PROPOSED COASTAL PROTECTION SCHEME,
ST FRANCIS BAY, KOUGA LOCAL MUNICIPALITY, EASTERN CAPE PROVINCE

ENVIRONMENTAL IMPACT REPORT

DEDEAT REFERENCE NUMBER: EC08/C/LN2/M/01-2021

FINAL

Prepared for	On behalf of
St Francis Property Owners NPC PO Box 18 St Francis Bay 6312	Kouga Local Municipality PO Box 21 Jeffreys Bay 6330

Prepared by

36 Pickering Street, Newton Park, Port Elizabeth, 6045

Also in Grahamstown, East London, Johannesburg, Cape Town and Maputo

www.cesnet.co.za

MAY 2021

REVISIONS TRACKING TABLE

This report should be cited as follows: Coastal & Environmental Services, May 2021: *Proposed Coastal Protection Scheme, St Francis Bay, Kouga Local Municipality, Eastern Cape Province, Final Environmental Impact Report*. CES, Port Elizabeth.

CES Report Revision and Tracking Schedule		
Document Title	Final Environmental Impact Report: Proposed Coastal Protection Scheme, St Francis Bay, Kouga Local Municipality, Eastern Cape Province	
Client Name & Address	St Francis Property Owners NPC PO Box 18 St Francis Bay 6312 *On behalf of* Kouga Local Municipality PO Box 21 Jeffreys Bay 6330	
Document Reference	DEDEAT Ref: EC08/C/LN2/M/01-2021	
Status	Final	
Issue Date	Updated May 2021	
Authors	Mr Gregory Shaw	Coastal & Environmental Services
Reviewers	Dr Ted Avis	Coastal & Environmental Services

Port Elizabeth
36 Pickering St,
Newton Park
Port Elizabeth
6045
Info@cesnet.co.za
www.cesnet.co.za
Also in Grahamstown, Cape Town, East London Johannesburg and Maputo

AUTHOR AND EAP DETAILS

Details of the EAP

Dr Anthony Mark (Ted) Avis
Coastal & Environmental Services (CES)
Physical Address (Head Office): 67 African Street, Grahamstown 6139
Physical Address (Branch): 36 Pickering St, Newton Park, Port Elizabeth, 6001
Postal Address: P.O. Box 934, Grahamstown 6140
Telephone: +27 46 622 2364 (Head Office);
Website: www.cesnet.co.za
Email: g.shaw@cesnet.co.za

Expertise of the EAP

CES is a South African based company, with its head office in Grahamstown, and offices in Cape Town, Port Elizabeth, East London and Johannesburg, South Africa, as well as a wholly owned subsidiary in Maputo, Mozambique (CES is registered as an Environmental Practitioner with the Mozambican authorities). Coastal and Environmental Services (Pty) Ltd was established in 1990, to service a then fledgling market in the field of Environmental Management and Impact Assessment. The Company has grown apace with the increased market demand for environmental and social advisory services, in South Africa and numerous other African countries. Our principal area of expertise is in assessing the impacts of projects on the natural, social and economic environments through, among other instruments, the environmental impact assessment process, and in so doing contribute towards sustainable development.

Our staff is currently comprised of a number of professional and support staff. All professional staff members are well qualified, and as many as 90% have advanced postgraduate qualifications, including PhD, MSc and MA degrees in the biological, social and environmental sciences. In addition, CES has well-developed working relationships with a number of other individual specialist and specialist consulting companies who provide us with expertise in various disciplines. We have a demonstrated ability to manage EIAs for large and complex projects. This experience was initially gained during the undertaking of integrated environmental management studies, as well as the management of large and complex environmental and social impact assessments. CES has managed numerous large EIAs from pre-feasibility through to operation for international clients in six southern African countries. These have been rigorously reviewed by parties such as the World Bank, MIGA, European Investment Bank, IFC, German Investment Bank (KFW), African Development Bank, BHP Billiton international peer review team and the Dutch Development Bank (FMO).

Dr Ted Avis *(Role: Project Leader and Report Review)*
Ted Avis is a leading expert in the field of Environmental Impact Assessments, having project-managed numerous large-scale ESIAs to international standards (e.g. International Finance Corporation). Ted was principle consultant to Corridor Sands Limitada for the development of all environment aspects for the US$1billion Corridor Sands Project. He has managed ESIA studies and related environmental assessments of similar scope in Kenya, Madagascar, Egypt, Malawi, Zambia and South Africa. Ted has worked across Africa, and also has experience in large scale Strategic Environmental Assessments in southern Africa, and has been engaged by the International Finance Corporation (IFC) on a number of projects. Ted was instrumental in establishing the Environmental Science Department at Rhodes University whilst a Senior lecturer in Botany, based on his experience running honours modules in EIA practice and environmental. He is an Honorary Visiting Fellow in the Department of Environmental Sciences at Rhodes. He was one of the first certified Environmental Assessment Practitioner in South

Africa, gaining certification in April 2004. He has delivered papers and published in the field of EIA, Strategic Environmental Assessment and Integrated Coastal Zone Management and has been a principal of CES since its inception in 1990, and Managing Director since 1998. Ted holds a PhD in Botany, and was awarded a bronze medal by the South African Association of Botanists for the best PhD adjudicated in that year, entitled "Coastal Dune Ecology and Management in the Eastern Cape". Ted is a Certified Environmental Assessment Practitioner (since 2002) and a professional member of the South African Council for Natural Scientific Professionals (since 1993).

Mr Gregory Shaw *(Role: Project Management and Report Author)*
Gregory is a Principal Environmental Consultant and Business Development Manager. Greg has 12 years' experience in conducting environmental consultancy services in the energy, transport, maritime and agricultural sectors on behalf of South African and oversees government departments and agencies, local government authorities, private developers, international funding organisations, and non-government organisations. He has a strong track record of projects completed within budget, on time and in accordance with national and/or international environmental legislation and guidelines. Greg's skills include ESIA, environmental survey development, management, execution and monitoring, report writing, project management and strategic planning.

Ms Nicole Wienand *(Role: Report Assistance)*
Nicole is an Environmental Consultant with less than 1 years' experience, based in the Port Elizabeth branch. Nicole obtained her BSc Honours in Botany (Environmental Management) Cum Laude from Nelson Mandela University (NMU) in December 2018. She also holds a BSc Degree in Environmental Management (Cum Laude) from NMU. Nicole's honours project focused on the composition of subtidal marine benthic communities on warm temperate reefs off the coast of Port Elizabeth (a baseline survey) and for her undergraduate project she investigated dune movement in Sardinia Bay. Although she is new to the environmental consulting field, her key interests include marine ecology, GIS Mapping, the general EIA process, Public Participation Process (PPP) and Ecological Impact Assessments.

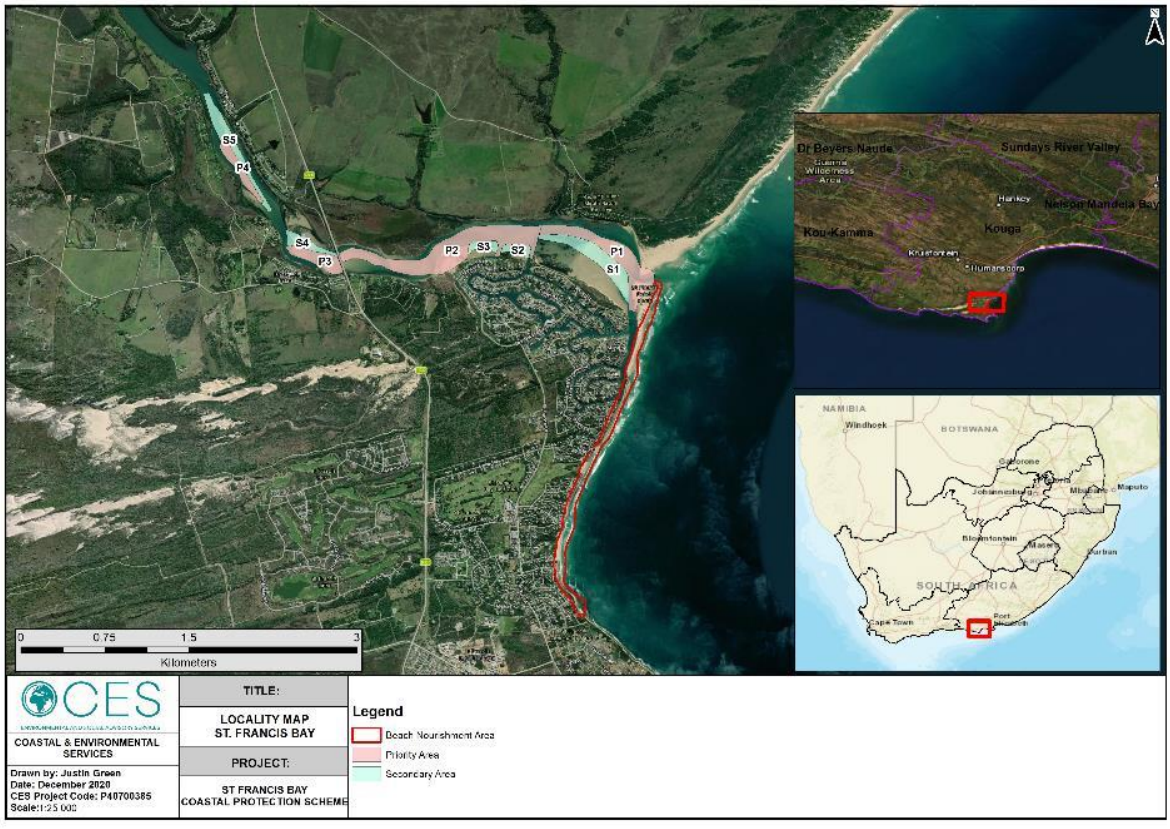
EXECUTIVE SUMMARY

Introduction

The St Francis Property Owners Non Profit Company (SFPO NPC), on behalf of the Kouga Local Municipality (Kouga LM), has proposed the implementation of a coastal protection scheme for St Francis Bay beach, located within the Eastern Cape Province. The proposed project area is situated approximately 100 km west of Port Elizabeth, within the Kouga LM, seated within the Sarah Baartman District Municipality (SBDM). The coastal protection scheme will include sand material sourcing from the Kromme River (and any other viable sources), beach nourishment of St Francis Bay beach and the development of coastal structures to retard the erosion of St Francis Bay beach.

CES were appointed by the SFPO NPC to apply for an Environmental Authorisation (EA) by means of conducting a Scoping and Environmental Impact Reporting (S&EIR) process. This was initiated in 2018. In 2019, CES together with the SFPO produced a Draft and Final Scoping Report and Sand Sourcing Specialist Report which was subject to the mandatory 30-day public participation process (PPP) between 20th of August 2019 until the 18th of September 2019. Following on from the approval of the Scoping Report by the Department on the 25th October 2019, CES progressed with the development of the Draft EIR and Draft Estuarine and Dune Assessment Specialist Report which were subject to PPP between 19th December 2019 – 5th February 2020.

It was decided that the Final EIR would not be submitted and the application (EC08/C/LN2/M/42-2019) was allowed to lapse in order to re-visit the design based on comments from I&APs and the Department. The update to the design (re-alignment of groynes) required additional technical studies (estuarine and coastal modelling), which have now been completed and this report has been updated to include the additional information and design available.



Location of the proposed beach nourishment scheme (from Advisian, 2018).

Project Description

The implementation of beach nourishment (i.e. the placement of a large volume of sand on the beach over time) together with the development of short stub groynes (i.e. a low solid barrier built into the sea) was considered to be the most suitable option for long-term coastal protection. The details of the other alternatives which were considered are provided in Chapter 3 of this report.

Sand Sourcing and Transportation of Material

In order for beach nourishment to be implemented, sand must first be obtained from a suitable source area. The identification of a suitable source area was based largely on finding an area where sand will consist of similar grain size to that which is required on the beach, as well as being feasible and cost effective to extract and place along the beach. Three (3) potential source areas have initially been identified and all are located within the Kromme River estuarine functional zone (see Appendix I). The maximum volume of sand which will need to be sourced is approximately 854 000 m^3 and will be transported either via dredger and pipeline or on occasion trucks.

Beach Nourishment

The option to artificially nourish the beach with sand from suitable borrow sources has been identified as the least environmentally intrusive method to protect the St Francis Bay coastline from further erosion. The aim of the beach nourishment will be to establish a minimum horizontal dry beach width of 40 m. This additional sand will provide a wide enough beach at the right level to act as the primary defence against erosion as waves will dissipate their energy over this re-established sand beach before reaching the existing eroding area. Long term maintenance will be required to maintain the required beach width and level.

Revetment Structures

To prevent further sea breaching through the St Francis Bay beach spit during a strong storm surge event, revetment structures have been implemented by Kouga Municipality along the length of the beach spit as a temporary coastal protection to prevent further erosion of the spit. This temporary revetment needs to be integrated within the long-term coastal protection scheme consisting of stub groynes and beach nourishment. The design of the temporary revetment needs to be reviewed so its suitability and long-term functionality can be assessed as the revetment would form an integral part of the long-term coastal protection infrastructure and would be the last defence against wave action, should the proposed re-nourished beach not be sufficient.

Stub Groynes

In order to retain the sand in the nearshore and beach area following the implementation of beach nourishment, and to promote increased sedimentation in the future, six (6) stub groynes will be constructed along the length of the beach. These stub groynes will extend from the back end of the beach and reach a length of between 170m and 200m offshore. The stub groynes will be angled perpendicular to the shoreline (except groyne 5 which is oblique), and will be shorter than full length groynes which are generally used for erosion prevention. The shorter (stub) groynes will allow a percentage of sediment (expected to be around 50% of the long-shore drift) to pass between each groyne. This is to facilitate sand movement through the longshore drift process since it is not the intention of the project to trap all sediment moving along the coastline. Maintaining this sand movement along the coast is also anticipated to mitigate for the potential of accelerated erosion “downstream” of the groynes, particularly of the northern most groyne. In addition to the natural movement of sediment, nourishment of the shoreline in the lee of the northern most groyne will be included as part of the project. The volume of sediment will be monitored and re-nourishment will be carried out and form part of the annual maintenance regime.

A maximum of approximately 44 300 m^3 of rock material will be required for the proposed stub groynes. The rock material used for the groynes will be sourced from a licenced local quarry, the details of which will be subject to availability and grading of rock material, and will become known during the detail design stage of the project.

Alternatives

The preferred alternative considered in this Environmental Impact Report involves the implementation of the proposed coastal protection scheme, which will include sand material sourced from the Kromme River, beach nourishment of St Francis Bay beach and the development of coastal structures to retard the erosion of St Francis Bay beach and to protect the beach spit. The preferred alternative was determined by the SFPO NPC, in conjunction with the Kouga Local Municipality, coastal engineers (Advisian), and CES. Following extensive engagement with stakeholders and Interested and Affected Parties, additional alternatives were considered and resulted in a revised design. The revised design considers the movement of the groyne locations to avoid impacting negatively on surfing breaks. The design also re-orientates the groynes to perpendicular as opposed to oblique to facilitate more even wave breaking along the frontage. Advisian also conducted more extensive modelling to provide insight into the changes that might be experienced in the estuary and marine environment as a result of the project.

The impacts associated with the various locations and technology (revetment) alternatives have been assessed in this Environmental Impact Report.

Project Need and Desirability

The proposed coastal protection scheme provides a viable solution for increasing the accumulation of sediment and decreasing the potential adverse effects associated with the loss of the beach amenity. Besides the loss of all beaches within the project area in recent years, the need for this intervention became self-evident during 2020 when the sand spit at the marina was breached on four occasions, resulting in emergency repairs and reinforcement of the spit to protect properties on the marina.

The project aligns with the planning and development objectives from municipal to national level in the following ways:

- *"to create a safe environment with diverse opportunities for economic growth and development'* as per the Kouga LM Integrated Development Plan (IDP) 2017-2022. The proposed project will assist in achieving this important objective by (a) decreasing the exposure of the beachfront and municipal infrastructure such as roads, access stairs and parking facilities to dynamic coastal processes, thereby increasing the safety and quality of the beachfront area; (b) decreasing the potential of shifting sand bars in the Kromme river, thereby increasing the navigation ability and safety of boaters; (c) increasing the width of the beaches, thereby promoting tourism and economic growth and development, and (d) preventing the loss of physical infrastructure in both the public and private sector by arresting the current rapid rate of beach erosion.

- At district level St Francis Bay has been recognised as an important tourist destination. This project is referred to in the final Sarah Baartman District Municipality Coastal Management Programme as an opportunity to protect coastal infrastructure and particularly to maintain public access to the beach, car parks and ablutions.

- Assist with attaining the strategic objectives and actions set out in the Provincial Development Plan. It is also aligned with the Eastern Cape Vision 2030 Provincial Development Plan (2014) as it will contribute to employment creation and social development, tourism, coastal protection and maintenance of coastal infrastructure through preventing the loss and erosion of the St Francis Bay beaches and public and private land and amenities.

- Support the 2030 National Development Plan (NDP, 2013) on the development of economic infrastructure including water resources and services where "*water will be recognised as a foundation for activities such as tourism and recreation, reinforcing the importance of its protection*." A key development policy outlined under economic infrastructure is that of tourism infrastructure, including accommodation and tourism products, which will play an important role in attracting a variety of tourists to different parts of South Africa. It also outlines the importance of ensuring environmental sustainability while allowing for the delivery of cultural benefits, including recreational opportunities, in order to achieve the national social and economic development objectives.

Through the protection of coastal infrastructure and property and the enhancement of the local amenities which are considered attractions to tourism and recreational activities the project can be regarded as very desirable.

Relevant Legislation

The implementation of the proposed St Francis Bay coastal protection scheme will be subject to various South African legislative requirements. In addition to the environmental authorisation, there are other permits, contracts and licenses that will need to be obtained by the project proponent for the proposed project, some of which fall outside the scope of this S&EIR process. The relevant national legislation, policies and conventions to which South Africa is a signatory to, must be used to guide the proposed project in order to ensure that it remains fully legal and compliant.

Based on the listed activities identified in Listing Notice 2 of GN R 325 (2014 EIA Regulations, as amended on 7 April 2017), the proposed project will be subject to an S&EIR process. In order to comply with NEMA, the impacts associated with the activities listed above will need to be identified and assessed during this process and will include the necessary specialist reports required. The Competent Authority (CA) for this project is identified as the Member of the Executive Council (MEC) of the Eastern Cape Department of Economic Development, Environment Affairs and Tourism (DEDEAT).

Identification of Potential Impacts

The no-go alternative assumes that the status quo will remain unchanged and that there will be no new development. Under the No-go alternative, the erosion of the St Francis Bay beach will continue and as has occurred during the course of 2020, breaches in the spit will occur again and damage to infrastructure and property along the entire length of the beach will continue. The No-go alternative will mean that there will be no groyne construction, beach nourishment and therefore no protection of backshore infrastructure and residential properties.

A total of 41 impacts have been identified for this project. These are a combination of construction (30) impacts and operational (10) impacts. This is due to the scale of the activity during construction as opposed to operation which essentially only involves maintenance related activity. One (1) cumulative impact was identified.
After mitigation, there are no negative impacts of HIGH significance.

Seventeen construction impacts (Table 9.1), prior to mitigation, were considered to have moderate negative significance while nine impacts had low significance. Three of the impacts were seen as moderately beneficial as a result of the construction. One impact had no significance attached to it's assessment.

All but three impacts identified as moderately negative were reduced to low negative significance as a result of the suggested mitigation measures. In these three cases, it is not possible to carry out the construction of the project without loss or damage to estuarine and dune ecology. Given the sensitivity and conservation status of these habitats the impact remains of moderate negative significance.

The beneficial impacts are associated with the potential increase in available habitat for both marine flora and fauna and socio economic benefits. The groynes may provide for additional hard substrate for algal species, while the gaps in the rocks making up the groynes create crevices for crustaceans etc. This is considered more of a by-product of the project rather than a specific design decision.

The construction activities will lead to temporary and permanent job opportunities both directly associated with this project and indirectly through hospitality.

During the operational phase (Table 9.1), five impacts of negative significance have been identified.

The changes to the hydrodynamics of the Kromme estuary are not considered to be significant other than in the mouth area temporarily following the dredging activity. The removal of sand material from the channels will facilitate vessel traffic through more states of the tide and with increased vessel traffic is the impact of erosion from vessel wake. It should be noted that wind generated waves on the estuary throughout the year also result in erosion.

The visual impact of the groynes are anticipated to result in a negative impact since they will result in an altered landscape and seascape. The presence of the groynes may also result in rip tides. These rip tides are often in close proximity of the groynes structures themselves. The structure will also not be designed for public access. However, it is anticipated that the public will try and access these structures. Therefore, a health and safety impact has been identified.

Five beneficial impacts have been identified resulting in moderate to very high beneficial impacts. These beneficial impacts as associated with the nourishment of the beach providing additional local amenity and coastal protection. Two socio-economic benefits are of HIGH positive significance (Increased boat access during all tidal cycles and potential increased tourism). The protection of Coastal Public Property

is seen as a benefit of VERY HIGH significance, as the no-go option will eventually result in the loss of almost all beach amenities, and quite possible over time portions of marina properties.

The only cumulative impact identified, since no other specific projects are planned, is the potential for the scheme to result in an increase in boat traffic. This in turn could result in accelerated erosion to the banks of the estuary. The impact is deemed to be of moderate negative significance prior to mitigation. However, since vessel numbers are monitored and managed, this impact can be reduced to low.

IMPACT	SIGNIFICANCE	RISIDUAL RISK
CONSTRUCTION PHASE IMPACTS		
Estuarine Physical Characteristics – Change in hydrodynamics	LOW –	LOW –
Estuarine Physical Characteristics – Alteration of water channel due to scour	LOW –	LOW –
Estuarine Physical Characteristics - Erosion of the Kromme riverbanks and beach spit (also applicable for operation phase)	LOW-	LOW-
Surface Water Pollution (machinery)	MODERATE –	LOW –
Estuarine Ecology – Suspended sediment / turbidity (also applicable for maintenance dredging during operation phase)	MODERATE –	LOW --
Estuarine Ecology – Flora (Direct loss of estuarine floral species) (also applicable for maintenance dredging)	MODERATE –	LOW –
Estuarine Ecology – Estuarine Functional Zone (also applicable during operation phase)	MODERATE-	MODERATE-
Estuarine Ecology – Fauna (Direct loss of faunal) (also applicable for maintenance dredging)	MODERATE -	LOW –
Estuarine Ecology – Fauna (Loss of sandbank habitat)	MODERATE-	LOW-
Estuarine Ecology – Fauna (Impacts on bird species)	LOW –	LOW –
Dune Ecology – Loss of dune vegetation (Sand River)	MODERATE-	MODERATE-
Dune Ecology – Impacts on foredunes due to site access	LOW -	LOW-
Dune Ecology – Impacts on nearshore and beach ecology	MODERATE-	MODERATE -
Marine Ecology – Flora (Loss of nearshore reef)	MODERATE-	LOW-
Marine Ecology – Flora (Increased hard substrate/habitat for attachment of benthic species)	MODERATE+	MODERATE+
Marine Ecology – Fauna (Increased hard substrate/habitat for attachment of benthic species)	MODERATE+	MODERATE+
Local Amenity – Estuary (Temporary restricted access in areas)	MODERATE-	LOW-
Local Amenity – Estuary (Decreased area available for bait digging)	MODERATE-	LOW-
Local Amenity – Beach (Restricted access to areas during construction)	MODERATE-	LOW-
Visual Impact – Dredging and construction machinery	MODERATE-	LOW-
Loss of Archaeological Resources	LOW –	LOW +
Loss of Cultural Heritage (built environment)	NO SIGIFICANCE	NO SIGNIFICANCE
Loss of Cultural Landscape	LOW--	LOW-
Loss of graves	MODERATE-	LOW-
Loss of marine archaeological / heritage resources	LOW -	LOW -
Solid Waste Pollution (Relevant to all project aspects) (also relevant to operation phase)	LOW –	LOW –
Dust Pollution (Implementation of coastal protection infrastructure)	LOW –	LOW –
Increased Traffic (Relevant to sand sourcing should the option of truck transportation be implemented) and vehicle movements related to groyne and revetment construction and material transportation	MODERATE –	LOW –
Noise Disturbance (Relevant to all project aspects)	MODERATE –	LOW –
Employment Creation and Economic Benefits (Relevant to all project aspects)	MODERATE +	MODERATE +
OPERATIONAL PHASE IMPACTS		
Estuarine Physical Characteristics (Increased erosion due to boat traffic)	MODERATE-	LOW-
Dune Ecology (Restoration of beach habitat)	MODERATE+	MODERATE+
Marine Hydrodynamics - Impact (erosion) as a result of the infrastructure and dredging	MODERATE-	LOW-
Marine Hydrodynamics - Impact (reduction of sediment supply) to the northern beaches	MODERATE-	LOW-
Local Amenity – Estuary (Increased boat access during all tidal cycles)	MODERATE+	MODERATE+
Local Amenity – Estuary (Potential increased tourism)	MODERATE+	HIGH+
Local Amenity – Beach (Increased recreational use)	VERY HIGH+	VERY HIGH +
Visual Impact – Presence of groynes	MODERATE -	LOW -
Protection of Coastal Public Property (Relevant to all project aspects)	VERY HIGH +	VERY HIGH +
Public Health and Safety	MODERATE-	LOW-
CUMULATIVE IMPACTS		
Erosion of the banks of the estuary through increased boating activity	MODERATE-	LOW-

Public Participation

The previous EIA process for the project has been subjected to a rigorous Public Participation and stakeholder engagement process (PPP) to date, as comprehensively described in Section 8 of this EIR.

The following public participation has already been conducted as part of the S&EIR process.

Phase	Requirement	Date
Inception Phase	Site notices	Placed on 21 December 2018 and 9 April 2019.
	Pre-Assessment Public Meetings	Held on 20 December 2018.
	Pre-Assessment consultation with DEDEAT	Held on the 18 April 2019 and 1 March 2019.
Scoping Phase (30 day Pre-Assessment PPP period)	Newspaper Adverts	Placed in the Herald on the 27th of March 2019, Kouga express on the 28th of March 2019 and the St Francis Chronicle on the 4th of April 2019.
	Letters of notification	Sent at the commencement of the PPP period on the 1st of April 2019.
	Commenting Period	29th of March 2019 until the 29th of April 2019.
	Public Meeting	Held on the 15th of April 2019.
Scoping Phase (Formal Mandatory 30 day PPP Period)	Newspaper Adverts	Placed in the Herald on the 20th of August 2019, Kouga Express on the 22nd of August 2019 and the St Francis Chronicle on the 19th of August 2019.
	Letters of Notification	Sent at the commencement of the PPP period on the 20th of August 2019.
	Commenting Period	20th of August 2019 until the 18th of September 2019.
	Public meeting	Held on the 27th of August 2019.
	Ongoing consultation meeting with DEDEAT	Held on the 29th August 2019
EIA Phase (Formal Mandatory 30 day PPP Period)	Newspaper Adverts	Placed in the Herald on the 18th December 2019. Kouga Express 19th December 2019.
	Letters of Notification	Sent at the commencement of the PPP period – 19th December 2019.
	Commenting Period	19th December 2019 – 5th February 2020.
	Public Meeting	19th December 2019
	Newspaper Adverts	Placed in the Herald 17th January 2020.
	Letter of notification	Sent out on the 16th January 2020.
	Public Meeting	25th January 2020
New Application		
EIA Phase 2020/2021 (Formal Mandatory 30 day PPP Period)	Notifications	Notification sent to registered I&APs on the 14th December 2020 to inform them of the pending new application.
	Newspaper Adverts	The Herald – 4th February 2021 St Francis Today – 5th February 2021 St Francis Chronicle – 18th February 2021 Kouga Express – 11th February 2021
	Commenting Period	5th February 2021 – 8th March 2021
	Public Meeting	18th February 2021

Comments received to date have varied between those related to the engineering solutions and those regarding environmental / social considerations.

There has been a history of coastal protection in St Francis Bay, of which only one long term solution was implemented and was not successful. Concerns over the suitability of the proposed solution included groyne design, their orientation and the effects of the design on the coastline and waves.

A large number of stakeholders questioned how the Kromme Estuary may be impacted through the extraction of sand material. These were both environmental (i.e. habitat and species impacts) and social (i.e. reduction of sand bank amenity).

Additional key issues were:

- Inclusivity of the PPP process for all members of the community (specifically disabled and those in the informal settlements);
- Consideration of the design to accommodate the surfing community;
- Concern over the lack of specific ecological data collected to inform the EIA process;
- Alignment with national, district and local planning policies;
- Erosion of the bank of the estuary through increased vessel traffic;
- Questions regarding the engineering design and its suitability;
- The impacts to the Kromme Properties Shareblock;
- Validity of the information used to inform the impacts..

DOCUMENT CHECKLIST

Requirements for the Environmental Impact Report in terms of Appendix 2 of GN R. 982 (as amended in GN R. 326) and where the relevant information can be found within this Report.

Item in GN R.982 (Appendix 2)	Requirement	Relevant Chapter/ Section
3	An environmental impact assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include—	
(b) The location of the development footprint of the activity on the approved site as contemplated in the accepted scoping report, including:	(i) the 21 digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; and (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	**Refer to Chapter 2, Table 2.1.**
(c) A plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is—	(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	**Refer to Figure 1.1 and Figure 2.1.**
(d) A description of the scope of the proposed activity, including—	(i) all listed and specified activities triggered and being applied for; and (ii) a description of the associated structures and infrastructure related to the development;	**Refer to Chapter 2, Section 2.2 to 2.4 and Chapter 5**
(e)	A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;	**Refer to Chapter 5.**
(f)	A motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred development footprint within the approved site as contemplated in the accepted scoping report;	**Refer to Chapter 4.**
(g)	A motivation for the preferred development footprint within	**Refer to Section 3.4.**

Item in GN R.982 (Appendix 2)	Requirement	Relevant Chapter/ Section
	the approved site as contemplated in the accepted scoping report;	
(h) A full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including:	(i) details of the development footprint alternatives considered; (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them; (iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts— (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated; (vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks; (vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (viii) the possible mitigation measures that could be applied and level of residual risk;	**Refer to:** **(i) Chapter 3;** **(ii) Chapter 8 and Appendix B;** **(iii) Appendix B;** **(iv) Chapter 6;** **(v) Chapter 7, Section 7.2;** **(vi) Chapter 7, Section 7.1;** **(vii) Chapter 7;** **(viii) Chapter 7;** **(ix) n/a;** **(x) Section 3.4.**

Item in GN R.982 (Appendix 2)	Requirement	Relevant Chapter/ Section
	(ix) if no alternative development footprints for the activity were investigated, the motivation for not considering such; and (x) a concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report;	
(i) A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity, including—	(i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	**Refer to Chapter 7, Section 7.2.**
(j) an assessment of each identified potentially significant impact and risk, including—	(i) cumulative impacts; (ii) the nature, significance and consequences of the impact and risk; (iii) the extent and duration of the impact and risk; (iv) the probability of the impact and risk occurring; (v) the degree to which the impact and risk can be reversed; (vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and (vii) the degree to which the impact and risk can be mitigated;	**Refer to Chapter 7, Section 7.2.**
(k)	where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;	**Refer to Chapter 2 and Chapter 6.**
(l) an environmental impact statement which contains—	(i) a summary of the key findings of the environmental impact assessment: (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and	**Refer to Chapter 9.**

Item in GN R.982 (Appendix 2)	Requirement	Relevant Chapter/ Section
	infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	
(m)	based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;	**Refer to Chapter 9.**
(n)	the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	**Refer to Chapter 3, Section 3.4.**
(o)	any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	**Refer to Chapter 9**
(p)	a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	**Refer to Section 1.3**
(q)	a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	**Refer to Chapter 9**
(r)	where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;	**Refer to Chapter 9**

Item in GN R.982 (Appendix 2)	Requirement	Relevant Chapter/ Section
(s) an undertaking under oath or affirmation by the EAP in relation to—	(i) the correctness of the information provided in the reports; (ii) the inclusion of comments and inputs from stakeholders and I&APs; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) any information provided by the EAP to interested and affected parties and any	**Refer to Appendix A.**
(t)	where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	**Not applicable.**
(u) an indication of any deviation from the approved scoping report, including the plan of study, including—	(i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and (ii) a motivation for the deviation;	**Not applicable.**
(v)	any specific information that may be required by the competent authority; and	**Please refer to the comments on the previous Draft EIR, provided by DEDEAT, which are included in the IRT (Appendix B).**
(w)	any other matters required in terms of section 24(4)(a) and (b) of the Act.	**The requirements of Section 24(a) and (b) have been met in this EIR.**

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

1.1 Project Background

The St Francis Property Owners Non Profit Company (SFPO NPC), on behalf of the Kouga Local Municipality (Kouga LM), has proposed the implementation of a coastal protection scheme for St Francis Bay beach, located within the Eastern Cape Province. The proposed project area is situated approximately 100 km west of Port Elizabeth, within the Kouga LM, seated within the Sarah Baartman District Municipality (SBDM) (Figure 1.1).

The coastal protection scheme will include sand material sourcing from the Kromme River, beach nourishment of St Francis Bay beach and the development of coastal structures to retard the erosion of St Francis Bay beach.

CES were appointed by the SFPO NPC to apply for an Environmental Authorisation (EA) by means of conducting a Scoping and Environmental Impact Reporting (S&EIR) process. This was initiated in late 2018. In 2019, CES together with the SFPO produced a Draft and Final Scoping Report and Sand Sourcing Specialist Report which was subject to the mandatory 30-day public participation process (PPP) between 20th of August 2019 until the 18th of September 2019. Following on from the approval of the Scoping Report by the Department on the 25th October 2019, CES progressed with the development of the Draft EIR and Draft Estuarine and Dune Assessment Specialist Report which was subject to PPP between 19th December 2019 – 5th February 2020.

It was decided that the Final EIR would not be submitted and the application (EC08/C/LN2/M/42-2019) was allowed to lapse in order to re-visit the design based on comments from I&APs and the Department.

The update to this report includes the following considerations:

- The amendment of the orientation of the groynes from oblique to perpendicular (to the wave direction);
- The updating of the shoreline modelling to consider the possible erosion to the coastline as a result of the installation of the groynes;
- Modelling of the shoreline evolution and the impact on the beaches to the north of the scheme following the installation of the groynes and beach nourishment;
- Collection of updated bathymetry and topographic data for the estuary;
- Completion of numerical modelling of the pre- and post-dredging scenarios and the changes to the hydrodynamics of the Kromme Estuary.

1.2 Objective of this report

This Environmental Impact Assessment Report (EIR) has been compiled in accordance with the requirements as stipulated in Section 23 and Appendix 3 of the 2014 EIA Regulations (as amended in April 2017 (GN R 982, as amended by GN R 326), which clearly outlines the content of an EIR.

The objective of the environmental impact assessment process is to, through a consultative process—

(a) determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;

(b) describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the development footprint on the approved site as contemplated

in the accepted scoping report;

(c) identify the location of the development footprint within the approved site as contemplated in the accepted scoping report based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;

(d) determine the—

(e) nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and

(f) degree to which these impacts—

(g) can be reversed;

(h) may cause irreplaceable loss of resources, and

(i) can be avoided, managed or mitigated;

(j) identify the most ideal location for the activity within the development footprint of the approved site as contemplated in the accepted scoping report based on the lowest level of environmental sensitivity identified during the assessment;

(k) identify, assess, and rank the impacts the activity will impose on the development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity;

(l) identify suitable measures to avoid, manage or mitigate identified impacts; and

(m) *identify* residual risks that need to be managed and monitored.

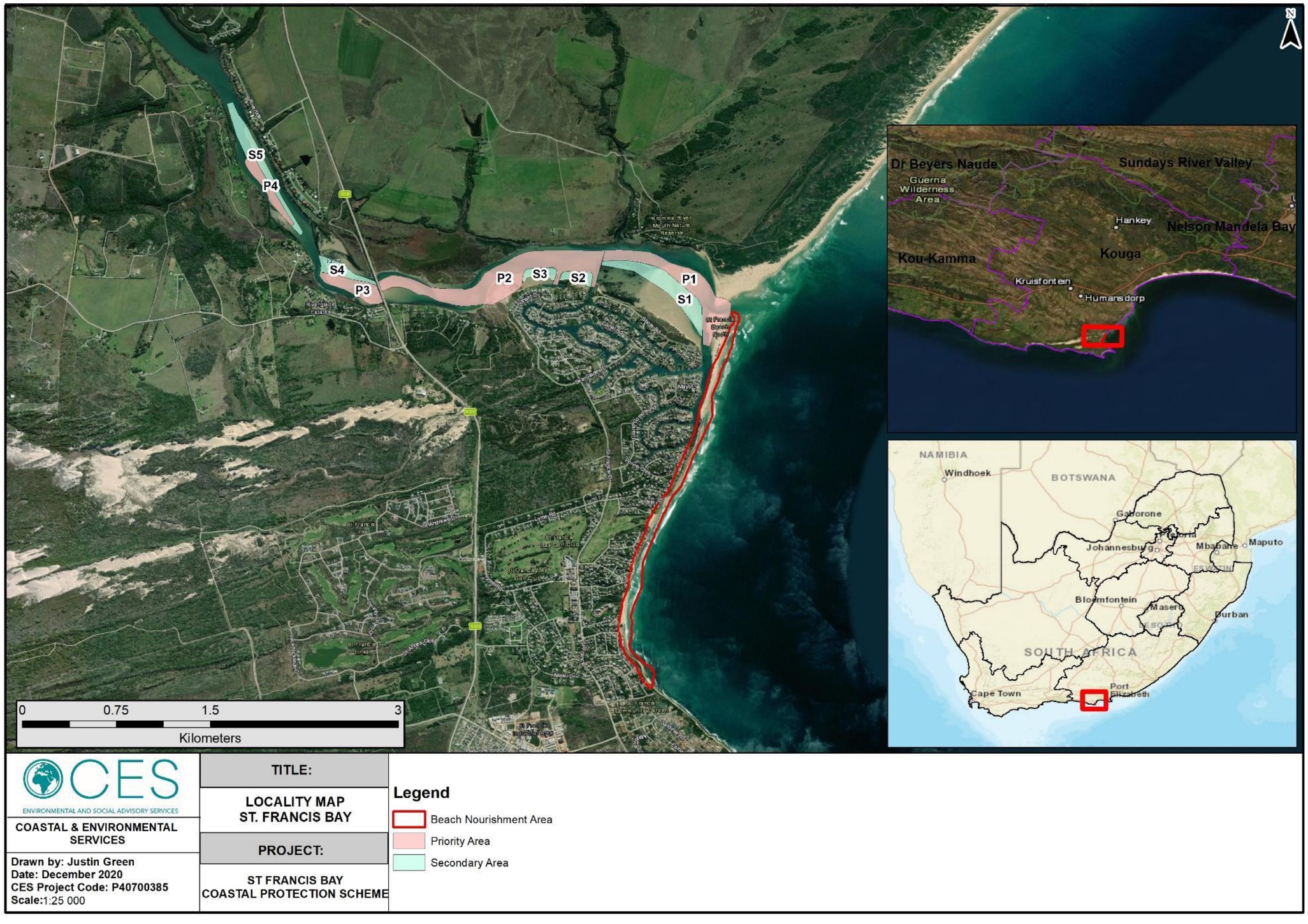


Figure 1.1: Location of the proposed project (nourishment and groynes) together with the proposed priority and secondary sand sourcing areas.

This EIR is structured as follows:

Chapter 1 – Introduction: Provides background information on the proposed project, a brief description of the EIA process required by the National Environmental Management Act (NEMA) (Act No. 107 of 1998, as amended) and its associated regulations, and describes the key steps in the EIA process that have been undertaken thus far, and those that are still to be undertaken.

Chapter 2 – Project Description: Provides a description of the proposed development, a description of the activities and technical details of the project, the proposed location/properties on which the development is to occur and the preliminary layout of the development and its associated infrastructure.

Chapter 3 – Alternatives: Identifies all the potential alternatives associated with the project including the fundamental, incremental and no development alternatives. An analysis of the alternatives is provided as well as a motivation for not considering certain alternatives. The preferred alternative is also identified and reasons are given as to why this is the preferred alternative.

Chapter 4 – Need and desirability of the project: Provides motivation on the need and desirability of the proposed development with respect to national and local plans and policies.

Chapter 5 – Relevant Legislation: Identifies all the legislation and guidelines that have been considered in the preparation of this EIR and outlines the Listed Activities triggered by the proposed development.

Chapter 6 – Description of the Affected Environment: Provides an overview of the biophysical and socio-economic characteristics of the site and its environs that may be affected by the proposed development, compiled largely from published information, but supplemented by information from the site visits.

Chapter 7 – Impact Assessment: Identifies the positive and negative impacts on the environment and the community that will result from the proposed activity. This will include the assessment of geographical, physical, biological, social, economic, heritage and cultural aspects and will include possible mitigation measures for each identified impact. The direct, indirect and cumulative impacts will be assessed using a prescribed methodology.

Chapter 8 – Public Participation Process: Provides the activities conducted during the mandatory 30-day Public Participation Period, as legislated. This will include details regarding the public meeting events that were held during this period, the advertisements and notifications which were placed, the comments or queries received from Interested and Affected Parties as well as the responses provided by the EAP.

Chapter 9 – Conclusions and Recommendations: Provides a final statement from the EAP which sums up the EIR and the overall impact that the proposed project will have on the environment. The key mitigation measures, which should be included in the EA, are summarised in the concluding statement.

References: Cites any texts referred to during preparation of this report.

Appendices: Contains all supporting and supplementary information.

1.3 Assumptions and Limitations

This report is based on information that is currently available and, as a result, the following limitations

and assumptions under which this report was compiled are implicit:

- Descriptions of the natural and social environments are based on limited fieldwork and available literature;
- The report is based on a project description taken from preliminary design specifications and site layouts for the proposed project that have not yet been finalised, and are likely to undergo a number of iterations and refinements (based on environmental and technical inputs) before they can be regarded as definitive; and
- It should be emphasised that information, as presented in this document, only has reference to the study area as indicated on the project maps. Therefore, this information cannot be applied to any other area without a detailed investigation being undertaken.

2 TERMS OF REFERENCE

2.1 Location and Site Description of the Proposed Project

The proposed coastal protection scheme is situated along the coastal areas of St Francis Bay, a town located approximately 100 km west of Port Elizabeth, within the Eastern Cape Province (Figure 2.1). The proposed project will take place over coastal public property and within the confines of the Kromme River estuary. As a result, there are limited defined farm, erf or property portions assigned to this project (Table 2.1). The proposed beach nourishment will take place over land defined by the Chief Surveyor-General as "parks." The areas where sand will potentially be sourced for the beach nourishment are likely to be located within or adjacent to the Kromme River estuary and the land is defined as "Humansdorp Administrative Area 5."

