achieved through the implementation of management and mitigation actions designed to achieve the following specific objectives (also listed in Section 1.2):

1. Minimise direct impacts to sea turtles associated with the activities of Eni staff and contractor personnel
2. Minimise indirect impacts from a potential increase in poaching of turtles and eggs as a result of PIIM and undertake additional conservation actions through the establishment of partnerships

¹⁹ IFC Para 14 and 18

with local NGOs/actors

3. Consider and minimise cumulative impacts through collaboration with other large-scale developments in the district.
4. Monitoring the status of sea turtles, scale of impacts to the species and effectiveness of mitigation measures (addressed in the monitoring and evaluation section (see Section 8).

The objectives have been established to address one or more project impacts/issues. Following the development of objectives and targets, a series of mitigation measures was generated with the goal of achieving the targets. Mitigation measures have previously been described in various project documentation including the ESHIA, Appendix E: Sea turtle report prepared by ESL Consulting, preconstruction survey report and offshore management plans. Mitigation measures and additional conservation actions relevant for the production phase are identified in the BAP are outlined in Table 7-1, Table 7-2 and Table 7-3. Mitigation actions implemented during the construction phase but that are no longer applicable to the production phase are outlined in Annex 1.

Key avoidance measures applied during the construction phase (see Annex 1) include:

- Construction scheduling planned to avoid the peak nesting season (temporal avoidance). This measure was only partially achieved due to changes in the construction methodology
- Nightly beach patrols prior to construction work in the AoI nesting habitat
- Horizontal direct drilling was originally planned to avoid beach habitat however was abandoned following equipment failure.

Key minimisation measures include:

- Development and implementation of the bushmeat plan
- Directional lighting on Eni Ghana infrastructure (applied during the construction phase. See Annex 1)
- Pre-construction monitoring in the direct impact area to locate and move nests as required (applied during the construction phase. See Annex 1)

Key additional conservation activities (ACA) include:

- Beach surveillance and patrols to deter poaching
- Support for the establishment and management of turtle hatcheries
- Community awareness raising to deter poaching
- Beach clean-up activities

7.1.1 Minimise direct impacts to sea turtles associated with the activities of Eni staff and contractor personnel

Table 7-1. Actions designed to reduce threats to sea turtles associated with the direct activities of staff and contractor personnel

Action	Action description	Impact addressed	Mitigation type	Action target	Performance indicator	Responsibility	Action Progress	Date for completion
Develop and implement bush meat action plan Source: plan ms hse 014 Eni Ghana - Bushmeat Action Plan ESHIA Phase2 Annex G Section G.4.8.3 WBG PS6	The existing bush meat action plan shall be maintained and enforced to reduce or eliminate the involvement of Eni staff and contractors in the capture and trade of protected species including turtles, turtle eggs. With specific reference to turtles, this plan shall prohibit the harvesting, transport and consumption of adult and juvenile turtles in the ORF concession area for Eni employees & contractors. This is communicated in employee induction training and included in the disciplinary policy (i.e. that possession can be grounds for disciplinary action). This message shall also be reinforced on company and contractor noticeboards that it is prohibited by law. Staff are housed on site and provided with food.	Illegal harvesting / induced access	Minimisation	100% of Eni and contractor staff receive induction training. No turtles or eggs harvested in the Aol by employees or contractors	% staff received induction training Outcome: Number of adults/nests poached/consumed by project staff or contractors (security observations)	Eni HSEQ Manager Env. Coordinator All ORF Personnel and Contractor staff Resourcing: Internal	Ongoing	Ongoing

Action	Action description	Impact addressed	Mitigation type	Action target	Performance indicator	Responsibility	Action Progress	Date for completion
Provide training to HSE staff on protocol to follow when sea turtles are observed. Source: Ghana Wildlife Society	A sea turtle specialist has been engaged to provide training to the site HSE personnel. Training includes legal and Eni Policy requirements, related to sea turtles, turtle identification, and protocol to follow in the event of an observation, including - Personal safety - Who to contact in the event of a turtle sighting - How to keep the animal safe and free from harassment - To allow the animal to re-enter the water on its own accord. - To identify when intervention is required to return the animal to the water. - What to do to when a nest is found (how to disguise a nest) - How to recognise when a nest is in an unsafe location Information will also be provided on sea turtle protocols to Site HSE supervisors	Habitat disturbance Illegal harvesting	Minimisation	All site HSE staff receive necessary training	Training attendance	Eni Env Coord. Resourcing: External - contracted to ESL	4Q 2019	Ongoing

Action	Action description	Impact addressed	Mitigation type	Action target	Performance indicator	Responsibility	Action Progress	Date for completion
Raise awareness among staff of threats to nesting sea turtles Source: WBG	Review the staff HSE induction material to include information on threats to sea turtles, including, but not limited to the risk of domestic pets predating or interfering with nesting turtles, hatchlings or eggs.	Illegal harvesting Nest disturbance and predation	Minimisation	Staff HSE induction material updated	Induction revised	Eni HSEQ Manager All Project Personnel (Eni and contractors) Resourcing: Internal	Ongoing	Ongoing

7.1.2 Minimise indirect impacts from a potential increase in poaching of turtles and eggs as a result of PIIM and undertake additional conservation actions through the establishment of partnerships with local NGOs/actors

Table 7-2. Description of minimisation and additional conservation actions which will be implemented to reduce the harvest of turtles and eggs by local communities

Action	Action description ²⁰	Impact addressed	Mitigation type	Action target	Performance indicator	Responsibility	Action Progress	Date for completion
Establish beach surveillance and enforcement for nest protection (see details in section 5.2.1) Source: Eni Ghana ACA	Support nightly surveillance in the AoI to reduce or even eliminate a variety of threats including egg/ turtle poaching and depredation during peak & shoulder nesting season (August – Feb). Measures include: - patrol endorsed by the Community Chief/Head and support of the existing village governance structures - Collect monitoring data during patrols and report effort and results in BAP contractor reports - Translocating of at risk nests - Disguise tracks and nests with a palm frond rake (after monitoring data collected).	Illegal harvesting Nest predation	Minimisation / ACA	Beach surveillance completed as outlined in the BAP (during shoulder and peak nesting season) = ~130 days in 2020 No increase in the number of poached and predated turtle nests	Number of beach surveillance patrols completed per week/season Number of nests observed which are been poached or damaged by predators	Eni Ghana, BAP Contractor (incl. local community members recruited to assist with beach patrols) Resourcing: External - contracted to ESL	142 days on the beach in 2018 and 138 days on the beach in 2019	Ongoing - during peak and shoulder season

²⁰ Detailed instructions for implementation to be developed in conjunction with Eni Ghana and Ghana Wildlife Society

Action	Action description ²⁰	Impact addressed	Mitigation type	Action target	Performance indicator	Responsibility	Action Progress	Date for completion
	- beach patrols will be scheduled at random times/ intervals, so poachers don't determine pattern of surveillance.							
Hatchery Development (see details in section 5.2.2) Source: Eni Ghana ACA	Management and maintenance of sea turtle hatcheries and incubators within the project area to assist in nest relocation. ESL currently contracted to undertake any relocation and management of hatcheries	Illegal harvesting Nest predation	Minimisation/ ACA	1. Hatchery completed and functioning and staffed	% of at-risk nests relocated once found Number (%) of successful hatchlings from translocated nests	Eni HSEQ Manager BAP contractor Resourcing: External - contracted to ESL	Three hatcheries constructed in the AoI. ESL manages the hatcheries.	January 2020
Community education and awareness (see details in section 5.2.4) Source: Eni Ghana ACA	Conduct education and awareness with Wildlife Clubs through video presentations in schools on threats to sea turtles. Suggested topics: Ghana laws/illegal to poach, global and local decline of species, sea turtle life history, importance to ecosystem, IUCN threat status, threats from fisheries, economic benefits of ecotourism etc.	Illegal harvesting Habitat disturbance	Minimisation/ ACA	Students in the AoI informed on the ecology and threats to sea turtles	Number of community members involved in education and awareness programmes	Eni HSEQ Manager EXTERNAL	20-25 June, 2017 involving 95 community members	During the peak nesting season once a year