Table 2.1: Properties Associated with the Proposed Project (as defined by the Chief Surveyor-General)

DESCRIPTION OF AFFECTED FARM PORTION			
Property Name and Number	21 digit SG Code	Ward	Municipality/ Province
A portion of Humansdorp Administrative Region 5	C034	12	Kouga Local Municipality
Parks 720 1076655	C03400140000072000000	12	Kouga Local Municipality
Parks 1343 1073783	C03400140000134300000	12	Kouga Local Municipality
Parks 623 1073698	C03400140000062300000	12	Kouga Local Municipality
Parks 2257 1073784	C03400140000225700000	12	Kouga Local Municipality
Parks 185 1073697	C03400140000018500000	12	Kouga Local Municipality
Parks 53 1077075	C03400140000005300000	12	Kouga Local Municipality
Parks 184 1073696	C03400140000018400000	12	Kouga Local Municipality
Parks 625 1076606	C03400140000062500000	12	Kouga Local Municipality

2.2 Project Concept

As a result of significant erosion events occurring over the past few decades the St Francis Bay beach has lost a considerable amount of sand material, and the existing dune area across the frontage. This has resulted in existing infrastructure becoming more vulnerable to loss and damage, should more significant erosion events take place.

The erosion has led to a reduction in the width of the beach (see Appendix F). The width of beach is not only important from a recreational and tourism amenity point of view but offers significant coastal protection by reducing the wave energy. A reduction in wave energy reduces the ability for sediment to be moved and therefore reduces the severity of erosion. The effects of the erosion of the beach (in both width and depth of sediment) has been realised across the full frontage, stretching from the car park at the end of Nevil Rd in the south to the Kromme Estuary mouth in the north (Figure 2.2).

Approximately 700 m of the frontage, referred to as "the spit" is particularly vulnerable. The erosion has been significant and dramatic, such that over the 42 year period between 1975 and 2017, the high water mark has retreated by 75 metres (Figure 2.3). As a result, the beach has effectively been lost, and erosion of the vegetated sand spit is occurring. In 2020 the spit breached four times during particularly high tides and storm swell. This caused damage to infrastructure and it continues to pose a risk for as long as the spit remains "unprotected".

Consequently, various interventions including a beach nourishment scheme, revetment construction and the construction of groynes is required to arrest the rapid erosion of the beach, and ultimately restore it to its pre-erosion status, or at least to a condition that affords protection from storm attack, sea level rise and erosion events associated with these natural perturbations.

A number of interventions have been implemented in the past, including the construction and subsequent maintenance, repair work and upgrading of rock revetments, sand-pumping, Pressure Equalization Modules (PEM) and nourishment of the St Francis Bay beach. However, these are short term solutions and a more long term solution has been proposed in order to protect this section of coastline from undergoing further erosion. Numerous historic studies have been undertaken to investigate and evaluate the erosion problems, and several studies have proposed possible remedial solutions (Figure 2.4). These solutions have proved insufficient over the past twenty to thirty years (an example being the collapse of the tarred road at Anne Avenue and Ralph Road and ablution facilities at Ann Avenue in 2006/2007 into the sea) and therefore a more permanent solution is required.

The existing Environmental Authorisation (EA) (DEDEAT Ref No: EC08/C/LN1&3/M/21-2015), issued to the Kouga LM on the 1st of June 2016, for the coastal protection along the St Francis Bay beach states that "*the rock revetments as authorised in this Environmental Authorisation are only a temporary, intermediate solution*." The Environmental Authorisation further states that "*the second phase will be subject to a separate environmental assessment and will focus on beach nourishment and installation of various alternatives to provide further protection and encourage sand accumulation on the beach by means such as groynes, off-shore reefs and/or additional revetments*." This environmental process responds directly to the directive given in the EA issued on the 1st of June 2016. Please refer to Appendix H for the EA dated the 1st of June 2016.

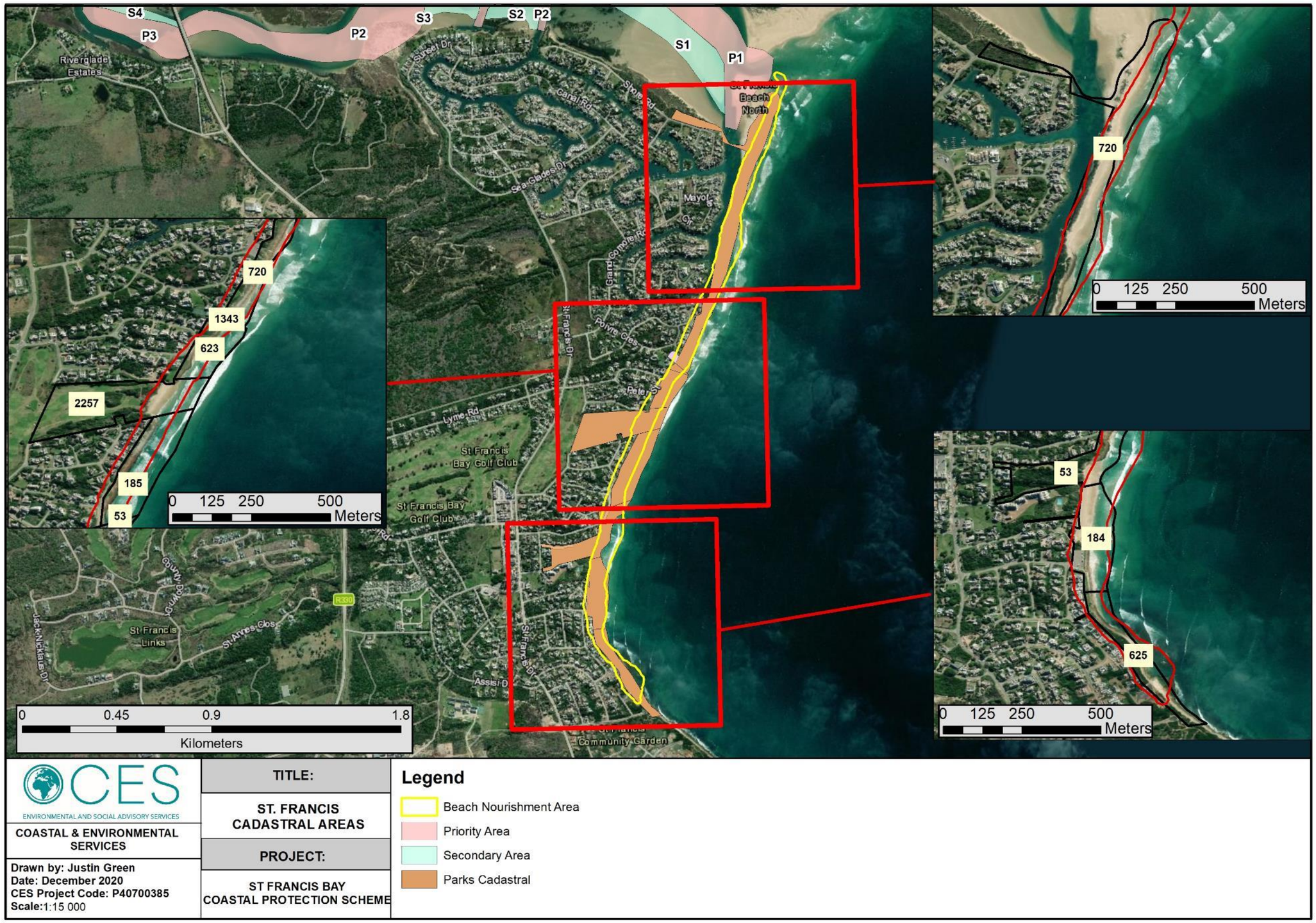


Figure 2.1: Locality map of the proposed project properties.

Figure 2.2: Location of the proposed beach nourishment scheme (from Advisian, 2018).

Figure 2.3: Spit retreat observed between 1975 and 2017.

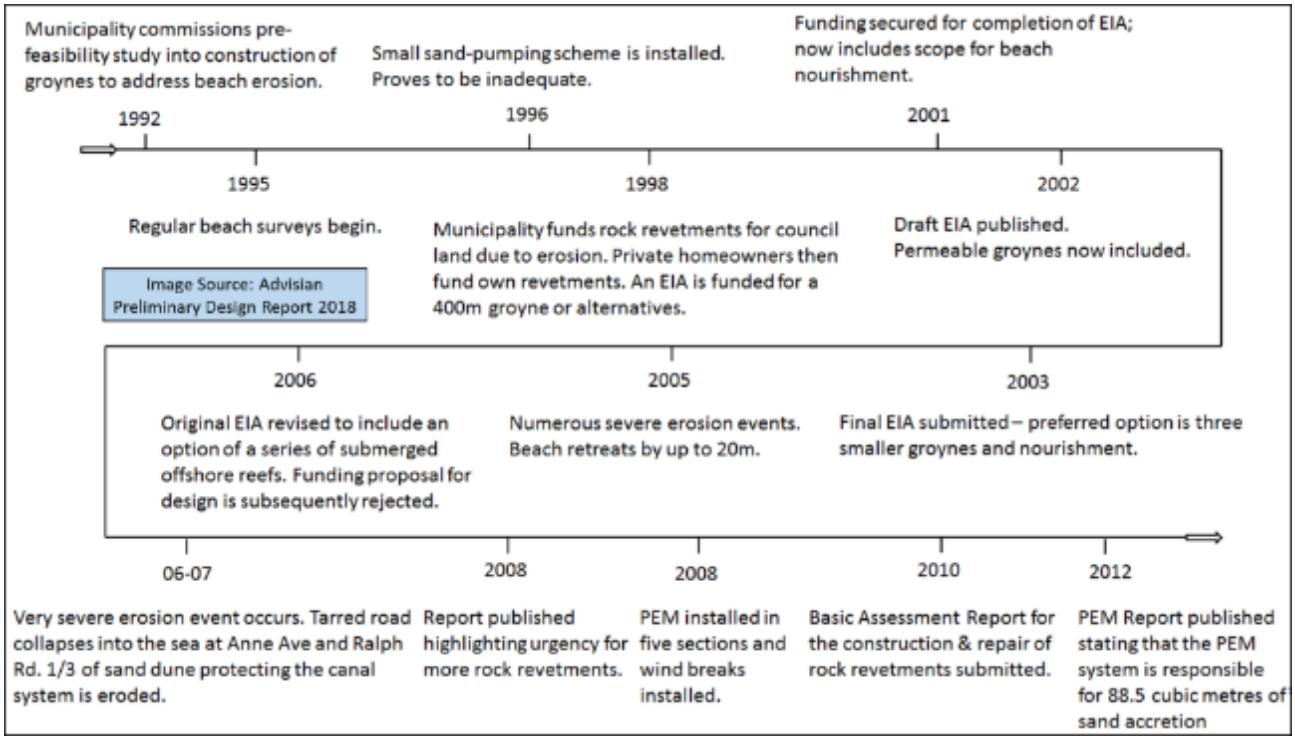


Figure 2.4: Time-line showing the historical report and interventions which were implemented for the St Francis coastal protection scheme (from Advisian, 2018).

2.3 Detailed Description of the Proposed Project

Several conceptual options were initially investigated by Advisian (refer to the preliminary design reports prepared by Advisian, which are included in Appendix F of this Final EIR). The preferred solution is the implementation of beach nourishment (i.e. the placement of a large volume of sand on the beach over time) together with the development of short stub groynes (i.e. a low solid barrier built into the sea). The details of the other alternatives which were considered are provided in Chapter 3 of this report.

Sand Sourcing (supported by the Sand Sourcing Specialist Study)

In order for beach nourishment to be implemented, sand must first be obtained from a suitable source area. The identification of a suitable source area was based largely on finding an area where sand will consist of similar grain size to that which is required on the beach as well as being feasible to extract and place along the beach (see Section 3.3.2 and Appendix I). Three potential source areas were initially identified and all were located within the Kromme River estuarine functional zone. However, as the investigations into possible sources progressed, and through considering feedback from the public, more discreet areas were identified and classified as priority and secondary areas (Figure 2.5).

To characterise the intertidal areas in the Kromme Estuary and the open beach, two sampling campaigns were completed on the 18th of December 2018 and the 15th of April 2019. The samples collected were taken to Tosca Lab (Pty) Ltd in Port Elizabeth for analysis. The particle size analyses that were undertaken as part of this study included the dry sieving of the samples that had been collected (as per SANS 3001: AG1 - Particle size analysis of aggregates by sieving).

The comparisons showed that overall the particle sizes of the sediment in the estuary are slightly finer than along the beach. There are many samples (mainly in the 2018 data collection) that have median particle sizes less than 0.3 mm, of which there are none in the set of beach samples. However, there is significant overlap of the particle size envelopes from the estuary and beach, particularly between the data collected in 2019. The 2019 estuary samples have median particle sizes (0.31 mm to 0.35 mm) that are compatible with the median particle sizes of the beach (0.3 mm to 0.38 mm). Also, the compatibility at the finer and coarser ends of the envelopes is good.

Given the similarity of the particle size envelopes from the intertidal areas on the south side of the Kromme Estuary and the beach of St Francis Bay, it is concluded that the source (intertidal estuary) and receiver (beach) sites are compatible with respect to particle size distribution. The similarity of particle size distributions between the upper, middle and lower intertidal parts of the estuary indicates that, based on particle size alone, there is no preferred location for extraction of sediment. Also, it is likely that sediments in the subtidal channel, which were not sampled, would be coarser than the adjacent intertidal areas (due to higher current velocities), and so also compatible with the beach.

The proposed coastal protection scheme does not intend to remove all of the features (sand banks) of the estuary, but to rather harvest as much sand material as possible while being cognizant of the ecological and social importance of those features. The current locations for potential extraction are based on high-level GIS mapping of the sand banks and estuarine channel, including vegetated sand bank areas where necessary (Figure 2.5).

The total sand that can be extracted, based on depths of 1m in priority areas and 2m in secondary areas, equates to 1 074 000 m^3 (Table 2.2). According to the engineers appointed for the development of the proposed coastal protection scheme, the required volume of sand for capital nourishment is approximately 854 000 m^3. Additional sand may be required to account for losses during the nourishment process (e.g. dredging and pumping losses).

Table 2.2: Potential sand available from each source area (assuming 1m deep excavations from the channel and 2m deep excavations from the intertidal areas). See Figure 2.5 for locations

Priority / Secondary Area	Label	Area (m^2)	Depth (m)	Volume (m^3)
Priority Area	P1	167 000	1	167 000
Secondary Area	S1	108 000	2	216 000
			Subtotal	***383 000***
Priority Area	P2	296 000	1	296 000
Secondary Area	S2	19 000	2	38 000
	S3	20 000	2	40 000
			Subtotal	***374 000***
Priority Area	P3	57 000	1	57 000
	P4	42 000	1	42 000
Secondary Area	S4	35 000	2	70 000
	S5	74 000	2	148 000
			Subtotal	***317 000***

Priority Areas	562 000
Secondary Areas	512 000
GRAND TOTAL	1 074 000

Advisian advised that the current loss of sand material from the beach is 50 000 m^3 to 100 000 m^3 per annum, but that the loss after full implementation of the preferred solution can be expected to be in the order of 25 000 m^3 to 50 000 m^3 per annum. The analysis of the data collected for the preliminary design suggests that much of the material being transported by longshore drift (South to North) finds its way into the estuary under natural conditions. Given that the design will be such to facilitate the

current longshore sediment transport, it is anticipated that the majority of the 25 000 m^3 to 50 000 m^3 "lost" from the nourishment will be deposited into the estuary providing suitable material for the maintenance requirements. The volume of sand required for maintenance will differ as the project progresses through the various phases, but will be limited to a maximum of approximately 25 000 m^3 to 50 000 m^3 per annum (Table 2.4).

Beach Nourishment

The option to artificially nourish the beach with sand from suitable borrow sources has been identified as the least environmentally intrusive method to protect the St Francis Bay coastline from further erosion. The aim of the beach nourishment will be to establish a minimum horizontal dry beach width of 40 m measured from the back of the beach (please refer to Appendix F for a detailed description of the proposed long-term protection solution). This additional sand will provide added protection from erosion as waves will dissipate their energy over this re-established sand beach before reaching the existing eroding area. Long term maintenance will be required to maintain the required beach level.

Revetment Structures

To prevent further sea breaching through the St Francis Bay beach spit during a strong storm surge event, revetment structures have been constructed by Kouga Municipality along the length of the beach spit as temporary coastal protection to prevent further erosion of the spit. This temporary revetment needs to be integrated within the long-term coastal protection scheme consisting of stub groynes and beach nourishment. The design of the temporary revetment needs to be reviewed so its suitability and long-term functionality can be assessed as the revetment would form an integral part of the long-term coastal protection infrastructure, and would be of the last defence against wave action, should the proposed re-nourished beach not be sufficient.

Stub Groynes

In order to retain the sand in the nearshore and beach area following the implementation of beach nourishment, and to promote increased sedimentation in the future, six (6) stub groynes will be constructed along the length of the beach. These stub groynes will extend from the back end of the beach and reach a length of between 170m and 200m offshore (Figure 2.6 and Figure 2.7). The stub groynes will be angled perpendicular to the shoreline (except groyne 5 which is oblique), and will be shorter than full length groynes which are generally used for erosion prevention. The shorter (stub) groynes will allow a certain percentage of sediment (expected to be approximately 50% of the long shore drift) to pass between each groyne. This is to facilitate sand movement through the longshore drift process since it is not the intention of the project to trap all sediment moving along the coastline. Maintaining this sand movement along the coast is also anticipated to mitigate for the potential of accelerated erosion "downstream" of the groynes, particularly of the northern most groyne. In addition to the natural movement of sediment, nourishment of the shoreline in the lee of the northern most groyne will be included as part of the project. The volume of sediment will be monitored and re-nourishment will be carried out and form part of the annual maintenance regime.

A maximum of approximately 44 300 m^3 of rock material will be required for the proposed stub groynes. The rock material used for the groynes will be sourced from a licenced local quarry, the details of which will be subject to availability and grading of rock material, and will become known during the implementation stage of each phase of the project.

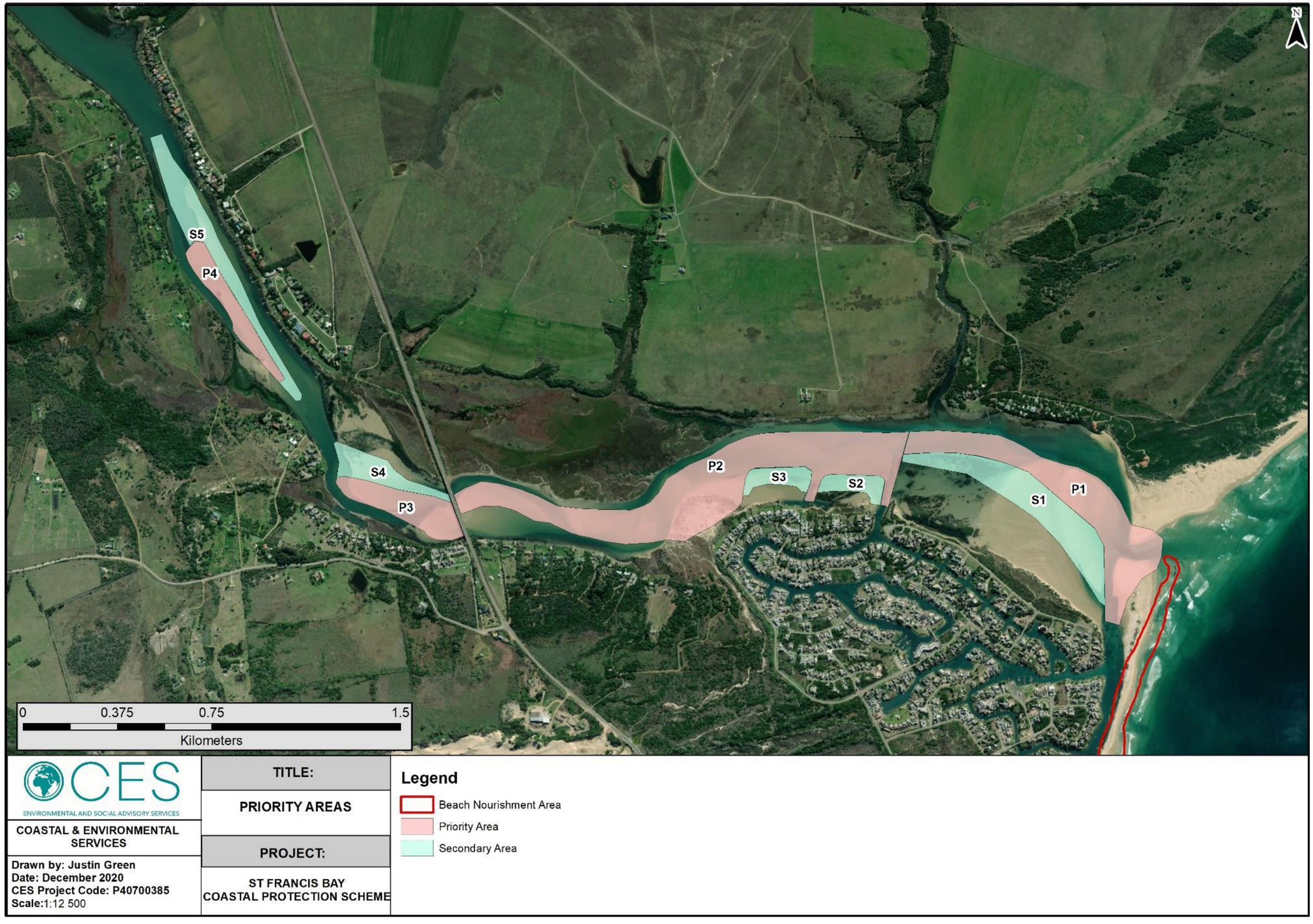


Figure 2.5 Potential areas to be used to source sand material.

2.4 Phases of the Development Process

A phased implementation of the abovementioned coastal beach protection infrastructure will most likely be required due to financial constraints. Should funding for the full scheme be available at the time of construction then the full scheme will be developed. However, the design of the scheme is such that each phase can be regarded as a standalone project, allowing for funding for additional phases to be sourced prior to their construction.

The advantage associated with a phased approach is that the performance of the first groyne(s) can be assessed, and any desired adjustments can be made to groynes constructed in the subsequent phases. The phased implementation is based on five (5) areas along St Francis Bay beach (Figure 2.6). Area 1 will consist of a 650 m length of beach which will undergo beach nourishment as well as the construction of two (2) 200 m long groynes, one at each end. The long shore drift is northwards, and it is therefore sensible to construct the northernmost groynes first to intercept the transported sand (Figure 2.7). Area 2 will consist of 470 m of beach with one (1) groyne 170 m long and Area 3 a 340 m length of beach with two (2) groynes of 170 m in length. Areas 4 and 5 are flanked by the groynes constructed during previous phases and are 280 m and 390 m long respectively. Area 5 also includes a groyne 170 m long. This phased approach will ensure that construction of infrastructure in any phase will only commence when sufficient funding for that particular phase has been secured, thus negating the risk of partially constructed infrastructure.

In order to widen the beach by 40 m with the use of beach nourishment only, a total of between 850 000 to 1,2 million m^3 of sand material would be required (depending on the losses and the state of the beaches at the time of nourishment). Table 2.3 presents the estimated volume of material required for each stage.

Table 2.3: Total initial nourishment requirements of each phase of the coastal protection scheme.

Nourishment Phase	Estimated Initial Sand Volume Required (m^3)
Phase 1	259 000 - 361 000
Phase 2	166 000 -247 000
Phase 3	167 000 - 205 000
Phase 4	78 000 - 134 000
Phase 5	182 000 - 235 000

The operational phase material is considered a top up of the construction material and dependent on the erosion of material from the beach. The volume of sand required for maintenance will differ as the project progresses through the various phases, but will be limited to a maximum of approximately 25 000 m^3 to 50 000 m^3 per annum (Table 2.4). This material is anticipated to be available from the Kromme Estuary.

Table 2.4: Anticipated annual maintenance requirements at the completion of each phase of the coastal protection scheme.

Nourishment Phase	Cumulative maintenance requirement	
	From	To
Annual Maintenance at Completion of Phase 1	8 000	16 000
Annual Maintenance at Completion of Phase 2	13 250	26 550
Annual Maintenance at Completion of Phase 3	17 550	35 200
Annual Maintenance at Completion of Phase 4	20 350	40 850
Annual Maintenance at Completion of Phase 5	24 950	50 050

As detailed below, similar equipment and construction methodologies are anticipated for both construction and operational phases with the scale of the activity being reduced during the "operational" phase.

2.5 Construction methodology

In this section potential methodologies are described for the construction of the groynes, beach nourishment and revetment construction. Specific construction methods employed will be finalised through the procurement of a contractor for each phase of the project.

The potential methodologies described below include sourcing of material, transporting, stockpiling and the incorporation thereof into the works. It is likely that the project will be implemented in phases, as funding becomes available. The methodology comments on the duration of each of the phases with an estimated timeframe should the project be implemented without the phases. It is worth noting that there may be a number of years between each of the phases. Therefore, each phase should be considered a discreet project in itself and assumed that all activities and associated machinery will be mobilised and demobilised for each phase. This is expected for both the beach nourishment and the groyne development.

Similarly, potential methodologies to be employed during maintenance of the infrastructure is described below.

2.5.1 Construction stage:

The following activities are envisaged during the construction stage:

2.5.1.1 Groyne construction:

Rock for the construction of groynes will be obtained from nearby commercial quarries. The rock will be transported by truck via the R330 provincial road to St Francis Bay and then along the internal road network through St Francis Bay to a potential stockpile area or to access points onto the beach at George Road Parking Area and/or a temporary access point at Aldabara Road Parking Area. The rock will be further transported along the beach to the groyne positions where it will be placed by way of back-tipping and placing the material by excavators, where needed.

This activity will most probably be affected by tides and is expected to be limited to approximately 6 to 8 hours per day. The rate of construction is expected to be in the order of 240 m^3/day. Depending on the size of the trucks approximately 30 - 40 truckloads per day will be required and depending on the haul distance it is envisaged that approximately 10 trucks will be used. The expected duration of this part of the work is:

- For Phase 1: 3 Months
- For Phase 2: 2 Months
- For Phase 3: 3 Months
- For Phase 5: 2 Months
- Should the complete solution be implemented without phasing (highly unlikely): 8 Months

2.5.1.2 Beach nourishment:

Sand will be sourced from the Kromme River Estuary by way of dredging. To ensure that dredging of the estuary is undertaken in a manner which does not significantly alter the current orientation of the

existing main estuarine channel, the dredging will have to be undertaken from the existing channel outwards.

A dredger or dredgers with a combined capability to deliver between 250 - 300 m^3 sand per hour will be required. There are various types of dredgers available (i.e. cutter suction, jet suction, bucket) that would be suitable for this type of work. The depth of the water will limit the size of the vessels since the vessels will require a shallow draft. While a suitable dredger will be decided upon by a contractor it is likely the dimensions of the dredger will be in the region of 21 m long, 4.8m wide and 1.4 m of hull. It may or may not be self-propelled and likely to have spud legs to secure it.

It is expected that in-line booster pumps will be employed when sand is transported over long distances. The discharge pipes are expected to range between 250 mm to 350 mm in diameter. Depending on the nature of the pumps it is likely that the pumps would occur at intervals of 1 000 m. The sand will be dredged through pipelines along the channel attached to buoys or in places it may be placed on sandbanks.

The noise level associated with the dredging and nourishment activity is expected to be approx. 80 dB at source. Depending on the size of the booster pumps, noise levels are expected to be 92 dB at source, reducing down to 60 dB at 500 m (ICF Jones and Stokes, 2008). To provide context normal conversation is about 60 dB, a lawn mower is about 90 dB, and a loud concert is about 120 dB.

Dredged sand may be spread along the beach using equipment such as a dozer.

Assuming that dredging for the construction phase will take place 8 hours per day, 5 days per week, the expected duration of this part of the work is:

- For Phase 1: 8 Months
- For Phase 2: 5 Months
- For Phase 3: 4 Months
- For Phase 4: 3 Months
- For Phase 5: 5 Months
- Should the complete solution be implemented without phasing (highly unlikely): 16 Months.

It may be that it becomes feasible to transport sand by truck from the upper reaches of the source area identified in the Sand Sourcing Specialist Study. In such a case it is envisaged that the sand will be dredged to a suitable point, where it will be loaded by a loader or TLB onto trucks. The trucks will then transport the sand along the internal road network of St Francis Bay onto the beach. This option is not really envisaged, and if it is employed, it is expected to be relatively limited.

It is envisaged that limited clearing of vegetation, as well as separation of vegetation and debris from the sand will be required at the mouth of the Sand River, and that this vegetation and debris will have to be spoiled at an approved spoil site. Such clearance will be done using mechanical equipment such as excavators or TLB's, and the material will have to be loaded onto trucks and transported off-site. It is foreseen that this will be a limited operation.

2.5.1.3 Revetment construction:

This activity will pertain to the revetment for the spit area. This revetment may be a rock revetment, a geotextile sand container revetment or a composite revetment (rock / geotextile sand container revetment).

Rock for the construction of a rock revetment will be obtained from nearby commercial quarries. The rock will be transported by truck via the R330 provincial road to St Francis Bay and then along the internal road network through St Francis Bay to a potential stockpile area or to an access point onto the beach at George Road Parking Area or via a temporary access point at Aldabara Road Parking Area. The rocks will be further transported along the beach to the position where it will be placed against the spit sand dune.

The activity may be affected by tides and is expected to be limited to approximately 6 to 8 hours per day. The rate of construction is expected to be in the order of 65 m^3/day. Depending on the size of the trucks approximately 11 truckloads per day will be required and it is envisaged that approximately 3 trucks will be used. The expected duration of this part of the work is 3 months.

Sand for a geotextile sand container revetment will be taken from the beach or be dredged from the canal system, and this activity can take place 8 hours per day. A fairly small dredger can be employed to fill the geotextile containers should sand from the canals be used.

2.5.1.4 Storage of plant and equipment:

A suitable open area on disturbed land, available at the time of construction of any phase, should be identified prior to tender stage for the Contractor's camp. This area must be sufficient and suitable to house overnight the contractor's plant, such as trucks, loaders, TLB's and the like.

If the dozer used to spread the sand on the beach is stored on the beach overnight, then such storage area must be safely barricaded or fenced to ensure safety of the public.

2.5.1.5 Stockpiling of material:

It may be that it would be necessary to stockpile rock, should the quarry supplying the rock blast a specific rock size required for the project and removal thereof be required because of limited storage at the quarry. In such a case a suitable open area on disturbed land, available at the time of construction of any phase, should be identified prior to tender stage for such temporary stockpiling of rock. The area should be fenced off and access controlled to ensure public safety.

2.5.2 Maintenance:

Annual maintenance of the infrastructure will be required. This will mainly entail sand nourishment necessary to ensure that the beach width and level remain stable. It will be a dredging operation, using sand obtained from the Kromme Estuary and the canal system. It will not be a continuous operation, but will be performed from time to time, influenced by the requirement for sand on the beach. The point of sand sourcing will change, depending on where dredging is required to ensure navigability of the estuary and canal system. It may be necessary to use mechanical equipment from time to time to spread the placed sand along the beach.

Ad hoc maintenance of the groynes and revetment may also be required over the design life of the infrastructure, but this is not expected to happen at regular intervals.

Assuming that dredging for the operational phase will take place 8 hours per day, 5 days per week, the expected duration of this part of the work is:

- At completion of Phase 1: Between 2 and 4 weeks
- At completion of Phase 2: Between 3 and 5 weeks
- At completion of Phase 3: Between 4 and 7 weeks

- At completion of Phase 4: Between 4 and 8 weeks
- At completion of Phase 5: Between 5 and 10 weeks

Dredging for maintenance purposes will take place from areas in the river and canals where build-up of sand has taken place, and dredging in any particular area in the river and canals will probably be limited to a period of less than two weeks. As noted earlier it is possible that there would be a number of years between phases and therefore, maintenance dredging will take place as required for each of the phases as completed.

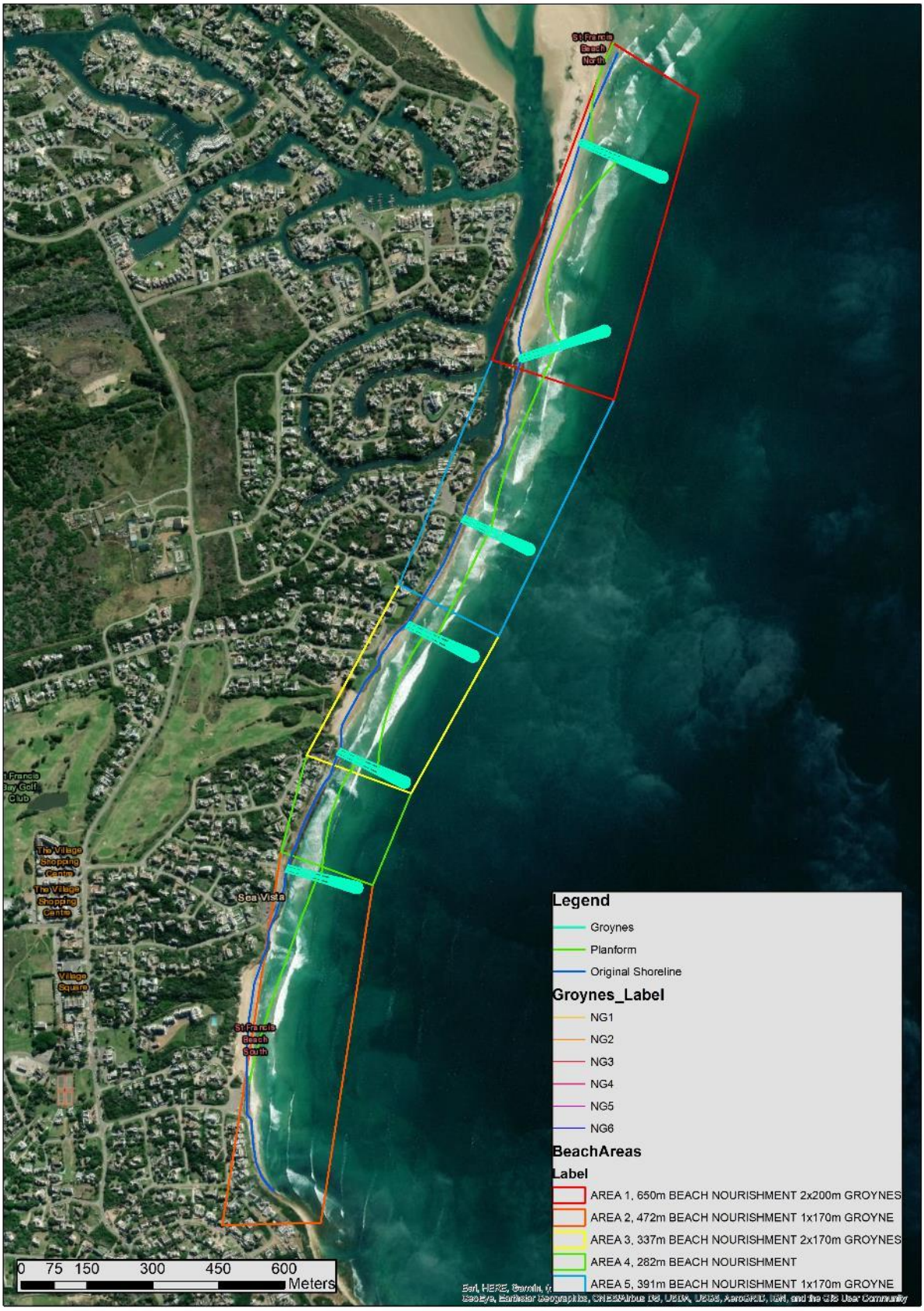


Figure 2.6: Proposed layout for the stub groynes.

Figure 2.7: General layout of proposed coastal protection infrastructure.

3 ALTERNATIVES

According to Appendix 3, Section 3 (1), of the 2014 EIA Regulations (as amended), "an environmental impact assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include—

(g) a motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report;

(h) a full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including:

(i) details of the development footprint alternatives considered;

(ix) if no alternative development footprints for the activity were investigated, the motivation for not considering such; and

(xi) a concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report;

(n) the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;

3.1 Reasonable and feasible alternatives

Alternatives should include consideration of all possible means by which the purpose and need of the proposed activity could be accomplished. The no-go alternative must also, in all cases, be included in the assessment phase as the baseline against which the impacts of the other alternatives are assessed. The determination of whether the preferred activity or site location is appropriate is informed by the specific circumstances of the proposed project and its environment.

"Alternatives", in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to—

(a) the property on which or location where it is proposed to undertake the activity.
(b) the type of activity to be undertaken.
(c) the design or layout of the activity.
(d) the technology to be used in the activity.
(e) the operational aspects of the activity.
(f) the option of not implementing the activity.

There are two types of alternatives: Fundamental Alternatives and Incremental Alternatives.

3.2 Fundamental Alternatives

Fundamental alternatives are developments that are entirely different from the proposed project and usually involve a different type of development on the proposed site, or a different location for the proposed development.

3.2.1 *Location alternatives*

The proposed project location occurs along the St Francis Bay beach. There are no alternatives to the location of the beach nourishment activity as this is determined by the need to prevent further erosion from occurring along the St Francis Bay beach, to protect existing infrastructure and properties and to restore the beach as an amenity for the community.

3.2.2 *Sand sourcing alternatives*

The alternatives for the sources of sediment were assessed (see Appendix I). In order for beach nourishment to be implemented, sand must first be obtained from a suitable source area. The identification of a suitable source area is based largely on finding an area where sand will consist of similar grain size to that which is required on the beach, as well as being technically and financially feasible to extract and place along the beach. The Kromme River estuary has been identified as the most accessible potential sand source which also is likely to contain the volume of sand required for the proposed beach nourishment.

In 2002, Entech undertook a study of the potential sand sources for beach nourishment, concluding that the two most viable sources were the Sand River dunes and the Kromme Estuary. The extraction of sand from the lower intertidal sand flats of the Kromme Estuary was considered sustainable due to the flood dominated character of the estuary, caused by the damming of the upper reaches and resulting in consequent sand build-up in the lower reaches. At that stage, a total of 500 000 m^3 was the estimated requirement for beach nourishment.

The Sand River dunes have since been declared as a protected area and are therefore no longer considered a viable source of sand material. According to ASR (2006), the Kromme River has previously been used as a source of 'sporadic and un-sustained sand and approximately 600 000 m^3 of sand is available for beach nourishment'.

Other alternative sand sources include the use of sand from an off-shore source, the marina canal system and/or material from an external source. Off-shore sources have been considered previously. However, the conclusion with those studies suggested that using the material from an offshore source would have high cost implications due to the off-shore dredging and pumping operations. The marina canal system requires dredging on a regular basis. The material within the marina system is likely to be suitable but the volume available would not be sufficient for the required beach nourishment project. Other alternative sources that have been proposed by several parties include sand material from Oyster Bay and from the port of Port St Francis. Both these alternatives do not provide sufficient material and the cost of transporting 1 m^3 of material would be significantly more than that obtained from the Kromme Estuary.

For example, Advisian has, on Page 78 of their report in Appendix F, estimated the cost of sand pumping (read dredging) to be R58-85/m^3. Escalated to current costs this amounts to approximately R65/m^3.

Trucking sand from Oyster Bay will cost in the order of 25km @ R15/m^3.km which equates to a transport cost alone of R375/m^3.

Trucking sand from Paradise Beach (Jeffrey's Bay) will cost in the order of 22 km @ R15/m^3.km which equates to a transport cost alone of R330/m^3.

Within the Kromme Estuary, three (3) potential locations, based on proximity to the site, were identified as the sand source for the proposed beach nourishment:

1. The sand bank located at the Kromme River mouth;
2. The sand bank located at the Sand River mouth; and
3. The Kromme River channel.

It was proposed that more than one of these sources be used depending on sediment availability, suitability and feasibility. A separate study, compiled by CES (Appendix I), considered these three sand source areas and determined whether one (1) or more of these areas would be required in order to satisfy the volume requirements of the proposed beach nourishment.

The advantages and disadvantages of each location alternative were assessed on a broad scale and presented here (Table 3.1). Further information is contained in the Sand Sourcing Specialist Report in Appendix I.

Table 3.1: Assessment of preliminarily identified sand sources.

Sand Source Alternative	Location Illustration	Potential Advantages	Potential Disadvantages
Sand bank located at the Kromme River mouth		• Close proximity to the St Francis Bay beach (will require less transportation); • Is a suitable sand source (similar grain size properties); • Improved navigability of the lower reaches of the Kromme River channel; • Limited environmental impact.	• Volume of sand material may be insufficient; • Popular recreational beach area; • No improvement to navigability of the middle and upper reaches of the Kromme River channel.
Sand bank located at the Sand River mouth		• Limited environmental impact, but there will be loss of pioneer dune vegetation; • Improved navigability of the middle reaches of the Kromme River channel; • No disturbance to popular recreational beach area; • Sand is a suitable source for beach nourishment.	• Volume of sand material may be insufficient; • No improvement to navigability of the upper and lower reaches of the Kromme River channel; • Relatively further from the St Francis Bay beach (will pose transportation and access challenges)

Sand Source Alternative	Location Illustration	Potential Advantages	Potential Disadvantages
Kromme River channel		• Will improve the navigability of the Kromme River channel; • Likely to provide sufficient volume of sand material; • Fewer ongoing transportation and access challenges; • Limited disturbance to popular recreational beach area.	• Long distance and hence potentially costly pipelines required.

The conclusion was that the sediment within the Kromme Estuary and particularly those sites identified as source sites contained similar grain size to that of the St Francis Bay beach. This suggests that the sources in the Kromme are compatible with the beach and suitable for nourishment.

Certain contaminants such as clays and ash could have an effect on the suitability of the source. However, vegetation is easily separated. The separation of the vegetation from the sand will affect the cost of the operation, but will not prevent the sand from being a suitable source for beach nourishment.

In addition to the grain size, the sources within the Kromme Estuary are anticipated to be able to provide the volume of sediment required for the nourishment of the beach (approx. 854 000 m^3) as well as the ongoing maintenance (between 25 000m^3 and 50 000m^3 per annum). These areas were further refined during the scoping phase of the project and classified into priority and secondary areas based on whether material would be dredged from the channels or from the sandbanks within the estuary (Figure 2.5). Comments from Interested and Affected Parties were also considered and further refinement of the boundaries of these areas were made. For example: the priority areas in the channel were moved away from the Northern Banks to reduce the potential for impacts to the northern banks and the saltmarsh vegetation. The secondary areas, mostly associated with sandbank features were also modified to accommodate the amenity that these areas provide for local community members.

3.2.3 *Activity Alternatives*

Due to the increasing need to protect the St Francis Bay beach and public and private property from ongoing erosion, and to restore the beach as an amenity, the activity of beach nourishment and construction of coastal protection infrastructure (stub groynes) is the only reasonable and feasible activity identified for this project. This conclusion is based on the results of the Advisian Design Report which incorporated a number of design standards and best practice guidelines, as presented in Box 3.1 below. No other activity alternatives will be assessed further in this study.