Action	Action description ²⁰	Impact addressed	Mitigation type	Action target	Performance indicator	Responsibility	Action Progress	Date for completion
Beach clean up (see details in section 5.2.5) Source: Eni Ghana	Beach Cleaning Initiative within the direct Aol to collect all plastic and other waste from the beaches. Implemented in collaboration with local governmental institutions and a Waste Management Contractor	Habitat disturbance	ACA	Waste removed from the Aol as required	Weight of rubbish removed from the beach (kg)	Eni HSEQ Manager	One activity completed (superseded by plastic waste recycling initiative)	31 January 2019 11,300kg of waste including over 500kg of plastic
Plastic waste recycling (see details in section 5.2.5) Source: Eni Ghana	Plastic Waste Recycling Initiative was established in 2019 as an outcome of the Beach Cleaning exercise conducted on 31 st Jan., 2019. This initiative has equipped community-based Enterprises with the requisite knowledge and logistics to effectively collect, segregate and store plastic waste collected from the communities and beaches within the OCTP Aol. The plastic waste is sold to a Waste Management Contractor who in turn sells to a recycler. This is to promote zero plastic waste pollution and protect sea turtles and other fauna from the negative effects of plastics	Habitat disturbance	ACA	Plastic waste removed from the Aol	Weight of plastic rubbish removed from the beach and recycled (kg)	Eni HSEQ Manager	Delayed due to Covid restrictions -Initial meeting with community Leaders undertaken on 11 September, 2019 -Awareness session for Working Groups on 3 rd December, 2019 -Formulation of Enterprise and Procurement of Logistics in January 2020 -Launch of Initiative in February 2020 -First collection for recycling in August 2020	Initiative ongoing

7.1.3 Consider and minimise cumulative impacts through reasonable efforts to work in collaboration with other large-scale developments in the district

Table 7-3 Actions to facilitate collaboration with other large-scale developments in the district to address cumulative impacts.

Action	Action description	Action source	Mitigation type	Action target	Performance indicator	Responsibility	Resources required	Action progress	Date for completion
Encourage the Cumulative Impact Co-management Platform Forum to address biodiversity issues	Raise the issue of cumulative impact management, within the Cumulative Impact Co-management Forum and encourage the establishment of a cross-industry and regulator group in which potential cumulative impacts to biodiversity management will be addressed	FFI/WBG	Minimise/Additional conservation action	Have the issue of cumulative impact management included within the agenda of a suitable forum and make a presentation about biodiversity changes and how companies could share information on monitoring and management approaches.	Agenda item accepted Presentation made	Eni HSEQ Manager WBG Resourcing: Internal	WBG	The forum has met on 26 Feb, 2019 4 Dec, 2019 28 Feb, 2020 23 April, 2020 26 May, 2020	Ongoing

7.2 Implementation of ACAs

A selection of additional conservation actions (ACA) were presented in the Sea Turtle BAP developed by the project in 2016. At the time it was predicted that the successful implementation of avoidance, minimisation and restoration activities and proposed ACAs would likely be sufficient to achieve No Net Loss for sea turtles and nesting habitat in the study area. After the construction phase in early 2019, Eni Ghana/GWS refined and developed three ACAs (and a one-off beach clean up and ongoing waste reduction programme) which were incorporated into the latest BAP version in Table 7-2. In 2019, the implementation of ACA commenced through the BAP contractor, GWS. These actions will continue to be implemented (and refined where necessary) over the life of the project, currently by the new BAP contractor, ESL. The successful implementation of beach surveillance and/or use of the hatchery to physically protect hatchlings in the study area are anticipated to remain ongoing in order to sufficiently achieve NNL over the project lifespan. The other ACAs form enabling mechanisms which improve community understanding and capacity, and improve the understanding of local threats for which there is limited information available (turtle poaching).

The following sections provide more details of planned mitigation actions.

7.2.1 Beach surveillance

Overview

During the production phase, nightly beach patrols will be undertaken within the AoI (5 km of nesting beach) during the peak nesting season to deter harvesting of nesting females and removal of eggs (three per week during the shoulder season). This action is undertaken concurrently with nest monitoring. In April 2020, a contract was issued to ESL to undertake beach patrols and monitoring activities from 2020 onwards. Four local community members have been recruited to assist ESL with monitoring and patrols. Current local beach patrol members are endorsed by the Community Chief/Head which gives the project backing and support of the existing village governance structures. Local beach patrol members are paired and tasked to monitor a kilometre of shoreline each, throughout the night from 7 pm to 6 am. Each team will walk the distance 3 times every night. This is necessary since the beach is often active throughout the night with fishing activities. The patrols are scheduled to meet the peak period of poaching activities between 9 – 5 am. At least two ESL staff will be on the ground to supervise the activities of the local participants to make sure they comply with the directives and to capture and record data.

The night beach patrols shall be undertaken in accordance with measures outlined below:

- Patrol members must receive suitable and regular training. Additional practical training will be provided once to each member prior to commencement of the peak season monitoring by a competent turtle specialist.
- Disguise tracks and nests with a palm frond rake to hide the tracks from potential poachers (after monitoring data collected).
- Relocate nests which are deemed to be of high risk of poaching/predation/inundation in

accordance with the relocation protocol (Annex 1).

- If evidence of poaching is observed, beach patrols will be scheduled at random intervals so poachers don't determine pattern of surveillance.
- Establish a security procedure if poachers are encountered in the field, including not to engage with poachers, and who to notify.
- Required equipment; red head lamp, disposable cameras, phone, tape measure, light bag to carry equipment in the field, clipboard and stationary.
- ESL staff are required to wear the uniform at all times and carry suitable identification at all times.
- Ensure that BAP contractor have the correct permit to undertake the necessary tasks from Ghana Wildlife Division. Permits must be renewed on an annual basis.
- Monitoring requirements outlined in Section 8.

Timeframe

Night beach patrols occur during the shoulder (January, September and October) and peak nesting season (November – January). Patrol will take place three nights per week in the shoulder season and daily during the peak season.

Implementation planning

Table 7-4 provides a summary of the planned actions and progress.

Table 7-4 Beach surveillance actions and progress to date

ID	Task	Verification indicator	Previous	Future	Status	Comments
			2017 - 2019	2020 onwards		
1	Engage the Community Chief/Head ²¹ within the AoI before every nesting season (July-August) – to explain the project, its importance and obtain permission	Permission granted	✓	✓	Ongoing	Undertaken by GWS. ESL will commence in June 2020. The team leader for ESL has already worked in this area with communities.
2	Ensure any local beach patrol members recruited by contractor to assist are endorsed by the Community	Endorsement received	✓	In progress	Ongoing	

²¹ ESL should take the action that is culturally appropriate to obtain and retain the support of traditional leadership in the community.

	Chief/Head of each community					
3	Suitable training is provided to all night beach patrol participants (ESL staff and local community members)	100% of participants received training	✓	In progress	Ongoing	Internal training provided by GWS. Additional training provided by ESL (including Andrews Agyekumhene)
4	Implement the nest translocation protocol (Annex 3) when nests are determined to be in danger of poaching/ inundation threats in the AOI. Relocate to the secure hatcheries.	% of at-risk nests relocated once found	✓	In progress	Ongoing	Internal training provided by GWS. Additional training provided by ESL (including Andrews Agyekumhene)
5	Undertake night beach patrols as per the required schedule	All patrols completed	✓	Commencing in August 2020	Ongoing	
6	Incorporate progress and findings into the end of year composite report	Patrol results presented in report	✓	Not started	Ongoing	

7.2.2 Hatchery development

Overview

Sea turtle hatcheries have been planned and constructed in the Aol. The purpose of hatcheries is for nests threatened by poaching, predation and/or inundation to be located and protected within the community hatchery (see Annex 2). The Krisan community had an existing turtle hatchery which had been constructed a number of years earlier by GWS. In its current state GWS had assessed the suitability of this hatchery as insufficient especially given the number of nests found to be at risk of exposure or poaching. Thus, GWS recommended the creation of additional hatcheries within the communities. Eni Ghana with support of GWS installed an additional three hatcheries in order to assist in nest relocation within the project area of influence.

Timeframe

Sea turtle hatcheries were constructed in three communities (Eikwei, Krisan and Bakanta) in the Aol in December 2019. Data from Sea turtle monitoring shows that the majority of the recorded nesting events occurred between Eikwei, Krisan and Sanzule. Two of the hatcheries were located at Eikwei and Krisan respectively for easy accessibility during relocation. The following equipment was used to construct the hatcheries including PVC pipes and elbow, coated pressure pipes, silicon glue, wire mesh, green net and bundle fence net.

The management of the hatchery involves daily inspections in and around the hatchery by the community patrol. This is done during nesting and outside key nesting seasons of each year. As part of the supervision, the sea turtle expert will regularly join volunteers at the hatchery sites.



Figure 7-2 Hatchery located at Bakanta (Eni Ghana, 2019)

The translocation of threatened nests and maintenance of the hatcheries is ongoing and will continue to occur during the shoulder and peak nesting seasons. ESL will supervise the ongoing maintenance and use of the hatchery in 2020 and beyond.

Implementation planning

Table 7-5 provides a summary of the planned actions and progress.

Table 7-5 Hatchery development actions and progress

ID	Task	Verification indicator	Previous	Future	Status	Comments
			2017 - 2019	2020 onwards		
1	Engage the Community Chief/Head of the relevant communities to obtain permission to construct and maintain turtle hatcheries	Permission granted	✓		Completed	
2	Select suitable beach locations and build three hatcheries in the Aol	Construction complete	✓	✓	Completed	Hatcheries have been constructed.
3	IUCN member to revise/update the nest translocation protocol developed in 2016 (see Annex 2)	Protocol finalized and adopted	-	-	Revision pending	A nest translocation protocol was developed in 2016 (BAP, Annex 1).
4	Suitable training is provided to ESL and relevant local community members on how to implement the nest translocation protocol, manage the hatchery and collect data.	100% of participants received training	✓	Not started	Ongoing	Training will be provided by ESL (including Andrews Agyekumhene)
5	Translocate the eggs from threatened turtle nests during nesting surveys/ beach patrols to the two Eni built hatcheries	Number of threatened nests which are translocated	-	-	Ongoing	No translocations were completed during the construction phase. Only threatened nests will be moved.
6	Complete regular checks to ensure the safety and progress of the nests in the hatchery. Also, ongoing	% of hatchlings which successfully emerge	-	-	Ongoing	No translocations were completed during the construction phase.

	maintenance to the hatchery.					
7	Incorporate progress and findings into the end of year composite report	Hatchery results presented in report	✓	Not started	Ongoing	

7.2.3 Community awareness and education

Overview

The first formal community awareness campaign was completed by GWS in the AoI between 20-25 June, 2017 and involved 95 community members. Public education campaigns have been observed to enhance the success of virtually all nest protection programs (Marcovaldi and Thome 1999). Education can play a significant role in protecting sea turtle nests and hatchlings by shifting the habits of coastal communities which may be harmful towards sea turtles and other natural values. Whilst not considered an in-situ protection, measures changing the habits of local community can reduce main threats faced by turtles. Where appropriate, biodiversity messaging will also be integrated into other social engagement activities

The broad objective of community awareness and education is to create an attitude of stewardship which fosters recognition and compliance with conservation and management strategies within communities in the AoI. Eni Ghana aims to reach as many community members as possible each year (community awareness previously reached 95 people). Current and future community awareness activities and key messages include:

- Local community members are made aware of Eni beach patrols, monitoring and mitigation measures and the significance of these actions.
- Local community members are encouraged to support nest protection by reporting illegal activities.
- Local community members are informed that harvesting of sea turtles and their eggs is illegal in Ghana. Community members shall be made aware of where to find notification of opportunities available from the presence of new industries (such as employment and training), particularly those with Eni Ghana.
- General information on sea turtle biology, lifecycle, global decline and the role of the sea turtle in the ecosystem, opportunities available from activities supporting sea turtle conservation.
- Methods to reduce threats including incidental catch in fisheries, proper disposal of rubbish away from the beach, sand mining and use of vehicles on the beach.

Education presentations are integrated with other project concerns such as avifauna and bush meat and are designed for target audiences such as fishermen and school children. Applied methods of environmental education include specific courses for targeted audiences and activities that involve youth groups (e.g., paper recycling, release of hatchlings, selective garbage collection, junior ecological tour guiding and community gardens).

Timeframe

Between 2017-2019, Eni Ghana engaged GWS to provide education presentations and materials to the coastal and inland communities within the AoI. ESL has been contracted to undertake future community awareness and education activities.

Implementation planning

Table 7-6 provide a summary of the planned actions and progress.

Table 7-6 Community awareness and education actions and progress

ID	Task	Verification indicator	Previous	Future	Status	Comments
			2017 - 2019	2020 onwards		
1	Engage the Community Chief/Head of the relevant communities to obtain permission to provide community awareness and education to the community members (once per season). This will follow the protocol established through previous consultations.	Permission granted	✓	✓	Ongoing	
2	Discuss with Community Chief/Head, opinion leaders and community members on the need to promote sea turtle conservation in their communities (each community once per season)	Each community visited	✓	In progress	Ongoing	
3	Develop and distribute awareness raising posters and signs in the AoI to deliver conservation messages	Number of posters/signs	-	Not started	Ongoing	
4	Educate fishermen on the importance of sea turtle to the fisheries industry and sensitize them to protect sea turtles and their eggs. Explain the impact of entanglement in ghost nets ²² if they are discarded.	Number of fishermen addressed per year	✓	Not started	Ongoing	
5	Educate school children in communities in the AoI through video documentaries and poster presentations on sea turtle conservation.	Number of school presentations per year	✓	Not started	Ongoing	

²² Ghost nets: fishing nets that have been left or lost in the ocean by fishermen. These nets are so-named as they drift with the ocean swell and are nearly invisible in the low light level.

7	Incorporate progress and findings into the end of year composite report	Awareness actions presented in report	✓	Not started	Ongoing	
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7.2.4 Beach clean up and waste reduction programmes

Overview

Eni Ghana organized a Beach Cleaning Initiative in the Aol on the 31 January 2019. This was completed in collaboration with local governmental institutions and a Waste Management Contractor, other contractors and members of the communities within the direct Aol to collect all plastic and other waste from the beaches. During the day, 60 community members participated and collected over 11,300kg of waste including over 500kg of plastic.

An additional outcome of this exercise involved the formulation of the Plastic Waste Recycling Initiative. This was established in collaboration with local governmental institutions and a Waste Management Contractor to facilitate the collection and recycling of plastic waste from the communities within the Aol.

All seven sea turtles including the three species confirmed in the Aol are known to ingest or become entangled in marine debris. Ingestion can cause intestinal blockage and internal injury, dietary dilution, malnutrition, and increased buoyancy which in turn can result in poor health, reduced growth rates and reproductive output, or death. Beach litter may entangle nesting females or emerging hatchlings or impede females during the nest site selection stage, causing them to abort the nesting attempt and return to the sea without depositing eggs. Entanglement in plastic debris (including ghost fishing gear) is known to cause lacerations, increased drag—which reduces the ability to forage effectively or escape threats—and may lead to drowning or death by starvation. The presence of plastic pollution on nesting beaches may also alter nest properties by affecting temperature and sediment permeability (Nelms et al., 2015).

Timeframe

The first Beach Cleaning Initiative was undertaken on the 31 January 2019.

An Introduction of Plastic Waste Recycling Initiative was delivered to Community Leaders on 11 September, 2019. Plastic waste recycling project remains ongoing.

Implementation planning

Table 7-7 provide a summary of the planned actions and progress.

Table 7-7 Beach clean-up actions and progress

ID	Task		Previous	Future	Status	Comments
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		Verification indicator	2017 - 2019	2020 onwards		
1	Undertake a Beach Cleaning Initiative in the Aol	Amount of marine debris removed (kg)	✓	-	Completed	First beach clean up was undertaken on 31 January 2019 and collected over 11,300kg of waste including over 500kg of plastic.
2	Design and implement the Plastic Waste Recycling Initiative in the Aol	Amount of plastic waste recycled (kg)	✓		Ongoing	An Introduction of Plastic Waste Recycling Initiative was delivered to Community Leaders on 11th September, 2019 and an awareness session conducted for the Working Group in November 2019. Waste collection Enterprise formed but launch postponed due to COVID-19 pandemic.
3	Incorporate progress and findings into the end of year composite report	Beach clean up achievements presented in report	✓	-	Ongoing	

8. SEA TURTLE MONITORING AND EVALUATION PLAN

The monitoring and evaluation plan is ongoing and is used to evaluate the BAPs performance against performance indicators and targets. Ongoing monitoring will enable the Project to refine and improve the residual impact assessment. Data obtained during multiple season surveys will improve the accuracy of the predicted impacts. Other considerations are that the programme be cost effective, replicable, quantitatively rigorous and easily taught to local community members who assist the BAP contractor undertaking the monitoring over the long-term.

The results of monitoring will be used to inform the need for any adaptive management/corrective actions, including additional mitigation measures if needed. Monitoring activities in the BAP will be periodically reviewed and updated as necessary, based on monitoring results.

8.1 Objectives

The objectives of the monitoring and evaluation programme are to:

- Assess the status and impacts on sea turtles in the Aol. Monitoring data will be used to determine long term trends and recovery.
- Assess the implementation and the effectiveness of biodiversity management actions (including offsets) and inform corrective management actions as part of an adaptive management approach.
- Demonstrate how the Project is progressing towards lender requirements which are NNL for sea turtles.