Box 3.1: Design Standards and Best Practice Guidelines incorporated into the Advisian Design Report (after Advisian, 2018).

STANDARDS:

- BS 6349-1:2000. British Standards for Maritime Structures: Part 1 Code of practice for general criteria.
- BS 6349-2: 1988. British Standards for Maritime Structures: Part 2. Design of Quay wall, jetties and dolphins.

- BS EN 1997. Eurocode 7: Geotechnical design.
- BS EN 1992. Eurocode 2: Design of Concrete Structures.
- BS EN 1993. Eurocode 3: Design of Steel Structures.
- BS EN 1998. Eurocode 8: Design of structures for earthquake resistance.
- UK National Annex to BS EN1997- Eurocode 7: Geotechnical design – Part 1: General rules.
- BS EN 13383 Parts 1 and 2 European Armourstone Specification.
- SANS 10160 Basis for structural design
- SANS 10100-1 Structural use of concrete

BEST PRACTICE GUIDELINES:

- The Rock Manual: the use of rock in hydraulic engineering (2nd edition), C683, CIRIA. London (CIRIA, CUR, CETMEF, 2007).
- Wave overtopping of sea defences and related structures: Assessment Manual. Environment Agency, UK www.overtopping-manual.com (EurOtop, 2007).
- Coastal Engineering Manual, US Army Corps of Engineers, 2003.

3.3 Incremental Alternatives

Incremental alternatives are modifications or variations to the design of a project that provide different options to reduce or minimise environmental impacts. There are several incremental alternatives that can be considered, including:

- The design or layout of the activity;
- The technology to be used in the activity;
- The operational aspects of the activity.

3.3.1 *Layout Alternatives*

This pertains to the layout of the proposed development of coastal structures to retard the erosion of St Francis Bay beach (i.e. the construction of stub groynes along the length of the beach). A number of specific layout alternatives have been considered (Table 3.2).

Table 3.2: Assessment of preliminarily identified layout alternatives (after Advisian, 2018).

Layout Alternative	Location Illustration	Potential Advantages	Potential Disadvantages
Beach Nourishment Only		• Soft solution (no hard structures) • More economical • Simple construction • Aesthetically attractive • Least environmental impact	• Sand expected to be lost more rapidly • Highest maintenance requirement • Initial high levels of erosion • Possibly not a long term solution due to inadequate supply of sand for ongoing nourishment

Layout Alternative	Location Illustration	Potential Advantages	Potential Disadvantages
Beach Nourishment And Groynes		• Prevents loss of sand deposited through nourishment • Encourages sedimentation and deposition of sand on the beach and within the nearshore area • Limits loss of sediment from St Francis Bay system, and hence offers a long-term solution	• Expensive • Not suited for near perpendicular wave attack • Can induce new local currents or change local current patterns • Can cause downdrift erosion • Interrupts traversing of beach
Beach Nourishment And Offshore Breakwaters		• High level of coastal protection • Less beach maintenance expected	• More complex constructability • Larger volumes of sand nourishment required • Large visual impact • May cause hazardous rip currents • Very expensive • High level of environmental impact on the marine system
Beach Nourishment and Oblique Groynes		• Moderate level of coastal protection • Additional area behind headland would be protected and could be used to create amenity features • Angled alignment ensures some beach areas would be stable • Offers both partial longshore and cross-shore transport control	• Some beach maintenance required • Expensive • Can induce new local currents or change local current patterns • Moderate environmental impact

Layout Alternative	Location Illustration	Potential Advantages	Potential Disadvantages
Beach Nourishment and Short Stub Groynes		• More economical than other options. • Angled alignment ensures some pockets will be stable • Low environmental impact • Staged approach makes it more financially feasible	• Lower level of coastal protection • Beach maintenance required • Sand in some stretches of coast will not be retained by coastal structures • Moderate to low environmental impact

The Advisian preliminary design report outlined a number of potential layout alternatives, of which the most feasible has been adopted for this project (Beach Nourishment and Short Stub Groynes, specifically Option 1B in Figure 3.2 above). At present the design layout in Figure 2.6 and 2.7 in Chapter 2 shows the most accurate and effective representation of the proposed development layout.

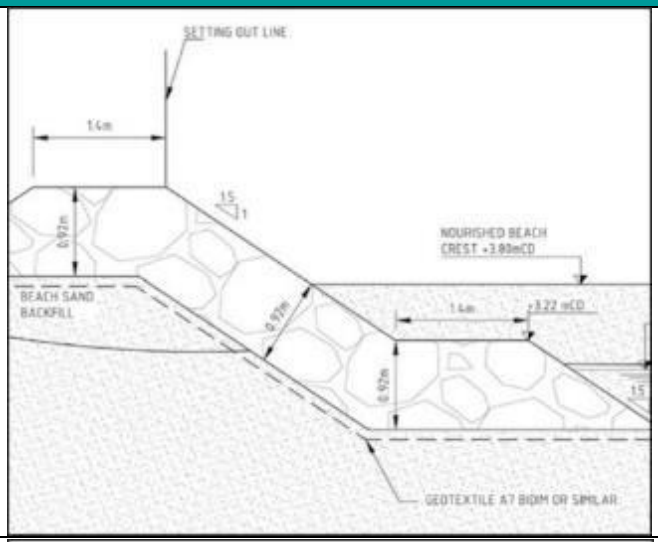
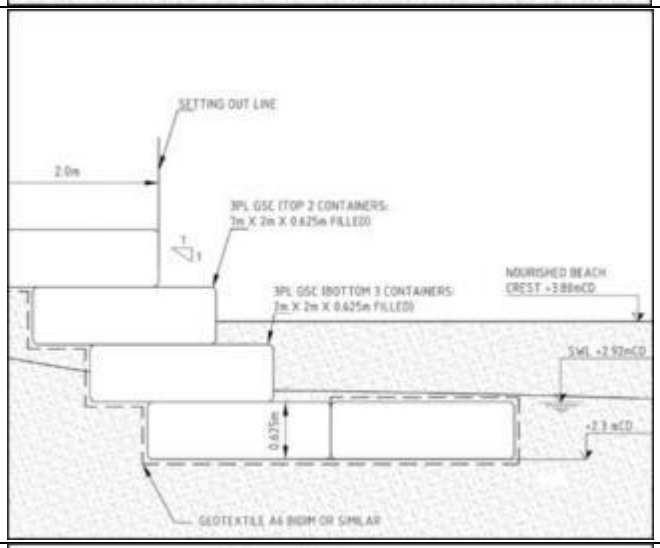
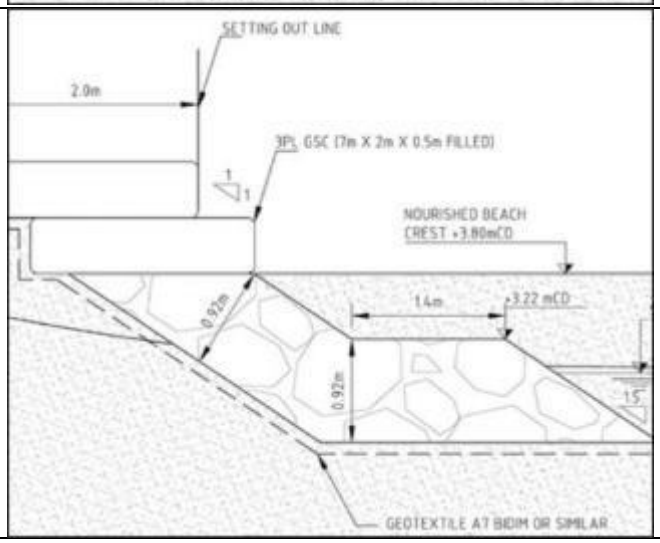
Comments regarding the orientation (angle) of the groynes as well as the positioning of the groynes were received from the community and amendments made accordingly. These amendments are reflected in the latest design drawings in Chapter 2 and supported by supplementary design reports in Appendix F.

3.3.2 *Technology Alternatives*

As the activity is related to the protection of the St Francis Bay coastline by means of beach nourishment and construction of coastal protection infrastructure (stub groynes), the most appropriate construction methods will be used based on what is available in terms of equipment and materials at the time of commencement of each phase of the project. The technology used for the maintenance of the beach infrastructure (operational phase) will depend on what is available on the market at the time.

The Kouga Local Municipality constructed an emergency revetment during 2020 in response to breaches of the spit. This emergency revetment is vulnerable and could be undermined or damaged at any time by wave activity and storm surges. Advisian will evaluate the condition of the emergency revetment when the long term coastal protection scheme is implemented, and incorporate it appropriately in their detail design (Table 3.3).

Table 3.3: Assessment of preliminarily technology alternatives for the revetment structures (after Advisian, 2019).

Revetment Alternative	Revetment Design	Potential Advantages	Potential Disadvantages
Rock revetment solution		• Guaranteed design life • Shorter construction duration • Proven to work efficiently along St Francis Bay when properly designed and maintained.	• Less aesthetically attractive • More construction vehicles required on beach
Geotextile sand container (GSC) revetment		• Soft solution (no hard structures) • More aesthetically pleasing • Easily disassembled • Less construction vehicles required on beach • Procured GSCs are available for use	• No design life guaranteed and tends to be short term solution in harsher wave conditions. • Highest cost • Longer construction duration • More complex constructability • More maintenance required • Vulnerable to vandalism
Composite revetment option		• More aesthetically attractive • Procured GSCs are available for use • Lowest cost	• Longer construction duration • More maintenance required • Vulnerable to vandalism

3.3.3 *Operational Alternatives*

The operational phase of the project will consist of activities related to the maintenance of the proposed beach infrastructure, which may include repair work, additional beach nourishment, ongoing dredging and continued monitoring of the beach erosion. It is envisaged that the dredging undertaken during the operational phase will be similar to that of the construction phase (albeit on a much smaller scale, non-continuous, and using smaller dredgers) and therefore the impacts associated with dredging will be similar to that of experienced during the construction phase.

It is considered that the maintenance material can be obtained from the Kromme Estuary (See Appendix I). Should other suitable sand sources be identified during the operational phase of the scheme these will be investigated. If necessary, additional environmental authorisations would be sought to allow the use of such material during beach maintenance activities.

This will be the only operational alternative relevant to the project and, therefore, this EIR has not considered any other operational alternatives.

3.4 Preferred Alternative

The preferred alternative considered in this EIR involves the implementation of the proposed coastal protection scheme, which will include sand material sourced from the Kromme River, beach nourishment of St Francis Bay beach and the development of coastal structures to retard the erosion of St Francis Bay beach and to project the beach spit. The preferred alternative was determined by the SFPO NPC, in conjunction with the Kouga Local Municipality, coastal engineers (Advisian), and CES. The impacts associated with the various location and technology (revetment) alternatives will be assessed in this EIR.

3.5 No-Go Alternative

It is mandatory to consider the “no-go” option in the EIA process. The no-action option assumes that no sand sourcing is conducted and therefore no beach nourishment is implemented, as well as no coastal protection infrastructure is constructed along the St Francis Bay beach. This was predicted to result in the continued erosion of the St Francis Bay beach with potential damage to backshore infrastructure and properties, which will have significant negative ecological impacts on the dune and beach system, and the Kromme River mouth and estuary.

In 2020, these risks were realised and the spit at St Francis Bay breached on four occasions. The breaches occurred during periods of high tides and storm swells which resulted in strong currents and large waves. The breaches resulted in the infrastructure on and in the marina being directly exposed to the ocean and resulted in damage.

Environmentally, large areas of dune habitat has been lost with much of the sand on the beach being reworked to repair the breach on each occasion.

The no-go alternative will be assessed in an objective manner as part of this EIR.

4 PROJECT NEED AND DESIRABILITY

According to Appendix 2, Section 2 (1) of the 2014 EIA Regulations (as amended), a "*scoping report must contain the information that is necessary for a proper understanding of the process, informing all preferred alternatives, including location alternatives, the scope of the assessment, and the consultation process to be undertaken through the environmental impact assessment process, and must include—*

(f) a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location."

4.1 Alignment with National Development Plans

The National Development Plan - The 2030 National Development Plan (NDP, 2013) places emphasis on the development of economic infrastructure including water resources and services and states that "*water will be recognised as a foundation for activities such as tourism and recreation, reinforcing the importance of its protection*." A key development policy outlined under economic infrastructure is that of tourism infrastructure, including accommodation and tourism products, which will play an important role in attracting a variety of tourists to different parts of South Africa. It also outlines the importance of ensuring environmental sustainability while allowing for the delivery of cultural benefits, including recreational opportunities, in order to achieve the national social and economic development objectives. The main goal outlined in the NDP is to boost economic growth, increase employment opportunities and reduce overall poverty.

Operation Phakisa - In order to ensure the implementation of the NDP, the South African government initiated Operation Phakisa. This initiative encourages government and stakeholder engagement and provides a framework for the setting of concrete plans and targets, as well as ongoing monitoring, to ensure the achievement of the objectives set out by the NDP. Operation Phakisa translates detailed plans and objectives into identifiable results. In 2013, Operation Phakisa launched the Oceans Economy Lab in order to unlock the potential of South Africa's extensive coastline, thereby contributing to employment creation and improving the country's GDP. It focuses on six (6) priority growth areas, namely (1) marine transport and manufacturing work stream, (2) offshore oil and gas exploration, (3) the aquaculture work stream, (4) marine protection services and ocean governance work stream, (5) small harbours work stream and lastly, and (6) the coastal and marine tourism work stream.

The nourishment of St Francis Bay's beach therefore aligns itself with the Operation Phakisa's Ocean Economy, particularly focus area number 6, the coastal and marine tourism work stream. The aim of the coastal and marine tourism work stream is to "*identify high impact, coastal tourism initiatives, interventions and projects*". Due to the threat posed by coastal erosion on the high tourism value of the recreational amenity that is the St Francis Bay beach area, the proposed development can be regarded as a 'high impact, coastal tourism initiative, intervention or project' as defined by the coastal and marine tourism stream of Operation Phakisa's Ocean Economy Lab. Phakisa projects are focussed on development of coastal towns with approximately R 20 million designated for the Eastern Cape province.

The Kouga Local Municipality submitted a proposal to the Phakisa representatives for several projects in St Francis Bay, including the proposed coastal protection infrastructure. In addition, the rural development strategy for the transformation of society and creation of equal opportunities aims to ensure that job creation is achieved in various sectors including the tourism sector (NDP, 2013). The proposed nourishment of St Francis Bay's beaches aligns itself with the NDP (2013) as it will be contributing to job creation, tourism, and environmental sustainability, thereby promoting social and economic development.

National Coastal Management Programme - This project, which will take place within Coastal Public Property, is not a programme but a specific intervention with goals aligned to the provisions of the ICMA. It is to improve access to the coastline, improve its recreational value; ensure that the coastlines coastal protection functions can continue; and assist in protecting natural and built assets from sea level rise. In the absence of a local CMP the project must align with the ICMA and the National Coastal Management Programme of South Africa. Note that the District level CMP has been finalised.

The majority of the project (i.e. the borrowing of material, nourishment of the beach and construction of the groynes) will be below the highwater mark. This project is the protection of coastal infrastructure which supports important coastal and marine tourism, and aligns with priorities 1 and 2 of the National Coastal Management Programme, namely:

Priority 1: Effective planning for coastal vulnerability to global change (including climate change)

Goal: Ensuring that all planning and decision-making tools applied by all organs of state within the coast zone address coastal vulnerability by taking into account the dynamic nature of our coast, sensitive coastal environments, health and safety of people, illegal structures within coastal public property, and appropriate placement of infra-structure so as not to compromise investment by the state, as well as the rehabilitation of coastal ecosystems.
Management Objective 1.3: Rehabilitation of areas along the coast that have been adversely effected.

Priority 2: Ensuring equitable public access in the coastal zone

Goal: Ensuring that the public has safe and equitable access to coastal public property through the establishment of sufficient coastal access land that is cognisant of the sensitivity of coastal ecosystems, the needs and livelihoods of coastal communities or other socio-economic considerations, as well as the removal of inappropriate and unsafe coastal access points.
Management Objective 2.3: Provide capacity strengthening mechanisms for municipalities to effectively implement, maintain and monitor coastal access.

4.2 Alignment with Provincial Development Plans

Grounded in the NDP (2013), the Eastern Cape Vision 2030 Provincial Development Plan (PDP) (2014) outlines several strategic objectives to improve social development and increase economic growth, particularly through employment creation. The Eastern Cape's PDP (2014) also recognises the importance of the tourism industry and aims to grow and develop the tourism industry, as well as grow and develop the ocean economy. According to the PDP, over 70% of the Eastern Capes tourism is based in the coastal zone, with 52% of international tourism based around the Eastern Cape's beaches. In order to grow the provinces coastal economy, the need for coastal monitoring and protection is recognised (Eastern Cape Vision 2030 Provincial Development Plan, 2014).

Some of the Strategic Objectives and Actions outlined in the PDP include protecting the coast and other sensitive areas from environmental degradation, focusing on the development of domestic tourism, particularly beach holidays near Port Elizabeth, and upgrading beachfronts and associated tourism attraction throughout the province. Other sector strategies for the Eastern Cape include growing the eco-tourism industry, building stronger local tourism networks and taking advantage of the provinces extensive coastline.

The proposed project at St Francis Bay will assist with attaining the strategic objectives and actions set out in the PDP. It is also aligned with the Eastern Cape Vision 2030 Provincial Development Plan (2014) as it will contribute to employment creation and social development, tourism, coastal protection and maintenance of coastal infrastructure through preventing the loss and erosion of the St Francis Bay beaches and public and private land and amenities.

4.3 Alignment with District and Local Development Plans

The Sarah Baartman Coastal Management Programme was finalised in January 2020. The broad objectives, which have driven the development of management actions in the draft plan are listed below. Those to which the current project are aligned are shown in bold italics:

Natural, archaeological and cultural diversity and resource management

- Adopt a catchment management approach in coastal zone management.
- Apply a risk-averse approach in development planning, where high risk areas are avoided, and where important biodiversity areas, unique habitats, ecological processes and other natural areas are protected.
- ***Manage the coastal environment and its catchment area to be resilient to the impacts of climate change.***
- ***Allow ecological processes to function, and avoid disturbance to dynamic coastal areas.***
- Protect archaeological, cultural and heritage resources.
- Facilitate equitable and sustainable utilisation of natural resources.
- Promote collective responsibility and co-operative governance in managing the coastal zone, through education and awareness programmes, capacity building, and skills development.
- Facilitate information sharing and transparency to allow for participatory management of the coastal zone and informed decision-making.

Coastal Pollution

- Maintain good coastal water quality that is safe for recreational exposure and resource use, and that is needed by natural organisms to persist.

Coastal Development

- Plan for sustainable coastal development that protects natural habitats and archaeological/cultural/heritage features and the ecological processes that support these, and enhances the livelihoods and well-being of the local community.
- Prioritise low impact development that is suitable to the area, and retains 'sense of place'.
- ***The coast must be developed in a manner that allows for safe access and enjoyment by all people.***
- ***Coastal development must be designed to build resilience to the impacts of climate change and sea-level rise.***

The Kouga LM Integrated Development Plan (IDP) 2017-2022 lists several objectives in its mission statement. Among these objectives is "*to create a safe environment with diverse opportunities for economic growth and development*'. The proposed project will therefore assist in achieving this important objective by (a) decreasing the exposure of the beachfront and municipal infrastructure such as roads, access stairs and parking facilities to dynamic coastal processes, thereby increasing the safety and quality of the beachfront area; (b) decreasing the potential of shifting sand bars in the Kromme river, thereby increasing the navigation ability and safety of boaters; (c) increasing the width of the beaches, thereby promoting tourism and economic growth and development, and (d) preventing the loss of physical infrastructure in both the public and private sector by arresting the current rapid rate of beach erosion.

The IDP lists several municipal desired outcomes and development priorities required to improve local economic growth. One of the key performance areas is tourism and the objective within this sector is "*to create an enabling environment for economic growth that attracts investors and tourists, encourages innovation and facilitates pro-poor inventions*". The relevant priorities for this objective include employment and job creation, tourism and investment opportunities.

4.4 Project Desirability

The St Francis Bay beach is a major tourism attraction and contributes significantly to the Kouga Local Municipality's social and economic development, and its rates and taxes base. As noted earlier, over the 42 year period between 1975 and 2017, the high water mark of the St Francis beach retreated by 75 metres. As a result the beach, and the amenities it offers, has effectively been lost. Erosion of the vegetated sand spit is resulting in ecological impacts on the dune system. The system will continue to erode, as it is no longer in a dynamic state of equilibrium. This lack of equilibrium has resulted in the system being in a constant state of erosion.

This erosion has been caused by a number of factors, but primarily the stabilisation of the St Francis Bay headland bypass dune system in the 1970's, and the construction of two large dams in the catchment. The former has been reported on in scientific literature from as early as 1985 (see Lubke, 1985[1]). Stabilisation of the headland bypass dune reduced the amount of sediment blowing into the Kromme, which would then be flushed out to sea during flood event. A further cause was the establishment of the Impofu dam, which was completed in 1983, and numerous small impoundments on tributaries of the Kromme River. These dams have significantly reduced flow volumes and velocities, which in turn resulted in large amounts of sediment being deposited in the river and estuarine systems. Reduced flow and the large number of impoundments has restricted the frequency and velocity of high flow (flood) events, which would normally have occurred frequently enough to flush deposited sediment from the system. This sediment would have been deposited immediately offshore in a sand bar, with much of it being redeposited on St Francis Bay beach due to natural wave action.

Consequently, various interventions including a beach nourishment scheme, revetment construction and the construction of groynes is required to arrest the now rapid erosion of the beach, and ultimately restore it to its pre-erosion status, or at least to a condition that affords protection from storm attack, sea level rise and erosion events associated with these natural perturbations.

Studies on current and projected rates of erosion indicate that with sea level rise over a 50 year period, the current beach crest (at +3,8m above Chart Datum - CD) will recede by between 15 and 25m. This means the existing beach crest will 15 to 25m inland, but over-wash of sediment during storm events will reach 40m inland. This is likely to result in the complete loss of the current sand spit and Ski Canal,

[1] Lubke, RA (1985) Erosion of the beach at St Francis Bay, Eastern Cape, South Africa. Biol. Conserv.,32:99-127

and the likely loss of the houses on its banks (Advisian, 2018).

The ongoing erosion and eventual loss of the beach and dune system will have a number of potentially adverse effects, which are outlined and described below. As mentioned above a number of these risks were realised in 2020:

1. Decrease in the width of beaches and the consequent loss of area available for recreational activities;
2. Loss and erosion of the sand spit between the Kromme river and the Indian ocean that protects the popular St Francis Ski Canal and the marina;
3. Damage to infrastructure including roads, houses, parking bays, access stairs and ablution facilities located adjacent to beaches;
4. Decreased navigation ability of the river channel due to shifting sand bars, posing as a safety hazard for boaters;
5. Loss of a functional coastal dune system along the sand spit, and
6. Severe alterations to the Kromme River estuary with resultant significant ecological impacts on the system;
7. Loss of future residential development in the St Francis Bay area; and
8. The impact of the loss of potential employment in the Sea Vista settlement due to reduced development and fewer holiday makers.

Beach nourishment will ensure a beach wide and high enough to protect backshore infrastructure and properties, the groynes will reduce sand loss due to long-shore drift, and revetments will add to the protection of backshore infrastructure and properties.

The proposed coastal protection scheme therefore provides a viable solution for increasing the accumulation of sediment and decreasing the potential adverse effects listed above. The proposed project will ensure that local communities obtain employment during both the construction and operational phases of the project. This will include the creation of approximately thirty (30) temporary jobs during the construction phase and five (5) during the operation phase. In addition, by securing the recreational amenities, tourism will continue and permanent jobs in this sector and temporary employment in the domestic sector will be sustained. The proposed project therefore aligns itself with national, provincial, district and local development plans as well as the local spatial development framework. It will contribute to tourism, job creation and sustainable economic development. In addition, and as described in Section 4.2 of this report, this environmental process responds directly to the directive given in the EA issued by the DEDEAT on the 1st of June 2016.

The availability of suitable material within the Kromme Estuary provides an opportunity to reduce the distance and resources associated with the movement of material required for the beach nourishment. It also allows areas of the Kromme Estuary, which have become shallower over time, to facilitate greater movement of water during lower states of the tide. It also facilitates the ability for recreational and commercial vessels (boats, barges, etc.) safer passage throughout the lower reaches. While not a primary objective, facilitating safe vessel passage within the estuary is a benefit of the dredging activity.

The project is therefore regarded as very desirable, as it is required to protect both the natural and built capital of St Francis Bay.

5 RELEVANT LEGISLATION

According to Appendix 3, Section 3 (1), of the 2014 EIA Regulations (as amended), "an environmental impact assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include—

(e) a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context."

5.1 Overview of applicable legislation

The implementation of the proposed St Francis Bay coastal protection scheme will be subject to various South African legislative requirements. In addition to the environmental authorisation, there are other permits, contracts and licenses that will need to be obtained by the project proponent for the proposed project, some of which fall outside the scope of this S&EIR process. The relevant national legislation, policies and conventions to which South Africa is a signatory to, must be used to guide the proposed project in order to ensure that it remains fully legal and compliant (Table 5.1).

Table 5.1: Relevant Legislation.

Legislation	Relevance to the Proposed Project	Permit / Licence Required	Comment
ENVIRONMENTAL			
The Constitution of South Africa (Act No. 108 of 1996)	The developer has an obligation to ensure that the proposed activity is ecologically sustainable, will not result in pollution and ecological degradation while demonstrating economic and social development and upholding environmental rights.	-	-
National Environmental Management Act (NEMA) (Act No. 7 of 1998)	This S&EIR will be undertaken in terms of NEMA requirements. The applicant must be mindful of the principles, broad liability and implications associated with NEMA and must eliminate or mitigate any potential impacts.	-	-
Environmental Impact Assessment (EIA) Regulations, 2014 (as amended in April 2017)	The proposed project triggers the three lists of activities, published on 4 December 2014 (as amended on 7 April 2017), as Listing Notices GN R.983, R.984, and R.985 (as amended by R.327, R.325 and R.324). These Listing Notices define the activities that require, respectively, a Basic Assessment or an S&EIR process. Based on the NEMA EIA listed activities identified by EAP, namely the Listing Notice 2 (GN R.984, as amended by GN R. 325), the proposed project will be subject to the S&EIR process as stipulated in the Regulations. The relevant competent authority is the Eastern Cape Department of Economic Development, Environmental Affairs and Tourism (DEDEAT). This Assessment will be submitted to DEDEAT to ensure that the national environmental principles, fair decision making and integrated environmental management approach is applied throughout the process. The assessment and associated environmental management plan aims to prevent pollution and ecological degradation, promote conservation and secure ecological sustainable	✓	Environmental Authorisation required

Legislation	Relevance to the Proposed Project	Permit / Licence Required	Comment
	development and use of natural resources while promoting justifiable economic and social development, as outlined in the Act.		
The National Environment Management: Biodiversity Act (NEMBA) (Act No. 10 of 2004)	The project is located within the Eastern Cape in an area considered to be a Critical Biodiversity Area (CBA) which means there is potentially sensitive and potentially irreplaceable vegetation. To avoid and or mitigate threats to any endangered ecosystems all impacts on sensitive ecosystems will be assessed in detail during the EIA process to ensure the impacts of the proposed project are understood and can be mitigated. If the specialist assessments identify protected species on site that will be at risk due to project related activities, the developer will require the necessary permit(s) in terms of this act. The proposed activities could leave the project area susceptible to alien vegetation. To avoid alien vegetation from establishing on disturbed areas, appropriate measures will be implemented.	✓	A permit may be required for the removal of indigenous vegetation.
Conservation of Agricultural Resources Act (43 of 1983) & Subdivision of Agricultural Land Act (No. 70 of 1970)	The Act provides a list of declared weeds and invader plants as well as indicators of bush encroachment.	-	-
National Environmental Management: Waste Act (Act No. 59 of 2008)	Construction activities will generate construction related waste that will need to be disposed of at a registered landfill site if the waste cannot be recycled or reused. Waste generated will be dealt with in a manner compliant with the requirements of the Act.	-	-
National Water Act (NWA) (Act No. 36 of 1998)	The proposed project and its associated infrastructure will alter the bed, banks, course or characteristics of a watercourse. Once the layout is finalised and exact locations of the affected areas of the watercourse are confirmed, the developer will apply for the relevant water use authorisations from DWS. It is noted however, that estuaries do not fall under the jurisdiction of DWS and, instead, must be contemplated under the National Environmental Management: Integrated Coastal. Management Amendment Act (Act No. 24 of 2008, as amended).	TBC	The requirements in terms of Water Use Authorisations, if any, will be discussed with DWS

Legislation	Relevance to the Proposed Project	Permit / Licence Required	Comment
National Environmental Management: Integrated Coastal Management (ICM) Act (Act No. 24 of 2008)	The proposed project occurs within Coastal Public Property (CPP) as it aims to maintain the existing beach located in St Francis Bay. The roles and responsibilities of key stakeholders must be clearly defined to encourage ownership of the ICM goals. The potential impacts associated with the coastal environment will be identified and further assessed in the EIA phase of the project. The ICM Act provides for additional criteria that must be considered by the competent authority when evaluating an application for an activity which will take place in the coastal zone. The EIR must assess the potential risks and impacts that the natural environment will have on the proposed project in terms of storm surges, sea level rise and other coastal processes which occur in the area.	✓	The use of vehicles in a coastal protection zone and the reclamation of land, as well as the dredging of the Kromme Estuary, may require a permit (coastal lease) from the Coastal Conservation and Strategies Directorate of the Department of Environment Affairs (DEA), Oceans and Coast Branch.
	Measures affecting erosion and accretion 15. (1) No person, owner or occupier of land adjacent to the seashore or other coastal public property capable of erosion or accretion may require any organ of state or any other person to take measures to prevent the erosion or accretion of the seashore or such other coastal public property, or of land adjacent to coastal public property, unless the erosion is caused by an intentional act or omission of that organ of state or other person. (2) No person may construct, maintain or extend any structure, or take other measures on coastal public property to prevent or promote erosion or accretion of the seashore except as provided for in this Act.	-	-
20.(1) (h)	A municipality in whose area coastal access land falls, must describe or otherwise indicate all coastal access land in any municipal coastal management programme and in any municipal spatial development framework prepared in terms of the Municipal Systems Act;	-	-
48.(2)	Before adopting a programme contemplated in subsection (1)(a), a municipality must by notice in the Gazette invite members of the public to submit written representations on or objections to the programme in accordance with the procedure contemplated in Chapter 4 of the Municipal Systems Act	-	-
48. (4)	A municipality may prepare and adopt a coastal management programme as part of an integrated development plan and spatial development framework adopted in accordance with the Municipal Systems Act and if it does so, compliance with the public participation requirements prescribed in terms of the Municipal Systems Act for the preparation and adoption of integrated development plans will be regarded as compliance with public participation requirements in terms of this Act.	-	-

Legislation	Relevance to the Proposed Project	Permit / Licence Required	Comment
51	An environmental implementation or environmental management plan in terms of Chapter 3 of the National Environmental Management Act, an integrated development plan in terms of the Municipal Systems Act and a provincial or municipal land development plan must (a) be aligned with the national coastal management programme and any applicable provincial coastal management programme; (b) contain those provisions of the national coastal management programme and any applicable provincial coastal management programme that specifically applies to it; and (c) give effect to the national coastal management programme and any applicable provincial coastal management programme.	-	-
National Environmental Management: Air Quality Act (Act No. 39 of 2004)	The clearing of vegetation, excavations, stockpiles and transportation of materials might result in construction-related dust. It is expected to be below the dust control regulations of 2013 since mitigation measures will be implemented to reduce dust fall out. Dust control regulations were published under Government Notice R827 in Government Gazette 36974 of 1 November 2013.	-	-
SOCIAL			
National Heritage Resources Act (25 of 1999)	The project will be registered with South African Heritage Resource Agency (SAHRA) as well as the Eastern Cape Provincial Heritage Resources Authority (ECPHRA). A desktop heritage assessment must be undertaken to determine if heritage features occur on site and what level impact assessment (if any) maybe required. In the event that archaeological or historically significant sites would be destroyed, damaged, excavated, altered or defaced by the proposed project activity, the relevant permit will be granted before the project can continue.	-	-
Occupational Health and Safety Act (85 of 1993)	The developer must be mindful of the principles and broad liability and implications contained in the Operational Health and Safety Act and mitigate any potential impacts.	-	-
PLANNING			
National Road Traffic Act (No. 93 of 1996)	All the requirements stipulated in the NRTA will need to be complied with during the construction and operational phases of the proposed project.	-	-

5.2 The Constitution (Act No. 108 of 1996)

This is the supreme law of the land. As a result, all laws, including those pertaining to the proposed project, must conform to the Constitution. The Bill of Rights - Chapter 2 of the Constitution, includes an environmental right (Section 24) according to which, "*everyone has the right –*

(a) To an environment that is not harmful to their health or well-being; and

(b) To have the environment protected for the benefit of present and future generations, through reasonable legislative and other measures that–

(i) prevent pollution and ecological degradation.
(ii) promote conservation; and
(iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."

Relevance to the proposed project

The proponent has an obligation to ensure that the proposed project will:

- Not result in pollution and ecological degradation; and
- Be ecologically sustainable, while demonstrating economic and social development.

5.3 Local Government Municipal Systems Act (Act No. 32 of 2000)

The Municipal Systems Act is part of a series of legislation which aims to empower local government to fulfil its Constitutional objects. In 1998 the government issued a Local Government White Paper, which outlined a policy framework for local government. Later that year government passed the Municipal Demarcation Act, which enabled the re-demarcation of municipal boundaries; and the Municipal Structures Act, which defined the structures of local government. The Municipal Systems Act will complement these pieces of legislation, by regulating key municipal organisational, planning, participatory and service delivery systems. National government has also prepared the Municipal Financial Management Bill, which regulates municipal financial matters. Together, these pieces of legislation provide a framework for a democratic, accountable and developmental local government system, as envisaged by the Constitution.

The Local Government Municipal Systems Act (MSA) of 2000 Chapter 1; Interpretation; defines: "local community" or '"community", in relation to a municipality means that body of persons comprising (a) the residents of the municipality; (b) the ratepayers of the municipality, (c) any civic organisations and non-governmental private sector or labour organisations or bodies which are involved in local affairs within the municipality: and (d) visitors or other people residing outside the municipality who, because of their presence in the municipality make use of services or facilities provided by the municipality, and includes, more specifically, the poor and other disadvantaged sections of such body of persons.

MSA Chapter 4; Mechanisms, processes and procedures for community participation; section 17. (3) states: 'When establishing mechanisms, processes and procedures in terms of subsection (2) the municipality must take into account the special needs of (a) people who cannot read or write; (b) people with disabilities (c) women: and (d) other disadvantaged groups'.

Relevance to the proposed project

This project should provide proportionate and appropriate opportunity for all Interested and Affected Parties (I&APs as defined by NEMA) an opportunity to be informed of the details of the project and provided a mechanism in which they are able to provide feedback. This is included under the 2014 EIA Regulations (as amended) and referred to as the public participation process where I&APs can register their details and be involved in public meetings.

5.4 National Environmental Management Act (Act No. 107 of 1998, as amended)

The objective of the National Environmental Management Act (NEMA) is "*provide for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote cooperative governance and procedures for co-ordinating environmental functions exercised by organs of state; to provide for certain aspects of the administration and enforcement of other environmental management laws; and to provide for matters connected therewith*."

NEMA provides the basis for environmental governance in South Africa by establishing principles and institutions for decision-making on matters affecting the environment. A key aspect of NEMA is that it provides a set of environmental management principles that apply throughout South Africa to the actions of all organs of state that may significantly affect the environment. Section 2 of NEMA contains principles relevant to the proposed project, and likely to be utilised in the process of decision making by DEDEAT (Table 5.2).

Table 5.2: NEMA Environmental Management Principles.

(2)	*Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.*
(3)	*Development must be socially, environmentally and economically sustainable.*
(4)(a)	*Sustainable development requires the consideration of all relevant factors including the following:* *i. That the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied;* *ii. That pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;* *iii. That waste is avoided, or where it cannot be altogether avoided, minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner.*
(4)(e)	*Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle.*
(4)(i)	*The social, economic and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated, and decisions must be appropriate in the light of such consideration and assessment.*
(4)(j)	*The right of workers to refuse work that is harmful to human health or the environment and to be informed of dangers must be respected and protected.*
(4)(p)	*The costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment.*
(4)(r)	*Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.*

As these principles are utilised as a guideline by the competent authority in ensuring the protection of the environment, the proposed project should, where possible, be in accordance with these principles. Where this is not possible, deviation from these principles would have to be very strongly motivated. NEMA introduces the duty of care concept, which is based on the policy of strict liability. This duty of care extends to the prevention, control and rehabilitation of significant pollution and environmental degradation. It also dictates a duty of care to address emergency incidents of pollution. A failure to perform this duty of care may lead to criminal prosecution, and may lead to the prosecution of managers or directors of companies for the conduct of the legal persons.

In addition NEMA introduced a framework for environmental impact assessments, which aims to avoid detrimental environmental impacts through the regulation of specific activities that cannot commence without prior environmental authorisation. Authorisation in terms of these Regulations, the 2014 EIA Regulations (GN R. 982, as amended by GN R. 326 in 2017), either requires a Basic Assessment or a Full Scoping and Environmental Impact Assessment report (S&EIR), depending on the type of activity. These assessments specify mitigation and management guidelines to minimise negative environmental impacts and optimise positive impacts.

Relevance to the proposed project

An application for Environmental Authorisation (as triggered by the 2014 EIA Regulations (as amended)) will be required. In terms of Section 28, every person who causes, has caused, or may cause significant pollution or degradation of the environment, must take reasonable measures to prevent pollution or rectify the damage caused. The undertaking of various specialist studies, in order to identify potential impacts on the environment and to recommend mitigation measures to minimise these impacts, complies with Section 28 of NEMA. The applicant must apply the NEMA principles, the fair decision-making and conflict management procedures that are provided for in NEMA. The developer must apply the principles of Integrated Environmental Management and consider, investigate and assess the potential impact of existing and planned activities on the environment, socio-economic conditions and the cultural heritage.

Three lists of activities, provided in the EIA Regulations published on 4 December 2014 as Government Notice Numbers R.983, R.984, and R.985 (as amended by R.327, R.325 and R.324 respectively), define which process would be required to assess impacts associated with a particular development. The impacts of the project may be subject to a Basic Assessment (BA) process, which applies to activities with limited environmental impacts (GN R.983 and R.984, as amended), or may be subject to a more rigorous, two-tiered approach comprising of an S&EIR, required to assess activities with potentially more significant environmental impacts (GN R.985, as amended). The listed activities triggered by the proposed project include activities from each of the three listing notices (Table 5.3).

Table 5.3: NEMA Listed Activities triggered by the proposed project.

Listing Notice	Activity Number	Description	Relevance
Listing Notice 1 – GN R 983 (GN R 327) (Basic Assessment)	15	The development of structures in the coastal public property where the development footprint is bigger than 50 square metres, excluding — (iv) activities listed in activity 14 in Listing Notice 2 of 2014, in which case that activity applies.	This notice is unlikely to be relevant as Activity 14 in Listing Notice 2 is deemed applicable.

Listing Notice	Activity Number	Description	Relevance
	17	Development – (iii) Within the littoral active zone; (iv) In front of a development setback; or (v) If no development setback exists, within a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever is the greater. In respect of – (c) Embankments; (d) Rock revetments or stabilising structures including stabilizing walls; or (e) Infrastructure or structures with a development footprint of 50 square metres or more.	The positioning of the stub groynes, which are likely to be greater than $50m^3$ will occur within the littoral active zone and within 100m of the HMW of the sea.
	18	The planting of vegetation or placing of any material on dunes or exposed sand surfaces of more than 10 square metres, within the littoral active zone, for the purposes of preventing free movement of sand, erosion, accretion.	Sand material of more than $10m^3$ will be placed on the beach (within the littoral active zone) in order to prevent beach erosion.
	19	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse.	Dredging and excavation of over $10m^3$ of material may take place within the Kromme River.
	19 A	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from – (i) The seashore; (ii) The littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is greater.	Dredging and excavation of over $10m^3$ of material will take place within the Kromme River estuary and depositing of sand of more than $10m^3$ will take place along the seashore.
	27	The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation	The proposed development may require the clearance of indigenous vegetation, especially at the mouth of the Sand River.

Listing Notice	Activity Number	Description	Relevance
	48	The expansion of – (i) Infrastructure or structures where the physical footprint is expanded by 100 square metres or more; where such expansion occurs – (a) Within a watercourse; (b) In front of a development setback; or (c) If no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.	The existing revetment, which is located in front of a development setback, will be expanded along the spit.
	52	The expansion of structures in the coastal public property where the development footprint will be increased by more than 50 square metres.	Unlikely, but included at this stage in the event that any existing infrastructure is expanded as part of the required process.
	54	The expansion of facilities – (i) In the sea; (ii) In an estuary; (iii) Within the littoral active zone; (iv) In front of a development setback; or (v) If no development setback exists, within a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever is the greater. In respect of – (c) Embankments; (d) Rock revetments or stabilising structures including stabilising walls; or (e) Infrastructure or structures where the development footprint is expanded by 50 square metres or more	
	55	Expansion— (i) in the sea; (ii) in an estuary; (iii) within the littoral active zone; (iv) in front of a development setback; or (v) if no development setback exists, within a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever is the greater; in respect of — (c) inter- and sub-tidal structures for entrapment of sand.	
	65	The expansion and related operation of — (ii) any other structure or infrastructure; on or along the sea bed, where the expansion will constitute an increased development footprint.	