8.2 Study area

The sea turtle nesting surveys are completed along 5 km of beach front which extends for 2.5 km either side of the pipeline construction site in order to cover the Aol of the offshore pipeline works (Figure 1-1). This study area is consistent with the pre-construction/baseline study area which allows comparison of results between seasons. A buffer area of 300 m each side of the landfall location is considered the “direct or primary” impact zone, consistent with previous estimates. The remaining area is considered the secondary area of influence.

8.3 Indicators (metrics)

The Project has developed a practical set of indicators for sea turtles. Indicators are defined as a variable that provides a simple and reliable means to measure achievement, to reflect changes connected to a management action, or to help assess the performance of a development actor (OECD, 2002).

The monitoring and evaluation plan is based on a “state-pressure-response” indicator framework which uses three monitoring indicator types (Sparks *et al.*, 2011):

- *State indicators*: monitoring of the status and/or condition of relevant biodiversity values (e.g., species (olive ridley, green turtle and leatherback) and habitats (Beach).

- *Pressure indicators*: monitoring the extent, intensity and/or trends of threats to biodiversity (including from Eni Ghana).
- *Response indicators*: monitoring the implementation (and effectiveness) of mitigation measures and management controls designed to reduce biodiversity loss

Biodiversity indicators must also be sufficiently sensitive to provide a warning of change before irreversible change occurs (The Energy & Biodiversity Initiative, 2003). For each indicator the Monitoring Plan outlines the baseline, desired Project target, warning threshold, methodology, staff responsible, frequency and potential corrective actions. The development, choice and use of indicators (and thresholds) is an iterative and continual process – validation, review and revision are essential elements of fine-tuning the process moving forward (The Energy & Biodiversity Initiative, 2003).

8.4 Biodiversity targets (No net loss)

The three confirmed sea turtle species and nesting habitat are assigned a NNL target (see Table 2-1). These biodiversity targets are outlined in column 6 of the monitoring plan below (referred to as the ‘BAP target’) against each of the indicators. Where technically feasible, the biodiversity targets and thresholds have been defined in quantitative terms based on the Project’s biodiversity baseline (2016) and ongoing monitoring (2017 – 2020).

8.5 Thresholds for adaptive management

Preliminary warning thresholds have been defined for all state, pressure and response indicators as required by IFC PS6 GN 52 (IFC, 2018). These are intended to provide an early warning system of the need for corrective management responses to avoid compromising achieving NNL targets (Table 8-1). These thresholds have been developed based on the best available site knowledge but will require revision as site monitoring data is collected and improves the Project understanding. Exceedance of these thresholds does not necessarily imply direct causation by the Project. Nevertheless, it is necessary to confirm if there are any significant changes in project activities that may be contributing in part or full to the exceedance of the threshold.

Table 8-1 Description of threshold implications

Threshold levels	Management response or action
Below threshold	No management/corrective action is required as the Project is not having any measurable adverse effect. The result is consistent with past monitoring events.
Warning threshold	For state indicators: Project activities may be having or contributing to a measurable adverse effect on the state or condition of a feature and is outside the expected limits of variation. i.e. noticeable decline in the frequency of sea turtles nesting within the AoI. For pressure indicators: a change in threat level has been observed which is likely to affect the state or condition of a feature. i.e. noticeable increase

	in poaching rate. The threat may or may not be related to the presence or activities of the project, so analysis of causation and contribution is necessary. For response indicators: a failure to implement required management measures that could affect the state or condition of a feature. The Environmental Coordinator or HSE Manager needs to be made aware of the threshold breach immediately. This result may indicate that the Project is not tracking towards the intended NNL target and corrective adaptation is required. Required actions include: 1. Investigate why the threshold has been breached. 2. Consider if monitoring methodology/baseline information or threshold values require updating or amendment. 3. Increase or adapt the management/corrective response activity²³ 4. Amend the residual impact calculation/offset requirement as required. 5. Inform WBG of any exceedances within the quarterly QMR reports and AMR
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8.6 Monitoring plan

This section utilises the nesting survey monitoring methodology originally outlined in the BAP in 2016.

The outcomes of the monitoring shall be reported through the combination of monthly and annual BAP monitoring reports, following templates agreed with the BAP contractor. Issues pertaining to internal management actions shall be reported through Eni Ghana internal management reporting protocol.

Table 8-2 outlines the method, monitoring indicators, baseline, BAP target and warning thresholds.

²³ IFC PS6 Para 7

Table 8-2 Sea turtle monitoring plan

Survey method	Indicator description (metric)	Indicator type	Baseline condition	Monitoring results	BAP target (NNL)	Warning (orange) threshold
Nesting surveys (see section 8.7.2)	Survey effort per nesting observation recorded in the study area in the shoulder/peak season (August – Feb) per year <i>Calculation = Total number of sea turtle nesting events (nests and non-nesting emergences) divided by the number of survey days between August - February</i>	State/ outcome	2015/2016 – 19 nesting observations/109 survey days = 5.7 days per observation	2017/2018 – 2 observation/ 37 survey days = 18.5 days 2018/2019 – 9 observation/ 97 survey days = 10.8 days 2019/2020 – 9 observation/ 140 survey days = 15.6 days	Maintain the number of nesting events and/or survey effort per nesting observation as the 2015/16 baseline = 5.7 days per observation. (Scheduled survey effort in 2020 is 130 days. Therefore ~23 observations are required to maintain the 2015 baseline results).	7.5 days per nesting observation (i.e. one nest observed every 7.5 days or more during the nesting season)
	Sea turtle species recorded nesting in the study area per year	State/ outcome	Olive ridley, green and leatherback turtles were recorded during the 2015/2016 baseline	Olive ridley have been observed every nesting season. Leatherback have been observed in the peak season in 2018. Green turtles have been observed in the peak season in 2015, 2017 and 2019.	Olive Ridley is observed every year. Green and leatherback are observed at least every 2 years.	One or more species absent during a consecutive 2 year period
	Nesting success. % of nesting events per year compared to total number of crawls <i>Calculation = Number of sea turtle nests divided by the total number of nesting events (Nests + non-nesting emergence (NNE) events)</i>	State/out come	2015/2016 – 53% nesting success (10 nests out of 19 beach crawls).	2017/2018 - 50% success rate (1 out of 2) 2018/2019 – 44% success rate (4 out of 9) 2019/2020 - 67% success rate (6 out of 9)	Maintain or improve the % of successful nesting events against the 2015 baseline	Less than 50% nesting success will trigger review of causation and options available for improvement

Survey method	Indicator description (metric)	Indicator type	Baseline condition	Monitoring results	BAP target (NNL)	Warning (orange) threshold
	Poaching rate. Number of poached nests and adult nesting females recorded in the study area per year	Pressure	2015/2016 – None observed during ESL baseline (one week). 16% recorded during GWS work (3 out of 19 nesting observations)	2017/2017 – 50% poaching rate (1 out of 2) 2018/2019 - 11% poaching rate (1 out of 9). 2019/2020 – 22% poaching rate (2 out of 9) Overall, the poaching rate since the Project commenced is 20% between 2017-2020 (4 of 20 observations).	Maintain or reduce the poaching rate compared to the 2015/2016 baseline (16%).	Higher than 20% poaching rate will trigger review of drivers and options available for further intervention
	Number of nests and/or adults poached/consumed by project staff or contractors.	Pressure	n.a.		No turtles or eggs harvested in the Aol by employees or contractors	One or more
	Average number of fisherman/people on the beach per survey day/night.	Pressure	2015/2016 – not recorded	2017 – average of 20 people observed on the beach per transect 2018 – average of 35 people observed on the beach per transect 2019 – average of 40 people observed on the beach per transect.	No Eni target. This data will be used to interpret disturbance results based on non-project related influences	n.a.

Survey method	Indicator description (metric)	Indicator type	Baseline condition	Monitoring results	BAP target (NNL)	Warning (orange) threshold
Habitat assessment (see section 8.7.1)	Recovery/passive rehabilitation of the pipeline construction site.	State/outcome	Compare to 2015 baseline (see Table 8-4)	Update with Nov 2020 assessment results	Beach habitat at pipeline construction site is stable/restored following temporary construction disturbance	Following issues are noted at the pipeline site: steep slopes and/or large reduction in the back beach width.
	Changes in beach habitat parameters compared to the 2015 baseline habitat assessment (excluding the lighting assessment)	State/outcome	Compare to 2015 baseline (see Table 8-4)	Update with Nov 2020 assessment results	Beach habitat parameters at monitoring locations are consistent with the 2015 baseline assessment and natural variations.	Following issues are noted at any monitoring location: steep slopes and/or large reduction in the back beach width.
	Changes in the number and intensity of artificial lighting in the AoI compared to the 2015 baseline assessment	Pressure	Compare to 2015 baseline (see Table 8-4)	Update with Nov 2020 assessment results	The extent and intensity of light pollution on the nesting beaches does not increase	Greater than 25% increase in the number/intensity of lights compared to the baseline.
Eni Ghana internal reporting	Number/percentage of staff received environmental induction training including that involvement/consumption in sea turtle poaching is illegal and prohibited by staff.	Response	n.a.		100% of Eni and contractor staff receive induction training	Less than 75% of new staff receive training

Survey method	Indicator description (metric)	Indicator type	Baseline condition	Monitoring results	BAP target (NNL)	Warning (orange) threshold
ACA – Beach surveillance (BAP table 5.2)	Number of beach surveillance night patrols completed per year	Response	Previous nesting season survey effort completed during the months of August to January 2015/16 – 109 days	2017/18 – 37 days 2018/19 – 97 days 2019/20 – 140 days	Beach surveillance completed as outlined in the BAP (during shoulder and peak nesting season) = ~130 days in 2020	Fewer than 100 days of beach surveillance per year
ACA – Hatchery development (BAP table 5.2)	Number of at-risk sea turtle nests relocated to a secure hatchery in the Aol	Response	No translocation data		100% of at-risk nests are relocated to secure hatcheries	Greater than 20% of nests which remain <i>in situ</i> are poached/ predated/ damaged
	Number (%) of successful hatchlings from nests which have been translocated to the secure Eni hatcheries	Response	No translocation data Note: In situ hatchling success in the Aol recorded between 2017-2019 was ~80%.		Preliminary target: 70-80% hatchling success rate is achieved in Eni hatcheries	Less than 70% hatchling success rate
ACA – Community awareness and education (BAP table 5.2)	Number of community members involved in education and awareness programmes	Response	Community members where interviewed during the 2015 surveys although the number was not captured	2017 – 95 people 2019 – 60 people (during the beach clean) 2020 – 95 people (during the bush meat survey)	Community awareness and education programme reaches at least 95 people per year across the 5 communities in the Aol	Fewer than 50 people are involved. COVID-19 to be considered
ACA – Waste reduction programme (BAP Table 5.2)	Amount of plastic waste removed from the beach and recycled (kg)	Response	n.a.	n.a.	Reduction in plastic waste on the beach in the study area	Increase in plastic waste

8.7 Methodology

A method used for the habitat assessment and nesting surveys are provided in the following two sections.

8.7.1 Habitat assessment

The aim of the habitat assessment is to provide information on the nature of the beach, identify physical changes to nesting habitat and monitor threats to sea turtles. The habitat assessment is undertaken to assess changes in the physical parameters of nesting habitat against the 2015 baseline assessment at least once a year at the six existing locations in the Aol. The 2015 baseline assessment is presented below – see Table 8-4. Where possible, the data is collected at low tide to enable comparison to the preconstruction survey.

The community and GPS locations previously used are confirmed in Table 8-3.

Table 8-3. Habitat assessment locations

Community Name	GPS Location	
	Northern	Western
Eikwe	04.96319°	002.4737 °
Krisan	04.96138 °	002.46461 °
Sanzule	04.95960 °	002.45587 °
Project footprint/ Pipeline construction site	04.95799 °	002.44868 °
Anwolakrom	04.95733 °	002.44559 °
Bakanta	04.95343 °	002.42966 °

The following characteristics will be measured at each location with accompanying GPS coordinate and photographs. Information to assist in undertaking a habitat assessment can be found in ‘Sea Turtle Nesting Beach Characterization Manual’ (Varela-Acevedo et al. 2009). Beach characteristics to be measured include:

- Date and tide;
- Wave or weather conditions, which might influence beach characteristics;
- Width of intertidal area and width of the back beach;
- Beach slope and sketch the beach profile including the boundary parameter;
- Beach vegetation including presence of alien species;
- Available beach area for nesting sea turtles;
- Presence and location of anthropogenic activities and threats on the beaches including evidence of sand mining, predation, rubbish, debris, egg poaching and interaction with nesting adults;

- Sand softness at 50 cm deep (at the landfall site); and

Inland characteristics include:

- Current inland habitat type; and
- Presence / absence of human activity (recorded and differentiated during the daytime and at night); including interviews with local people to ensure any seasonal activity in the area is also considered.

Lighting assessment (as part of the habitat assessment):

- Identify sources of light and relative intensity (ranked following procedures described by Knowles (2009, downloadable at www.widecast.org) and Varela-Acevedo et al. 2009. Assessment within the AoI will include both project and non-project related light sources. ORF light sources are not anticipated due to the distance that the plant is set back from the beach and the vegetation screening.
- The basic procedure for conducting a lighting assessment to walk the beach, identify and characterize all visible light sources during the night. The following light ranking scale, has been adapted from that developed by Ecological Associates Inc.:
 - Rank of “1” described indirect light visible by an observer on the beach, but not likely to present a strong attraction to nesting or hatching sea turtles
 - Rank of “2” described direct light or a visible globe, glowing element, lamp, or reflector likely to disorient sea turtles. Note: neither “1” nor “2” lights were strong enough to cast a discernible shadow on the beach on a dark night.
 - Rank of “3” (most problematic to sea turtles) described a light source strong enough to cast a discernible shadow on the beach, regardless of the illumination being direct or indirect.

The 2015 baseline habitat assessment was completed during the preconstruction field survey in November 2015. The lighting assessment was subsequently added in March 2016. The results of this assessment are presented in Table 8-4.

Table 8-4. Baseline habitat assessment outlining beach characteristics in the Aol (based on 2015-2016 data)

Community Name	GPS Location		Nature of slope	Width		Beach Vegetation (Dominant)	Available Beach for turtle nesting	Anthropogenic activities on beach	Artificial illumination ²⁴	Threats to sea turtle nesting on beach
	Northern	Western		Intertidal	Back Beach					
Eikwe	04.96319°	002.4737 °	Mainly gentle; small section outside the community has cliffs under coconuts	18 m	5 m	<i>Cocos nucifera</i> (Coconut palm)	Limited About 2m wide	Beach Seine fishing (D/N)	1 x yellow light shielded from beach (intensity 2) 1 x yellow light (intensity 3) 3 x white lights (intensity 1) 1 x yellow light 400 m east of Krisan (intensity 3)	Inundation of nests; eroding beaches evident in roots of coconut showing in the air
Krisan	04.96138 °	002.46461 °	Gentle beach	2 m	14 m	<i>Cocos nucifera</i> ; <i>Ipomea pes caprea</i>	Narrow	Beach Seine fishing (D/N); Sand mining (D)	1 x yellow light which spills on the football pitch and back beach (intensity 3)	Artificial Light from the main ECG Pole in the community
Sanzule	04.95960 °	002.45587 °	Mainly gentle	9 m	32 m	<i>Cocos nucifera</i> ; <i>Ipomea pes caprea</i>	Wide	Beach Seine fishing (D/N); Sand mining (D); Block moulding (D)	1 x yellow light (intensity 3)	Debris (Plastic, fallen coconut branches, old fishing nets); vehicular movement at back beach
Project footprint/ Pipeline construction site	04.95799 °	002.44868 °	Gentle beach	25 m	21 m	<i>Cocos nucifera</i> ; <i>Ipomea pes caprea</i>	Wide	Beach Seine fishing; boat storage; access road	1 x recently installed yellow light facing the project footprint from the edge of Anwolakrom (intensity 3)	Plastic and waste debris, vehicular movement on the back beach

²⁴ Intensity scale follows method outlined in Knowles 2009 and Varela-Acevedo et al. 2009

Community Name	GPS Location		Nature of slope	Width		Beach Vegetation (Dominant)	Available Beach for turtle nesting	Anthropogenic activities on beach	Artificial illumination ²⁴	Threats to sea turtle nesting on beach
	Northern	Western		Intertidal	Back Beach					
Anwolakrom	04.95733 °	002.44559 °	Mainly gentle	21 m	15 m	Cocos nucifera	Wide	Beach Seine fishing (D/N); Lobster fishing (N); Fire wood collection and selling (D); Resting sheds for fishermen (D)	3 x recently installed yellow lights (intensity 3) 2 x yellow lights facing away from the beach (intensity 2)	Vehicular movement at. back beach. Reduction area available for female nesting from firewood gathering at the beach
Bakanta	04.95343 °	002.42966 °	Mainly gentle	25 m	17 m	Cocos nucifera	Wide	Beach Seine fishing (D/N); Resting sheds for fishermen (D)	1 x yellow light (intensity 2)	Vehicular movement at back beach

8.7.2 Sea turtle nesting surveys

The aim of the nesting surveys is to provide regular and consistent information on the abundance, diversity and seasonality of species utilizing the Aol. Data must be collected on the number of nests deposited annually, the number of nesting females that are reproductively active annually, and poaching activity. The data will be collected and recorded by the BAP contractor (local community recruits will assist with the beach patrols but will not record/capture the nesting data).