Listing Notice	Activity Number	Description	Relevance
	67	Phased activities for all activities— (i) listed in this Notice, which commenced on or after the effective date of this Notice or similarly listed in any of the previous NEMA notices, which commenced on or after the effective date of such previous NEMA Notices.	The various phases of beach nourishment and implementation of revetments and other structures along the St Francis Bay beach has been ongoing since 1996 and will continue to be conducted in phases.
Listing Notice 2 - GN R 984 (GN R 325) (Full Scoping & EIR)	14	The development and related operation of—(iii) any other structure or infrastructure — on, below or along the sea bed.	Stub groynes will be developed along the sea bed.
	23	The reclamation of an island or parts of the sea.	Part of the sea will be reclaimed by the proposed development.
	26	Development – (i) In the sea; (ii) In an estuary; (iii) Within the littoral active zone; (iv) In front of a development setback; or (v) If no development setback exists, within a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever is the greater. In respect of – (c) Inter- and sub-tidal structure for entrapment of sand.	The positioning of the stub groynes, for the entrapment of sand will, occur within the littoral active zone and within 100m of the HMW of the sea, as will the revetment structures.
Listing Notice 3 – GN R 985 (GN R 324) (Basic Assessment)	12	The clearance of an area of 300 square metres or more of indigenous vegetation In a. Eastern Cape ii. Within critical biodiversity areas identified in bioregional plans; iii. Within the littoral active zone or 100 metres inland from the high water mark of the sea, whichever distance is the greater, iv. Outside urban areas, within 100 metres inland from an estuarine functional zone.	The proposed development, which is located within both a terrestrial and aquatic CBA, within 100m of the HMW and within 100m of the Kromme River estuary:

Listing Notice	Activity Number	Description	Relevance
	14	The development of—ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse; (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse In a. Eastern Cape i. Outside urban areas: (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (ii) Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined; or (jj) In an estuarine functional zone, excluding areas falling behind the development setback line.	- May require the clearance of indigenous vegetation, and - Will have a physical footprint of more than 10m^2
	26	Phased activities for all activities— i. listed in this Notice and as it applies to a specific geographical area, which commenced on or after the effective date of this Notice; or ii. similarly listed in any of the previous NEMA notices, and as it applies to a specific geographical area, which commenced on or after the effective date of such previous NEMA Notices— where any phase of the activity was below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold.	The various phases of beach nourishment and implementation of revetments and other structures along the St Francis Bay beach has been ongoing since 1996 and will continue to be conducted in phases.

Relevance to the proposed project

Based on the listed activities identified in Listing Notice 2 of GN R 325 (2014 EIA Regulations, as amended on 7 April 2017), the proposed project will be subject to an S&EIR process. In order to comply with NEMA, the impacts associated with the activities listed above will need to be identified and assessed during this process and will include the necessary specialist reports required. The Competent Authority (CA) for this project is identified as the Member of the Executive Council (MEC) of the Eastern Cape Department of Economic Development, Environment Affairs and Tourism (DEDEAT).

5.5 National Environment Management: Biodiversity Act (Act No. 10 of 2004)

The National Environment Management: Biodiversity Act (NEMBA) provides for the management and conservation of South Africa's biodiversity and the protection of species and ecosystems that warrant national protection.

The objectives of NEMBA are:

(a) within the framework of the National Environmental Management Act, to provide for—
  (i) the management and conservation of biological diversity within the Republic and of the components of such biological diversity;
  (ii) the use of indigenous biological resources in a sustainable manner; and
  (iii) the fair and equitable sharing among stakeholders of benefits arising from bioprospecting involving indigenous biological resources;
(b) to give effect to ratified international agreements relating to biodiversity which are binding on the Republic;
(c) to provide for co-operative governance in biodiversity management and conservation; and
(d) to provide for a South African National Biodiversity Institute to assist in achieving the objectives of this Act.

The Act provides for the management and conservation of South Africa's biodiversity within the framework of NEMA (Table 5.4). In terms of the Biodiversity Act, the developer has a responsibility for:

- The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (including The Endangered and Threatened Ecosystem Regulations, Government Notice R. 1002 dated 9th December 2011);
- Application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all developments within the area are in line with ecological sustainable development and protection of biodiversity;
- Limit further loss of biodiversity and conserve endangered ecosystems.

Table 5.4: Management and conservation of biodiversity within the framework of NEMA.

Chapter 4	• Provides for the protection of species that are threatened or in need of national protection to ensure their survival in the wild; • To give effect to the Republic's obligations under international agreements regulating international trade in specimens of endangered species; and • Ensure that the commercial utilization of biodiversity is managed in an ecologically sustainable way.
Chapter 5 (Part 2) Section 73	A person who is the owner of land on which a listed invasive species occurs must: a) Notify any relevant competent authority, in writing, of the listed invasive species occurring on that land; b) Take steps to control and eradicate the listed invasive species and to prevent it from spreading; and c) Take all required steps to prevent or minimise harm to biodiversity.
Chapter 5 (Part 2) Section 75	• Control and eradication of a listed invasive species must be carried out by means or methods that are appropriate for the species concerned and the environment in which it occurs. • Any action taken to control and eradicate a listed invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment. • The methods employed to control and eradicate a listed invasive species must also be directed at the offspring, propagating material and re-growth

	of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating or re-establishing itself in any manner.

NEMBA's permit system is further regulated in the NEMBA Threatened or Protected Species Regulations Government Notice R. 152 of 2007. The NEMBA Alien and Invasive Species List (Government Notice R 599 of 2014) defines Alien and Invasive species that are regulated by the NEMBA Alien and Invasive Species Regulations (Government Notice 98 of 2014).

Relevance to the proposed project

The proponent must:

- Not cause a threat to any endangered ecosystems and must protect and promote biodiversity;
- Assess the impacts of the proposed project on endangered ecosystems;
- Not remove or damage any protected species without a permit;
- Ensure that the site is cleared of alien vegetation using appropriate means;
- Implement an invasive species monitoring, control and eradication plan for land/activities under their control should be developed, as part of their environmental plans in accordance with Section 11 of NEMA.

5.6 Conservation of Agricultural Resources Act (Act No. 43 of 1983)

The Conservation of Agricultural Resources Act (CARA) aims to control over-utilisation of the natural agricultural resources to promote the conservation of soil, water sources and vegetation through the combat of weeds and invader plants. Regulations 15 and 16 under this Act, which relate problem plants, were amended in March 2001. The Act provides a list of declared weeds and invader plants as well as indicators of bush encroachment. In terms of weeds and invader plants:

- A land user shall control any category 1 plants that occur on any land or inland water surface;
- No person shall, except for the purposes of a biological control reserve:
  - Establish, plant, maintain, multiply or propagate weeds and invader plants;
  - Import or sell propagating material of category weeds and invader plants; and
  - Acquire propagating material of weeds and invader plants.

These lists include:

- Combating of category 1 plants (Section 15A) according to CARA (Act No 43 of 1983); and
- Combating of category 2 plants (Section 15B) according to CARA (Act No 43 of 1983)

Relevance to the proposed project

- An invasive species monitoring, control and eradication plan for land/activities under the control of the proponent should be developed as part of the Environmental Management Programme (EMPr) in accordance with CARA.

5.7 National Environmental Management: Waste Act (Act No. 59 of 2008)

The National Environmental Management: Waste Management Act (NEMWA) gives legal effect to the Government's policies and principles relating to waste management in South Africa, as reflected in the National Waste Management Strategy (NWMS).

The objects of the Act are "*to protect health, well-being and the environment by providing reasonable measures for—*

- *minimising the consumption of natural resources;*
- *avoiding and minimising the generation of waste;*
- *reducing, re-using, recycling and recovering waste;*
- *treating and safely disposing of waste as a last resort;*
- *preventing pollution and ecological degradation;*
- *securing ecologically sustainable development while promoting justifiable economic and social development;*
- *promoting and ensuring the effective delivery of waste services;*
- *remediating land where contamination presents, or may present, a significant risk of harm to health or the environment; and*
- *achieving integrated waste management reporting and planning.*"

Chapter 4 of this Act deals with the general duty in respect to waste management and emphasises that, "*a holder of waste must, within the holder's power, take all reasonable measures to:- avoid the generation of waste and where such generation cannot be avoided, to minimise the toxicity and amounts of waste that are generated; reduce, re-use, recycle and recover waste; where waste must be disposed of, ensure that the waste is treated and disposed of in an environmentally sound manner; manage the waste in such a manner that it does not endanger health or the environment or cause a nuisance through noise, odour or visual impacts; prevent any employee or any person under his or her supervision from contravening this Act; and prevent the waste from being used for an unauthorised purpose*".

Chapter 4, Part 3 of this Act deals with reduction re-use and recovery of waste, Part 4 deals with waste management activities, Part 5 covers storage collection and transportation of waste, Part 6 deals with treatment, processing and disposal of wastes, Part 7 covers industry waste management plans and Part 8 deals with contaminated land. Chapter 5 covers all issues regarding the licensing of waste management activities.

Relevance to the proposed project

- All reasonable measures must be taken to avoid the generation of waste and, where such generation cannot be avoided, minimise the toxicity and amounts of waste that are generated; reduce, re-use, recycle and recover waste; where waste must be disposed of, ensure that the waste is treated and disposed of in an environmentally sound manner;
- Manage the waste in such a manner that it does not endanger human health or the environment or cause a nuisance through noise, odour or visual impacts;
- Prevent any employee or any person from contravening this Act and prevent the waste from being used for an unauthorised purpose;
- All waste must be disposed of at a registered waste disposal facility.

5.8 National Water Act (Act No. 36 of 1998)

The National Water Act (NWA) provides for fundamental reform of the law relating to water resources in South Africa.

The purpose of the Act is "*to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways which take into account amongst other factors–*

(a) meeting the basic human needs of present and future generations;

(b) promoting equitable access to water;

(c) redressing the results of past racial and gender discrimination;
(d) promoting the efficient, sustainable and beneficial use of water in the public interest;
(e) facilitating social and economic development;
(f) providing for growing demand for water use;
(g) protecting aquatic and associated ecosystems and their biological diversity;
(h) reducing and preventing pollution and degradation of water resources;
(i) meeting international obligations;
(j) promoting dam safety;
(k) managing floods and droughts."

Section 21 of the NWA describes activities defined as a water use under the Act. These activities may only be undertaken subject to the application for, and issue of, a Water Use License (WUL) or general authorisation (GA). Water use activities include—

(a) taking water from a water resource;
(b) storing water;
(c) impeding or diverting the flow of water in a watercourse;
(d) engaging in a stream flow reduction activity contemplated in section 36;
(e) engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);
(f) discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
(g) disposing of waste in a manner which may detrimentally impact on a water resource;
(h) disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;
(i) altering the bed, banks, course or characteristics of a watercourse;
(j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and
(k) using water for recreational purposes."

Relevance to the proposed project

- Infrastructure constructed within the 100m regulatory area of a river or drainage line or within the 500m regulatory area a wetland, will require a water use authorisation (WUA). This will be discussed with the Department of Water and Sanitation (DWS) and reported on in the EIR;
- According to Section 19(1) of the NWA, "*an owner of land, a person in control of land or a person who occupies or uses the land on which—*
  (a) Any activity or process is or was performed or undertaken; or
  (b) Any other situation exists, which causes, has caused or is likely to cause pollution of a water resource, must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring."
- Appropriate measures must be taken to prevent the pollution of water courses and other water resources and riparian zones must be protected.

5.9 National Environmental Management: Integrated Coastal Management (ICM) Act (Act No. 24 of 2008)

According to Section 2 of the NEM: ICMA, the objects of this Act are:

- *To determine the coastal zone of the Republic;*

- *To provide, within the framework of the National Environmental Management Act, for the co-ordinated and integrated management of the coastal zone by all spheres of government in accordance with the principles of co-operative governance;*
- *To preserve, protect, extend and enhance the status of coastal public property as being held in trust by the State on behalf of all South Africans, including future generations;*
- *To secure equitable access to the opportunities and benefits of coastal public property; and*
- *To give effect to the Republic's obligations in terms of international law regarding coastal management and the marine environment.*

Section 13 of the NEM: ICMA states that any natural person in the Republic:

- Has a right of reasonable access to coastal public property; and
- Is entitled to use and enjoy coastal public property.

Coastal Public Property is defined by the Act as coastal waters, land submerged by coastal waters, any island in coastal waters, the seashore, any admiralty reserve owned by the state, any other state land declared as coastal public property and any natural resources. The ICM Act unequivocally vests ownership of coastal public property in the citizens of South Africa. Coastal public property cannot be transferred, sold, attached or acquired by prescription, nor can the rights over it be acquired by prescription. It is the duty of the State as trustee to ensure that coastal public property is used, managed, protected, conserved and enhanced in the interests of the whole community, as opposed to only a few individuals or groups.

Chapter 2; Part 3; Responsibilities of municipalities with regard to coastal access land; Section 20 (h) which states: 'describe or otherwise indicate all coastal access land in any municipal coastal management programme and in any municipal spatial development framework prepared in terms of the Municipal Systems Act'.

Chapter 6; Part 3; 48 (2) Municipal coastal management programmes; Preparation and adoption of municipal coastal management programmes; Before adopting a programme contemplated in subsection (1)(a): 'a municipality, must invite members of the public to submit written representations on or objections to the programme in accordance with the procedure contemplated in Chapter 4 of the Municipal Systems Act'.

Chapter 6; Part 4; Co-ordination and alignment of plans and coastal management programmes states:

Alignment of plans and coastal management programmes;
Section 51. An environmental implementation or environmental management plan in terms of Chapter 3 of the National Environmental Management Act, an integrated development plan in terms of the Municipal Systems Act and a provincial or municipal land development plan must (a) be aligned with the national coastal management programme and any applicable provincial coastal management programme; (b) contain those provisions of the national coastal management programme and any applicable provincial coastal management programme that specifically applies to it; and (c) give effect to the national coastal management programme and any applicable provincial coastal management programme.

Ensuring consistency between coastal management programmes and other statutory plans;
Section 52 (4). Each municipality in the coastal zone must ensure that its integrated development plan (including its spatial development framework) is consistent with other statutory plans adopted by either a national or a provincial organ of state.

Section 65(1) (subject to sections 67 and 95) states that no person may occupy any part of, or site on, or construct or erect any building, road, barrier or structure on or in, coastal public property except under and in accordance with a coastal lease awarded by the Minister in terms of this Chapter. This is relevant to the proposed project as the entire project occurs within what is defined as coastal public property.

Relevance to the proposed project

- The use of vehicles in a coastal protection zone and the reclamation of land, as well as the dredging of the Kromme Estuary, may require a permit (coastal lease) from the Coastal Conservation and Strategies Directorate of the DEA, Oceans and Coast Branch (DEA Oceans and Coasts).
- The DEA Oceans and Coasts have confirmed that once the EA application has been submitted to DEDEAT, all correspondence must be submitted to DEA Oceans and Coasts. Confirmation if the applicant will need to apply for reclamation of land, coastal lease and off-road vehicle (ORV) permits will be provided once the background information documentation (with supporting documents) has been provided to the DEA Oceans and Coasts.
- In line with the requirements of Section 48 to 50 of the National Environmental Management: Integrated Coastal Management Act 24 of 2008 (ICMA), the Sarah Baartman District Municipality (SBDM) has developed a Coastal Management Programme (CMPr) to guide integrated management of the coastal zone within the District Municipality's jurisdiction. The draft report was released on the 30th October for public review and response.
- The EIR must assess the potential risks and impacts that the natural environment will have on the proposed project in terms of storm surges, sea level rise and other coastal processes which occur in the area.

5.10 National Environmental Management: Air Quality Act (Act No. 39 of 2004, as amended)

The National Environmental Management: Air Quality Act (NEMAQA) is the principal legislation regulating air quality in South Africa. Its purpose is:

- *to protect the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development while promoting justifiable economic and social development;*
- *to provide for national norms and standards regulating air quality monitoring, management and control by all spheres of government;*
- *for specific air quality measures; and for matters incidental thereto.*

The objects of the Act are to:

(a) to protect the environment by providing reasonable measures for—
  (i) the protection and enhancement of the quality of air in the Republic;
  (ii) the prevention of air pollution and ecological degradation; and
  (iii) securing ecologically sustainable development while promoting justifiable economic and social development; and

(b) generally to give effect to section 24(b) of the Constitution in order to enhance the quality of ambient air for the sake of securing an environment that is not harmful to the health and wellbeing of people.

The Air Quality Act empowers the Minister to establish a national framework for achieving the objects of this Act. The said national framework will bind all organs of state. The said national framework will inter alia have to establish national standards for municipalities to monitor ambient air quality and point, non-point and mobile emissions.

Relevance to the proposed project

- The proposed project does not require an Air Emissions Licence according to the NEMAQA;
- The "best practicable means" must be implemented for the abatement of dust during construction and operation.

5.11 National Heritage Resources Act (Act No. 25 of 1999)

The protection of archaeological and paleontological resources is the responsibility of a provincial heritage resources authority and all archaeological objects, paleontological material and meteorites are the property of the State. "*Any person who discovers archaeological or paleontological objects or material or a meteorite in the course of development must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority*".

Relevance to the proposed project

- No person may alter or demolish any structure or part of a structure, which is older than 60 years or disturb any archaeological or paleontological site or grave older than 60 years without a permit issued by the relevant provincial heritage resources authority;
- No person may, without a permit issued by the responsible heritage resources authority destroy, damage, excavate, alter or deface archaeological or historically significant sites;
- The South African Heritage Resources Agency (SAHRA) and the Eastern Cape Provincial Heritage Resources Authority (ECPHRA) must be informed of the project.

5.12 Occupational Health and Safety Act (Act No. 85 of 1993)

The objective of the Occupational Health and Safety Act (OHSA) is to provide for the health and safety of persons at work. In addition, the Act requires that, "*as far as reasonably practicable, employers must ensure that their activities do not expose non-employees to health hazards*". The importance of the Act lies in its numerous regulations, many of which will be relevant to the proposed project (Table 5.5). These cover, among other issues, noise and lighting.

Table 5.5: Health and safety of persons at work according to the Occupational Health and Safety Act.

8: GENERAL DUTIES OF THE EMPLOYERS TO THEIR EMPLOYEES	
(1)	Every employer shall provide and maintain, as far as is reasonably practicable, a working environment that is safe and without risk to the health of his employees.
(2)	Without derogating from the generality of an employer's duties under subsection (1), the matters to which those duties refer include in particular- a) The provision and maintenance of systems of work, plant and machinery that, as far as is reasonably practicable, are safe and without risks to health; b) Taking such steps as may be reasonably practicable to eliminate or mitigate any hazard or potential hazard to the safety or health of employees, before resorting to personal protective equipment; c) Establishing, as far as is reasonably practicable, what hazards to the health or safety of persons are attached to any work which is performed, any article or substance which is produced, processed, used, handled, stored or transported and any plant or machinery which is used in his business, and he shall, as far as is reasonably practicable, further establish what precautionary measures should be taken with respect to such work, article,

	substance, plant or machinery in order to protect the health and safety of persons, and he shall provide the necessary means to apply such precautionary measures; d) Providing such information, instructions, training and supervision as may be necessary to ensure, as far as is reasonably practicable, the health and safety at work of his employees; e) As far as is reasonably practicable, not permitting any employee to do any work or to produce, process, use, handle, store or transport any article or substance or to operate any plant or machinery, unless the precautionary measures contemplated in paragraphs (b) and (d), or any other precautionary measures which may be prescribed, have been taken; f) Taking all necessary measures to ensure that tire requirements of this Act are complied with by every person in his employment or on premises under his control where plant or machinery is used; g) Enforcing such measures as may be necessary in the interest of health and safety; h) Ensuring that work is performed and that plant or machinery is used under the general supervision of a person trained to understand the hazards associated with it and who have the authority to ensure that precautionary measures taken by the employer are implemented; and authority as contemplated in Section 37 (1) (b).
14: GENERAL DUTIES OF EMPLOYEES AT WORK Every employee shall at work:-	
(a)	Take reasonable care for the health and safety of himself and of other persons who may be affected by his acts or omissions;
(b)	As regards any duty or requirement imposed on his employer or any other person by this Act, cooperate with such employer or person to enable that duty or requirement to be performed or complied with;
(c)	Carry out any lawful order given to him, and obey the health and safety rules and procedures laid down by his employer or by anyone authorized thereto by his employer, in the interest of health or safety;
(d)	If any situation which is unsafe or unhealthy comes to his attention, as soon as practicable report such situation to his employer or to the health and safety representative for his workplace or section thereof, as the case may be, who shall report it to the employer; and
(e)	If he is involved in any incident which may affect his health or which has caused an injury to himself, report such incident to his employer or to anyone authorized thereto by the employer, or to his health and safety representative, as soon as practicable but not later than the end of the particular shift during which the incident occurred, unless the circumstances were such that the reporting of the incident was not possible, in which case he shall report the incident as soon as practicable thereafter.
15: DUTY NOT TO INTERFERE WITH, DAMAGE OR MISUSE THINGS [S. 15 substituted by S. 3 of Act No. 181 of 1993.]	
	No person shall intentionally or recklessly interfere with, damage or misuse anything which is provided in the interest of health or safety.

Relevance to the proposed project

- The proponent must be aware of the principles and broad liability and implications contained in the OHSA and mitigate any potential impacts.

5.13 National Road Traffic Act (Act No. 93 of 1996)

The National Road Traffic Act (NRTA) provides for all road traffic matters and is applied uniformly throughout South Africa. The Act enforces the necessity of registering and licensing motor vehicles. It also stipulates requirements regarding fitness of drivers and vehicles as well as making provision for the transportation of dangerous goods.

Relevance to the proposed project

- All the requirements stipulated in the NRTA will need to be complied with during the construction and operational phases of the proposed project;
- The proposed project will likely require the use of the R330 provincial road as well as a number of other roads located within St Francis Bay.

5.14 Other Relevant Legislation

Other legislation that may be relevant to the proposed project includes:

- The Environment Conservation Act No 73 of 1989 (ECA) Noise Control Regulations, which specifically provide for regulations to be made with regard to the control of noise, vibration and shock, including prevention, acceptable levels, powers of local authorities and related matters;
- Provincial Nature and Environmental Conservation Ordinance (No. 19 of 1974), which lists species of special concern which require permits for removal. Schedules 1 to 4 list protected and endangered plant and animal species;
- Spatial Planning and Land Use Management Act (SPLUMA) (Act 16 of 2013 – came into force on 1 July 2015) aims to provide inclusive, developmental, equitable and efficient spatial planning at the different spheres of the government. This act repeals national laws on the Removal of Restrictions Act, Physical Planning Act, Less Formal Township Planning Act and Development Facilitation Act;
- Sarah Baartman District Municipality and Kouga Local Municipality By-Laws;

In addition to the above, the following spatial tools from the South African National Biodiversity Institute (SANBI) need to be taken into consideration:

- The South African Vegetation Map (Mucina and Rutherford);
- The Subtropical Thicket Ecosystem Programme (STEP);
- The Eastern Cape Biodiversity Conservation Plan (ECBCP); and
- The National Freshwater Ecosystem Priority Areas (NFEPA) project.

6 DESCRIPTION OF THE AFFECTED ENVIRONMENT

6.1 Climate

St Francis Bay is characterised by a warm, temperate climate, with average temperatures ranging between 18.5 °C in July to 24 °C in February. The coldest temperatures are experienced during July, where average temperatures may drop to a low of 8.2 °C. The warmest months include January and February (Figure 6.1). Rainfall in St Francis occurs throughout the year, averaging around 525 mm per annum. The highest rainfall occurs during August, averaging around 62 mm, while the lowest rainfall occurs during January (26 mm).

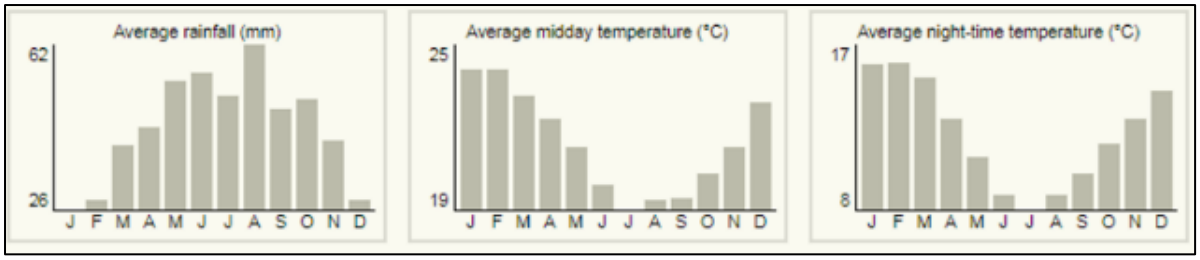


Figure 6.1 Average rainfall, midday temperatures and night time temperatures for St Francis Bay (SA Explorer, 2017).

6.2 Geology and Topography

St Francis Bay is characterised by relatively flat terrain (Figure 6.2), descending slightly towards the Kromme and Sand River channels that traverse the broader area. A deviation from the norm is evident along the coastal zone, where an elevation profile from a point inland in the west to the intertidal zone in the east, displays a steep decline from 7 m at the mean high water spring (MHWS) mark to 1 m just below the mean low water spring (MLWS) (Figure 6.3).

The underlying geology of the broader St Francis Bay area falls within the Cape Super Group, more specifically represented by the upper portions of the Table Mountain Group and the Bokkeveld Group (both subdivisions of the Cape Super Group) (Figure 6.4). Recent Cenozoic Aeolian deposits belonging to the Algoa Group largely mask the strata of the underlying geology in the surrounding area. The sediments of the Algoa Group have been accumulating for approximately 41 million years and represent a series of marine transgressions and regressions of the Agulhas Sea, which opened as a consequence of the early rifting between Africa and South America. The Schelm Hoek Formation, representing the most recent accumulation of aeolian deposits within the Algoa Group, is characterised by unconsolidated, calcareous sands interspersed by locally developed paleosols and Late Stone Age middens. The dune fields of the Schelm Hoek Formation can reach a thickness of 100 m.

The Table Mountain Group is characterised by quarzitic sandstones that were deposited along the coastal plains of the Agulhas Sea approximately 510-400 million years ago. It constitutes the first of three subdivisions of the Cape Super Group. The Table Mountain Group is unconformably overlain by the fine-grained sandstone and mudrock units of the Bokkeveld Group. The five coarsening-upward cycles, together with the abundance of marine invertebrate fossils, suggest the sediments of this group were deposited along the continental slopes of the Agulhas Sea Basin approximately 400 million years ago. The Ceres Subgroup constitutes the lower strata of the Bokkeveld Group. The underlying geology of the St Francis Bay area is especially important because of the abundance of the marine fossils which provides insight to early Agulhas Sea life. According to SOTER (2005), the soils within the St Francis Bay area are classified as Gleyic Arenosols (or Gelysols) - soils formed under waterlogged conditions, usually in low lying areas with shallow groundwater.

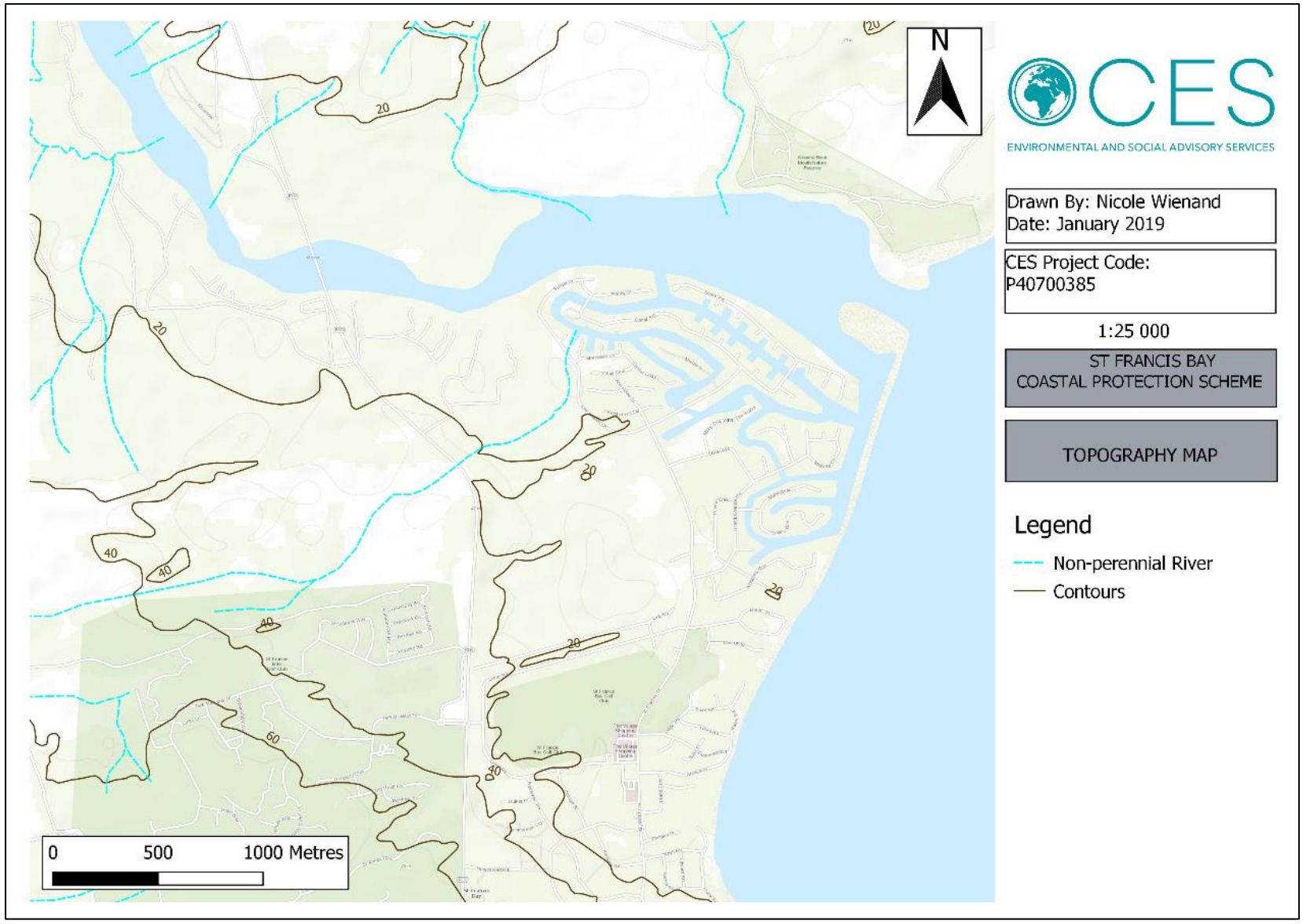


Figure 6.2: Topography of St Francis Bay

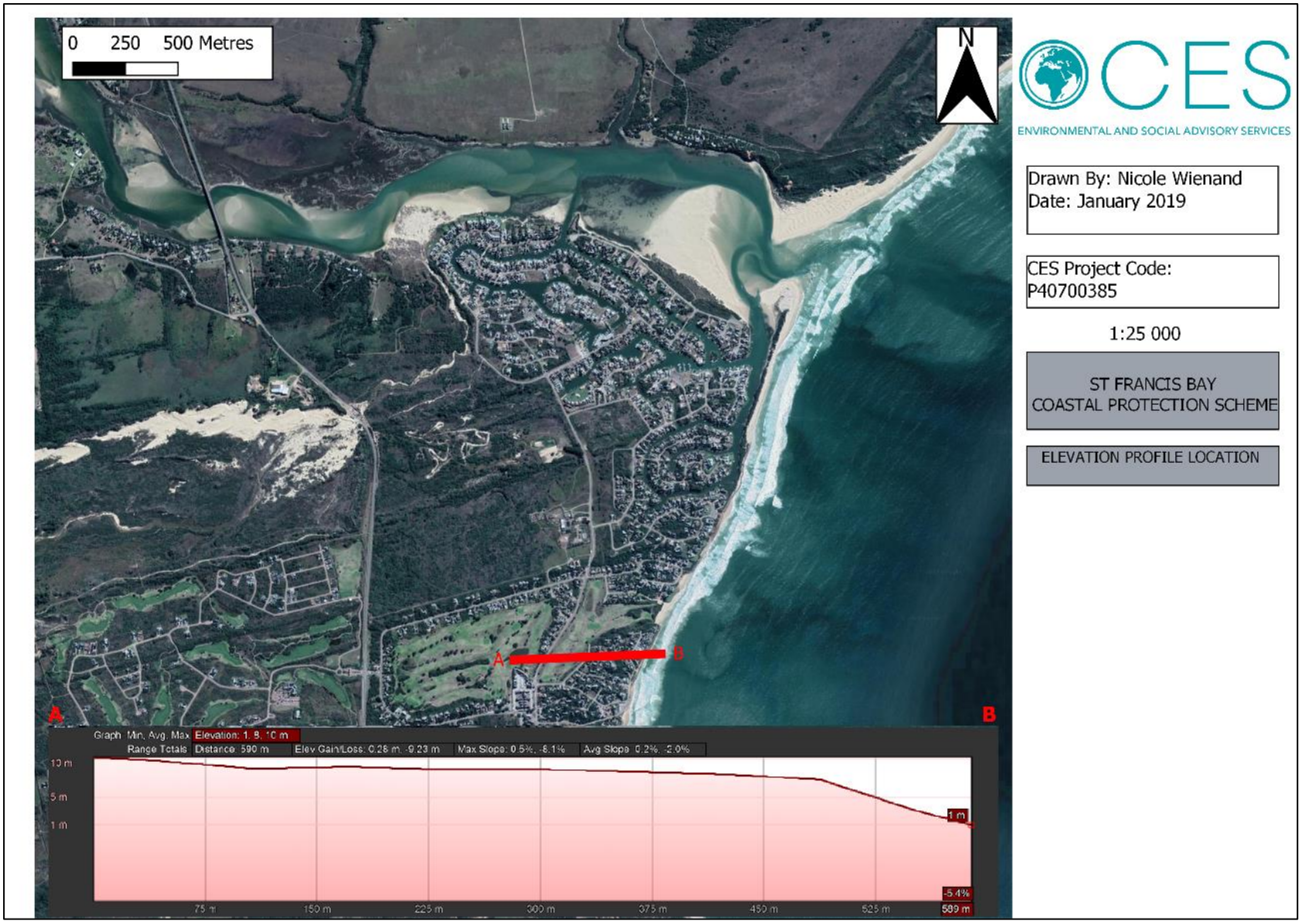


Figure 6.3: East-West elevation profile from a point inland in the west, to the intertidal zone in the east

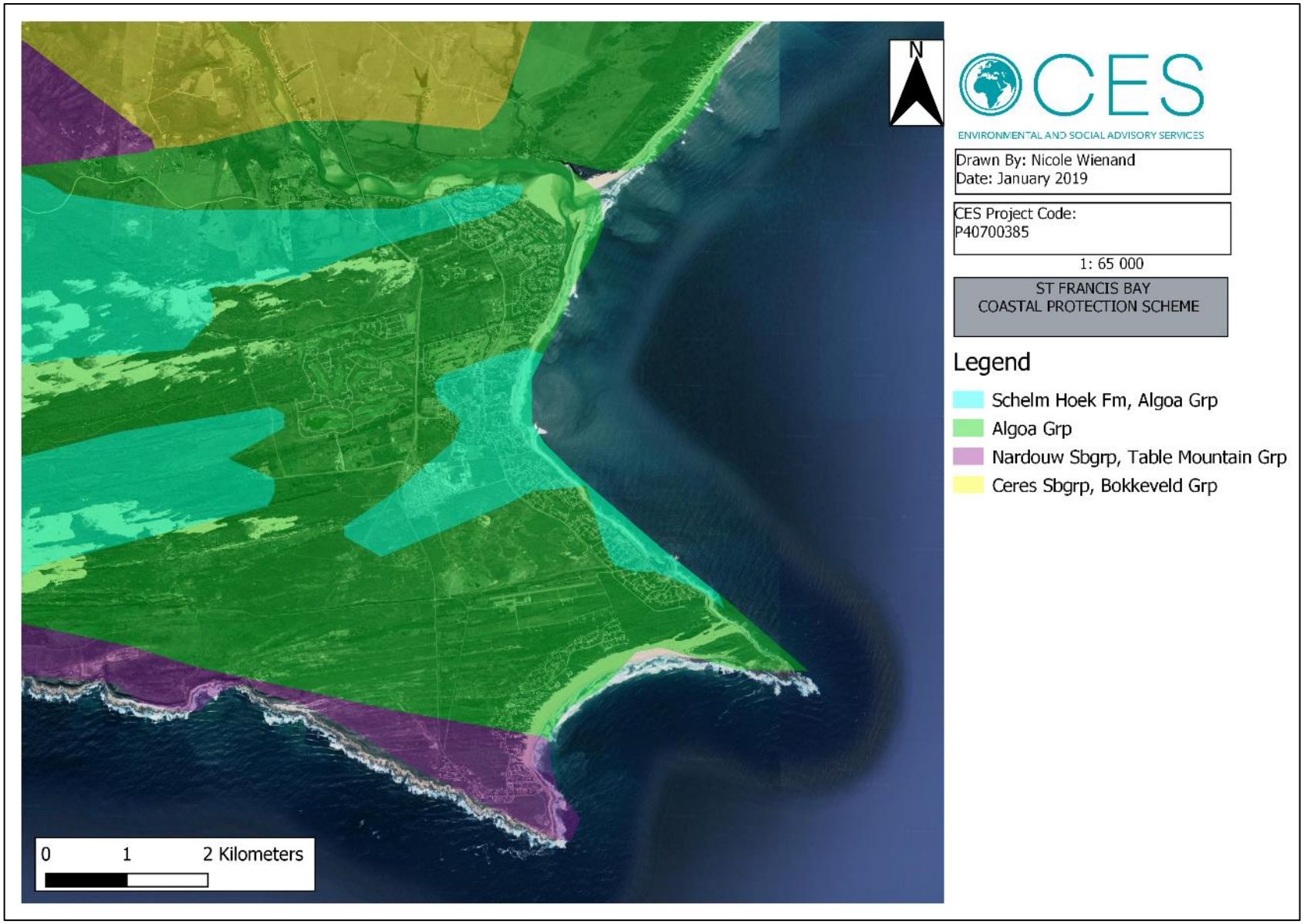


Figure 6.4: Geology of St Francis Bay

6.3 Land Use

According to the Kouga Municipality Spatial Development Framework (2015), the project site is classified as 'open space' and is located both within and outside the urban edge of St Francis Bay (Figure 6.5). The project will also be located within areas defined by the NEM ICM as coastal public property (i.e. the St Francis Bay beach as well as the Kromme River estuary).

6.4 Vegetation

The South African Vegetation Map (SA VEGMAP) of 2018 is an important resource for biodiversity monitoring and conservation management in South Africa. Under the custodianship of the South African National Biodiversity Institute (SAMBI) the SA VEGMAP (2018) was updated in order to provide floristically based vegetation units of South Africa, Lesotho and Swaziland at a greater level of detail than had been available before.

The map provides a detailed description of each of South Africa's unique vegetation types along with a comprehensive list of the important species associated with each, including endemic and biologically important species. According to the SA VEGMAP (2018) spatial dataset, the vegetation of the proposed project area consists of (Figure 6.6):

- Cape Seashore Vegetation;
- St Francis Dune Thicket;
- Elands Forest Thicket;
- Sunday's Mesic Thicket; and
- Albany Alluvial Vegetation.

These vegetation types are discussed briefly below.

Cape Seashore Vegetation

Cape Seashore Vegetation typically occurs on recently deposited coastal sandy sediments forming dunes and beaches, along the Eastern and Western Cape Provinces of South Africa. It stretches along the temperate coasts of the Atlantic and Indian Ocean, from Olifants River mouth to Cape Agulhas in the south west; and from Cape Agulhas to East London in the south. This vegetation type is characteristic of beaches, coastal dunes, dune slacks and coastal cliffs. It ranges from open grassy and herbaceous vegetation to dwarf-shrubby vegetation, often dominated by a single pioneer species. The age of the substrate and natural disturbance regime (moving dunes), coupled with the distance from the upper tidal mark and the exposure of the dune slope (leeward verses seaward), influences the composition of the plant communities present (Mucina et al., 2006).

Cape Seashore Vegetation is classified as Least Concern (Skowno et al., 2019), with a conservation target of 20%. Almost half of the area is statutorily conserved in formal protected areas, including National Parks and Nature Reserves, while a considerable portion is protected in a number of private conservation areas. Only 1.7% of this vegetation type has been transformed, mainly as a consequence of urban development (Mucina et al., 2006).

St Francis Dune Thicket

St Francis Dune Thicket occurs on flat to moderately undulating coastal dunes from Tsitsikama River Mouth to Sundays River Mouth within the Eastern Cape Province. It is characterised by a mosaic of low (1-3 m) thicket and asteraceous fynbos. The thicket component is dominated by small bush clumps,

consisting of small trees and woody shrubs, which are best developed in fire-protected dune slacks, while the fynbos component occurs on dune slopes and crests. The fynbos component becomes less prominent towards the eastern distribution of this vegetation type. The geology underlying this vegetation type is mainly restricted to the Schelm Hoek Formation (Grobler et al., 2018).

St Francis Dune Thicket is classified as poorly protected, with a Conservation Target of 19%.

Elands Forest Thicket

This vegetation type occurs in between St Franics Bay and Uitenhage and is associated with moderate slopes around the Elands River, Seekoei River, and Kromme River. It consists of medium-sized to tall (3 - 5 m) thicket with a canopy composed of trees (e.g. *Olea europaea subsp. cuspidata*, *Pittosporum viridiflorum*) and emergent succulent trees like *Euphorbia tetragona*. Elands Forest Thicket was historically encompassed by fire-prone shrublands (renosterveld and grassy fynbos), and the periodic fires experienced here likely prevented the establishment of true forest vegetation (Vlok & Euston-Brown 2002).

The vegetation is classified as poorly protected, with a Conservation Target of 19%.

Sundays Mesic Thicket

Sundays Mesic Thicket occurs at the southern foot of the Zuurberg Mountains from Skurweberg near Kirkwood in the west to Nuweposkop near Paterson in the east. Smaller areas occur along the south-eastern slopes of the Groot Winterhoek and Elandsberg Mountains around Uitenhage, in incised valleys around Addo Heights, and in the lower reaches of river valleys and adjacent coastal forelands from the Gamtoos River south-eastward to Kromme River Mouth. It is characterised by medium-sized to tall (3 - 5 m) thicket dominated by small trees and woody shrubs, with *Cussonia spicata* and *Euphorbia triangularis* emergent above the canopy.

The vegetation is classified as well protected, with a Conservation Target of 19%.

Albany Alluvial Vegetation

This vegetation type occurs between East London and Cape St Francis on wide floodplains (usually close to the coast where the topography becomes flatter) of large rivers such as the Sundays, Zwartkops, Coega, Gamtoos, Baviaanskloof and Great Fish River. This alluvial ecosystem is embedded within the Albany Thicket Biome.

Two major types of vegetation pattern are observed in these zones, namely riverine thicket and thornveld (*Acacia natalitia*). The riverine thicket tends to occur in the narrow floodplain zones in regions close to the coast or further inland, whereas the thornveld occurs on the wide floodplains further inland. At least two endemic plant species occur in the ecosystem. Approximately 6% of the ecosystem is protected in the Greater Addo Elephant National Park, Baviaanskloof Wilderness Area, Loerie Dam, Springs, Swartkops Valley and Yellowwoods Nature Reserves and the Double Drift Reserve Complex. A further 2% is found in eight private conservation areas.