Surveys to record turtle nesting activity are conducted by patrolling the beach on foot within the Project Aol (Figure 1-1). Surveys are completed by suitably qualified personnel with experience in undertaking turtle nesting surveys (ESL are the current BAP contractors). Surveys are conducted at dawn (starting at sunrise) and at night (in conjunction with beach surveillance/patrols). The BAP contractor may amend the time of the night patrol to more closely align with the time of poaching activity observed in the field. Have scheduled monitoring to occur three times to meet the peak period of activities; 7 pm to 9 pm, 12 am to 2 am and 4 am to 6 am. The dawn surveys will allow data collection of nocturnal activity before removal by the tides/human activity, while night surveys will allow direct observation of adult turtle presence, species identification and potentially poaching activity (and a deterrent to poacher).

Nests and non-nesting emergences (NNE) are located by following tracks left behind by the turtle during ascent and descent on the beach. The tracks are used to determine the species of turtle. A photo of each observed track is taken and recorded to confirm species identification as required. For both nests and NNEs, the location is recorded using a Global Positioning System (GPS). The position of the nest on the beach relative to the tide mark is recorded using a 15-m flexible tape measure. In 2020, Eni Ghana will investigate and trial the deployment of electronic, hand-held data recorders (data recording applications) to optimize the data collection process and reduce the risk of errors arising from data transfer from field sheets to electronic format.

The required survey effort is presented below:

- Nesting surveys are undertaken in the peak nesting season (likely to occur between October – December) and the shoulder nesting season (August, September and January). Where feasible, the BAP contractor with assistance from community members will monitor the study area every day/night during peak nesting season (three months) and three times per week in the shoulder season (three months). Refer to Table 8-5 for scheduling.
- Nesting surveys are undertaken after sunrise for the best viewing of crawls. Since turtle tracks begin to deteriorate as the sun dries out the sand (Shroeder and Murphy 1999). Also, easier to correctly identify crawls during daylight.
- Night patrols/monitoring is completed during the peak season to collect data but also to deter poachers and record their activity (therefore this activity is also an important mitigation measure and additional conservation action).
- Count and photograph all crawls regardless of age. Photographs are taken of adult females to confirm identification (care taken not to alter nesting behaviour and camera flash must be avoided).
- Surveyors move along the beach at the level of the last high tide.

- Surveyors mark crawls that have been recorded by sweeping feet across the track in order to avoid double counting in subsequent days. The type of mark in the sand should be consistent and familiar to all survey personnel.

A sea turtle specialist is required to provide training and support to the community-based beach surveillance volunteers. In 2020, ongoing training will be provided by the Andrews Agyekumhene (member of the IUCN SSC Marine Turtle Specialist Group) as part of the ESL contract.

The minimum data that needs to be collected is outlined in the list below:

- Date and time observed. Record all survey days including days when no sea turtles are recorded.
- Record all turtle nesting activity, including species identification and if successful nesting occurred OR poached nest. Clearly record all incidents of poaching.
- Record any unsuccessful nesting emergence, termed non-nesting emergence (NNE), i.e. returned to ocean without nesting.
- Outline GPS location and habitat characteristics of nests found and unsuccessful nesting attempts (NNE), including the reason for this, if known. Document the nest location on the beach, across the beach and Nest location habitat (e.g. bare sand, grass, under vegetation).
- Data on estimated clutch size, if it is possible to directly observe the turtle nesting.
- Details of any stranded or deceased sea turtles that have washed ashore, if found, (including species identification, visual injuries, state and carapace measurements). BUT keep this data separate from nesting data.
- Identification of any direct human and/or predator interference to nesting. A depredated nest will generally be characterized by eggshells or partially consumed eggs littering the nesting site. Depredated nests must be counted and recorded as nesting emergences during the survey, but must be clearly noted as depredated when quantifying nest success. Record any community engagement or consultation (who, where, what).
- NEW - Average number of fisherman/people on the beach per survey day/night. GWS collected this data in 2018 and 2019.

Data collection forms for nesting beaches are simple and straightforward and all surveyors will use the same data form for a particular beach. Electronic data recorders shall be trialled in 2020 in order to improve the data capture and management process. Both 'open source' and proprietary software is currently available that can be adapted for this purpose including Survey 123 and Esri. The use of such software will improve data management, provide real time data and reduce field staff error. Data collection software will be used in the next phase of monitoring (2020). Training shall be provided to the BAP contractor.

Hatchery data collection

Hatchery data is collected and analysed to determine the success of the reproductive effort at the hatchery and inform management decisions and adaptive management. The following parameters will be collected and recorded during laying (or reburial) (Eckert *et al.*, 1999):

- Nest identification number
- Date and time laid
- Nest depth – Top (to first egg in the egg chamber)
- Nest depth – Bottom (to bottom of egg chamber)
- Nest location along the beach (GPS)
- Nest location across the beach (distance from the high tide mark)
- Nest location habitat (e.g. bare sand, grass, under vegetation)
- Number of eggs laid – clutch count (yolkless eggs should be counted and reported separately. Multi-yolked should be counted as one egg. Also record number eggs broken during excavation or transport)
- Sand temperature
- Egg diameter (greatest and least diameter of 10 eggs chosen at random)
- Egg weight

The following parameters will be collected and recorded after emergence of hatchlings from sea turtle nests in the AoI and/or hatchery:

- Nest identification number
- Date laid
- Date emerged (incubation length)
- Time of emergence
- Number of hatchlings that incubate successfully – Hatchling success %
- Number of hatchlings that emerge from the nest - Emergence success %
- Number of hatchlings that cross the beach and reach the water

The following documents are useful additional resources to inform the management, monitoring and evaluation of a sea turtle conservation programme:

1. SWOT Scientific Advisory Board (2011). The State of the World's Sea Turtles (SWOT): Minimum Data Standards for Nesting Beach Monitoring, version 1.0
2. Eckert, K. L., K. A. Bjorndal, F.A. Abreu-Grobois, and M. Donnelly (Editors). 1999. Research and Management Techniques for the Conservation of Sea Turtles. IUCN/SSC Marine Turtle Specialist Group Publication No. 4.
3. Choi, Ga-Young and Karen L. Eckert. 2009. Manual of Best Practices for Safeguarding Sea Turtle Nesting Beaches. Wider Caribbean Sea Turtle Conservation Network (WIDECAST) Technical Report No. 9. Ballwin, Missouri. 86 pp
4. Varela-Acevedo, Elda, Karen L. Eckert, Scott A. Eckert, Gillian Cambers and Julia A. Horrocks (2009). Sea Turtle Nesting Beach Characterization Manual, p.46-97. In: Examining the Effects of Changing Coastline Processes on Hawksbill Sea Turtle (*Eretmochelys imbricata*) Nesting Habitat, Master's Project, Nicholas School of the Environment and Earth Sciences, Duke University. Beaufort, N. Carolina USA. 97 pp;

8.8 Schedule and duration

Table 8-5 outlines the proposed monitoring and beach surveillance schedule.

Table 8-5. Monitoring schedule (and beach patrol)

Responsible party	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
BAP contractor – Sea turtle nesting surveys	Shoulder season – 3 days p/w	Shoulder season – 3 days p/w						Shoulder season – 3 days p/w	Shoulder season – 3 days p/w	Peak season – every day	Peak season – every day	Peak season – every day
BAP contractor – habitat assessment											Complete an annual habitat assessment	

9. INTEGRATION AND IMPLEMENTATION

Actions outlined in this BAP will be incorporated into the broader BMP to be completed by Eni Ghana.

9.1 Roles and responsibilities

The Eni Ghana environment team is responsible for implementing the activities outlined in the BAP and monitoring and evaluation plan, including managing contracts and work plans with contractors with support from HQ and FFI. The Eni Ghana environment team is responsible for coordinating management responses if/when thresholds are exceeded.

The beach nesting surveys require at least one experienced and qualified biologist with proven experience in sea turtle surveys to be present during all surveys and patrols. Appropriate training and mentoring will be provided to all local community members involved in beach patrols. Specific training will also be provided to the Eni site HSE personnel officer (as per Table 9-1). Training requirements outlined in Section 9.3.