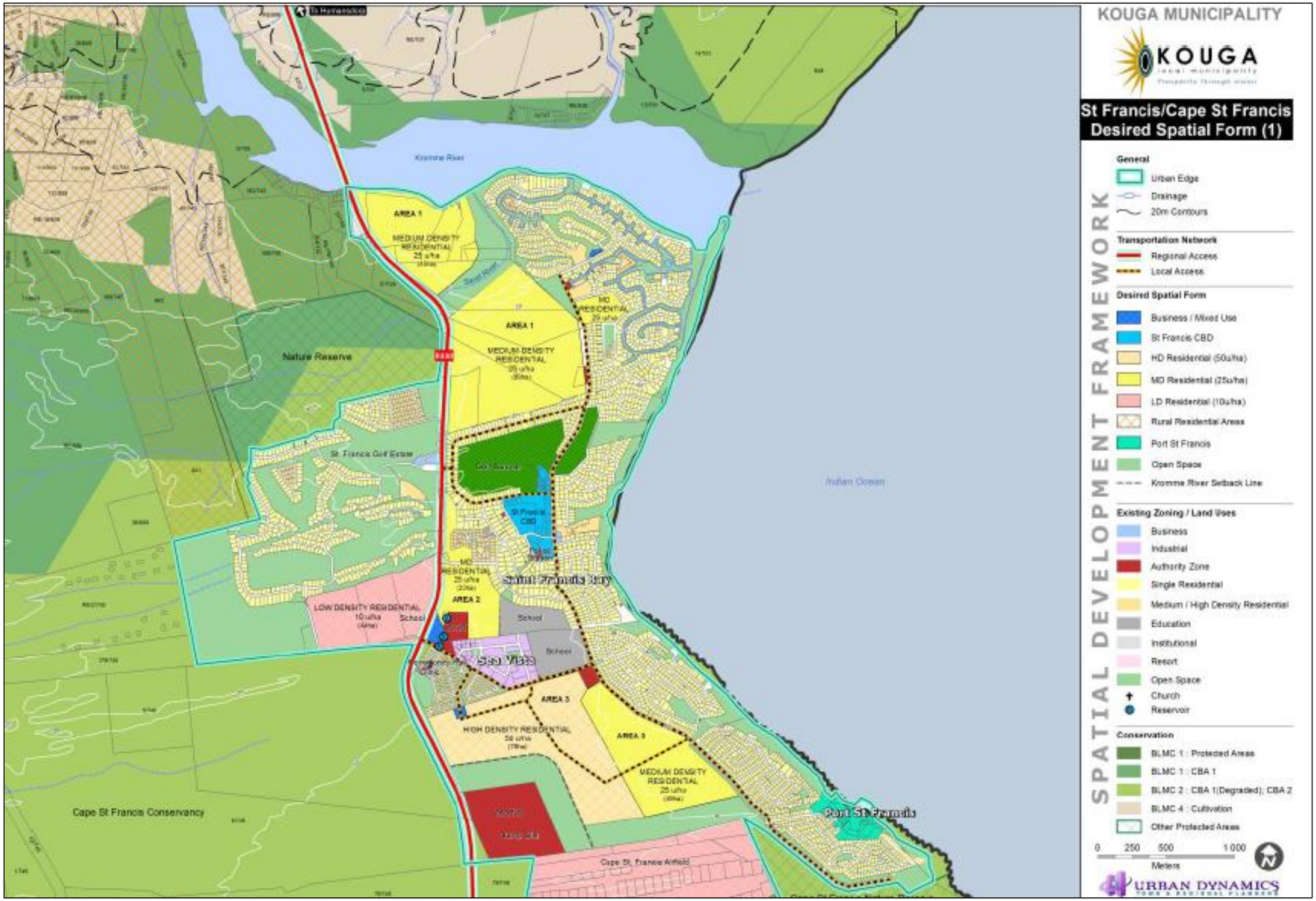


Figure 6.5: Land use at the project site and surround St Francis Bay area (Kouga Municipality Spatial Development Framework, 2015).

6.5 Protected Areas

The application area does not fall within any formally protected areas or within any delineated National Protected Areas Expansion Strategy (NPAES) Focus Areas (Figure 6.7). The closest National Park to the application area is the Tsitsikama National Park (62 km west of the application site) and the Addo Elephant National Park (103 km north east of the application site). The closest protected areas are the Kromme River Mouth Private Nature Reserve (380 m North); the Rebelsrus Private Nature Reserve (6.3 km south west); and lastly the Erma Booysen Florareservaat Local Authority Nature reserve and Seal Bay Local Authority Nature Reserve (both located approximately 3 km south of the application site). In addition, the Kromme Estuary is identified as an 'estuarine' wetland as defined by the National Freshwater Ecosystem Priority Areas (NFEPA). The NFEPA database also defines a number of smaller artificial and natural wetlands which are located around the estuary (Figure 6.8).

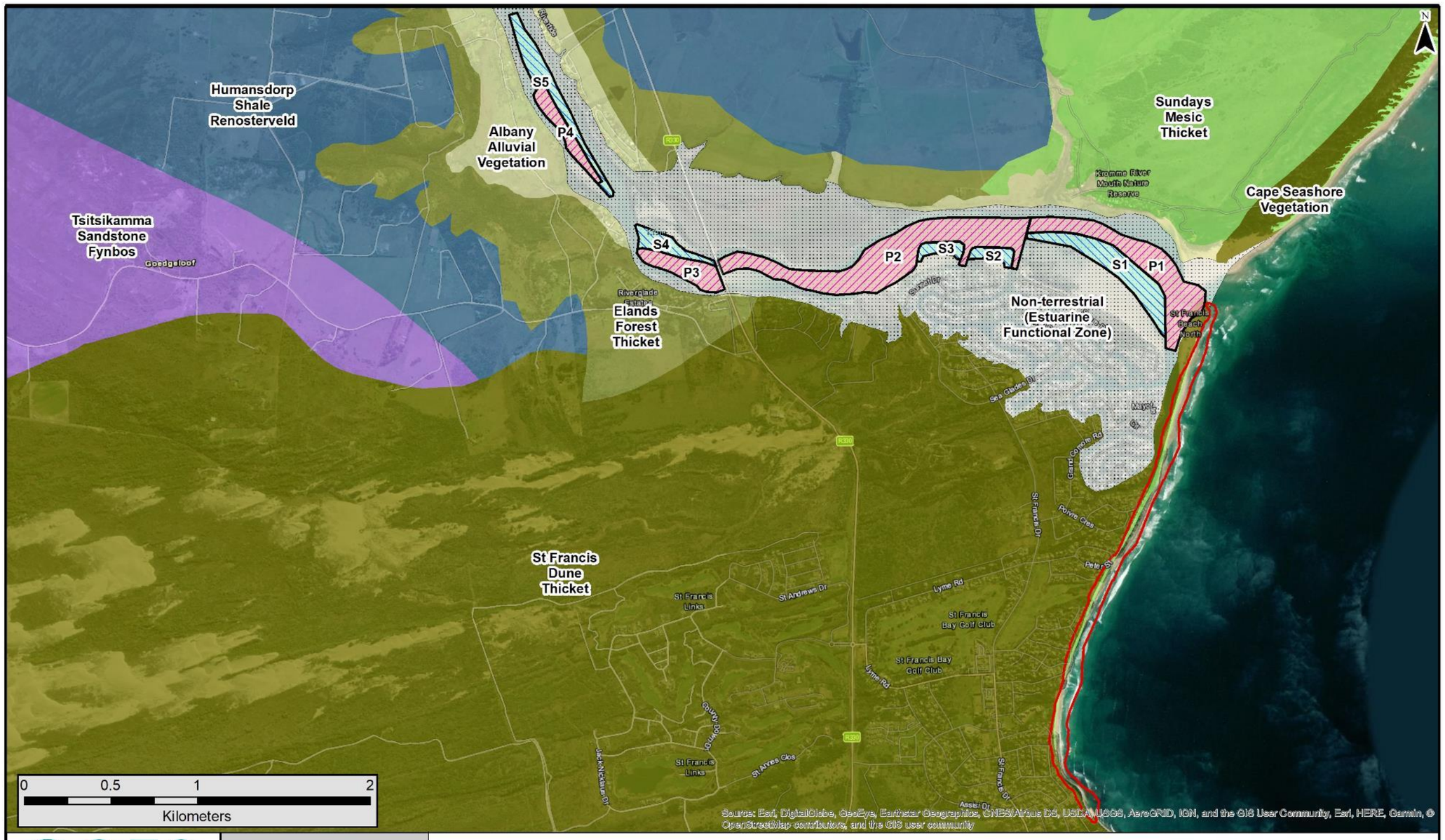


Figure 6.6: SANBI Vegetation map

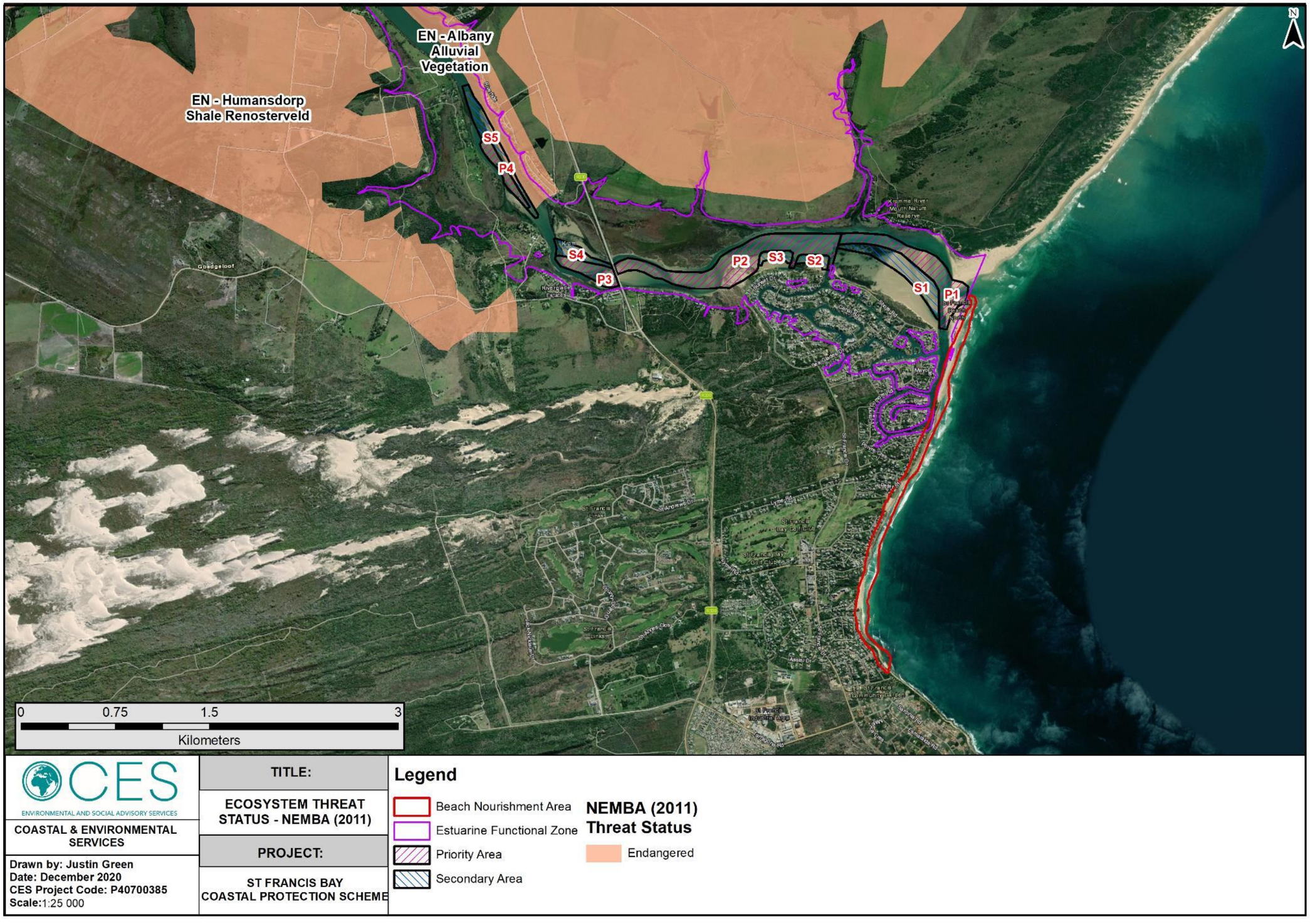


Figure 6.7: NEMBA threatened ecosystems in the broader St Francis Bay area.

6.6 Threatened Ecosystems

The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA) published a national list of ecosystems that are threatened and in need of protection (GN. 1002 of 2011).The application site is not located in any threatened ecosystems as legislated by NEMBA and the nearest threatened ecosystem is the Humansdorp Shale Renosterveld (classified as endangered) located approximately 1.3 km north-west (refer to Figure 6.7).

The Eastern Cape Biodiversity Conservation Plan (ECBCP, 2019) replaces the ECBCP (2007) in its entirety and provides a map of important biodiversity areas, outside of the Protected Areas network, which must be used to inform land use and resource-use planning and decision making.

The aim of the ECBCP (2019) was to map biodiversity priority areas through a systematic conservation planning process. The main outputs of the ECBCP include Protected Areas (PA), Critical Biodiversity Areas (CBA), Ecological Support Areas (ESA), Other Natural Areas (ONA) and No Natural Habitat Remaining (NNR) for both terrestrial and aquatic ecosystems.

According to the ECBCP the application site falls within a terrestrial and aquatic CBA1 (Figure 6.9 and 6.10).

Table 6.1: Description of the CBA designations.

CBA area	Desired State	Management requirements
CBA1	Natural	Maintain in a natural state (or near-natural state if this is the current condition of the site) that secures the retention of biodiversity pattern and ecological processes: For areas classified as CBA1, the following objectives must apply: Ecosystem and species must remain intact and undisturbed; Since these areas demonstrate high irreplaceability, if disturbed or lost, biodiversity targets will not be met; Important: these biodiversity features are at, or beyond, their limits of acceptable change. If land use activities are unavoidable in these areas, and depending on expert opinion of the condition of the site, a Biodiversity Offset must be designed and implemented.

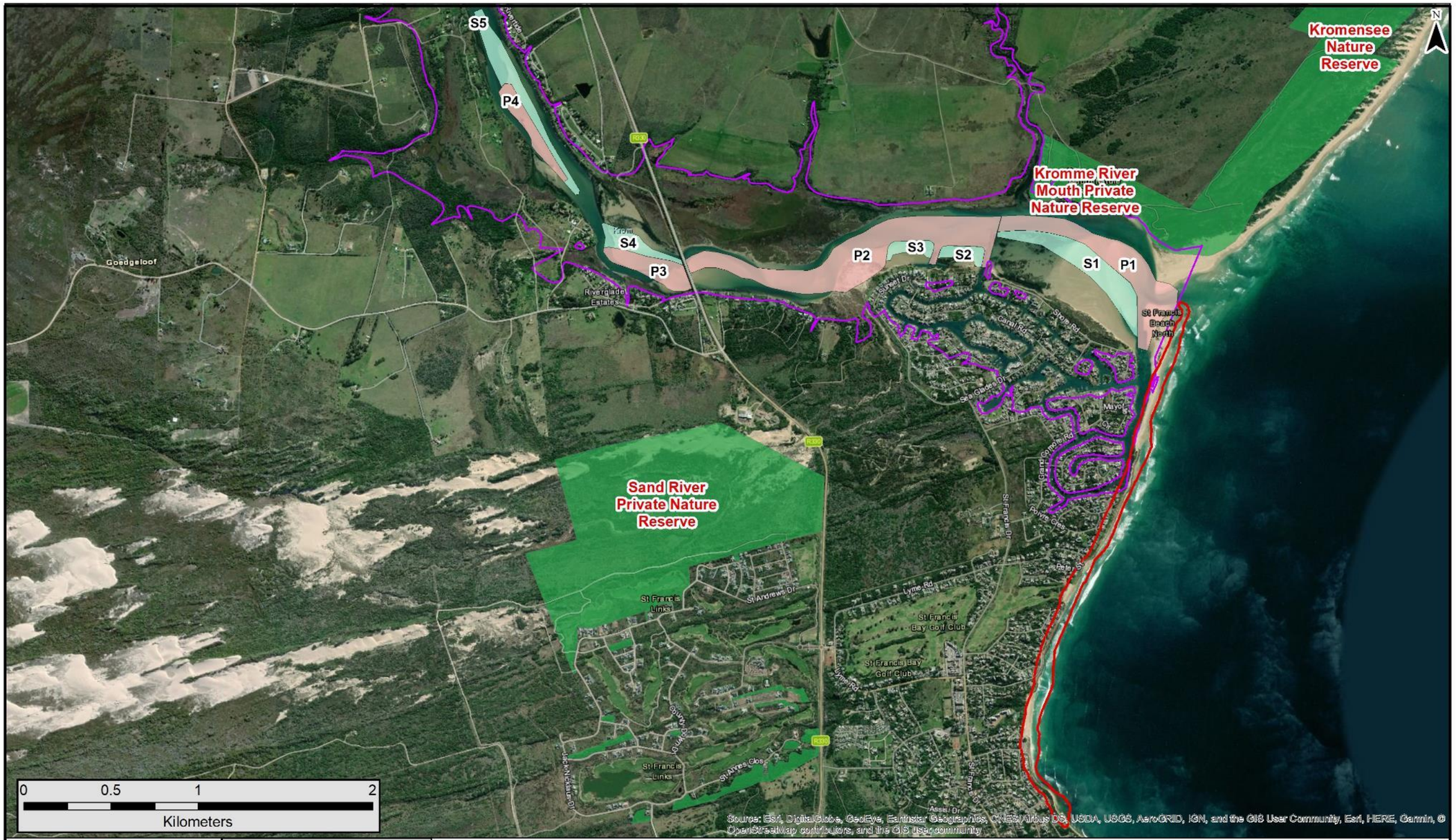


Figure 6.8: Surrounding protected areas and their distances to the estuary and beach study sites.

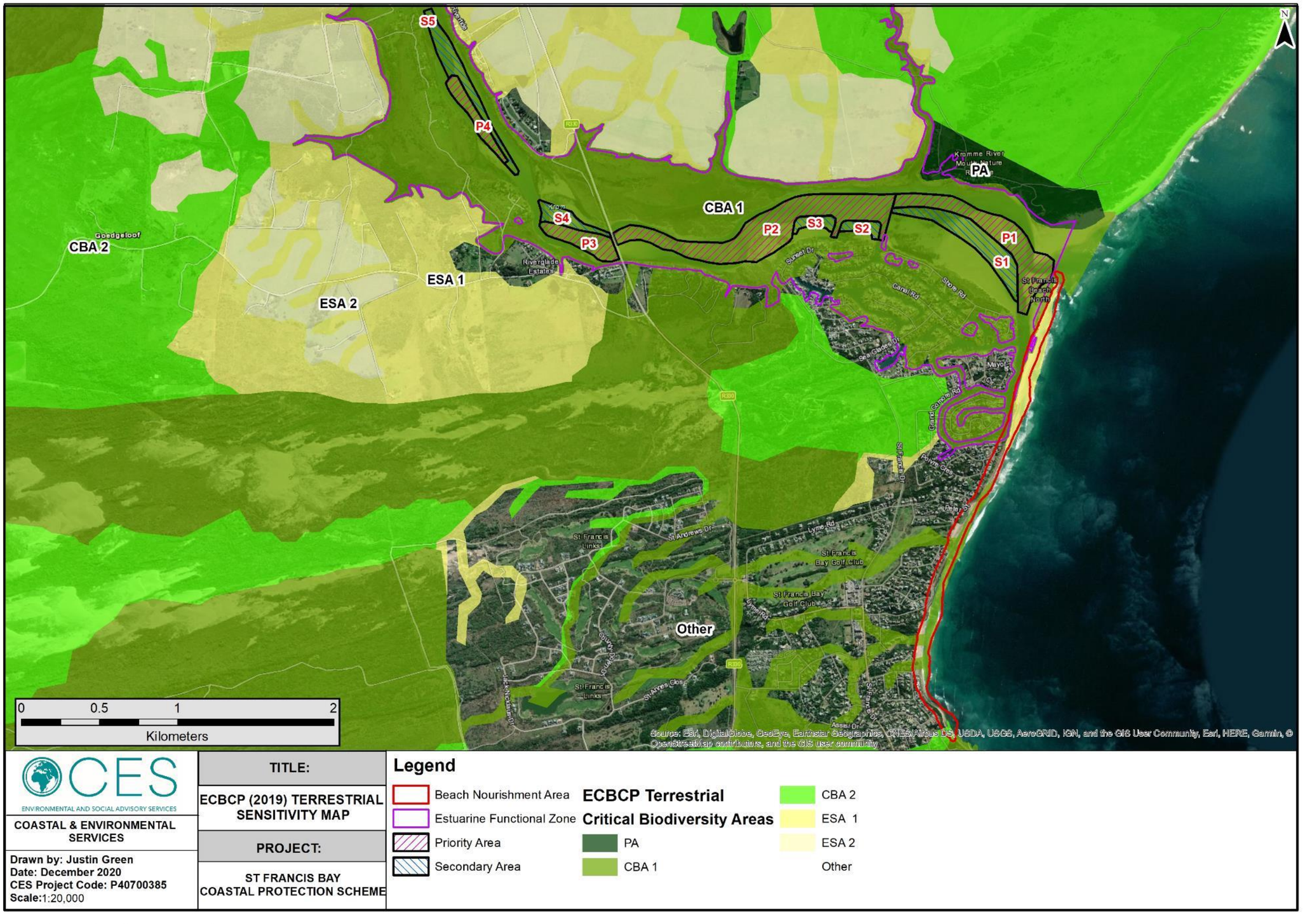


Figure 6.9: Critical Biodiversity Areas of St Francis Bay

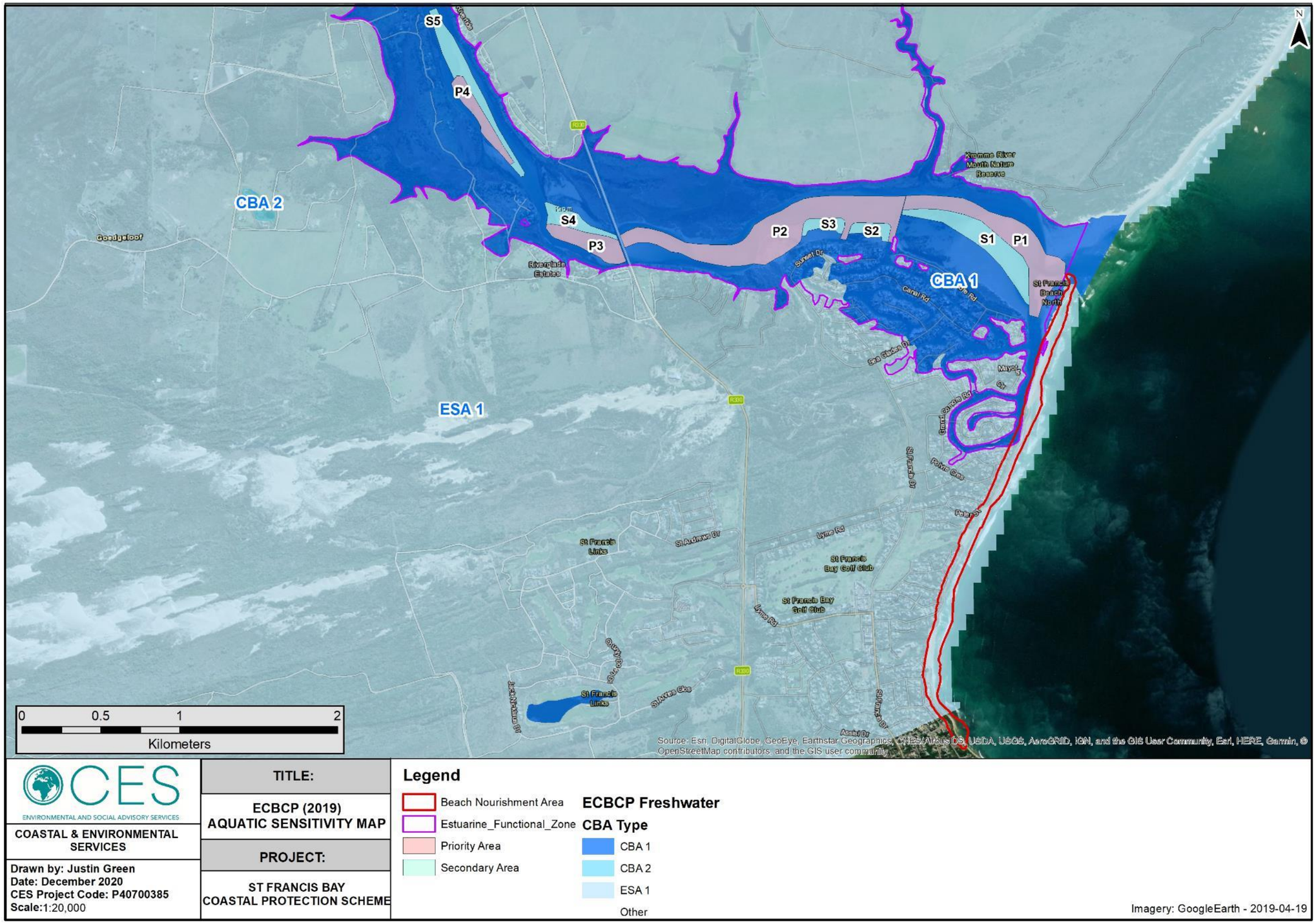


Figure 6.10: Critical Aquatic Biodiversity Areas of St Francis Bay

6.7 Physical marine environment and hydrodynamic conditions

The south-east coast of South Africa is characterised by a particularly dynamic marine environment. The south-east coast of South Africa is a region with relatively high-energy shores, dominated by waves from the south-westerly quarter. The relatively exposed nature of St Francis Bay, together with the complex interaction between coastal and estuarine processes, has resulted in the drastic removal of sediment and the consequent beach erosion observed over the last two decades. Waves along this stretch of coast typically approach from the west-southwest, as a consequence of the prevailing wind, reaching maximum heights of up to 12 m. Variation in wave frequency and intensity is observed during cold fronts which occur on average every three to five days during winter months. The dominant winds approach from the west to south-west, however easterly winds are a common occurrence. Sea surface water temperatures are generally warm, ranging from 22-25°C in February to 18-20°C degrees in August. Deviations from the norm are observed during periods of sporadic upwelling, when sea surface water temperatures may drop to a low of 8°C. Tides are classified as semidiurnal, with the maximum tidal range rarely exceeding 2 m.

The south east orientation of St Francis Bay results in significantly lower and more variable wave energy regimes than the exposed southern oriented coastlines of South Africa (Figure 6.11). This is principally due to this beach being sheltered from the persistent waves and swells generated by west and southwest winds. The predominant south westerly waves, which occur approximately 80% of the time, must angle themselves around the Cape St Francis headland in order to enter the bay, which results in waves that approach the beach at an angle and drive alongshore currents to the east along much of this coast. These wave-driven currents also transport sand in an easterly direction, and in the absence of a sand supply, result in net erosion. Easterly wave events are often generated relatively locally, resulting in short period high waves (known as steep waves) that result in direct erosion of sand off the beach face and into deeper water. Thus, sediment is 'zigzagged' up the coast, away from St Francis Bay. This combination of wave events and the lack of a constant sand supply must be addressed in order to provide long-term coastal protection, and reinstate the wide sandy beach that first attracted people to the area (ASR Ltd, 2006).

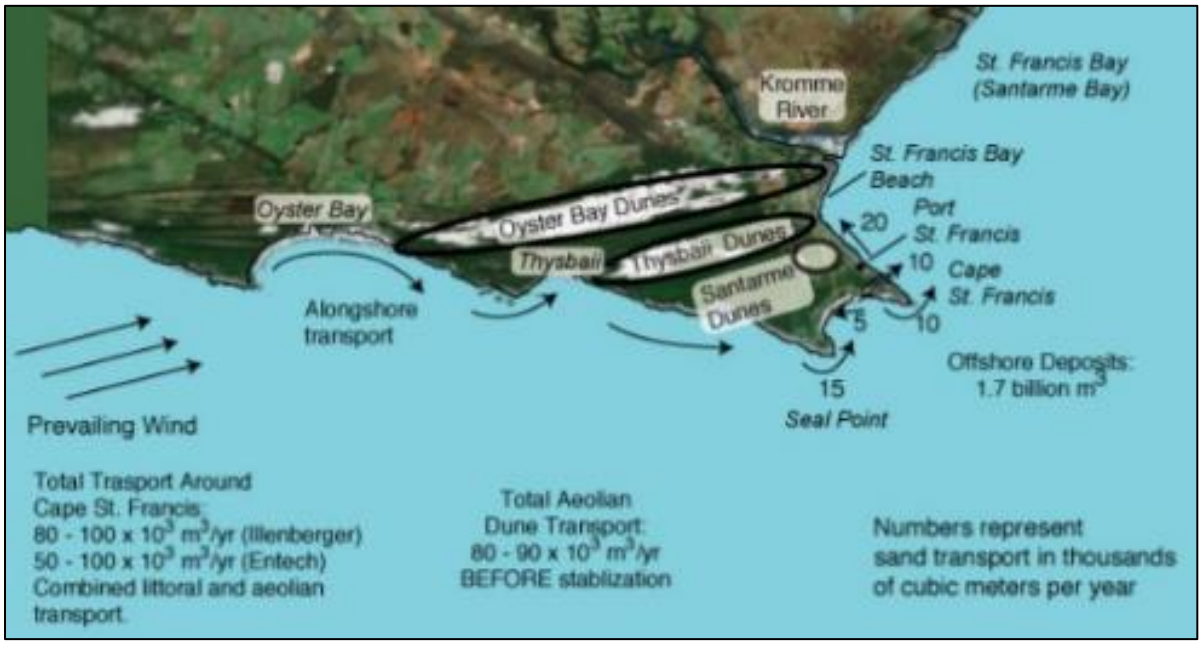


Figure 6.11: Sediment movement around St Francis Bay area (from ASR Ltd, 2006).

Estimates for the total amount of sediment moving around Cape St. Francis from west to east vary between 50 and 100 thousand cubic meters per year. Illenberger (2001) estimates a range of 80 – 100,000 m^3 per year while the Entech (2002) report gives a wider range of 50 – 100,000 m^3 per year. Of this total amount, the transport is divided between wave driven littoral transport along the coast and around the headland, and wind driven (aeolian) transport across Cape St Francis through the headland bypass dune systems. It is believed that the largest fraction of the total sediment transport across the region is through aeolian processes moving sand through the dune fields (ASR Ltd, 2006).

The net shoreline retreat along the St Francis Bay beach has been approximately 30 m to 50 m over the past 30 years. This is a shoreline retreat of between 1m and 1,5m per annum, and is regarded as very significant. This has resulted from increased sediment-carrying capacity within the lower reaches of the Kromme Estuary, resulting in less sediment available to accumulate on the St Francis Bay beach. The increased sedimentation potential of the lower reaches of the river is a direct result of the construction of several dams further upstream, which act as sediment traps.

In 2020, Advisian revised the numerical wave and shoreline modelling to assess the proposed changes to the overall groyne layout of the St. Francis Bay coastal protection scheme (please refer to Appendix F for more information). The model was updated using updated bathymetric and topographic data and as a result, more accurate nearshore wave climates were established to assess the shoreline evolution along the project site due to the construction of the coastal protection scheme.

The wave climate in St Francis Bay is considered relatively mild since most of the offshore swell wave energy is substantially reduced in wave height due to the shelter offered by Cape St. Francis, as well as refraction and diffraction effects (Figure 6.13). However, local strong winds can generate strong short-period waves throughout St Francis Bay, which enhances the harshness of the coastal environment (Figure 6.12) (Advisian, 2020).

The reductions in wave heights in the nearshore are due to the combined effects of offshore shoals, refraction, diffraction, bed friction losses and wave breaking.

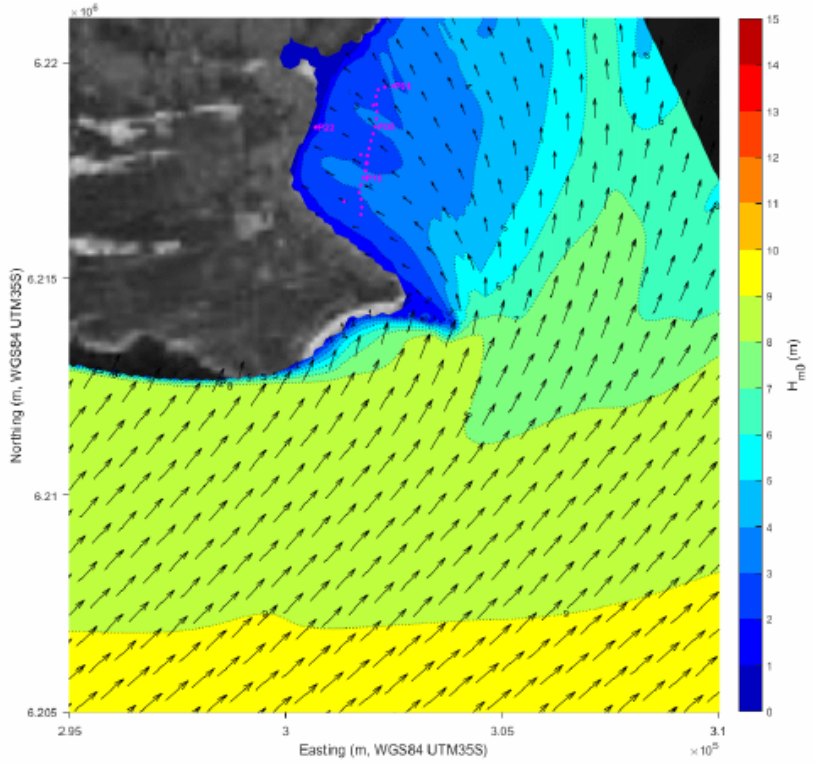


Figure 6.12 Extreme wave condition and direction illustrating sheltering effects of Cape St Francis. Arrows show the direction of the waves

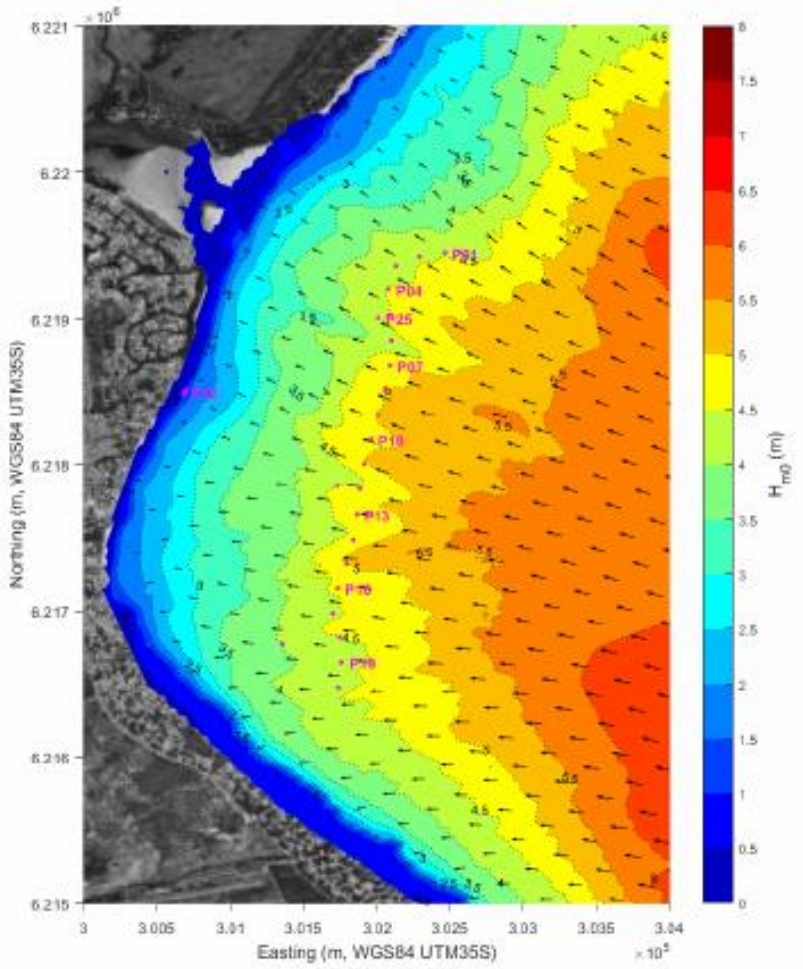


Figure 6.13 Simulated wave condition and direction for the strongest easterly wind and swell conditions. Arrows show the direction of the waves

The sediment transport along the coast is defined by the angle of incidence of the dominant wave direction and the energy in the waves. In order to validate the modelling the shoreline evolution was run for a 45 year modelling period (1975 – 2020) and compared to the current situation (Figure 6.14). The model for St Francis reproduces the historical shoreline changes due to the reduction of available sand supply (damming of the Kromme river and stabilization of Santereme dunes) over the past decades, and the effect of the constructed rock revetments sufficiently well to allow its application in the assessment of the proposed coastal protection scheme.

Figure 6.15 illustrates the long-term shoreline evolution (with and without nourishment) in response to the installation of the groynes. The model shows that the construction of the long-term coastal protection scheme will have an impact on the northern coast in terms of creating an erosional environment. However, this effect is considered relatively limited as the length of the groynes do not extend sufficiently far offshore to fully block the entire littoral drift.

In addition, the existing and future imported sand will still travel towards this northern beach area due to longshore processes, as long as maintenance nourishment of at least 6,000 m^3/year for each of the embayments south of the spit, and at least 10,000 m^3/year for the remaining embayment at the spit takes place on a regular basis.

The proposed groyne scheme in combination with beach maintenance will provide a continuous supply of sediment of approx. 28,000m^3 per year that will be transported towards the northern coastline when the complete solution is implemented. This is considered to be more beneficial to the northern coastline than the current situation (no-go scenario). Allowing the St Frances Beach to erode to the extent where negligible sediment transport can occur would result in the northern beaches experiencing accelerated erosion.

Figure 6.14 provides the shoreline evolution of St. Francis Bay beach for the 45-year modelling period considered (1975 – 2020)

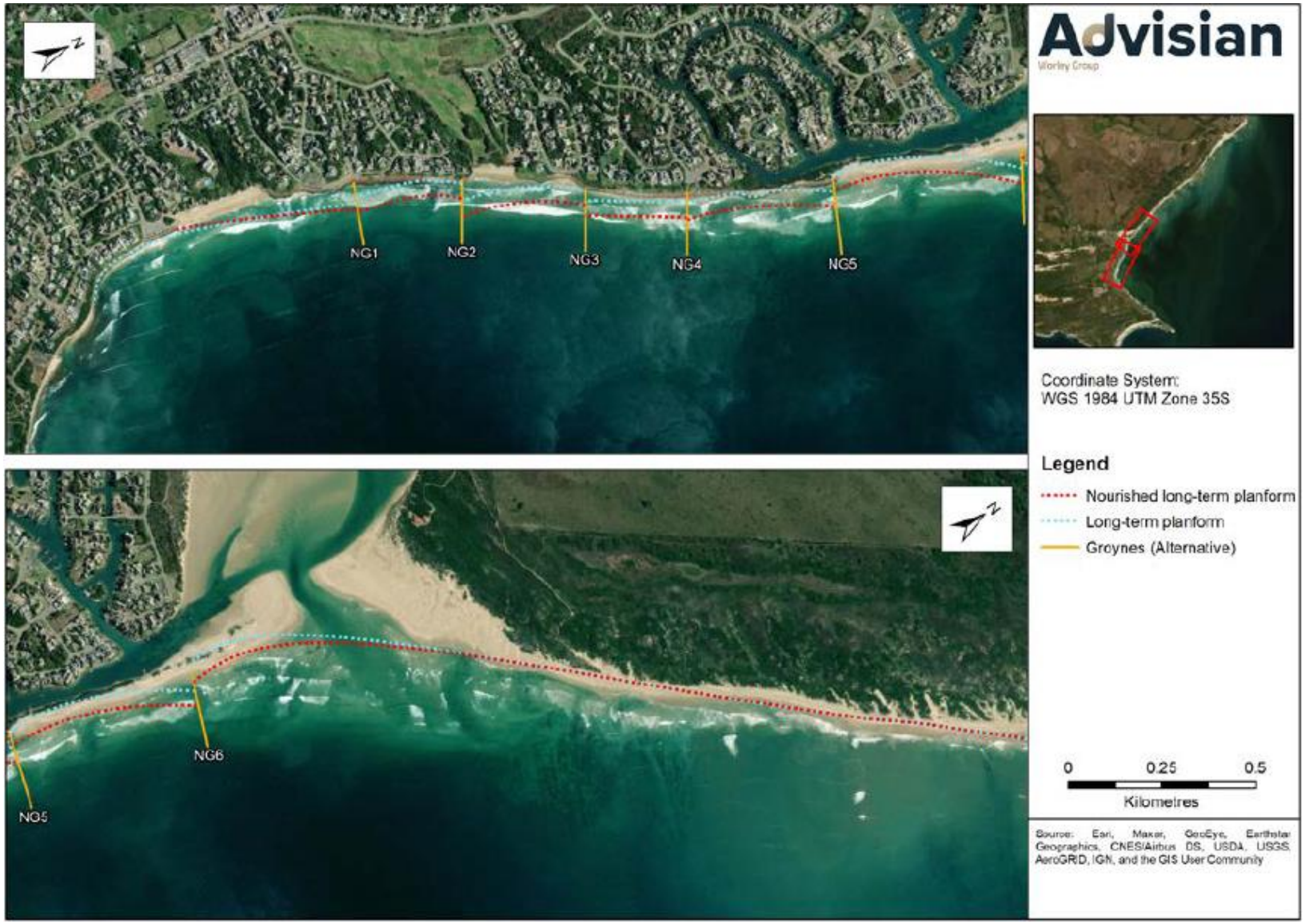


Figure 6.15 Long term shoreline planform, with the groynes installed, with and without nourishment (2020 – 2045)

6.8 Marine ecology

St Francis Bay is within the warm temperate Agulhas Bioregion, one of four inshore bioregions spanning the coast of South Africa (Porter, S. Hutchings, K and B.M. Clark. 2012). This bioregion extends from the Mbashe River in the Eastern Cape west to Cape Point. It is considered an important area of mixing where warm Agulhas Current water mixes with cool Benguela Current water. The continental shelf also extends considerably further offshore relative to the east and west of this bioregion (Porter, S. Hutchings, K and B.M. Clark. 2012).

These characteristics of the coast play an important role in providing habitat for many organisms and contribute to the maintenance of important fisheries (Wallace et al. 1984). The wide oceanic shelf provides and a range of habitats and the temperature mixing also plays a large role in accounting for the highest number of endemic fish species along the South African coast (Wallace et al. 1984).

Three main substrate types comprise the St Francis Bay off-shore area, with the dominant type being sand, and low-profile scoured reef and elevated reefs (e.g. the Umzumawethu reef) in the shallower off-shore areas.

Subtidal trawl and dredge surveys conducted mainly over soft bottom habitats from Mossel Bay to Cape Padrone recorded high diversities of polychaetes (56 species of bristleworms), followed by gastropods (53 species of snails) , ophiuroids (9 species of brittlestar) and mysids (4 species of shrimps) (Wallace et al. 1984). Wallace et al. (1984) also conducted inshore ichthyofauna surveys using otter-nets, blanket nets, try nets, scoop-nets and dredges in an effort to gain an understanding of the fish community composition the same survey in St Francis Bay and these catches are summarised in Table 6.2.