Equipment – standardised data sheets, writing utensils, digital camera to confirm species identification or unusual findings, GPS, 15-m flexible tape measure, head torch - using red light headlamp to prevent the disturbance of turtles from white light.

Hand-held data recording device; android-based tablet with customized version of “Survey 123” software installed.

9.2 Review and adaptive management

The BAP design process (and monitoring and evaluation programme) is an iterative process to allow for a continuously improving action plan, which will evolve over time as information and understanding of the biodiversity features of the landscape improve. Provisional warning thresholds outlined in the monitoring and evaluation section will be reviewed every year by the BAP contractor to ensure they are appropriate (i.e. are sensitive enough to be triggered but sufficiently robust to only be triggered if there is an impact risk for the Project).

Survey monitoring requirements and effectiveness of mitigation measures will be assessed at the end of each monitoring season. Any decision to alter monitoring schedules will be undertaken based on the precautionary principle given that numbers of actively nesting females vary enormously from year to year for environmental reasons not well understood (Eckert et al. 1999). Year-to-year fluctuations are common and will be thoughtfully reviewed and considered rather than immediately construed as absolute indications of the status of the population. Also nesting survey data should not be assumed constant in a temporal sense, data collected over a specified time interval cannot be extrapolated to large, unsurveyed time intervals (Shroeder and Murphy 1999).

Performance will be assessed against the mitigation targets (section 5) and the state-pressure-response indicators and defined thresholds (section 6) on an annual basis and reported to the Eni Ghana HSEQ Manager. Formally appointed sea turtle specialist(s) are involved in the assessment to ensure that internationally acceptable standards are being maintained, and are up to date with any changes/new approaches to turtle conservation. Eni Ghana have engaged ESL including a member of the IUCN SSC

Marine Turtle Specialist Group. At a minimum, the review will consider changes the abundance and diversity of species utilizing the AoI, level of poaching observed, effectiveness of nest translocations and other mitigation measures.

9.3 Training requirements

All ESL staff and community members undertaking sea turtle monitoring and/or beach patrols will be fully trained prior to conducting surveys. A training programme include a classroom (theory) session and field (practical) sessions (Shroeder and Murphy 1999). Training will also be provided in the use of electronic survey data collectors.

Theory training include photographs of species and of various types of crawls for each of the species that are known to nest on the survey beach. Identification guides will be provided. Practical sessions are led by experienced surveyors (competent turtle specialist to mentor staff during ground truthing surveys). New staff will work side- by-side with experienced surveyors until they are fully confident of their ability to identify nesting emergences from false crawls and distinguish among the species using the survey beach (Shroeder and Murphy 1999).

Table 9-1. Training requirements

Position/Role	Training Topic	Action Progress	Date for completion	Frequency
Eni site HSE personnel	Training will include legal and Eni Policy requirements, related to sea turtles, turtle identification, and protocol to follow in the event of an observation. See Table 7-1.	Ongoing	Ongoing	As new staff commence
Eni operational staff and contractors who work on site	Employee induction training which explains that harvesting of adult and juvenile turtles is prohibited for Eni employees & contractors. Included the disciplinary policy (i.e. that possession can be grounds for disciplinary action). See Table 7-1.	Ongoing	Ongoing	As new staff commence
Local community members involved in beach patrols	Local community members have been recruited to assist with beach patrols. Patrol members will receive regular training in how to complete field surveys and data collection from the BAP contractor.	Ongoing	Ongoing	Every season

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11. ANNEX 1. COMMITMENT REGISTER

Annex 1 outlines the history of changes to the sea turtle commitments from the original Sea Turtle BAP developed for the construction phase (2016-2019) and the current version which has been updated from the operational phase (2019 onwards).

Date	Construction phase ID ref	Objective	Original mitigation description	Commentary
June 2019	Updates to Table 5.1 (7.1) - 4 actions completed - 2 actions ongoing	Avoid harm to turtle nests during landfall construction and for the duration of the project	Avoid laying pipeline during peak nesting season	COMPLETED. Pipeline construction commenced in June 2018. Post trenching continued until 31 December 2018 and demobilization conducted in January 2019. This timing overlapped with the peak turtle nesting season. One observation was recorded within 300m of the land fall site during this period. <i>This action is no longer applicable and has been removed.</i>
			Complete pre- work inspections 60 days prior to beach construction	COMPLETED. Continuous surveys (daily inspections) were performed in the months of May-June 2018 (42 days) and November - January 2019 (91 days). No 'at risk' nests observed. <i>This action is no longer applicable and has been removed.</i>
			Develop and implement a nest translocation protocol in the impacted area (300 m either side of the land fall)	ONGOING. A nest translocation protocol was developed (2016 BAP, Annex 3). No nests were recorded in the direct pipeline footprint prior to construction and as such no translocations were necessary. <i>This action is ongoing and moved to Table 7-2 (incorporated into the beach surveillance and hatchery ACA).</i>
			Undertake construction during the day during nesting season	COMPLETED. Construction of the pipeline on the beach occurred during both the day and night (based on the presence of a large temporary light tower on the beach). Night operations and lighting may have contributed to disturbance of females attempting to nest within 300m of the LTE.

Date	Construction phase ID ref	Objective	Original mitigation description	Commentary
				<i>This action is no longer applicable and has been removed.</i>
			Monitor for turtle entrapment in construction site (Night-time monitoring of turtles that may become disorientated or entrapped in trenches)	COMPLETED. Monitoring and inspections were completed during the construction phase. No turtle nesting or hatchling emergence activities were observed in the direct footprint during the construction period. <i>This action is no longer applicable and has been removed.</i>
			Provide training of sea turtle requirements to all staff and contractors (including the site environment officer)	ONGOING. Internal training was provided by GWS experts (BAP contractor) to GWS field staff and volunteers. <i>This action is ongoing and moved to Table 7-1.</i>
June 2019	Updates to Table 5.2 - 4 actions completed - 4 actions ongoing (Table 7.2)	Maintain the viability of nesting beaches in the Aol and reduce the harvest of eggs and females by the future project workforce in the Aol.	Establish conservative setback requirements for project buildings	COMPLETED. Permanent building and processing facilities were located further than 50 m from beach habitat. Light pollution from the onshore processing facility do not extend to the beach. <i>This action is no longer applicable and has been removed.</i>
			Limit the landfall construction area footprint	COMPLETED. The original Right of Way (ROW) for the pipeline was designed at 34 m wide. Recent satellite imagery shows that the RoW may have extended to ~40m at its intersection with the beach. <i>This action is no longer applicable and has been removed.</i>
			Acquire sand for construction from responsible inland sources	COMPLETED. No construction sand was sourced from the beaches. <i>This action is no longer applicable and has been removed.</i>
			Design and implement bush meat action plan	ONGOING. A bushmeat action plan has been developed and employees and contractors are prohibited from capturing or trading sea turtle meat

Date	Construction phase ID ref	Objective	Original mitigation description	Commentary
				and/or products. No evidence of staff/contractors poaching has been provided since construction commenced. <i>This action is ongoing and moved to Table 7-1.</i>
			Utilise security personnel to patrol beach in construction area	COMPLETED. No evidence of staff/contractors poaching has been provided during the construction phase. Construction workers have now demobilized and only operational staff remain. Beach patrols in the study area will continue back will not be completed by the security personnel. <i>This action is no longer applicable and has been removed.</i>
			Ensure beach and back beach are restored	ONGOING. The pipeline construction only finished within the last 15 months, in January 2019. Future habitat monitoring at the landfall location will be required to inform the effectiveness of this action. The STBAP anticipates that the beach area should be fully restored within 3 years. <i>This action has been removed as a mitigation action. However, progress will be monitored as part of the Habitat assessment (refer to Project footprint/ Pipeline construction site). Where monitoring results show recovery does not occur then future correction actions will be necessary.</i>
			No planting of alien species	COMPLETED. No active planting of alien species has been documented in the beach zone. <i>This action is no longer applicable and has been removed. However, can be reinserted if monitoring results highlight alien species have established.</i>
			Monitor alien species in nesting habitat	ONGOING. The presence of alien species was monitored as part of Habitat assessments (see monitoring section).