Table 6.2 Proportion that each species (%) caught in inshore trawls contributes according to the frequency of that species relative to that of the total catch in St Francis Bay.

Species Name	Common Name	Habitat	Percentage of Catch
Myliobatus Aquila	Eagle ray	Shallow water to 95m	0.9
Squalus megalops	Spiny dogfish	Shore down to 500m, usually cloase to bottom, juveniles pelagic over continental shelf	1.65
Argyrosomus inodorus	Silver kob	Important nursery areas are sandy and muddy substrata of the nearshore, shandy reef edges and estuaries	4.13
Galeichthys feliceps	White sea-catfish	Sheltered reefs or muddy bottom down to 100m	16.45
Merluccius capensis	Hake	In water between 50-400m deep. Closer to the surface at night	6.38
Pomadasys olivaceum	Piggy grunter	Juveniles and adults in coastal waters. Often over offshore reefs and soft substrate banks	30.08
Pagellus natalensis	Red tjor tjor	Deep water species brought closer inshore by upwelled water over sandy bottoms	6.65
Pterogymnus laniarius	Panga	Adults over rocky reefs 20-230m deep	5.75
Pomatomus saltatrix	Shad	Predatory over sandy bottoms and reef edges	17.31
Trachurus trachurus	Maasbanker	Pelagic, surface to 400m	5.75

Wallace et al. (1984) findings for the soft bottom species were corroborated through the National Biodiversity Assessment (2011) results, where the majority of the coastal and nearshore habitats for the study area were considered to be sandy substrate (Figure 6.16).

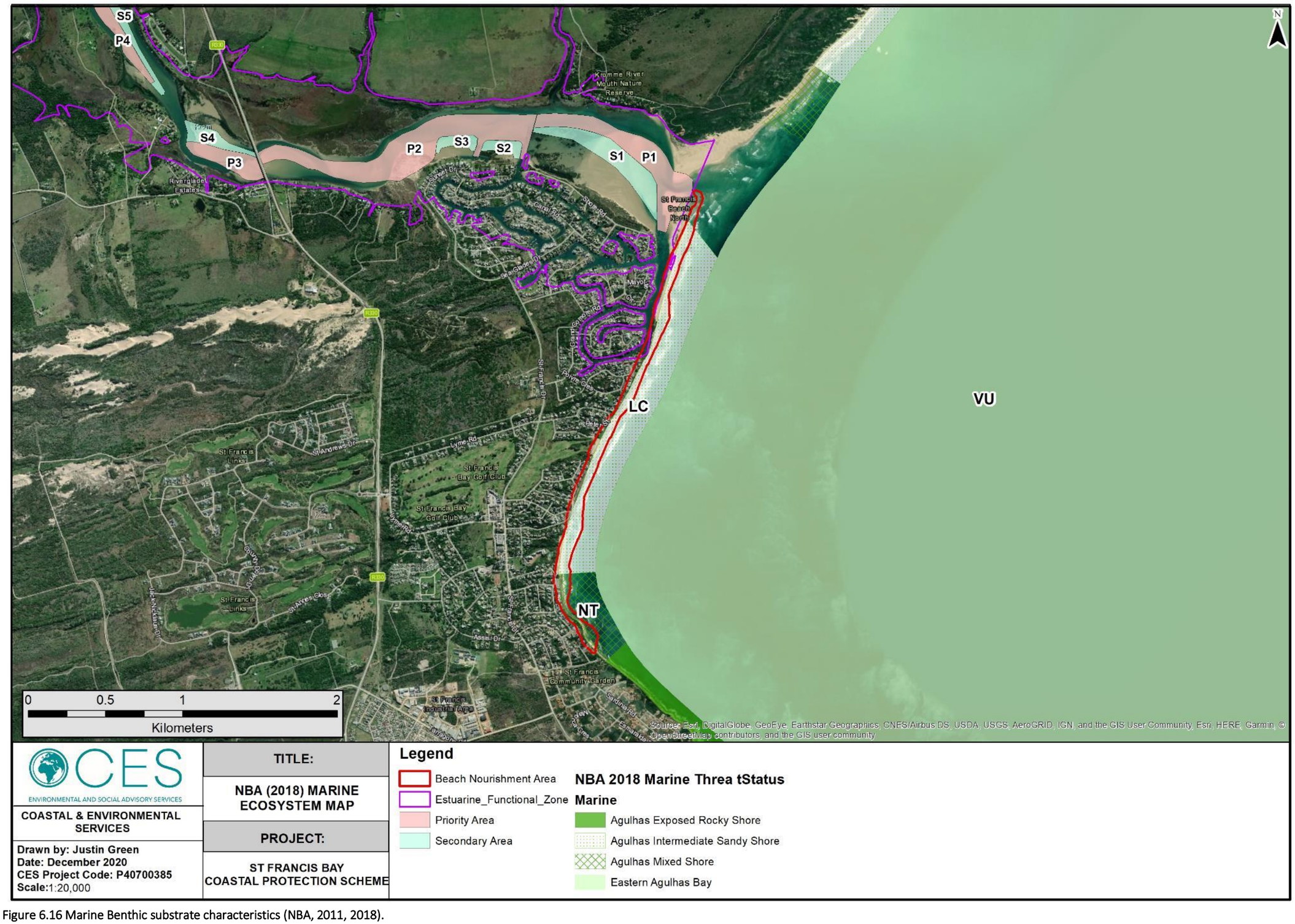


Figure 6.16 Marine Benthic substrate characteristics (NBA, 2011, 2018).

There are two prominent reefs located off-shore the St Francis Bay beach, namely the Umzumawethu reef and the Anne Avenue reef (Plate 6.1). According to ASR (2006), the Umzumawethu reef is only approximately 1 m above the height of the adjacent sea bed. It is, however, relatively large in extent and is therefore a significant control point for the St Francis Bay Beach, resulting in the 'dog-leg' (curving) shape between the Kromme Entrance and the reef.

Plate 6.1. Approximate position of the Umzumawethu reef

The first survey of the bathymetry of the St Francis Bay off-shore area was undertaken in December 2005. Due to the influence of the reefs on the shape of St Francis Bay Beach (as described above) high resolution bathymetry survey of the Umzumawethu and Anne Ave reefs was undertaken and combined to the existing survey data. Additional data digitized from the nautical chart for the area, acquired from ASR, and beach profiles were also incorporated into the bathymetric data. During spot dives conducted by ASR, a number of small low scoured reefs were identified where populations of red algae (Figure 6.17) dominate, particularly *Plocamium corallorhiza, P. Cornutum, Pterosiphonia cloiophylla, Hypnea spicifera, Chondrococcus hornemannii, Gigartina paxillata, Laurencia flexuosa* and articulated corallines *Amphiroa bowerbankii, A. ephedraea, Arthrocardia duthiae, Cheilosporum cultratum, Corallina sp.* and *Jania sp*. (Porter, S. Hutchings, K and B.M. Clark. 2012). Brown algae are also an important component, particularly species of *Dictyota* and *Dictyopteris, Zonaria subarticulata, Ecklonia biruncinata* and *Iyengaria stellata*. Green algae such as C*aulerpa filiformis, C. racemosa, Bryopsis spp.* and *Codium spp.* play a subordinate role to intertidal community composition (Porter, S. Hutchings, K and B.M. Clark. 2012).

On intertidal and shallow subtidal reefs, grazers and filter feeders are the most abundant fauna. In particular, molluscs such as *Perna perna* and *Petella cochlear* and the ascidian *Pyura stolonifera* dominate the infratidal and shallow subtidal (Porter, S. Hutchings, K and B.M. Clark. 2012). Deeper reefs are dominated by a high diversity of filter feeders, particularly colonial ascidians, sponges, soft corals and bryozoans.

Figure 6.17 Photographs of the Umzumawethu reef taken during spot dives (ASR, 2006).

The relatively hard and stable reefs result in greater biodiversity and species abundance than the sandy substrates (Pratt, 1994) and directly related to the higher complexity and stability of hard substrate. This is reflected in the NBA (2018) threat status for both reef habitat and sandy substrate being classified as “vulnerable” and “least threatened” accordingly (Figure 6.18).

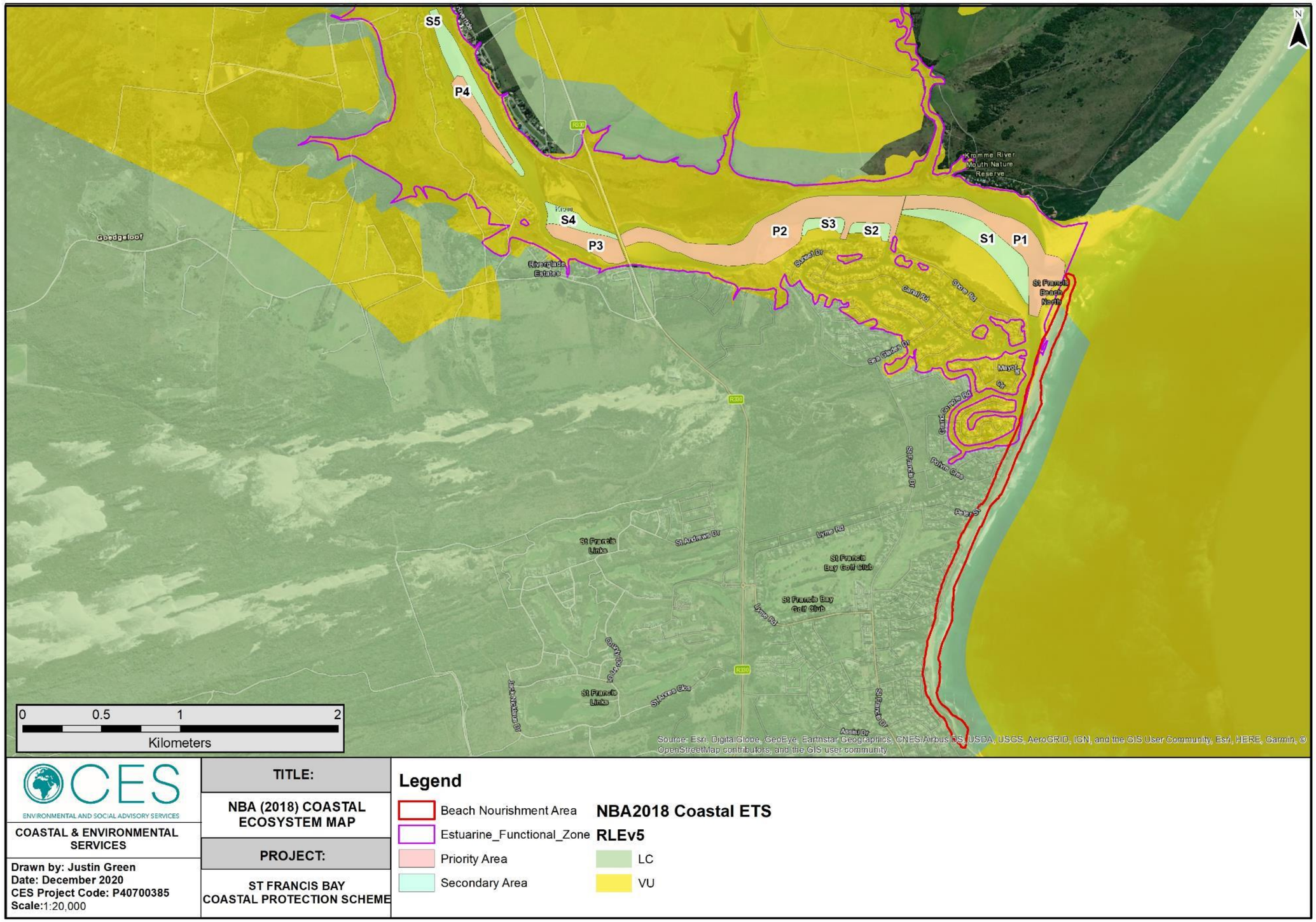


Figure 6.18 Ecosystem threat status for the coastal and inshore marine benthic habitat (NBA, 2011).

6.9 The Kromme River Estuary

The Kromme Estuary is a permanently open system and is located approximately 80 km west of Port Elizabeth on the south coast of South Africa. The system has a catchment of approximately 936 km^2 and consists of 1.73 km^2 of natural forest, 79.6 km^2 of fynbos, whilst the remainder consists mainly of private farms for livestock and grain cultivation (Baird *et al*., 1992). The Kromme Estuary is tidal for approximately 14 km (Bickerton and Pierce, 1988) (see Appendix J).

A sand spit of about half a kilometre long extends from the south bank of the estuary mouth and tends to push the mouth channel northwards. In the lower reaches of the estuary (up to about 5 km from the mouth) channel depths are around 1.5 m, characterised by a sandy bottom substrate. Further upstream, the estuary becomes deeper (3 to 5 m). In the upper reaches current velocities are usually lower than 0.3 $m.s^{-1}$, while current velocities of 1 $m.s^{-1}$ are common near the mouth. Extensive salt marshes cover the banks of the estuary in the middle and lower reaches, while the channel meanders between vegetated cliffs in the upper reaches. A marina has been developed on the south bank near the mouth (Coastal and Environmental Services, 2006). The mouth of the Kromme Estuary is flood tide dominated, resulting in the ingress of marine sediment in its lower reaches (Bickerton and Pierce, 1988). The main tributary is the Geelhoutboom River, which originates south of Humansdorp, and joins the Kromme Estuary about 8 km upstream of the mouth.

The Estuarine Health Index Score calculated for the Kromme Estuary based on its present status is 49, which translates to a Present Ecological Status of D (i.e. largely modified). However the Estuarine Importance Score is rated as "important". The Kromme Estuary has been targeted as a Desired Protected Area. The policy basis suggests that it should be restored to and maintained in the best possible state of health. However, it has been decided that based on current impacts, mostly caused by dams in the catchment, it is unlikely that this status would be realistically attained, and it is recommended that the estuary should be in an Ecological Reserve Category C (a moderately modified system where a loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged) (Coastal and Environmental Services, 2006).

6.9.1 *Physical Characteristics*

The flow pattern of the Kromme Estuary has been significantly modified by the construction of two large dams, i.e. the Churchill Dam (built in 1943) and the Mpofu Dam (built in 1983;) (Bickerton and Pierce, 1988; Bate and Adams, 2000). The dams in the catchment are considered to attenuate all floods with a return period of less than 1 in 30 years (Bickerton and Pierce, 1988) and have a combined storage capacity of *ca* 133 % of the mean annual run-off of the Kromme River catchment (Scharler and Baird, 2000). This results in high water column salinity throughout the year and the occasional occurrence of hypersaline conditions in the upper reaches.

Data collected during the past 30 years show that both the Sand and Geelhoutboom Rivers, the biggest tributaries of the Kromme Estuary, are not viable freshwater contributors to the system (Scharler *et al.,* 1997), due to numerous small agricultural dams within the respective catchments. Under natural conditions the Geelhoutboom tributary, on average, is estimated to have contributed less than 5 % of the freshwater inflow into the estuary throughout the year. Under current conditions this contribution is less than 1 % in mid- to late summer, but typically between 10 to 30 % during the remainder of the year (i.e. the peak contribution is during the early part of the wet season). Under current conditions, during dry years the Geelhoutboom tributary contribution is negligible in terms of freshwater inflow to the Kromme Estuary in the dry summer months, but typically 15 to 20 % during the remainder of the year. During wet years the freshwater contribution from the Geelhoutboom ranges between 5 to 10% during the rainy season in late winter to early spring to approximately 20 % during the dry months in

mid to late summer. The contribution from the Sand River is considered to be negligible (Coastal and Environmental Services, 2006). Studies of various biological disciplines have often characterised the estuary as freshwater-starved (e.g. Marais, 1983; Hanekom and Baird, 1984; Emmerson and Erasmus, 1987; Adams *et al.,* 1992; Newman, 1993; Jerling and Wooldridge, 1994). Salinity values above 35 PSU dominate at the tidal head of the estuary, whereas lower salinity values (< 35 PSU) were only measured occasionally near the surface in the upper reaches of the estuary (Scharler *et al.,* 1997).

Reduction in freshwater flow also results in marine sediments moving upstream due to tidal flow. Since the construction of the Churchill and Mpofu dams on the Kromme River, the upstream migration of marine sand has increased (Reddering and Esterhuysen, 1983).

On the south bank of the estuary mouth is a sand spit that extends for approximately 650m, and this spit tends to push the mouth channel northwards. The beach in front of the sand spit system has eroded, and the toe of the foredune is cliffed, and a typical pioneer zone with incipient foredunes is absent. A foredune is entirely absent from the back-beach area due to the severe erosion that has taken place. Rock revetments have been placed immediately above the high-water mark to prevent further shoreline erosion. Aside from two small pocket beaches located at George road and Mary Crescent, where some foredune vegetation is present in the back-beach area behind the HWM, at high tide there is no beach, and wave run-up occurs across the length of the beach face, with the rock revetments dissipating the wave energy.

A more natural shoreline is found to the north of the estuary mouth. A relatively large transverse dune system to the north (150m wide, 500m long) defines the northern bank of the estuary. Behind this, and to the north-east is a well vegetated dune cordon of 300m wide, with a small foredune and vegetated transverse dunes. There appears to be very little erosion in these areas.

The mouth of the Sand River is located 2km upstream of the mouth, on the south bank of the river. The Sand River's contribution to the freshwater inflow into the Kromme system is negligible. The dominant flow within the Sand River is subterranean, but reduced flows both in the system as well as the Kromme has resulted in a substantial accumulation of sand along this 250m of river bank. The sand mass is approximately 180m wide and 300m long, and has become stabilised by pioneer dune and salt marsh vegetation. Further east the sand has not yet become vegetated, as it is still inundated at high tide. Over time, and with ongoing sand accumulation it is expected that this sand will also become stabilised with dune vegetation.

6.9.2 *Vegetation Structure*

Vegetation in the Kromme Estuary can be divided into four (4) distinct groups (Figure 6.19:

- *Submerged Macrophytes*: Dominated by *Zostera capensis;*
- *Intertidal Salt Marsh*: Dominated by salt marsh species such as *Sarcocornia decumbens, Triglochin striata, Triglochin bulbosa*, *Bassia diffusa, Sporobolus virginicus, Limonium linifoloium, Spartina maritima* and *Salicornia meyeriana;*
- *Supratidal Salt Marsh:* Dominated by *Sarcocornia pillansii; and*
- *Reeds and Sedges*: Dominated by *Phragmites australis*

Submerged Macrophytes

Freshwater impoundment reduces the frequency of floods and sedimentary disturbances (Whitfield and Bate, 2007). Den Hartog (1977) has shown that plants such as submerged macrophytes, cannot develop or colonize areas where the substrate is constantly being modified by water currents. Therefore, reduced freshwater input into an estuary favours submerged macrophyte growth and dominance, as there is a decrease in turbidity and water velocities resulting in a more stable sediment

and salinity environment. The reduction of freshwater inflow into the Kromme Estuary over the past decade has led to an increase in Zostera capensis biomass and area distribution (Adams and Talbot, 1992; Wooldridge, 2007).

Bezuidenhout (2011), showed, that there has been a steady increase in the area covered by *Zostera capensis* since 1942 (10.8 ha), 1980 (13.7 ha), 1989 (21.7 ha) and in 2000 up to 30.98 ha. This three fold increase can be attributed to the following anthropogenic factors: reduced flows (which results in a lack of scouring and sedimentary disturbance, stable salinity and reduced turbidity), construction of the bridge, and reduction in sand input from the Sand River tributary.

Salt Marsh

Large intertidal salt marsh areas within the Kromme Estuary are important as only 18 % of South African estuaries are permanently open and these salt marshes are considered to be rare (Colloty, 2000). The largest section of salt marsh occurs on the seaward side of the road bridge on the northern bank approximately 2 km from the mouth (Figure 6.19). Small isolated salt marshes also occur further upstream on the west bank (4 km from the mouth) and on the east bank about 2 km from the head of the estuary. Salt marshes extend into the middle-upper reaches of the Geelhoutboom tributary. *Sarcocornia decumbens* was the dominant species in the intertidal zone. This species generally occupies the mid and upper levels of estuarine salt marshes (O" Callaghan, 1992). *Sarcocornia pillansii* was the dominant species in the supratidal zone. This species is dominant in most of the supratidal areas of warm and cold temperate South African estuaries (Adams *et al.,* 1999). There is some evidence of salt marsh erosion in the middle reaches of the estuary due to boat activity. In addition, lack of freshwater input into the Kromme Estuary has resulted in increased water column salinity that has caused salt accumulation in the intertidal marshes (Adams *et al.*, 1992), which has resulted in large areas of bare ground in the upper intertidal areas due to hypersaline. These bare patches were only colonized by the highly stress tolerant *Salicornia meyeriana.* When an increase in rainfall flushed some of the excess salt from these bare patches during winter there was a decrease in the cover of *Salicornia* and an increase in other salt marsh species.

Reeds and Sedges

According to Bezuidenhout (2011) a large area (7.2 ha) of *Phragmites australis* near the village of St. Francis Bay was lost as a result of development. Ignoring the loss of this inland reed bed, there was actually an increase of over 6 ha in the estuary itself. This increase in reedbed cover resulted from an increase in sedimentation due to decreased freshwater input (Adams and Talbot, 1992). Reed beds occur upstream of the road bridge on the south bank, and in small streams and tributaries feeding the estuary in the middle-upper reaches. Reeds can survive tidal inundation with saline water as long as their roots and rhizomes are located in brackish to fresh water (Adams and Bate, 1999). The upper reaches of the Kromme Estuary are rocky and extensive reed beds do not occur there naturally. However, reeds were probably more extensive in the Geelhoutboom tributary prior to the construction of farm dams when the water column salinity was lower (< 15 PSU).

Dune Vegetation

For most of its length the sand spit is well vegetated with typical pioneer woody species such as *Chrysanthemoides monolifera* (Bitou), but the most dominant species is the invasive Acacia, *Acacia cyclops* (Rooikrans). It is likely that this species was used to stabilise the sand spit, owing to its important function of protecting the seaward canal of the marina. It is only about 15m to 25m wide, and on average 6m high. The four breaches in 2020 have resulted in a reduction of dune habitat along the spit. This, together with the repair works have resulted in a disturbed foredune environment which now also contains rock material, reducing the ability for revegetation of the spit naturally.

The dune system at the Sand River has become well vegetated say with typical saltmarsh species closer to the river's edge, giving way to dune slack species in the depressions. Further inland woody pioneer

species such as *Metalasia muricate* and *Stoebe plumosa* are present. There is a clear successional gradient away from the water's edge, where the vegetation has become well established over time. In some locations the freshwater reed, *Phragmites australis* is present, indicating a source of freshwater close to the surface.

6.9.3 *Fauna*

The mouth of the estuary is permanently open and experiences regular tidal inflow and outflow, which is sufficient to maintain a tidal inlet. Consequently, the flood-tidal delta of the Kromme is well-developed and extends 4-5 km upstream of the mouth where it produces large intertidal sand flats, which are densely colonised by burrowing infauna (mainly *Callianassa* spp.). The open connection with the sea and strong tidal currents permit both active and passive migration of biotic elements and enable the maintenance of "typical" estuarine water level fluctuations, creating extensive sandy intertidal areas and salt marshes, which are important habitats for the estuarine biota (Harrison *et al.,* 1996a; Harrison *et al.,* 1996b).

The macrobenthic communities of estuarine substrate are divided into two main groups: suspension- and deposit feeders. The presence/absence of these types of species is strongly related to sediment type. The communities are dominated by crustaceans, *Cleistostoma edwardsii*, *C. algoense*, *Upogebia africana, Sesarma catenata* and *Uca urvillei* and the bivalve *Solen cylindraceus.* Other species include: *Glycera tridactyla*, *Tellina gilchristi* and *Macoma ordinaria*. The sediment of the estuary also contains bait species including: the sandprawn, *Callianassa kraussi*, the pencil bait, *Solen capensis* and the bloodworm, *Arenicola loveni*.

There is a significant lack of recent literature concerning the ichthyofaunal composition of the Kromme Estuary. However, according to Hanekom and Baird (1984), a total of 24 species have been recorded in this estuary (Table 6.3). Of these 24 species, 7 species occur throughout the estuary, namely *Cajjrogobius multifasciatus* (Smith), *GiJchristeUa aestuarius* (Gilchrist), *Gkmogobius giurus* (Hamilton-Buchanan), *Hepsetia breviceps* (Cuvier), *Liza dumerili* (Steindachner), *Liza richardsoni* (Smith) and *Rhabdosargus holubi* (Steindachner). The species *Monodactylus jalcijonnis* (Lacepede) and *Rhabdosargus holubi* occur predominantly in Zostera beds, while the species *Diplodus cervinus* (Valenciennes), *Lithognathus lithognathus* (Cuvier), *Spondyliosoma emarginatum* (Cuvier) *Gilchristella aestuarius*, *Liza dumerili, Liza richardsoni* and *Pomadasys olivaceum* usually dominate areas outside of Zostera beds. Species occurring in the highest abundance include *L. dumerili, G. giurus*, and *G. aestuarius.*

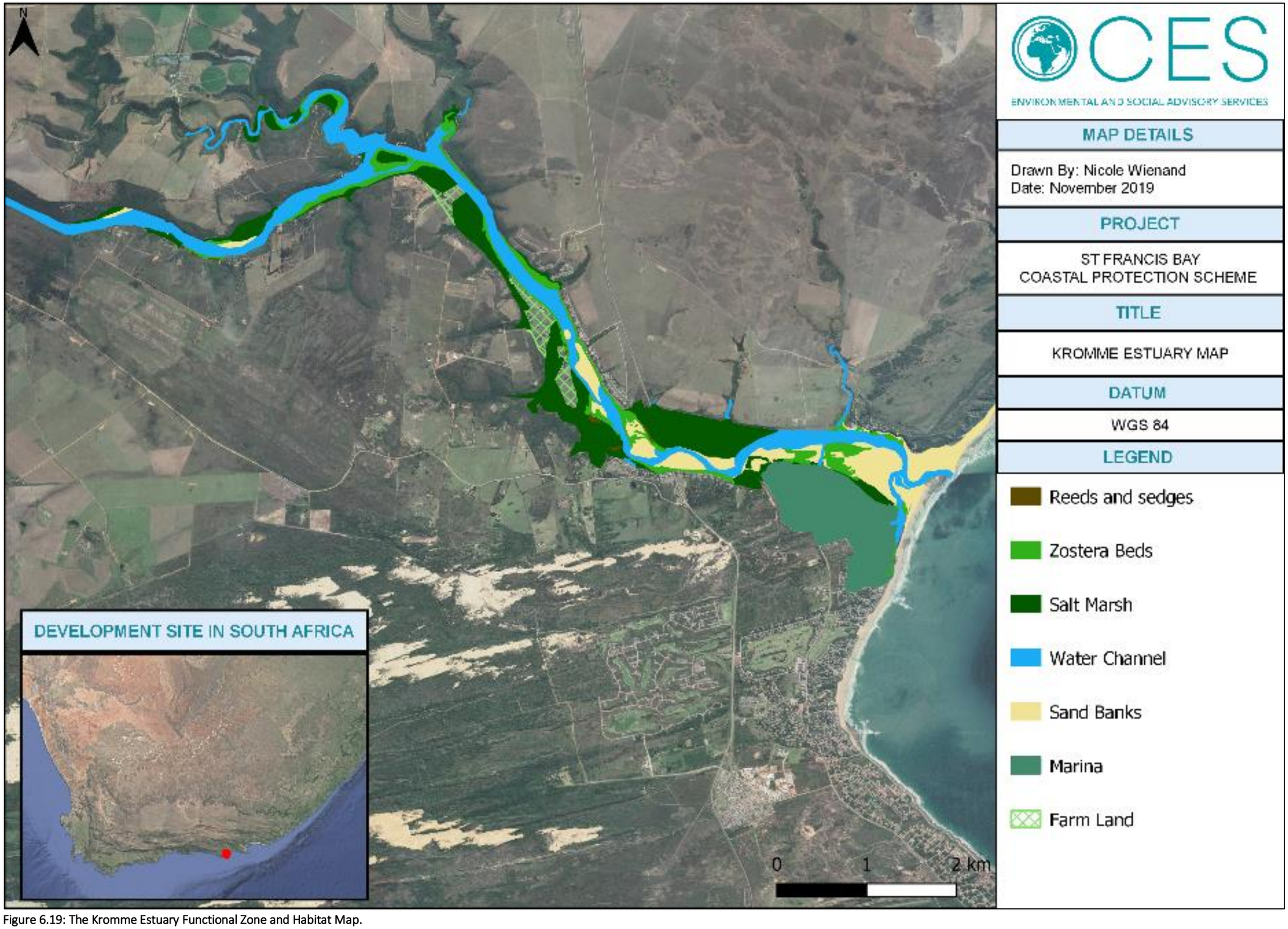


Figure 6.19: The Kromme Estuary Functional Zone and Habitat Map.

Table 6.3: Conservation Status of fish species recorded in the Kromme River Estuary

SPECIES	IUCN
Clinus superciliosus	Least Concern
Caffrogobius multifaciatus	-
Diplodus cervinus	Least Concern
Diplodus sargus	Least Concern
Gilchristella aestuarius	Least Concern
Glossogobius giurus	Least Concern
Hepsetia breviceps	Not Evaluated
Heteromycetes capensis	Not Evaluated
Lichia amia	Least Concern
Lithognathus lithognathus	Endangered
Chelon dumerili	Data Deficient
Chelon richardsonii	-
Chelon tricuspidens	-
Monodactylus falciformis	Least Concern
Mugil cephalus	Least Concern
Myxus capensis	Least Concern
Pomadasys commersonni	Not Evaluated
Pomadasys o/ivaceum	-
Psammogobius knysnaensis	-
Rhabdosargus holubi	Least Concern
Solea bleekeri	-
Spondyliosoma emarginatum	Least Concern
Syngnathus acus	Least Concern
Tachysurus jeliceps	•
Syngnathus watermeyeri	•

Although the Western Cape's endemic seahorse species *Hippocampus capensis*, commonly referred to as the Knysna Seahorse, historically occurred in the Kromme Estuary, sightings of this species has not been recorded for many years. This endangered species now only inhabits three estuarine systems along the South African coast, namely the Swartvlei Estuary, Keurbooms Estuary and the Knysna Estuary (Harding, 2017).

Important Bird and Biodiversity Areas (IBAs), as defined by BirdLife International, constitute a global network of over 13 500 sites, of which 112 sites are found in South Africa. IBAs are sites of global significance for bird conservation, identified nationally through multi-stakeholder processes using globally standardised, quantitative and scientifically agreed criteria. Essentially, these are the most important sites for conserving (https://www.birdlife.org.za/what-wedo/important-bird-and-biodiversity-areas/). Important Bird Areas (IBAs) as listed by BirdLife South Africa relative to St Francis Bay include the Tsitsikamma-Plettenberg Bay IBA in Koukamma LM, the Maitland-Gamtoos Coast IBA in the Kouga LM (Birdlife South Africa, 2019) (see Figure 6.20).

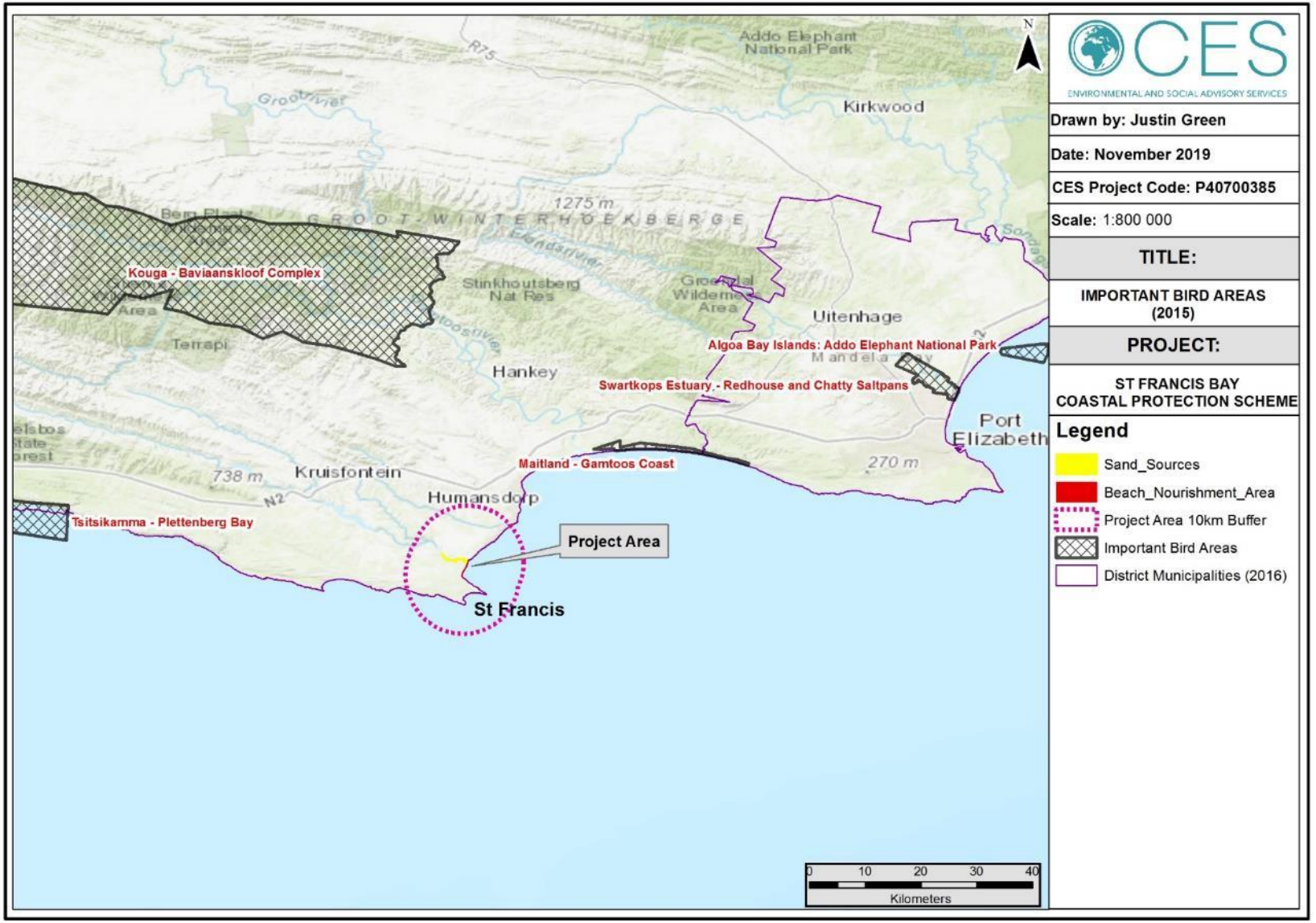


Figure 6.20. Important Bird Areas (IBA) in close proximity to the study site

According to South African Birding (2008), within just a few hours of bird watching, anywhere between 80 to 160 regularly occurring bird species can be spotted in and around the St Francis Bay area. Commonly spotted species include the African fish eagle (*Haliaeetus vocifer*); African Marsh-Harrier (*Circus ranivorus*); Osprey (*Pandion haliaetus*); Cape Gannet (Morus Capensis); African Black Oyster Catcher (*Haematopus moquini*); Goliath Heron (*Ardea goliath)*; African Spoonbill (*Platalea alba*); Black-winged Stilt (*Himantopus himantopus*); Blue Crane (*Anthropoides paradiseus*); Denham's Bustard (*Neotis denhami*), Olive Bush-Shrike *(Chlorophoneus olivaceus)*; Southern Tchagra *(Tchagra tchagra)*; Cape Longclaw (*Macronyx capensis)*, Cape Grassbird (*Sphenoeacus afer*), 5 species of kingfisher (family *Alcedinidae*); 3 species of sunbird (family *Nectariniidae*) and African Stonechat (*Saxicola torquatus*).

During low tide, when the sand banks within the estuary are exposed, it has been reported that large numbers of waterbirds feed and roost on the sand banks. Historically the presence in number of Swift Tern, Common Tern and Sandwich Tern have been of regional importance, but recent records are not available to confirm whether this is still the case. Bickerton and Pierce (1988) suggested that the Kromme has lower numbers of water fowl than expected compared to the Seekoei and Kabeljous estuaries.

The conservation status of the above listed species are listed in Table 6.4 below.

Table 6.4: Conservation Status of bird species recorded in the Kromme River Estuary

SPECIES	IUCN
Haliaeetus vocifer	Least Concern
Circus ranivorus	Least Concern
Pandion haliaetus	Least Concern
Morus Capensis	Vulnerable
Haematopus moquini	Near Threatened
Ardea goliath	Least Concern
Platalea alba	Least Concern
Himantopus	Least Concern
Anthropoides paradiseus	Vulnerable
Neotis denhami	Near Threatened
Chlorophoneus olivaceus	Least Concern
Tchagra	Least Concern
Macronyx capensis	Least Concern
Sphenoeacus afer	Least Concern
Saxicola torquatus	Least Concern

6.9.4 *Socio-Economic Value*

The open water of the Kromme Estuary is listed as 125 ha (Sowman and Fuggle, 1987). The Kromme Estuary supports many recreational activities including fishing, birding, bait collection, waterskiing, canoeing, boat cruisers, hiking and swimming (Adams, 2001). Tourism is viewed as an important income generator in the area (Davies, 2009 in Sale *et al.,* 2009). There is considerable concern that the recreational capacity of the Kromme River estuary is being exceeded. In 1992, the estimated increase of recreational activities on the river in peak holiday periods was ~400 %. Calculations were done using international safe space standards and it was determined that the carrying capacity of the river in terms of power boating and sailing activities is exceeded in peak holiday times. This implies that the river becomes unsafe for public use in these times (ARSC Kromme River Structure Plan, 1992).

St Francis Bay falls within the area known as the "Sunshine Coast", characterised by undeveloped coastal areas interspersed with small towns such as St Francis Bay. It can be expected that holiday makers, tourists and many permanent residents would be highly sensitive to negative changes in the

visual environment. It is also expected that these groups of people would place a high premium on landscape quality.

Four distinct landscape types exist within the study area:

- A sandy beach;
- An eroded foredune ridge backed by residential development;
- A barrier dune fronting the Marina Glades ski canal; and
- The Kromme River Estuary.

The overall landscape quality is considered to be high. The sense of place depicted in the study area is in part a pattern that occurs at various sites along the coast, but the strong curve of the St Francis Bay beach, the sandy beach zone which is contained by the rocky shore to the south west and the Kromme River estuary inlet to the north, as well as uniform architectural character contribute to the uniqueness of the site.

Similarly the landscape of the Kromme River estuary is also considered to be high. Although the presence of boat traffic and large numbers of tourists may interupt the the character of the view. In addition to landscape the estuary is considered to be a quiet and serene area, especially during the quieter periods of the day and outside of the main tourist season.

6.9.5 *Cultural Heritage and Palaeontological Features*

In 2019 a heritage and archaeological assessment was carried out by Exigo. This work was completed as part of obtaining authorisation and permits for repair work to the rock revetments along the St Francis Bay beach. The survey which covered a stretch of beach between the spit and just south of the Neville Road car park was deemed to be sufficient in informing this project as it covers a similar area, and given the nature of the features unlikely that any unidentified would now be present. It is unlikely that the dredging component of this project would affect cultural heritage and palaeontological features since the material is likely to be won from areas within the estuary which would have historically been covered by water and/or disturbed by the estuary.

In general the St Francis Bay area is particularly rich in archaeological shell middens. Many of these have been identified over the years and were presented in the specialist study in 2006 and 2019 (see Exigo report in Appendix G). The archaeology of this area relates primarily to the Holocene (last 10 000 years) occupation by San hunter-gatherers and later by KhoeKhoen pastoralists. The archaeological term used to describe the remains from the period is Later Stone Age (LSA). As mentioned there are many coastal shell middens in the vicinity of St Francis Bay. In addition to the middens, a number of graves have also been found in recent years during the construction of new houses in the St Francis Bay area.

However, for the area applicable for this project and according to the previous study, no archaeological sites or material was found. No shell concentrations, stone, bone or pottery fragments were observed. It is possible that some sites may already have been lost due to the coastal erosion, while other may have been destroyed through previous coastal development.

In terms of Marine and Underwater Cultural Heritage (MUCH), a number of ships are known to have wrecked along the coastline of Cape St Francis and the Kromme River mouth - four vessels in particular are listed as being wrecked in St Francis Bay. Of note is the wrecking site of the Lady Head (1859) in an unspecified location in the mouth of the Kromme River (See Figure 5-4 in Appendix G). A Maritime and Underwater Cultural Heritage Impact Assessment (MUCHIA) was considered as a large part of the proposed development, and particularly sand sourcing and beach replenishment, are proposed to occur below the high-water mark. However, the MUCH Unit of SAHRA granted exemption from MUCHIA, being cognisant of the fact that target areas for dredging occur largely to the riverside delta of the Kromme River estuary and areas within the river system to the west. In addition, the beach infrastructure (i.e. groynes) are expected to be constructed on top of the existing beach sand level without the need for excavation. The revetment at the spit will be installed on a nourished beach level, which will be approximately 1 m higher than the existing beach level.

6.9.6 *Socio-Economic Profile*

The Kouga Local Municipality falls under the Sarah Baartman District Municipality (previously known as the Cacadu District Municipality). According to Statistics South Africa, the unemployment rate of the Kouga Local Municipality is approximately 21.5%. There are an estimated 38 412 economically active individuals (i.e. people who are employed or unemployed but actively seeking employment) living within the Kouga Local Municipality, of which 21.5% are unemployed. Of these 38 412 individuals, 19 634 are classified as 'youth' (age 15 to 34), with 26.7% of the youth population unemployed.

The total population of the Kouga Local Municipality is 98 558, with the youth (ages 15 to 34) accounting for 26.8% of this. The population growth rate from 2001 to 2011 equated to 3.22% per annum and the majority of the population (85.5%) are found within urban areas. Only 7.2% of people aged 20 years or older, have completed primary school. 38% of people have received some form of secondary education, 4.9% have completed matric and only 9.5% have some form of higher education (Stats SA, 2011).

The tourism profile of the area includes a number of attractions that fall under various categories. St Francis Bay is world renowned for its waves, including the iconic Bruce's Beauties features in the 1966 film, 'The Endless Summer". Other wave attractions include Seal Point in Cape St Francis and Super Tubes in Jeffery's Bay, just around the corner. The Kromme River is famous for its skiing, canoeing, stand-up paddle (SUP) boarding, and fishing. Due to the diverse range of activities on offer, St Francis Bay is a popular holiday destination with its series of canals, upmarket restaurants, beaches, golf courses, and uniform white and thatched roof homes. Other activities on offer include bird and whale watching, kite surfing, jet-skiing and hiking (Kouga Integrated Development Plan, 2015).

7 IDENTIFICATION OF POTENTIAL IMPACTS

According to Appendix 3, Section 3 (1), of the of the 2014 EIA Regulations (as amended), "*an environmental impact assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include—*

(v) a full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including:

(v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts—

(aa) can be reversed;

(bb) may cause irreplaceable loss of resources; and

(cc) can be avoided, managed or mitigated;

(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;

(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;

(viii) the possible mitigation measures that could be applied and level of residual risk;

(ix) the outcome of the site selection matrix;

(vi) a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity, including—

i. a description of all environmental issues and risks that were identified during the environmental impact assessment process; and

ii. an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;

(vii) an assessment of each identified potentially significant impact and risk, including—

i. cumulative impacts;

ii. the nature, significance and consequences of the impact and risk;

iii. the extent and duration of the impact and risk;

iv. the probability of the impact and risk occurring;

v. the degree to which the impact and risk can be reversed;

vi. the degree to which the impact and risk may cause irreplaceable loss of resources; and

vii. the degree to which the impact and risk can be mitigated.

7.1 Issues Identification Matrix

The CES rating scale has been updated to meet the requirements outlined in Appendix 2 of the EIA Regulations (2014, as amended). This methodology takes into consideration the following criteria, and includes the new criteria for assessing post mitigation significance, by incorporating the principles of reversibility and irreplaceability:

- Nature of impact
- Type of impact
- Duration
- Extent
- Probability
- Severity or benefits

Nature of impact

Negative or positive impact on the environment.

Type of impact
Direct, indirect and/or cumulative effect of impact on the environment.

Duration, extent, probability and severity scales
These four factors need to be considered when assessing the significance of impacts (Table 7.1a, 7.1b), namely:

- ***Relationship of the impact to temporal scales*** - the temporal scale defines the significance of the impact at various time scales, as an indication of the duration of the impact.
- ***Relationship of the impact to spatial scales*** - the spatial scale defines the physical extent of the impact.
- ***The likelihood of the impact occurring*** - the likelihood of impacts taking place as a result of project actions differs between potential impacts. There is no doubt that some impacts could occur (e.g. loss of vegetation), but other impacts are not as likely to occur (e.g. vehicle accident), and may or may not result from the proposed development. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance. In this case likelihood equates to some extent with risk. If the impact is definite, then there is a high risk that it will occur. However, likelihood and risk are not to be confused, and for certain impacts (e.g. risk of a vehicle accident) a risk assessment will be required.
- ***The severity of the impact*** - the severity/beneficial scale is used in order to scientifically evaluate how severe negative impacts would be, or how beneficial positive impacts would be on a particular affected system (for ecological impacts) or a particular affected party. The severity of impacts can be evaluated with and without mitigation in order to demonstrate how serious the impact is when nothing is done about it, and how effective the mitigation might be. The word 'mitigation' means not just 'compensation', but includes concepts of containment and remedy. For beneficial impacts, optimization means anything that can enhance the benefits. However, mitigation or optimization must be practical, technically feasible and economically viable.

Reversibility and Mitigation
The degree of difficulty of reversing and/or mitigating the various impacts ranges from very difficult to easily achievable. Both the practical feasibility of the measure, the potential cost and effectiveness is taken into consideration when determining the appropriate degree of difficulty.

Table 7.1a: Evaluation Criteria for Duration, extent, probability.

Duration (Temporal Scale)		***Score***
Short term	*Less than 5 years*	*1*
Medium term	*Between 5-20 years*	*2*
Long term	*Between 20 and 40 years (a generation) and from a human perspective also permanent*	*3*
Permanent	*Over 40 years and resulting in a permanent and lasting change that will always be there*	*4*
Extent (Spatial Scale)		
Localised	*At localised scale and a few hectares in extent*	*1*
Study Area	*The proposed site and its immediate environs*	*2*
Regional	*District and Provincial level*	*3*
National	*Country*	*3*
International	*Internationally*	*4*
Probability (Likelihood)		
Unlikely	*The likelihood of these impacts occurring is slight*	*1*
May Occur	*The likelihood of these impacts occurring is possible*	*2*
Probable	*The likelihood of these impacts occurring is probable*	*3*
Definite	*The likelihood is that this impact will definitely occur*	*4*

Table 7.1b: Evaluation Criteria for impact severity.

Impact Severity *(The severity of negative impacts, or how beneficial positive impacts would be on a particular affected system or affected party)*		***Score***
Very severe	**Very beneficial**	**4**
An irreversible and permanent change to the affected system(s) or party(ies) which cannot be mitigated. For example the permanent loss of land.	A permanent and very substantial benefit to the affected system(s) or party(ies), with no real alternative to achieving this benefit. For example the vast improvement of sewage effluent quality.	
Severe	**Beneficial**	**3**
Long term impacts on the affected system(s) or party(ies) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming, or some combination of these. For example, the clearing of forest vegetation.	A long term impact and substantial benefit to the affected system(s) or party(ies). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these. For example an increase in the local economy.	
Moderately severe	**Moderately beneficial**	**2**
Medium to long term impacts on the affected system(s) or party (ies), which could be mitigated. For example constructing the sewage treatment facility where there was vegetation with a low conservation value.	A medium to long term impact of real benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are equally difficult, expensive and time consuming (or some combination of these), as achieving them in this way. For example a 'slight' improvement in sewage effluent quality.	
Slight	**Slightly beneficial**	**1**
Medium or short term impacts on the affected system(s) or party(ies). Mitigation is very easy, cheap, less time consuming or not necessary. For example a temporary fluctuation in the water table due to water abstraction.	A short to medium term impact and negligible benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are easier, cheaper and quicker, or some combination of these.	
No effect	**Don't know/Can't know**	
The system(s) or party(ies) is not affected by the proposed development.	In certain cases it may not be possible to determine the severity of an impact.	

** In certain cases it may not be possible to determine the severity of an impact thus it may be determined: Don't know/Can't know*

Significance

The scores for the three criteria in Table 7.1a are added to obtain a composite score. They must then be considered against the severity rating to determine the overall significance of an activity. This is because the severity of the impact is far more important than the other three criteria. The overall significance is then obtained by reading off the matrix presented in Table 7.2. The overall significance is either negative or positive (Criterion 1) and direct, indirect or cumulative (Criterion 2).

Table 7.2: Matrix used to determine the overall significance of the impact based on the likelihood and effect of the impact

SEVERITY		COMPOSITE DURATION, EXTENT & PROBABILITY SCORE									
		3	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
	Slight	**3**	4	5	6	7	8	9	10	11	12
	Mod severe	**3**	4	5	6	7	8	9	10	11	12
	Severe	**3**	4	5	6	7	8	9	10	11	12
	Very severe	**3**	4	5	6	7	8	9	10	11	12

The environmental significance scale is an attempt to evaluate the importance of a particular impact. This evaluation needs to be undertaken in the relevant context, as an impact can either be ecological or social, or both. The evaluation of the significance of an impact relies heavily on the values of the person making the judgment. For this reason, impacts of especially a social nature need to reflect the values of the affected society.
It is clear that an impact that has a slight severity could be of MODERATE significance because it is permanent (4), has a regional affect (3) and is definite. This elevates it from a LOW to a MODERATE rating. Conversely, a moderately severe impact could be rated as LOW since it is short term (1), localised (1) and only probable (3). An impact rated as severe could be of VERY HIGH significance because it is permanent (4), of national importance (3) and is definite (4).

The Significance Rating Scale is defined in Table 7.3 below.

Table 7.3: Description of Impacts Level Significance Ratings.

OVERALL SIGNIFICANCE *(The combination of all the above criteria as an overall significance)*	
VERY HIGH NEGATIVE	**VERY BENEFICIAL**
These impacts would be considered by society as constituting a major and usually permanent change to the (natural and/or social) environment, and usually result in severe or very severe effects, or beneficial or very beneficial effects. *Example: The loss of a species would be viewed by informed society as being of VERY HIGH significance.* *Example: The establishment of a large amount of infrastructure in a rural area, which previously had very few services, would be regarded by the affected parties as resulting in benefits with VERY HIGH significance.*	
HIGH NEGATIVE	**BENEFICIAL**
These impacts will usually result in long term effects on the social and/or natural environment. Impacts rated as HIGH will need to be considered by society as constituting an important and usually long-term change to the (natural and/or social) environment. Society would probably view these impacts in a serious light. *Example: The loss of a diverse vegetation type, which is fairly common elsewhere, would have a significance rating of HIGH over the long term, as the area could be rehabilitated.* *Example: The change to soil conditions will impact the natural system, and the impact on affected parties (such as people growing crops in the soil) would be HIGH.*	
MODERATE NEGATIVE	**SOME BENEFITS**
These impacts will usually result in medium to long term effects on the social and/or natural environment. Impacts rated as MODERATE will need to be considered by society as constituting a fairly important and usually medium term change to the (natural and/or social) environment. These impacts are real but not substantial. *Example: The loss of a sparse, open vegetation type of low diversity may be regarded as MODERATELY significant*.	
LOW NEGATIVE	**FEW BENEFITS**
These impacts will usually result in medium to short term effects on the social and/or natural environment. Impacts rated as LOW will need to be considered by the public and/or the specialist as constituting a fairly unimportant and usually short term change to the (natural and/or social) environment. These impacts are not substantial and are likely to have little real effect. *Example: The temporary changes in the water table of a wetland habitat, as these systems are adapted to fluctuating water levels.* *Example: The increased earning potential of people employed as a result of a development would only result in benefits of LOW significance to people who live some distance away.*	
NO SIGNIFICANCE	
There are no primary or secondary effects at all that are important to scientists or the public. *Example: A change to the geology of a particular formation may be regarded as severe from a geological perspective, but is of NO significance in the overall context.*	
DON'T KNOW	
In certain cases it may not be possible to determine the significance of an impact. For example, the primary or secondary impacts on the social or natural environment given the available information. *Example: The effect of a particular development on people's psychological perspective of the environment.*	

Once mitigation measure are proposed, the following criteria (Table 7.4) are then used to determine the overall post mitigation significance of the impact:

- Reversibility: The degree to which an environment can be returned to its original/partially original state.

- Irreplaceable loss: The degree of loss which an impact may cause.
- Mitigation potential: The degree of difficulty of reversing and/or mitigating the various impacts ranges from very difficult to easily achievable. The four categories used are listed and explained in Table 7.4 below. Both the practical feasibility of the measure, the potential cost and the potential effectiveness is taken into consideration when determining the appropriate degree of difficulty.

Table 7.4: Description of Impacts Level Significance Ratings.

Reversibility	
Reversible	*The activity will lead to an impact that can be reversed provided appropriate mitigation measures are implemented.*
Irreversible	*The activity will lead to an impact that is permanent regardless of the implementation of mitigation measures.*
Irreplaceable loss	
Resource will not be lost	*The resource will not be lost/destroyed provided mitigation measures are implemented.*
Resource will be partly lost	*The resource will be partially destroyed even though mitigation measures are implemented.*
Resource will be lost	*The resource will be lost despite the implementation of mitigation measures.*
Mitigation potential	
Easily achievable	*The impact can be easily, effectively and cost effectively mitigated/reversed.*
Achievable	*The impact can be effectively mitigated/reversed without much difficulty or cost.*
Difficult	*The impact could be mitigated/reversed but there will be some difficultly in ensuring effectiveness and/or implementation, and significant costs.*
Very Difficult	*The impact could be mitigated/reversed but it would be very difficult to ensure effectiveness, technically very challenging and financially very costly.*

7.2 Detailed Impact Assessment

A detailed impact assessment of all the construction and operational impacts identified is provided in Table 7.5 below.

Table 7.5: Construction and Operation Impacts and Key Mitigation Measures

IMPACT	DEVELOPMENT PHASE	PROJECT ALTERNATIVE	CAUSE AND COMMENT	DURATION	EXTENT	PROBABILITY	SEVERITY	REVERSIBILITY AND MITIGATION	SIGNIFICANCE	MITIGATION MEASURES	RESIDUAL RISK
Estuarine Physical Characteristics	Construction and Operation	Preferred Alternative	Removal of large volumes of sediment from the Kromme Estuary has the potential to change the physical (hydrodynamics) and sedimentary processes within the estuarine system. The dredging of the river will increase the tidal prism, and the area around the river mouth will allow the water to drain out more effectively. This in turn lowers the low-water level (with respect to MSL) resulting in the exposure of previously submerged sandbanks within the estuary. The sandbanks exposed under existing conditions is calculated at 52 ha. Following the dredging activity (assuming the full extraction volume) the exposed sandbanks exposed equate to 51 ha. However, it is assumed that this low water level will be a variable phenomenon in any case given the dynamic nature of the river mouth which will govern this low tide level. This may lead to exposure of shallow non-dredged areas within the estuary during low tides.	Long Term	Study Area	Probable	Slight	Difficult	**LOW –**	• Maintain the current main sand bank adjacent to Area S1 to act as a sand sink (i.e. a place for sand to accumulate); • Avoid sensitive areas identified in the Estuarine Report; and • At the completion of the initial phases (i.e. Phase 1 and Phase 2), monitor the flow and sedimentation rates of the system to assess the changes, if any, to the hydrodynamics. Use this data to inform the subsequent phases of sand sourcing.	**LOW –**
	Construction and Operation	Preferred Alternative	The removal of sand from the intertidal areas, together with the subsequent changes to the hydrodynamics of the Kromme Estuary and mouth, could result in the realignment of the main estuarine channel. While the modification of the course of the main channel is not planned, the dredging activity could result in it changing its current orientation or 'straight-lining' its path	Long Term	Study Area	Probable	Slight	Very Difficult	**LOW-**		**LOW-**

IMPACT	DEVELOPMENT PHASE	PROJECT ALTERNATIVE	CAUSE AND COMMENT	DURATION	EXTENT	PROBABILITY	SEVERITY	REVERSIBILITY AND MITIGATION	SIGNIFICANCE	MITIGATION MEASURES	RESIDUAL RISK
			resulting in potential impacts to habitats (dunes) and features (property, infrastructure) along the banks. Recent hydrodynamic modelling showed that current velocities are unlikely to change significantly as a result of the dredging, other than at the mouth. These modified velocities are expected to be temporary and while there might be some movement of the mouth it is unlikely to be a dramatic shift. Similarly, the only realignment of the channel is likely to occur under high flow conditions and not necessarily as a result of the dredging.								
	Operation	Preferred Alternative	Erosion of the Kromme riverbanks and beach spit. Advisian's (2020) modelling indicates that none of the dredging scenarios they tested led to any substantial changes in current velocities within the estuary under normal and/or flood conditions. They concluded that the currents outside the main channel (i.e. near to the banks) and in particular on the northern bank are low (up to 0.2m/s) and that the dredging would not lead to any significant change. This suggests that erosion of the banks of the river, as a result of the dredging, is unlikely. Any increase in current velocities have the ability to transport sediment. With current velocities increasing in the mouth under certain conditions, the integrity of the northern end of the spit could be put at risk through erosion. The project is anticipating nourishing the spit area	Long Term	Study Area	May Occur	Slight	Very Difficult	**LOW-**		**LOW-**

IMPACT	DEVELOPMENT PHASE	PROJECT ALTERNATIVE	CAUSE AND COMMENT	DURATION	EXTENT	PROBABILITY	SEVERITY	REVERSIBILITY AND MITIGATION	SIGNIFICANCE	MITIGATION MEASURES	RESIDUAL RISK
			which is also protected by revetments and future groyne infrastructure. While material is expected to be shifted in the area, ongoing maintenance of sand material on the spit is planned as part of this project.								
	Operation	Preferred Alternative	The increase in boat traffic as a result of the ability of the estuary to be used on more states of the tide may result in an increased risk of erosion of the banks of the estuary.	Long Term	Study Area	Definite	Moderately severe	Achievable	**MODERATE-**	• Reduce speed (i.e. no wake zones) of vessels in sensitive areas of the estuary • Impose stricter control of boat traffic during peak tourist season	**LOW-**
	-	No-go Alternative	The presence of the upstream dams limiting the flushing effect and leading to increase siltation	Long Term	Study Area	Definite	Severe	Difficult	**HIGH-**	-	**HIGH-**
	-	No-go Alternative	The combination of reduced freshwater flow and the permanently open river mouth results in an increase in salinity of the water column as well as intertidal and supratidal sediments.	Long Term	Estuary	Definite	Severe	Difficult	**HIGH-**	-	**HIGH-**
	-	No-go Alternative	The deterioration of water quality is mainly related to nutrient status and possible fluctuating temperature and oxygen levels downstream of dams. The estuary is highly regulated by the Churchill and Impofu dams, with no or little environmental releases being made to maintain riverine and estuarine function	Long Term	Study Area	Definite	May Occur	Difficult	**LOW-**	-	**LOW-**
Surface water Pollution (i.e. from machinery)	Construction	All Alternatives	There will be disturbance of beach sand during the sand sourcing and ongoing operations, and during the construction of the hard infrastructure required for coastal protection. Substances such as oil and diesel may enter the Kromme River and/or the ocean, if spillages are not effectively managed and/or prevented.	Short Term	Study Area	May Occur	Moderately severe	Achievable	**MODERATE –**	• Construction vehicles and equipment should be maintained and daily checks should be done for leaks; • Spill kits and drip trays must be readily available and utilised during refuelling. This includes spill kits and equipment to contain, manage and remediate any spillages in aquatic/marine environments. • Refuelling procedures for aquatic based craft must be included in a method statement;	**LOW –**

IMPACT	DEVELOPMENT PHASE	PROJECT ALTERNATIVE	CAUSE AND COMMENT	DURATION	EXTENT	PROBABILITY	SEVERITY	REVERSIBILITY AND MITIGATION	SIGNIFICANCE	MITIGATION MEASURES	RESIDUAL RISK
										• No storage of fuel or chemicals close to the shore or estuary must be permitted.; • It is recommended that ready mixed cement is used if necessary. No cement mixing close to the shore or estuary must be permitted; • Servicing of machinery and vehicles must occur off site unless this is done in a bunded area.	
Estuarine Ecology	Construction and Operation	Preferred Alternative	During both construction and operation it is likely that there will be suspended sediment (turbidity) in the water column as a result of the dredging activity. Suspended sediment is directly related to the size of the particles where smaller particles remain suspended for longer than particles that are larger. Given that smaller particles remain in suspension for longer it is likely that those particles will be transported further from the source location. Suspended sediment in itself is not necessarily a problem. Estuaries by their nature are systems that have high turbidity from time to time (i.e. flooding events). Similarly, the habitats and species within the estuary are adapted to periods of inundation or periods of high turbidity. Where it might result in an adverse impact is where excessive amounts of finer material settle in areas that limit the ability of the species in those areas to flourish, resulting in a decline in populations. These impacts are presented	Long Term	Study Area	Possible	Moderately Severe	Difficult	**MODERATE-**	• Limit extraction of material to areas where sediment particle size is what is required for the beach nourishment. These larger grain sizes are less likely to become suspended in the water column. • Sensitive habitats will be identified and avoided where possible.	**LOW-**
Estuarine Ecology – Flora	Construction	Preferred Alternative	The methodology of extracting the sediment may result in the direct physical loss of estuarine floral species	Medium Term	Study Area	Definite	Moderately severe	Very Difficult	**MODERATE -**	• Where possible, sediment should be taken from areas where there is low abundance of estuarine vegetation.	**LOW-**

IMPACT	DEVELOPMENT PHASE	PROJECT ALTERNATIVE	CAUSE AND COMMENT	DURATION	EXTENT	PROBABILITY	SEVERITY	REVERSIBILITY AND MITIGATION	SIGNIFICANCE	MITIGATION MEASURES	RESIDUAL RISK
										• Associated equipment will be placed in areas of low sensitivity only.	
	Construction and Operation	Preferred Alternative	The estuarine functional zone (EFZ) includes the lateral boundaries of an estuary up to the 5 m contour, with the downstream boundary taken as the estuary mouth and the upstream boundary taken as the limits of tidal variation or salinity penetration, whichever penetrates furthest. Protection/rehabilitation of the estuarine functional zone is considered essential for protection of estuarine biodiversity and associated ecological processes. The proposed project is likely to impact on the estuarine functional zone both directly and indirectly: • The loss of habitat (direct removal of *Zostera capensis*, sandbanks and benthic habitat) • Increases in turbidity (direct impact) which may result in further loss of habitat as a result of smothering (indirect impact). • Altering the nutrient dynamics of the system as a result of releasing trapped nutrient from sediments. Previous authors who have studied water quality in the Kromme have concluded that due to the influence and constant flushing of the system through the tidal cycle, water quality is generally good.	Medium Term	Study Area	Definite	Moderate	Difficult	**MODERATE-**	• Only the correct size material (course) will be dredged for beach nourishment allowing; • Do not remove or disturb salt marsh habitat; • Sensitive Zostera habitats will be avoided where possible; and • Only the required volume of sediment will be dredged.	**MODERATE-**
	-	No-go Alternative	The estuary is considered to have a mouth status of permanently open which facilitates regular	Long Term	Estuary	Definite	Severe	Very Difficult	**HIGH-**		

IMPACT	DEVELOPMENT PHASE	PROJECT ALTERNATIVE	CAUSE AND COMMENT	DURATION	EXTENT	PROBABILITY	SEVERITY	REVERSIBILITY AND MITIGATION	SIGNIFICANCE	MITIGATION MEASURES	RESIDUAL RISK
			interaction with marine waters. This, in tandem with the reduced freshwater input results in the estuary being dominated by mostly marine habitats. This situation has resulted in hypersaline conditions in certain areas of saltmarsh, resulting in a species composition more representative of species more tolerant to elevated salinity levels (i.e. Salicornia sp.)								
	-	No-go Alternative	The areas of saltmarsh habitat within the Kromme Estuary have diminished over time. It is anticipated that this is due to development on the floodplain along with evidence of salt marsh erosion in the middle reaches of the estuary due to boat activity as well as waves caused by easterly and westerly winds. In addition, lack of freshwater input into the Kromme Estuary has resulted in increased water column salinity that has caused salt accumulation in the intertidal marshes (Adams et al., 1992), which has resulted in large areas of bare ground in the upper intertidal areas due to hypersaline conditions.	Long Term	Estuary	Probable	Moderate	Difficult	**MODERATE-_**		
	-	No-go Alternative	The reduction of freshwater leading to a reduction of flushing of the estuary has led to an increase in submerged macrophytes	Long Term	Estuary	Definite	Moderately Beneficial	Difficult	**MODERATE+**		
Estuarine Ecology – Fauna	Construction	Preferred Alternative	The extraction of sediment from sand banks, which provide habitat for faunal communities (e.g. sand prawns) will result in the loss of this habitat.	Long Term	Study Area	Definite	Moderately severe	Achievable	**MODERATE -**	• Limit dredging in habitats where high biodiversity / abundance of benthic species exist • Do not remove or disturb salt marsh habitat	**LOW -**

IMPACT	DEVELOPMENT PHASE	PROJECT ALTERNATIVE	CAUSE AND COMMENT	DURATION	EXTENT	PROBABILITY	SEVERITY	REVERSIBILITY AND MITIGATION	SIGNIFICANCE	MITIGATION MEASURES	RESIDUAL RISK
	Construction and operation	Preferred Alternative	Similarly to the impacts on the vegetation communities, faunal communities will be affected directly by the project as well as indirectly. Direct losses are expected for species associated with the sandbanks and channels. Important species in this habitat include sand prawn (*Callianassa kraussi*), pencil bait *Solen capensis* and bloodworm *Arenicola loveni*. Direct physical loss would be attributed to the removal of material directly by dredging. Given the type of material required for the project the habitat lost would be that associated with a sandy benthic substrate. This would be a habitat colonised by species adapted to coarse grained sediment - mostly molluscs, crustaceans and polychaetes.	Medium Term	Study Area	Definite	Moderately severe	Difficult	**MODERATE-**	• Only the correct size material (course) will be dredged for beach nourishment; • Only the required volume of sediment will be dredged; • Associated equipment will be placed in areas of low sensitivity only; and • Monitoring of sensitive habitats in close proximity to dredging activities must be implemented during both the construction and operational phases of the project	**LOW-**
	Construction	Preferred Alternative	The presence of excavators / dredgers working in the intertidal areas may result in disturbance to wading bird species. While wading species would be temporarily displaced the works would not take place in all intertidal area allowing foraging in other parts of the estuary. Some species may be drawn to the dredger as it would be disturbing the sediment and facilitate foraging.	Short Term	Study Area	Probable	Slight	Achievable	**LOW-**	• Avoid working in areas where bird species may nest. Especially during the breeding season. • Restrict activity to discreet sections of the sand banks and channel. • Encourage owners of dogs to keep their dogs on leashes while on the sandbanks to ensure those water birds using the sandbank are not disturbed unnecessarily.	**LOW-**
	-	No-go Alternative	The distribution of submerged macrophytes and the increase in sandbank habitat has resulted in an increase in faunal abundance and diversity of species suitable to these types of habitat, such as *Callianassa* spp.	Long Term	Study Area	Definite	Moderately Beneficial	Difficult	**MODERATE+**		
	-	No-go Alternative	The shift in the system to that of a marine	Long Term	Study Area	Definite	Moderately severe	Difficult	**HIGH-**		

IMPACT	DEVELOPMENT PHASE	PROJECT ALTERNATIVE	CAUSE AND COMMENT	DURATION	EXTENT	PROBABILITY	SEVERITY	REVERSIBILITY AND MITIGATION	SIGNIFICANCE	MITIGATION MEASURES	RESIDUAL RISK
			dominated one is likely to result in the loss of some species. One such species that has been lost from the system is the seahorse (*Hippocampus* sp.)								
Dune Ecology	Construction	Preferred Alternative	Loss of dune vegetation on the vegetated sand bank at the delta of the Sand River Mouth.	Long Term	Study Area	Probable	Moderately severe	Difficult	**MODERATE-**	It is not possible to mitigate this impact	**MODERATE-**
	Construction	Preferred Alternative	The construction of the groynes, as well as activities associated with beach nourishment will require access over the foredunes in selected areas, and damage to the foredunes and the loss of some vegetation is inevitable. However, the breaching of the sand spit has already resulted in substantial loss of vegetation, which reduces the severity of this impact.	Short Term	Study Area	Probable	Slight	Difficult	**LOW-**	• Enforce all provisions contained in the Construction EMP • Do not allow any laydown areas within the sensitive foredune area. • Limit access across the foredunes to four access points in total, where each groyne will be located. The access point where the sand spit starts (possibly at the Aldabara Road parking area) will need to serve the first two groynes. The second two will require access from Peter Crescent and at George road; and the final one at the Ralph Road parking area. These parking areas must also be used as laydown areas. • Limit pedestrian access to these same points. • Disallow workers from accessing the foredune areas.	**LOW-**
	Construction	Preferred Alternative	During the construction phase ecological impacts on the beach and nearshore areas are likely to be moderately significant, and will be difficult to mitigate. However, the beach and nearshore ecosystems are resilient to natural perturbations.	Short Term	Study Area	Probable	Moderate	Difficult	**MODERATE-**	• Enforce all provisions contained in the Construction EMP • Implement all mitigation measures mentioned above. • Do not allow any laydown areas within the sensitive foredune area.	**MODERATE-**
	Operation	Preferred Alternative	The construction of groynes, coupled with sand nourishment will increase the width of the beach and introduce additional substrate. Historically, there was a significant beach with significant volumes of sand. These former habitats would be restored.	Short Term	Study Area	Definite	Moderately Beneficial	Difficult	**MODERATE+**	• None Required	**MODERATE+**

IMPACT	DEVELOPMENT PHASE	PROJECT ALTERNATIVE	CAUSE AND COMMENT	DURATION	EXTENT	PROBABILITY	SEVERITY	REVERSIBILITY AND MITIGATION	SIGNIFICANCE	MITIGATION MEASURES	RESIDUAL RISK
	-	No-go Alternative	In 2020 the spit breached four times, resulting in property and marina infrastructure being exposed directly to the waves and storm surges. This also resulted in damage to property in the marinas and loss of dunes systems and dune vegetation.	Long Term	Study Area	Definite	Severe	Difficult	**HIGH-**	Emergency repair work, involving the placement of sand material from other areas along the beach and the construction of revetments along parts of the frontage to provide additional protection was undertaken. However, this did not mitigate the ecological impacts.	**HIGH-**
	-	No-go Alternative	The reduction of sediment into St Francis Bay has resulted in significant erosion, to the point that in 2020 the spit breached and the beaches have all but disappeared. It has been established that the longshore drift, which transports sediment, is in a northerly direction. With no further introduction of sediment (i.e. very little remaining on the beaches) into the system it is expected that erosion will continue and possibly accelerate along the beaches to the north	Long Term	Study Area	Probable	Moderate severe	Difficult	**MODERATE-**		
Marine Ecology – Flora	Construction	Preferred Alternative	The placement of sand and / or rock material on or near the nearshore reef structures will result in localised smothering, leading to a loss of individuals and habitat. This is particularly relevant for algal species since they are unable to move from these areas. It should be noted that these reefs would have been covered in sediment in the past.	Long Term	Study Area	Probable	Moderately severe	Difficult	**MODERATE-**	• Design and orientate groyne structures to avoid smothering the nearshore reefs as far as possible.	**LOW-**
	Construction	Preferred Alternative	The development of groyne structures of rock material may provide additional hard substrate for benthic species.	Long Term	Study Area	May occur	Moderately Beneficial	Difficult	**MODERATE+**	• None required	**MODERATE+**
Marine Ecology – Fauna	Construction	Preferred Alternative	The placement of sand and / or rock material on or near the nearshore reef structures may result in localised smothering leading to a limited loss of individuals and habitat. However, the development of groyne structures of rock material is anticipated to provide	Long Term	Study Area	May occur	Moderately Beneficial	Difficult	**MODERATE+**	• None required	**MODERATE+**

IMPACT	DEVELOPMENT PHASE	PROJECT ALTERNATIVE	CAUSE AND COMMENT	DURATION	EXTENT	PROBABILITY	SEVERITY	REVERSIBILITY AND MITIGATION	SIGNIFICANCE	MITIGATION MEASURES	RESIDUAL RISK
			additional hard substrate for benthic species.								
Marine Hydrodynamics	Operation	Preferred Alternative	Development of the groynes will alter the hydrodynamic regime through the refraction of waves and altering of local currents. This impact is expected to be limited to the area immediately north of the northern-most groyne. The design of the beach nourishment is to nourish this area as part of the maintenance activity. Similarly, the short groyne does not extend sufficiently into the marine environment to have an effect on the northern bank.	Permanent	Study Area	May Occur	Moderate	Difficult	**MODERATE-**	• Ensure that the adaptive management plan is developed to recognise and mitigate for any accelerated erosion.	**LOW-**
			Development of the groynes will restrict the longshore drift that transports sediment to the north. However, even with the restriction at least 50% of the material will pass through the scheme and the beach nourishment and maintenance introduces a new source of sediment which is able to be transported to the north. Please refer to Section 6.7 in this report and Appendix F for more information and detail.	Permanent	Study Area	May Occur	Moderate	Difficult	**MODERATE-**	• Place sand material immediately north of the northern most groyne to act as sacrificial material. • Maintain nourishment of at least 6,000 m³/year for each of the embayments south of the spit and 10,000 m³/year for the remaining embayment at the spit on a regular basis.	**LOW-**
Local Amenity – estuary	Construction	Preferred Alternative	The presence of excavators / dredger may result in some areas of the estuary having restricted access for public safety	Medium Term	Study Area	Possible	Slight	Achievable	**LOW-**	• Reduce, where possible, the extraction of material during times of peak tourist activity • Ensure that signage is clear and areas are made safe during excavation / dredging • Ensure that newly excavated / dredged areas are safe for use	**LOW-**
	Construction	Preferred Alternative	The removal of sand banks and specifically the fauna within the sandbanks may result in reduced areas available for bait digging – a popular activity in the Kromme Estuary.	Short Term	Study Area	Possible	Slight	Difficult	**LOW-**	• Reduce dredging activity in popular bait digging areas (i.e. sand bank near the mouth of the estuary) during peak tourist season • Ensure areas of the sandbanks are available to bait diggers during construction • Dredging from the channels initially will ensure that sand bank habitat is maintained for a longer period; and	**LOW-**

IMPACT	DEVELOPMENT PHASE	PROJECT ALTERNATIVE	CAUSE AND COMMENT	DURATION	EXTENT	PROBABILITY	SEVERITY	REVERSIBILITY AND MITIGATION	SIGNIFICANCE	MITIGATION MEASURES	RESIDUAL RISK
										• Inform bait diggers of construction schedule to allow digging in areas that are due to be dredged.	
	Operation	Preferred Alternative	The extraction of sediment from the navigation channels in the estuary will allow vessels access during all tidal cycles. This will improve safety and increase the recreational use of the estuary	Medium Term	Study Area	Probable	Beneficial	Achievable	**MODERATE+**	• Enforcement of the management of boating activities and restrictions in place (i.e. no wake zones, etc); • Identification and publication of buffer areas/safety zones around dredging equipment; • Development of a dredging programme that takes navigation and peak times into account; • Development and publication of water safety procedures and enforcement to ensure safety to all users of the estuary. • Clear channel marking where necessary; and • Ensure boating activity areas are clearly demarcated.	**MODERATE +**
	Operation	Preferred Alternative	The Kromme Estuary supports many recreational activities. As a result, tourism is viewed as an important income generator in the area.	Medium Term	Study Area	Probable	Beneficial	Difficult	**MODERATE+**	-	**HIGH+**
	-	No-go Alternative	Estuaries are valuable national assets that provide essential ecosystem services.	Long Term	Study Area	Definite	Beneficial	Achievable	**HIGH+**	-	**HIGH+**
Local Amenity – beach	Construction	Preferred Alternative	The presence of construction vehicles accessing the beach for the construction of the groynes, delivery of material and reworking of the sediment for nourishment may result in restricted access to certain parts of the beach (and carparks)	Short Term	Study Area	Definite	Moderately severe	Achievable	**MODERATE-**	• Reduce, where possible, the placement of material during times of peak tourist activity; • Ensure that signage is clear, and areas are made safe during placement / levelling of the beach; and • Ensure that newly nourished areas are safe for use.	**LOW-**
	Operation	Preferred Alternative	The construction of groynes, coupled with sand nourishment will increase the width of the beach, and this result in a significant improvement to the recreational amenities in a coastal town where the focus is on sea, beach and river activities. There is also likely to be resultant economic benefits.	Long Term	Study Area	Probable	Very beneficial	Achievable	**VERY HIGH+**	• Ensure that, where possible, groynes are designed and orientated to provide potential surf breaks.	**VERY HIGH +**

IMPACT	DEVELOPMENT PHASE	PROJECT ALTERNATIVE	CAUSE AND COMMENT	DURATION	EXTENT	PROBABILITY	SEVERITY	REVERSIBILITY AND MITIGATION	SIGNIFICANCE	MITIGATION MEASURES	RESIDUAL RISK
			The orientation and location of the groynes have been updated as a result of engagement with the surfing community. The original orientation and groyne locations were deemed to be intrusive to existing surfing areas. The presence of groyne structures may result in additional breaks which surfers could exploit.								
Visual Impact	Construction and operation (estuary)	Preferred Alternative	Visually, the presence of vessels on the estuary are unlikely to be considered to be out of the ordinary. However, should the preferred method be via excavator then this may not fit with the current expectation of "normal" activity on the estuary. The presences of pumps and pipes may also not be considered to be "normal". However, their visibility is expected to be of low significance and will likely only be visible to those in close proximity to dredging activities.	Short Term	Study Area	Probable	Moderately severe	Achievable	**MODERATE-**	• Only absolutely necessary equipment required for the dredging to be at the work site. All other equipment to be stored in an area less intrusive; and • Pumps and pipe placement should take visual disturbance into account for placement during the works.	**LOW-**
	Operation (groynes)	Preferred Alternative	The establishment of revetment structures and the presence of groynes.	Permanent	Study Area	May occur	Moderately severe	Difficult	**MODERATE -**	• Where possible ensure the design of the groynes does not impede the open seascapes view • Where possible ensure the design of the groynes are compatible and blend in.	**LOW-**
Loss of Archaeological Resources	Construction	Preferred Alternative	Dredging activities could damage or destroy potentially significant archaeological or cultural heritage sites, should such sites occur within the river. The study did not identify archaeological sites or features in the project area but the project is situated in the larger archaeological coastal sensitivity zone of St Francis where shell middens and other archaeological sites/materials are found. As such, care should be taken not to destroy previously undetected heritage remains.	Short Term	Study Area	Slight	Moderately severe	Achievable	**LOW –**	• Should any archaeological or cultural sites or objects be located during the construction of the proposed project, it should immediately be reported to the National Heritage Council and the ECPHRA.); • All construction site staff should be briefed to immediately report any sites or objects of heritage significance located during the construction phase. In the event of finding what appears to be an archaeological site or a cultural and/or historic site or object, work within that area should be stopped until a qualified archaeologist or	**LOW +**

IMPACT	DEVELOPMENT PHASE	PROJECT ALTERNATIVE	CAUSE AND COMMENT	DURATION	EXTENT	PROBABILITY	SEVERITY	REVERSIBILITY AND MITIGATION	SIGNIFICANCE	MITIGATION MEASURES	RESIDUAL RISK
			Should these sites be correctly identified and excavated by a trained professional, it could contribute to a better understanding of the cultural heritage of the area.							historian can examine the item or find.	
Loss of Cultural Heritage Resources (built environment)	Construction	Preferred Alternative	A large number of Contemporary Period structures and buildings occur in the project along the St Francis beach but these buildings are not significant in terms of the historical built environment per se. Impact on old buildings, structures or features as not anticipated.	Short Term	Study Area	Slight	No impact	Achievable	**NO SIGNIFICANCE**		**NO SIGNIFICANCE**
Loss of Cultural Landscape	Construction	Preferred Alternative	The larger area comprises a rich cultural horizon and the natural landscape surrounding the proposed project encompasses vast coastlines and river valleys, typical of the Eastern Cape coast. The cultural landscape holds Herder, Iron Age remains and a Colonial Period frontier which embraces a regional history, represented in a number of significant archaeological sites. However, the proposed project is unlikely to result in a significant impact on the general cultural landscape of this area.	Short Term	Study Area	Unlikely	Slight	Difficult	**LOW-**		**LOW-**
Loss of Graves / Human Burial sites	Construction	Preferred Alternative	No burial sites were located in the study area. It should be noted that graves and cemeteries often occur within settlements or around homesteads in the rural areas of the Eastern Cape, and they are also randomly scattered around archaeological and historical settlements. The probability of informal human burials encountered during development should thus not be excluded.	Short Term	Study Area	Unlikely	Severe	Very Difficult	**MODERATE-**	• If any human bones are found during the course of Construction work then they should be reported to an Archaeologist and work in the immediate vicinity should cease until the appropriate actions have been carried out by the archaeologist. • Where human remains are part of a burial they would need to be exhumed under a permit from SAHRA (for pre-colonial burials as well as burials later than about AD 1500). • Should any unmarked human burials/remains be	**LOW-**

IMPACT	DEVELOPMENT PHASE	PROJECT ALTERNATIVE	CAUSE AND COMMENT	DURATION	EXTENT	PROBABILITY	SEVERITY	REVERSIBILITY AND MITIGATION	SIGNIFICANCE	MITIGATION MEASURES	RESIDUAL RISK
										found during the course of construction, work in the immediate vicinity should cease and the find must immediately be reported to the archaeologist, or the South African Heritage Resources Agency (SAHRA). • Under no circumstances may burials be disturbed or removed until such time as necessary statutory procedures required for grave relocation have been met.	
Loss of Marine Archaeological and/or Cultural Heritage Resources (relevant to dredging, nourishment and groyne infrastructure)	Construction and Operation	Preferred Alternative	In terms of Marine and Underwater Cultural Heritage (MUCH), the dredging, beach nourishment and construction of the groynes pose a risk to maritime features in the area. The risk of damage or complete removal from the site is possible given the scale and nature of the activities. However, the target areas for dredging occur largely to the riverside delta of the Kromme River estuary and areas within the river system to the west. In addition, the beach infrastructure (i.e. groynes) are expected to be constructed on top of the existing beach sand and level without the need for excavation. The revetment at the spit will be installed on a nourished beach level, which will be approximately 1 m higher than the existing beach level. Therefore, no intersection with submerged items and artefacts are anticipated.	Short Term	Study Area	Possible	Slight	Achievable	**LOW-**	• A 50 m buffer around the river mouth should be implemented. This buffer includes the beach and coastal dune strips around the river mouth which could potentially hold the washed-up remains of wreckage, artefacts as well as possible survivor camp remnants. • The exclusion of a portion of dredging target area P1 which falls within this proposed buffer zone is recommended. The extent of this proposed exclusion area is approximately 1.1ha. • Bi-weekly monitoring and reporting to SAHRA MUCH Unit by an informed and trained Environmental Control Office (ECO) of the dredging of target areas P1 and S1 and the placing of the groyne and revetment • A suitably qualified MUCH specialist should be appointed during initial stages of the development in order to provide training to the assigned project ECO	**LOW-**
Solid Waste Pollution (relevant to all project aspects)	Construction and Operation	Preferred Alternative	The construction phase of the activity will produce construction waste in the form of building rubble, excavated soil as well as general waste (e.g. litter from workers on site).	Short Term	Study Area	May occur	Slight	Easily Achievable	**LOW –**	• Construction material should be reused or recycled where possible; • Waste that cannot be reused or recycled should be disposed of in the correct manner at the nearest registered waste disposal site;	**LOW –**

IMPACT	DEVELOPMENT PHASE	PROJECT ALTERNATIVE	CAUSE AND COMMENT	DURATION	EXTENT	PROBABILITY	SEVERITY	REVERSIBILITY AND MITIGATION	SIGNIFICANCE	MITIGATION MEASURES	RESIDUAL RISK
			During the operational phase, the ongoing maintenance activities may also produce solid waste. The incorrect management of this waste will have a negative impact on the environment as it can cause unnecessary pollution and also have a detrimental effect on the aesthetics of the proposed site.							• Any hazardous materials (e.g. paint, fuel, oil) must be disposed of immediately and in the correct manner; • General good house-keeping should be practiced on site; • If rubble is stored on site it should be stored on designated portions of land. Designated areas for storage of rubble should be set aside at the onset of construction; • Litter must be controlled during construction e.g. adequate bins must be made available on site at all times; • Construction materials stored as part of the project must be secured (i.e. plastics must be covered to prevent being blown off site). Skips must be regularly emptied and must be covered;	
Dust Pollution (implementation of coastal protection infrastructure)	Construction	Preferred Alternative	The construction of the rock revetments and stub groynes increases the potential for dust within the coastal area. During the construction phase of the activity, materials will be moved to and from the project site and this could result in dust pollution not only from the materials, but also from the construction vehicles which will be operating on site. The effects of dust will be exacerbated during high wind conditions.	Short Term	Study Area	Probable	Slight	Easily Achievable	**LOW –**	• Construction should preferably cease during period of high winds; • Exposed surfaces should be wet down where required to avoid dust emissions; • Vehicles transporting material such as sand should remain at a speed limit of 30km/h and, if required, cover their loads with a tarpaulin to avoid dust emissions.	**LOW –**
Traffic (relevant to sand sourcing should the option of truck transportation be implemented) and vehicle movements related to groyne and revetment construction and material transportation	Construction	Preferred Alternative	During construction, there will be an increase in the number of vehicles using the roads in and around St Francis Bay, including heavy construction vehicles. This may result in damage to the road as well as increased potential for road accidents. The construction vehicles could also impede traffic at certain sections of St Francis Bay if not adequately managed and controlled. As a result of the proposed project, there is likely to be an increase in the use of the roads within the adjacent area (e.g. the R330 and St	Short Term	Study Area	Probable	Moderately severe	Achievable	**MODERATE –**	• Appropriate warning signs must be erected, in accordance with the requirements of the District Road Engineer; • Vehicles must be roadworthy and serviced and must abide by the standard traffic laws; • Any Abnormal Loads must be approved with the traffic authorities and must comply with any conditions imposed by the authorities; • The contractor must employ flag staff if deemed necessary in order to prevent accidents;	**LOW –**

IMPACT	DEVELOPMENT PHASE	PROJECT ALTERNATIVE	CAUSE AND COMMENT	DURATION	EXTENT	PROBABILITY	SEVERITY	REVERSIBILITY AND MITIGATION	SIGNIFICANCE	MITIGATION MEASURES	RESIDUAL RISK
			Francis Bay internal roads).							• Speed limits on site must not exceed 30km/h and the speed limits along the public roads must be adhered to at all times; • Manage the travelling times of the delivery trucks so as to allow them to depart and arrive at spaced out time intervals, thus reducing the intensity of traffic and avoiding the formation of convoys of heavy vehicles.	
Noise Disturbance (relevant to all project aspects)	Construction	Preferred Alternative	It can be expected that there will be an increase in noise levels during the site preparation and construction phase of the project. The increase in noise will be associated with the operation of construction vehicles, dredging and other equipment and labourers. The noise level associated with the dredging and nourishment activity is expected to be approx. 80 dB at source. Depending on the size of the booster pumps, noise levels are expected to be 92 dB at source, reducing down to 60 dB at 500 m (ICF Jones and Stokes, 2008). To provide context normal conversation is about 60 dB, a lawn mower is about 90 dB, and a loud concert is about 120 dB.	Medium Term	Study Area	Definite	Moderately severe	Easily Achievable	**MODERATE –**	• All construction vehicles and equipment to be properly serviced in order to meet the necessary noise level requirements; • Restriction of work to daylight hours; • Programming of works close to noise sensitive residential properties should considered to avoid holiday periods; • Restriction of any unnecessary noise e.g. portable radios, vehicle radios, whistles etc.; • Machinery should be fitted with the required mufflers to reduce noise to acceptable, and notice given to surrounding residents prior to the commencement of construction; • Adhering to the municipal by-laws regarding noise.	**LOW –**
Employment Creation and Economic Benefits (relevant to all project aspects)	Construction	Preferred Alternative	The construction phase of the proposed project is expected to create approximately thirty (30) temporary jobs.	Short Term	Study Area	Probable	Moderate Beneficial	N/A	**MODERATE +**	• As far as possible, local labour should be used during construction; • Purchase materials locally, where possible, in order to support the local communities.	**MODERATE +**
Protection of Coastal Public Property (relevant to all project aspects)	Operation	Preferred Alternative	The construction of groynes, coupled with sand nourishment will increase the width of the beach and will stabilise the shoreline and protect the foredunes from wave attack from storm surges, and reduce the current undercutting and collapse of the foredune ridge. It will also protect	Long Term	Study Area	Definite	Very Beneficial	N/A	**VERY HIGH +**	• None applicable	**VERY HIGH +**

IMPACT	DEVELOPMENT PHASE	PROJECT ALTERNATIVE	CAUSE AND COMMENT	DURATION	EXTENT	PROBABILITY	SEVERITY	REVERSIBILITY AND MITIGATION	SIGNIFICANCE	MITIGATION MEASURES	RESIDUAL RISK
			associated social infrastructure. Especially since the spit breached on four occasions during 2020.								
Public health and safety	Operation	Preferred Alternative	Groyne structure will not be designed to be used by the public (i.e. walking, climbing). Groyne structures tend to create rip currents in proximity to the groynes themselves.	Long Term	Study Area	May occur	Moderately severe	Difficult	**MODERATE-**	• Ensure that appropriate and visible signage is erected warning the public of the dangers of climbing the structures and the rip currents. • Local life guards to ensure swimming areas are clearly demarcated.	**LOW-**

A detailed impact assessment of all the cumulative impacts identified is provided in Table 7.6 below.