Date	Construction phase ID ref	Objective	Original mitigation description	Commentary
				<i>This monitoring action has been removed from the mitigation table. Monitoring actions (Habitat Assessment) have been outlined in a separate section (See Section 8.7.1).</i>
June 2020	Updates to Table 5.3 (recently changed to Table 7.2)	Establish a robust sea turtle baseline and monitoring programme in the project Aol Maintain a sea turtle monitoring programme in the project Aol	All activities	ONGOING. All monitoring actions have been removed from the action tables and inserted into a separate monitoring section – see Section 8. <i>Nest translocation is ongoing and incorporated into the ACA – beach surveillance.</i>
June 2019	Updates to Table 5.4	Limit adverse behavioural impacts to nesting turtles and hatchlings as a result of artificial lighting	Prohibit staff having bonfires on the beach	COMPLETED. Eni Ghana prohibited staff from having bonfires on the beach at night. <i>This issue has not presented a problem in the study area and this action has been removed.</i>
June 2019	Updates to Table 5.6	Undertake additional conservation actions through the establishment of partnerships with local NGOs to reduce the harvest of turtles and eggs by local communities	Provide training of sea turtle requirements to relevant NGOs, company and staff of priority contractors	Internal training was provided by GWS to staff between 2016-2019. Ongoing training will be provided by the Andrews Agyekumhene (member of the IUCN SSC Marine Turtle Specialist Group) as part of the ESL contract to ensure accurate collection of data. <i>This action has been removed from the updated ACA list however training requirements are outlined in Section 7.</i>
			Engage and contribute to	A delay was experienced in engaging local GWS volunteers to patrol the

Date	Construction phase ID ref	Objective	Original mitigation description	Commentary
			existing community- based turtle conservation programme	beach. However, ESL has now been engaged to complete beach patrol in the study area. A biodiversity offset strategy (including residual impact assessment) is underway and will determine/ outline the need for any further conservation projects. <i>This action has been removed from the updated ACA list.</i>
			Undertake a bush meat survey (sea turtle meat and eggs)	In early 2020, GWS completed a sea turtle bush meat survey in 5 communities in the study area: Bakanta, Anwolakrom, Sanzule, Krisan and Eikwe. Data was collected to improve the understanding and extent of poaching in the study area and to inform the bush meat action plan. <i>This action was completed in June 2019.</i>
			Hatchery development	In January 2020, two hatcheries were constructed in the study area. These will be used for nest translocation in the upcoming nesting season. <i>This action was added to the updated ACA list in June 2019 (Table 7.2).</i>
June 2019	Updates to Table 5.7 (Table 7.3)	Work in collaboration with other large-scale developments in the district to address cumulative impacts	Promote the establishment of a committee to address biodiversity issues with relevant development projects in the district	<i>This action has moved to Table 7.3.</i>

12. ANNEX 2 NEST TRANSLOCATION PROTOCOL

Developed using the following sources:

Mortimer, J.A. 1999. Reducing Threats to eggs and hatchlings: Hatcheries

Boulon, R.H. 1999. Reducing threats to eggs and hatchlings: In situ protection

Miller, J.D. 1999. Determining clutch size and hatchling success, Eckert, K. L., K. A. Bjorndal, F.A. Abreu-Grobois, and M. Donnelly (Editors). 1999. Research and Management Techniques for the Conservation of Sea Turtles. IUCN/SSC Marine Turtle Specialist Group Publication No. 4.

Overview

Eggs should never be handled (such as with the intent of relocating them to hatchery enclosures) without explicit training, oversight by local sea turtle experts and without appropriate permits from Government. The preferred option is always the least manipulative intervention. Collecting and reburying eggs should be considered only as a last resort. Hatcheries have the following limitations that must be considered: hatchling success is usually lower than natural nests, requires well-trained staff and improper hatchling release can cause high mortality rates.

When should sea turtle eggs be translocated?

The following circumstances may warrant the removal of eggs from the natural burial chamber:

- Nests located at sites that are known to encounter severe and predictable erosion (i.e. high risk areas).
- Nests laid below or close to the high tide mark and may be lost prior to term due to inundation.
- Sea turtle eggs should be translocated if the trained BAP contractor determines the specific nest is threatened by poaching activities. Monitoring completed in 2017 and 2019 highlighted a high rate of poaching in the study area.

Use of a sea turtle hatchery

- Located as close as possible to the nesting beach in order to reduce transport trauma, reduce time out of the sand and allow for imprinting.
- Hatcheries should be positioned to include a range of microhabitats utilized by nesting turtles to allow for a range of representative temperature regimes.
- Located at least 1 m above the highest spring tides and away from areas that might get inundated.
- Enclose the hatchery with wire mesh to prevent human or predator intrusion.
- Bury a 1 – 2 m wide strip of netlon mesh (1 cm mesh) to a depth of 0.5 along the inside of the fence to protect against crabs and other small burrowing predators.
- The same hatchery site should only be used for 2 consecutive years to prevent issues with

fungus and bacteria.

Translocation steps

Best accomplished using regular beach patrols enabling collection at the time of deposition.

1. Collection of eggs

- Gently collect eggs at deposition and place in a clean bag and bucket. The container must be strong enough to reliably carry up to 12 kg of eggs. Hands should be removed of all chemical residues such as sun screen and insect repellent.
- Alternatively position a plastic bag in the hole to receive the eggs. Tie the bag prior to burial by the female to exclude sand. Efforts should be taken to reduce the amount of sand collected with eggs. Sand will abrade the egg shells and can reduce hatch success.
- Care taken not to disturb the turtle or collapse the egg chamber.
- Swiftly dig up eggs as soon as egg-laying is complete.
- Record nest depth and diameter of the neck of the nest so original dimensions can be replicated (measurement must be consistent).

2. Transport of eggs

- Transport eggs immediately. Secure and cushion from vibrations during transport.
- When transported eggs must be covered to reduce moisture loss.
- Special care provided for eggs that are longer than 2 hrs old or mid-term clutches that become threatened. The embryonic membranes can be easily torn if rotated or jarred. Mark the top of the egg with a soft grease pencil and maintain upright. Transfer eggs in an inflexible container rather than a sack to ensure not rotated.

3. Reburial process (hatchery)

- All eggs should be planted in the hatchery within 2 hours of being laid. No clutch should remain unburied for longer than 6 hours.
- Do not locate the nest too near (<1.0m) other translocated clutches or natural nests.
- As far as possible, attempt to replicate microhabitat in the hatchery to that of the natural nest. Replicate the natural nest depth and diameter.
- Sweep aside dry surface sand to expose damp surface (approximately 5-10 cm) to prevent it sifting into the excavation.
- Very dry weather can cause cave-ins during nest excavation. To improve stability pour fresh water into the unfinished nest and then continue nest construction.
- Do not pour eggs into the nest. Place a few at a time if less than 2 hours old. If older than 2 hours then place one at a time.
- Once eggs are in place cover eggs with excavated damp sand. Apply layers of 8-12 cm and firming tamp sand in place.
- Do not allow dry sand to come in contact with the eggs. Only use during the final

stages of covering the nests.

- Number and record each nest
- Construct a cylindrical mesh enclosure around the nests. Use netlon mesh (<1 cm) rather than chicken wire which is too large and can cause injury. Recommended that mesh is 40cm high and 195 cm in length and secured with a metal stake (0.25 cm). Bury 10 cm into the sand to reduce crab damage.

4. Hatchling release

- Hatchlings should be released as soon as possible after emerging from their nests.
- Delays in release can cause exhaustion, desiccation and possibly injury or death from predators.
- To prompt natural imprinting hatchlings should be allowed to crawl across the beach and enter the sea unassisted.
- Release sites should be randomized and occur at a different location (100 m away) to the last release site to avoid creating feeding stations.
- Hatchery staff should anticipate the arrival of hatchlings and check mesh enclosures are regular hourly intervals.
- When release is impossible (such as during the middle of a hot day) hatchlings should be kept in a soft, damp cloth sack and kept in a cool, dark, quiet location.
- Do not keep hatchling in water as they will engage in swim frenzy and exhaust energy resources required for ocean swimming.

5. Data collection

Hatchery data should be collected and analysed to determine the success of the reproductive effort at the hatchery and inform management decisions and adaptive management.

The following parameters should be collected and recorded **during initial nest laying** (for reburial at the hatchery):

- Nest tag or reference number
- Date and time laid
- Nest depth – Top (to first egg in the egg chamber)
- Nest depth – Bottom (to bottom of egg chamber)
- Nest location on the beach
- Nest location across the beach
- Nest location habitat (e.g. bare sand, grass, under vegetation)
- Number of eggs laid – clutch count (yolkless eggs should be counted and reported separately. Multi-yolked should be counted as one egg. Also record number eggs broken during excavation or transport)
- Sand temperature
- Egg diameter (greatest and least diameter of 10 eggs chosen at random)
- Egg weight

The following parameters should be collected and recorded after **emergence of hatchlings**:

- Nest tag number
- Date laid
- Date emerged (incubation length)
- Time of emergence
- Number of hatchlings that incubate successfully – Hatching success %
- Number of hatchlings that emerge from the nest - Emergence success %
- Number of hatchlings that cross the beach and reach the water