Table 7.6: Cumulative Impacts and Key Mitigation Measures

IMPACT	DEVELOPMENT PHASE	PROJECT ALTERNATIVE	CAUSE AND COMMENT	DURATION	EXTENT	PROBABILITY	SEVERITY	REVERSIBILITY AND MITIGATION	SIGNIFICANCE	MITIGATION MEASURES	RESIDUAL RISK
Increased Estuary Bank Erosion	Operation	Preferred Alternative	The Kromme Estuary supports many recreational activities including fishing, birding, bait collection, waterskiing, canoeing, boat cruisers, hiking and swimming and as such tourism is viewed as an important income generator in the area. The banks of the estuary have been eroded in areas, particularly in the middle reaches of the estuary. This can mainly be attributed to boat activity as well as waves caused by easterly and westerly winds. While the evidence of erosion is upstream from the proposed dredging area, increasing the area available for boat activity in the lower reaches could lead to additional erosion in the lower and middle reaches of the estuary due to increased boats and duration of boating through more states of the tide. Although the wake generated by boats is potentially less than that which is generated by the easterly and westerly winds, it may contribute to further bank erosion.	Long Term	Study Area	Probable	Moderately Severe	Difficult	**MODERATE-**	• Enforcement of the management of boating activities and restrictions in place (i.e. no wake zones, etc); • Design dredging areas that leave the bank of the estuary intact as far as possible; • Clear channel marking where necessary; • Ensure boating activity areas are clearly demarcated; and • Maintenance of the sandbank adjacent to S1 may provide a buffer to the marina complex and to the spit revetment and groyne during a flood event, providing a more resilient estuarine system	**LOW-**

IMPACT	DEVELOPMENT PHASE	PROJECT ALTERNATIVE	CAUSE AND COMMENT	DURATION	EXTENT	PROBABILITY	SEVERITY	REVERSIBILITY AND MITIGATION	SIGNIFICANCE	MITIGATION MEASURES	RESIDUAL RISK
			The hydrodynamic changes to the estuary as a result of the dredging have been demonstrated as minor to negligible. The project has amended the sand sourcing to exclude parts of the sandbank near the marina to provide a buffer under flood conditions.								

8 PUBLIC PARTICIPATION PROCESS

8.1 Objectives of Public Participation

The Public Participation Process (PPP) aims to:

- Disclose activities planned by the project proponent and the EIA team;
- Identify issues and concerns from I&APs;
- Harness local expertise, needs and knowledge from the I&APs;
- Respond to grievances and enquiries from I&APs;
- Identify additional or new stakeholders and people affected by, or interested in, the proposed project;
- Gather perceptions and comments on the proposed terms of reference for the specialist assessments;
- Ensure that all issues raised by I&APs have been adequately addressed and/or assessed;
- Share the findings of the EIA and specialists' assessments, such as significant impacts, mitigation measures, management actions, and monitoring programmes; and
- Include any new concerns or comments that arise.

This information is used to:

- Identify underestimated or unanticipated impacts;
- Alert the project to possible communication breakdowns and emerging problems and concerns;
- Encourage the use of local resources and knowledge in the project;
- Identify development opportunities and community projects; and
- Ensure that all issues and concerns raised during Scoping are dealt with adequately in the EIA Process. This is achieved through the preparation of an IRT, also referred to as a Comments Report (CR).

8.2 Public Participation Process

There are four key steps in the PPP to ensure that I&APs are informed of the proposed project and afforded sufficient opportunity to raise comments and / or concerns. These include:

1. Identifying potential I&APs;
2. Notifying I&APs through:
    i. Site notices;
    ii. Written notice;
    iii. Advertisements;
    iv. Public meeting;
3. Making provision for I&APs to review and comment on all draft reports before they are finalised and submitted to the competent authority; and
4. Compiling a record of responses to any comments and concerns provided by the I&APs and including and addressing these concerns in final reports.

The information presented in this report includes the public participation from the previous application and for which the Final Scoping Report was accepted by the Department (25th October 2019).

For ease of reference and relevant to this section the previous Draft EIR is referred to as the DEIR 2020. This Draft EIR will be referred to as the DEIR 2021.

This DEIR 2021 has been updated following the refinement of the design and the updating the coastal and estuarine modelling. However, since much of the information remains similar the comments received on the DEIR 2020 have been considered and included in this document as necessary.

8.2.1 *Interested and Affected Parties Database*

I&APs and Key Stakeholders were identified during the Pre-Assessment Scoping Phase of the project. However, I&APs have continued to register throughout the process. The identification and engagement of I&APs and Key Stakeholders was continued into and through the Formal Scoping and EIR Phases. All I&AP information (including contact details), together with dates and details of consultations and a record of all issues raised, was recorded within a comprehensive database of I&APs. This database was updated on an on-going basis throughout the project and will act as a record of the communication and involvement process. Appendix B contains the information shared and comments raised following the submission of the Final Scoping Report. Should electronic communications for the Scoping and Pre-Scoping Phases be required please refer to the FSR. In addition to the information gathered during the Scoping Phase, the previous Draft EIR phase also resulted in a number of comments. These too have been included as part of this Draft EIR in order to ensure that all issues raised throughout the process have been recorded and addressed.

8.2.2 *Notification of Interested and Affected Parties*

Prior to the commencement of the formal EIA process, the proposed coastal protection scheme has been presented to the community at meetings held on the 20th of December 2017, the 3rd of January 2018, the 11th of January 2018 and the 20th of December 2018, as well as at a pre-application scoping process public meeting held on the 15th of April 2019 . Both the Advisian Preliminary Design Reports and the pre-application Scoping Report were made available on the SFPO NPC web-site.

I&APs were further notified through the following:

- Site notices;
- Written notice;
- Advertisements; and
- Public meeting.

Site Notice

Site notices were initially placed in two (2) locations on the 21st of December 2018: 1) At the intersection of Canal Rd and Shore Rd and 2) At the beach stairway located at the end of the Aldbara Run.

Site notices were later placed (pre-Scoping Phase) at the following locations on the 9th of April 2019: 1) At the Spar located along St Francis Dr; 2) Main beach located at the end of Nevil Rd; 3) At the beach parking area located at the end of Anne Ave; 4) At the intersection of Canal Rd and Shore Rd; 5) At the Small Boat Harbour located along La Digue Pl; 6) The Library; 7) The St Francis Links; and 8) The Kouga Local Municipality Municipal Offices. Similar notices were displayed during the formal Scoping Phase and EIR phase (See Appendix B).

Written Notice

Letters of notification and Background Information Documents were sent to all registered Stakeholders and I&APs at the commencement of the Pre-Assessment PPP. Additional notices were sent to all registered I&APs informing them of the availability of the Draft Scoping Report at the commencement of the mandatory formal thirty (30) day public review period, which ran from the 20th of August 2019 until the 18th of September 2019.

Notices were sent to all registered I&APs (18th December 2019) informing them of the availability of the Draft Environmental Impact Report and the commencement of the mandatory formal thirty (30) day public review period, which ran from the 19 December 2019 to the 5th February 2020. A second notice was issued on the 16th January 2020 informing I&APs of the availability of the Draft EIR and the comment period.

As part of this new application notices were sent to all registered I&APs informing them of the application to be submitted by the SFPO NPC (See Appendix B).

Advertisement

Newspaper advertisements were placed in the Herald on the 27th of March 2019, the Kouga Express on the 28th of March 2019, and the St Francis Chronicle on the 4th of April 2019, in order to notify the general public of the proposed project and the availability of the Draft Scoping Report for public review during the pre-application public participation process. During the formal public participation process on the Draft Scoping Report, advertisements were placed in the Herald on the 20th of August 2019, the Kouga Express on the 22nd of August 2019, and in the St Francis Chronicle on the 19th of August 2019.

The availability of the DEIR 2020 was advertised in the Herald on the 18th December 2019 and the Kouga Express on the 19th December 2019. A second advert was placed in the Herald on the 18th January 2020.

Public meeting

A pre-application public meeting was held on the 20th of December 2018 to introduce the proposed project to the affected community. An additional public meeting was held at the St Francis Links on the 15th of April 2019 during the pre-assessment review of the Draft Scoping Report. The details of these meetings were conveyed to the public in newspaper advertisements that were placed in the Kouga Express, the St Francis Chronicle, and the Herald, notifying the public about the availability of the Draft Scoping Report, as well as via email and SMS. During the formal public review period for the Draft Scoping Report, a public meeting was held at the St Francis Bowling Club Hall on the 27th of August 2019.

The first public meeting for the DEIR 2020 was held at the St Francis Bowling Club Hall on the 19th December 2019. A second meeting was held at the St Francis Links on the 29th January 2020.

Please refer to Appendix B for proof of public participation conducted.

The DEIR 2021 was available for the mandatory 30 day commenting period between 5th February 2021 to the 8th March 2021 and was advertised in a similar manner to previous draft reports (i.e. via notices and a public meeting). See Appendix B for more information.

8.2.3 *Public Review of the Draft Reports*

The Draft Scoping Report was made available for a thirty (30) day pre-assessment public review period. All stakeholders and I&APs were notified of the availability of the DSR via newspaper advertisements, email and SMS. During the formal public review period, the Draft Scoping Report was made available from the 20th of August 2019 until the 18th of September 2019. I&APs were notified of the review period via the same means. The Scoping Report was approved by the Department on the 25th October 2019.

A DEIR 2020 was then made available for review between the 19th December 2019 – 5th February 2020 with two public meetings on the 19th December 2019 and the 29th January 2020. Following the closure of the PPP period it was decided that additional work would be carried out prior to the submission of the Final EIR. This additional work would take longer than what the EIA process would allow and therefore the application was allowed to lapse.

The availability of the DEIR 2021 was advertised via newspaper and direct notification (email and SMS). All registered I&APs were notified of the public meeting held on the 18th February 2021 on the 11th February 2021.

8.2.4 *Issues and Responses Trail*

All issues, comments and concerns raised during the previous public participation opportunities have been compiled into an Issues & Response Trail (IRT). Additional comments received during DEIR 2020 phase have been included. Comments received as a result of the PPP on the DEIR 2021 have been compiled into an updated IRT and incorporated and submitted as part of the Final EIR (Appendix B).

A large number of comments questioned how the Kromme estuary may be impacted through the extraction of sand material. These were both environmental (i.e. habitat and species impacts) and social (i.e. reduction of sand bank amenity).

Additional key issues were:

1. *The inclusivity of the PPP process for all members of the community (specifically disabled and those in the informal settlements)*. A summary of the process for the original application can be referenced in this section (Section 8 of the EIR) below. A detailed account of the PPP to date and specifically to obtain comment from all possible IAPs follows:

   CES requested that the department (DEDEAT) consider that the PPP period for the DEIR 2020 be extended to cover the holiday period as many of the owners of the properties are not permanent residents. The primary purpose of extending the review period to 6 weeks and to hold it over the Christmas period as this is the time that many non-resident St Francis Bay homeowners are in the town for the holiday period. Confirmation was received from DEDEAT on the 9th December 2019.

   Notifications of PPP commencement (as mandated by the legislation) and public meeting on the 19th December:

   - Were placed around St Francis Bay (St Francis Bay Spar, Municipal Offices, Small Boat Harbour (outside and inside the office building), SFPO offices, St Francis Community Library, Bruces Ocean Museum and Sea Vista Community Library) on the 17th December 2019 along with notification during the SFPO AGM on the 17th December (204 Attendees);
   - Sent out via email (18th December 2019) to all registered I&AP's;

- Sent out via email from the SFPO newsletter desk to all members on their data base on 18th December 2019; and
- Published in the press (Herald 18th December, Kouga Express 19th December), as prescribed in the legislation;

Hard copies of the report were made available in the Municipal Offices and SFPO offices on the 19th December 2019 and electronically from the CES website on the 19th December 2019.

The presentation on the 19th December 2019 summarised the information contained in the documentation. It covered the Project Description, Alternatives, Need for EIA, Baseline Environment (incl. Specialist Reports), IA methodology, Potential impacts of the scheme, Recommendations for mitigation and monitoring (EMP), Questions and information on where to send comments. The main difference between the EIR and Scoping Presentations were the inclusion of the specialist studies and the environmental impact ratings. The engineering design was the same as that presented in the Pre-Application meeting (Public Meeting held on 15th April 2019) and the Draft Scoping Report (Public Meeting held in August 2019). Thus, IAPs had the period from (29th March 2019) to 5th February 2020, a period of ten months, to read and understand the technical aspects of the proposed scheme.

The documentation referred to above included:

- The Draft EIR (including Draft EMPr);
- The preliminary engineering design report (released on 29th March 2019 during the Pre-Application PPP);
- The Estuarine Specialist Report (available from 20th August 2019 as part of the documentation from the Draft Scoping phase);
- The Sand Sourcing Specialist Report (available from the 19th December 2019 as part of the Draft EIR); and
- The Archaeological Specialist Report (available from the 19th December 2019 as part of the Draft EIR).

CES together with the SFPO considered the request for a second meeting outside of the holiday period (29th January 2020) to include local residents who may have been away. This was well outside the holiday period to accommodate local residents. Thus, we have held meetings to include residents, holiday makers and non-resident homeowners.

Notifications of a 2nd meeting on the 29th January 2020:

- Were placed around St Francis Bay (St Francis Bay Spar, Municipal Offices, Small Boat Harbour (outside and inside the office building), SFPO offices, St Francis Community Library, Bruces Ocean Museum and Sea Vista Community Library);
- Were sent out via email (16th January 2020) to all registered I&AP's; and
- Published in the press (Herald 17th January) and local posters (including St Francis Bay Facebook pages).

The presentation was very similar to that presented on the 19th December 2019.

According to the register, the meeting on the 19th December was attended to by 22 people.

Previous meeting registers indicate that there were:

- 30 people present during the initial public meeting held in December 2018;

- 25 people present during the Pre-Application meeting held on the 15th April 2019;
- 19 people during the Draft Scoping PPP (August 2019); and
- 66 people in attendance on the 29th January 2020.

CES consider that there has been significant opportunity for interested and affected parties to be involved in the project and to provide comment:

- Non mandatory 30 day comment period for Pre-Application Phase (April 2019) including 1 public meeting;
- Mandatory 30 day comment period for Scoping Phase including 1 public meeting;
- Mandatory 30 day comment period for the DEIR 2020 extended by 18 days to accommodate holiday makers, including 2 public meetings; and
- As the department are aware, comments have been submitted outside of the formal commenting periods which we have accommodated in the IRT.

2. *The consideration of the design to accommodate the surfing community*. The oblique nature of the initial groyne design and the location of some of the groynes was questioned by local surfers who were concerned that the location of the groynes would interrupt and affect local surf breaks. The proponent and their engineers re-designed the groynes (as presented in the DEIR 2021) to accommodate the concerns. This was through the repositioning of the groynes to avoid known surf breaks and secondly to align the groynes perpendicular to the shoreline to facilitate the potential for additional surf breaks. The potential impact of the groynes to surfing has been mitigated during the design phase and therefore is not carried through as an impact in the DEIR 2021.

3. *Concern over the lack of specific ecological data collected to inform the EIA process*. The Kromme Estuary was well known to the specialists involved since Dr Chantel Bezuidenhout studied the Kromme as part of her PhD. She was able to describe the system based on previous experience, desktop literature review and analysis of aerial imagery.

4. *Alignment of the project with the national, district and local planning policies*. CES are familiar with Chapter 6 of the ICMA, having prepared a number of CMPs. This project, which will take place within Coastal Public Property, is not a programme but a specific intervention with goals aligned to the provisions of the ICMA. It is to improve access to the coastline, improve its recreational value; ensure that the coastline's coastal protection functions can continue; and assist in protecting natural and built assets from sea level rise. The project does align with the policy guidelines contained in the local CMP and the District level CMP.

   On page 163 the Kouga CMP talks to various development issues and risks and highlights the inappropriate location of developments close to the high water mark, and the resultant threats due to beach erosion. It then goes on to mention under the opportunities section on page 171 that the environmental assessment being undertaken on the coastal erosion and beach nourishment scheme in St Francis bay is an opportunity. Implicit in this statement is the fact that the Kouga CMP supports this initiative and sees it as consistent with the coastal management programme.

5. *Erosion of the bank of the estuary through increased vessel traffic.* The DEIR 2021 recognises that the increase in vessel activity would lead to the potential for an increase in erosion of the banks of the estuary and includes potential mitigation measures for consideration. The management of vessels (i.e. numbers) and the speed of vessels in sensitive areas requires a dedicated resource. In this case the Kromme Joint River Committee (KJRC) are custodians, on behalf of the Kouga Local Municipality (KLM) of the Kromme and Geelhout Rivers as vested by virtue of the MOA signed between the KLM and the KJRC NPC dated September, 2016. It is therefore the responsibility of the KJRC to manage boat licencing and traffic.

6. *Concerns regarding the engineering design and its suitability*. The engineering reports describe, in detail, the previous proposals for the protection of this frontage. They also describe the current physical conditions experienced within the coastal zone along this frontage and offer an explanation of how the erosion has occurred, its rate and the risks of not proceeding with an engineering solution. Based on a number of design requirements (cost, effectiveness, ability of the scheme to facilitate longshore drift, etc) Advisian presented the preferred solution. In 2020, Advisian refined the design of the groynes. The design changes included the change in location of the groynes (to avoid surfing locations) and the orientation of the groynes (perpendicular to the shoreline) to promote additional surfing breaks. These design changes were informed by updating the coastal model which was expanded to understand the potential impacts to the beaches to the north of the scheme. The model investigated:

    a. Whether the groynes would lead to an increase in the erosion to the beaches to the north; and
    b. Whether the groynes would further limit the longshore sediment transport.

    Appendix F of the DEIR 2021 contains the detailed engineering reports – summaries of which have been included in the DEIR 2021.

7. *The impacts to the Kromme Properties Shareblock*. These were received and responded to as part of the IRT. Significant concerns were raised on the delineation of the material sources and the potential impact it would have on the property owners infrastructure (jetties) and recreational areas (i.e. sandbanks). The material sourcing areas in the vicinity of the shareblock are considered a priority area since the main channel runs adjacent to these properties. The secondary sources of material in this area are limited. Recent modelling of the estuary using pre- and post- dredging scenarios shows that the changes to the current velocities will not change significantly in this area and therefore risks to infrastructure as a result of the dredging are limited. The increase in boat activity which could increase the erosional effect have been addressed above. Sandbank amenities have been assessed and an overall net loss of 1 ha of sandbank habitat / area is not considered to be significant as it equates to 2% of the total sandbank area.

8. *The validity of the information used to inform the impacts*. The information used in the development of this report was based on desktop resources, scientific literature and updated engineering output (i.e. design and modelling). Advisian based their latest coastal and estuarine modelling on updated topographical and bathymetric surveys of the bay, the beach and the estuary. The model of the estuary specifically investigated the hydrodynamic conditions in a pre-dredging scenario and compared them to the hydrodynamic conditions in a post dredging scenario. The findings were:

    a. Very little change in current velocities within the estuary;
    b. A noticable change in velocities at the mouth of the estuary immediately after dredging. These return to pre-dredge conditions when the sediment reaches equilibrium shortly after dredging; and

c. The changes to the tidal prism result in lower water levels (at low tide) than that under the current scenario;

The specialist reports have subsequently been updated and any assumptions used to assess the impacts have been listed and potential limitations of the work identified in the respective reports. The Kromme Estuary is a fairly well researched estuary and the habitats that exist within the Kromme are well defined in scientific literature. Therefore, a suitable amount of information was available to provide adequate assessments.

8.3 Summary of PPP

The following public participation (Table 8.1) has already been conducted as part of the S&EIR process as part of a previous application.

Table 8.1: Summary of the PPP carried out to date, as part of the previous application.

Phase	Requirement	Date
Inception Phase	Site notices	Placed on 21 December 2018 and 9 April 2019.
	Pre-Assessment Public Meetings	Held on 20 December 2018.
	Pre-Assessment consultation with DEDEAT	Held on the 18 April 2019 and 1 March 2019.
Scoping Phase (30 day Pre-Assessment PPP period)	Newspaper Adverts	Placed in the Herald on the 27th of March 2019, Kouga express on the 28th of March 2019 and the St Francis Chronicle on the 4th of April 2019.
	Notifications	Sent at the commencement of the PPP period on the 1st of April 2019.
	Commenting Period	29th of March 2019 until the 29th of April 2019.
	Public Meeting	Held on the 15th of April 2019.
Scoping Phase (Formal Mandatory 30 day PPP Period)	Newspaper Adverts	Placed in the Herald on the 20th of August 2019, Kouga Express on the 22nd of August 2019 and the St Francis Chronicle on the 19th of August 209.
	Notifications	Sent at the commencement of the PPP period on the 20th of August 2019.
	Commenting Period	20th of August 2019 until the 18th of September 2019.
	Public meeting	Held on the 27th of August 2019.
	Ongoing consultation meeting with DEDEAT	Held on the 29th of August 2019.
	Site visit by Department of Environmental Affairs – Oceans and Coasts	5th September 2019.
EIA Phase 2019/2020 (Formal Mandatory 30 day PPP Period)	Newspaper Adverts	Placed in the Herald on the 18th December 2019. Kouga Express 19th December 2019.
	Notifications	Sent at the commencement of the PPP period – 19th December 2019.
	Commenting Period	19th December 2019 – 5th February 2020.
	Public Meeting	19th December 2019
	Newspaper Adverts	Placed in the Herald 17th January 2020.
	Notifications	Sent out on the 16th January 2020.
	Public Meeting	29th January 2020

Table 8.2: Summary of the PPP carried out as part of the new application.

Phase	Requirement	Date
Scoping Phase	See Table 8.1 above	See Table 8.1 above

EIA Phase 2020/2021 (Formal Mandatory 30 day PPP Period)	Notifications	Notification sent to registered I&APs on the 14th December 2020 to inform them of the pending new application.
	Newspaper Adverts	The Herald – 4th February 2021 St Francis Today – 5th February 2021 St Francis Chronicle – 18th February 2021 Kouga Express – 11th February 2021
	Commenting Period	5th February 2021 – 8th March 2021
	Public Meeting	18th February 2021

It is the EAP's opinion that the PPP process has been inclusive and extensive. The process has generated and collected a number of comments from I&APs. These comments have been addressed through the provision of engineering reports, public meetings and clarification in the reports generated.

9 CONCLUSIONS AND RECOMMENDATIONS

According to Appendix 3, Section 3 (1), of the of the 2014 EIA Regulations (as amended), "*an environmental impact assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include—*

(l) An environmental impact statement which contains:
- *(i) A summary of the key findings of the environmental impact assessment;*
- *(ii) A map at an appropriate scale which superimposes the proposed activity and its associated infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and*
- *(iii) A summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.*

(n) The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;

(o) Any aspects which were conditional to the finding of the assessment either by the EAP or specialist which are to be included as condition of the authorisation;

(p) A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed

(q) A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation.

In line with the above-mentioned legislative requirement, this Chapter of the EIR provides a summary of the findings of the proposed development and a comparative assessment of the positive and negative implications of the proposed project. In addition, this Chapter provides the EAP's opinion as to whether the activity should or should not be authorised as well as the reason(s) for the opinion.

9.1 Description of the proposed activity

The St Francis Property Owners Non Profit Company (SFPO NPC), on behalf of the Kouga Local Municipality (Kouga LM), has proposed the implementation of a coastal protection scheme for St Francis Bay beach, located within the Eastern Cape Province. The proposed project area is situated approximately 100 km west of Port Elizabeth, within the Kouga LM, seated within the Sarah Baartman District Municipality (SBDM).

The coastal protection scheme will include sand material sourcing from the Kromme River, beach nourishment of St Francis Bay beach and the development of coastal structures to retard the erosion of St Francis Bay beach. It is proposed that the preferred alternative included in this report is considered as the solution with which to proceed from an environmental point of view. That is:

1. Sand sourcing from the Kromme Estuary focussing on priority areas and secondary areas as required;
2. Beach nourishment along the full frontage, likely to be developed in phases; and
3. Construction of stub groynes as proposed that retain the nourished sediment but also facilitate the long shore sediment movement to ensure that the coast to the north of the scheme still receives sediment supply.

9.2 Conditions to be included in the Environmental Authorisation

The following conditions should be considered for inclusion in the Environmental Authorisation:

- The development of an adaptive management plan informing the maintenance dredging – prior to construction starting;
- The monitoring of the beach profiles to the north of the scheme – prior to construction starting;
- The monitoring of the estuarine channels and sandbanks (i.e. bathymetry) during construction phases;
- The completion of a vegetation assessment, specifically the *Zostera* and saltmarsh habitats – prior to construction starting. In this case the distribution and species composition is important;
- The appointment of an ECO for all construction phases of the project.

9.3 Assumptions, uncertainties and gaps

Assumptions

- Additional bathymetry and modelling may take place during and post construction of Phase 1.
- The sand sourcing study reported on compatibility and volume of material. During the procurement of a contractor the contractor may carry out additional and more specific testing of material.

Gaps

Only preliminary engineering input was provided in this phase of the project. It is general engineering practice that the detailed design phase of a project is only initiated once environmental authorisation for a project (based on what is submitted as preliminary design) is secured.

This has also provided the EIA process an opportunity to guide the Planning and Design proactively rather than reactively (e.g. surfing). Valuable comments have been received which will be incorporated into the detail design. The Environmental Management Programme (EMPr) should, therefore, be viewed as a dynamic evolving document that can be adapted and updated to specific needs and design conditions.

If the project is authorised by the Department of Economic Development, Environment and Tourism, SFPO NPC will be required to provide DEA with final layout plans. These plans should be informed by the EIA and any other post-authorization studies or surveys. The final layout requirement will further serve to demonstrate to how the relevant environmental standards and management specifications contained in the EMPr, as informed by the site-specific environmental context and potential impacts, as well as the relevant conditions of authorisation, has been incorporated in the detailed design process.

9.4 Need and desirability

Section 4 of the EIR describes the need and desirability of the project.

The project aligns with the planning and development objectives from municipal to national level in the following ways:

- "*to create a safe environment with diverse opportunities for economic growth and development*" as per the Kouga LM Integrated Development Plan (IDP) 2017-2022. The proposed project will assist in achieving this important objective by (a) decreasing the exposure of the beachfront and municipal infrastructure such as roads, access stairs and parking facilities to dynamic coastal processes, thereby increasing the safety and quality of the beachfront area; (b) decreasing the potential of shifting sand bars in the Kromme river, thereby increasing the navigation ability and safety of boaters; (c) increasing the width of the beaches, thereby promoting tourism and economic growth and development, and (d) preventing the loss of physical infrastructure in both the public and private sector by arresting the current rapid rate of beach erosion.

- At district level St Francis Bay has been recognised as an important tourist destination. This project is referred to in the draft Sarah Baartman District Municipality Coastal Management Programme as an opportunity to protect coastal infrastructure and particularly to maintain public access to the beach, car parks and ablutions.

- Assist with attaining the strategic objectives and actions set out in the Provincial Development Plan. It is also aligned with the Eastern Cape Vision 2030 Provincial Development Plan (2014) as it will contribute to employment creation and social development, tourism, coastal protection and maintenance of coastal infrastructure through preventing the loss and erosion of the St Francis Bay beaches and public and private land and amenities.

- Support the 2030 National Development Plan (NDP, 2013) on the development of economic infrastructure including water resources and services where "*water will be recognised as a foundation for activities such as tourism and recreation, reinforcing the importance of its protection*." A key development policy outlined under economic infrastructure is that of tourism infrastructure, including accommodation and tourism products, which will play an important role in attracting a variety of tourists to different parts of South Africa. It also outlines the importance of ensuring environmental sustainability while allowing for the delivery of cultural benefits, including recreational opportunities, in order to achieve the national social and economic development objectives.

Through the protection of coastal infrastructure and property and the enhancement of the local amenities which are considered attractions to tourism and recreational activities the project can be regarded as very desirable.

9.5 Public Participation Process

The current EIA process for the project has been subjected to a rigorous Public Participation and stakeholder engagement process (PPP) to date, as comprehensively described in Section 8 of this EIR.

The following public participation was conducted as part of the previous S&EIR process:

Phase	Requirement	Date
Inception Phase	Site notices	Placed on 21 December 2018 and 9 April 2019.

	Pre-Assessment Public Meetings	Held on 20 December 2018.
	Pre-Assessment consultation with DEDEAT	Held on the 18 April 2019 and 1 March 2019.
Scoping Phase (30 day Pre-Assessment PPP period)	Newspaper Adverts	Placed in the Herald on the 27th of March 2019, Kouga express on the 28th of March 2019 and the St Francis Chronicle on the 4th of April 2019.
	Notifications	Sent at the commencement of the PPP period on the 1st of April 2019.
	Commenting Period	29th of March 2019 until the 29th of April 2019.
	Public Meeting	Held on the 15th of April 2019.
Scoping Phase (Formal Mandatory 30 day PPP Period)	Newspaper Adverts	Placed in the Herald on the 20th of August 2019, Kouga Express on the 22nd of August 2019 and the St Francis Chronicle on the 19th of August 2019.
	Notifications	Sent at the commencement of the PPP period on the 20th of August 2019.
	Commenting Period	20th of August 2019 until the 18th of September 2019.
	Public meeting	Held on the 27th of August 2019.
	Ongoing consultation meeting with DEDEAT	Held on the 29th August 2019
	Site visit by Department of Environmental Affairs – Oceans and Coasts	5th September 2019.
EIA Phase (Formal Mandatory 30 day PPP Period)	Newspaper Adverts	Placed in the Herald on the 18th December 2019. Kouga Express 19th December 2019.
	Notifications	Sent at the commencement of the PPP period – 19th December 2019.
	Commenting Period	19th December 2019 – 5th February 2019.
	Public Meeting	19th December 2019
	Newspaper Adverts	Placed in the Herald 17th January 2020.
	Notifications	Sent out on the 16th January 2020.
	Public Meeting	29th January 2020
New Application		
EIA Phase 2020/2021 (Formal Mandatory 30 day PPP Period)	Notifications	Notification sent to registered I&APs on the 14th December 2020 to inform them of the pending new application.
	Newspaper Adverts	The Herald – 4th February 2021 St Francis Today – 5th February 2021 St Francis Chronicle – 18th February 2021 Kouga Express – 11th February 2021
	Commenting Period	5th February 2021 – 8th March 2021
	Public Meeting	18th February 2021

Comments received varied between those related to the engineering solutions and those regarding environmental / social considerations.

There has been a history of coastal protection attempts in St Francis Bay and many of the solutions have been compromised over time. Concerns over the suitability of the proposed solution included groyne design, orientation and the effects of the design on the coastline.

9.6 Summary of Impacts

The no-go alternative assumes that the status quo will remain unchanged and that there will be no new development. Under the No-go alternative, the erosion of the St Francis Bay beach will continue and as has occurred during the course of 2020, breaches in the spit will occur again and damage to infrastructure and property along the entire length of the beach will continue. The No-go alternative will mean that there will be no groyne construction, beach nourishment and therefore no protection of backshore infrastructure and residential properties.

A total of 41 impacts have been identified for this project. These are a combination of construction (30) impacts and operational (10) impacts. This is due to the scale of the activity during construction as opposed to operation which essentially only involves maintenance related activity. One (1) cumulative impact was identified.
After mitigation, there are no negative impacts of HIGH significance.

Seventeen construction impacts (Table 9.1), prior to mitigation, were considered to have moderate negative significance while nine impacts had low significance. Three of the impacts were seen as moderately beneficial as a result of the construction. One impact had no significance attached to it's assessment.

All but three impacts identified as moderately negative were reduced to low negative significance as a result of the suggested mitigation measures. In these three cases, it is not possible to carry out the construction of the project without loss or damage to estuarine and dune ecology. Given the sensitivity and conservation status of these habitats the impact remains of moderate negative significance.

The beneficial impacts are associated with the potential increase in available habitat for both marine flora and fauna and socio economic benefits. The groynes may provide for additional hard substrate for algal species, while the gaps in the rocks making up the groynes create crevices for crustaceans etc. This is considered more of a by-product of the project rather than a specific design decision.

The construction activities will lead to temporary and permanent job opportunities both directly associated with this project and indirectly through hospitality.

During the operational phase (Table 9.1), five impacts of negative significance have been identified.

The changes to the hydrodynamics of the Kromme estuary are not considered to be significant other than in the mouth area temporarily following the dredging activity. The removal of sand material from the channels will facilitate vessel traffic through more states of the tide and with increased vessel traffic is the impact of erosion from vessel wake. It should be noted that wind generated waves on the estuary throughout the year also result in erosion.

The visual impact of the groynes are anticipated to result in a negative impact since they will result in an altered landscape and seascape. The presence of the groynes may also result in rip tides. These rip tides are often in close proximity of the groynes structures themselves. The structure will also not be designed for public access. However, it is anticipated that the public will try and access these structures. Therefore, a health and safety impact has been identified.

Five beneficial impacts have been identified resulting in moderate to very high beneficial impacts. These beneficial impacts as associated with the nourishment of the beach providing additional local amenity and coastal protection. Two socio-economic benefits are of HIGH positive significance (Increased boat access during all tidal cycles and potential increased tourism). The protection of Coastal Public Property

is seen as a benefit of VERY HIGH significance, as the no-go option will eventually result in the loss of almost all beach amenities, and quite possible infrastructure and property along the length of the frontage.

The only cumulative impact identified, since no other specific projects are planned, is the potential for the scheme to result in an increase in boat traffic. This in turn could result in accelerated erosion to the banks of the estuary. The impact is deemed to be of moderate negative significance prior to mitigation. However, since vessel numbers are monitored and managed, this impact can be reduced to low.

Table 9.1 Project related impacts

IMPACT	SIGNIFICANCE	RISIDUAL RISK
CONSTRUCTION PHASE IMPACTS		
Estuarine Physical Characteristics – Change in hydrodynamics	LOW –	LOW –
Estuarine Physical Characteristics – Alteration of water channel due to scour	LOW –	LOW –
Estuarine Physical Characteristics - Erosion of the Kromme riverbanks and beach spit (also applicable for operation phase)	LOW-	LOW-

IMPACT	SIGNIFICANCE	RISIDUAL RISK
Surface Water Pollution (machinery)	MODERATE –	LOW –
Estuarine Ecology – Suspended sediment / turbidity (also applicable for maintenance dredging during operation phase)	MODERATE –	LOW --
Estuarine Ecology – Flora (Direct loss of estuarine floral species) (also applicable for maintenance dredging)	MODERATE –	LOW –
Estuarine Ecology – Estuarine Functional Zone (also applicable during operation phase)	MODERATE-	MODERATE-
Estuarine Ecology – Fauna (Direct loss of faunal) (also applicable for maintenance dredging)	MODERATE -	LOW –
Estuarine Ecology – Fauna (Loss of sandbank habitat)	MODERATE-	LOW-
Estuarine Ecology – Fauna (Impacts on bird species)	LOW –	LOW –
Dune Ecology – Loss of dune vegetation (Sand River)	MODERATE-	MODERATE-
Dune Ecology – Impacts on foredunes due to site access	LOW -	LOW-
Dune Ecology – Impacts on nearshore and beach ecology	MODERATE-	MODERATE -
Marine Ecology – Flora (Loss of nearshore reef)	MODERATE-	LOW-
Marine Ecology – Flora (Increased hard substrate/habitat for attachment of benthic species)	MODERATE+	MODERATE+
Marine Ecology – Fauna (Increased hard substrate/habitat for attachment of benthic species)	MODERATE+	MODERATE+
Local Amenity – Estuary (Temporary restricted access in areas)	MODERATE-	LOW-
Local Amenity – Estuary (Decreased area available for bait digging)	MODERATE-	LOW-
Local Amenity – Beach (Restricted access to areas during construction)	MODERATE-	LOW-
Visual Impact – Dredging and construction machinery	MODERATE-	LOW-
Loss of Archaeological Resources	LOW –	LOW +
Loss of Cultural Heritage (built environment)	NO SIGIFICANCE	NO SIGNIFICANCE
Loss of Cultural Landscape	LOW--	LOW-
Loss of graves	MODERATE-	LOW-
Loss of marine archaeological / heritage resources	LOW -	LOW -
Solid Waste Pollution (Relevant to all project aspects) (also relevant to operation phase)	LOW –	LOW –
Dust Pollution (Implementation of coastal protection infrastructure)	LOW –	LOW –
Increased Traffic (Relevant to sand sourcing should the option of truck transportation be implemented) and vehicle movements related to groyne and revetment construction and material transportation	MODERATE –	LOW –
Noise Disturbance (Relevant to all project aspects)	MODERATE –	LOW –
Employment Creation and Economic Benefits (Relevant to all project aspects)	MODERATE +	MODERATE +
OPERATIONAL PHASE IMPACTS		
Estuarine Physical Characteristics (Increased erosion due to boat traffic)	MODERATE-	LOW-
Dune Ecology (Restoration of beach habitat)	MODERATE+	MODERATE+
Marine Hydrodynamics - Impact (erosion) as a result of the infrastructure and dredging	MODERATE-	LOW-
Marine Hydrodynamics - Impact (reduction of sediment supply) to the northern beaches	MODERATE-	LOW-
Local Amenity – Estuary (Increased boat access during all tidal cycles)	MODERATE+	MODERATE+
Local Amenity – Estuary (Potential increased tourism)	MODERATE+	HIGH+
Local Amenity – Beach (Increased recreational use)	VERY HIGH+	VERY HIGH +
Visual Impact – Presence of groynes	MODERATE -	LOW -
Protection of Coastal Public Property (Relevant to all project aspects)	VERY HIGH +	VERY HIGH +
Public Health and Safety	MODERATE-	LOW-
CUMULATIVE IMPACTS		
Erosion of the banks of the estuary through increased boating activity	MODERATE-	LOW-

9.7 Site Sensitivity analysis

A site development sensitivity map was developed based on specialist and general site information gathered (Figure 9.1), and the site was classified into areas of No Development, Limited Development and No Limitations areas (Figure 9.2 and Figure 9.3).

- No development areas included areas of high sensitivity indicated by the biodiversity specialist.
- Limited Development areas (moderate and high sensitivity areas) are areas where construction is conditional on the fulfilment of certain aspect-specific requirements. For example, Limited Development areas include areas of moderate sensitivity identified by the estuarine and dune ecology experts.
- No Limitations areas are areas of Low Sensitivity where construction may take place without hindrance.

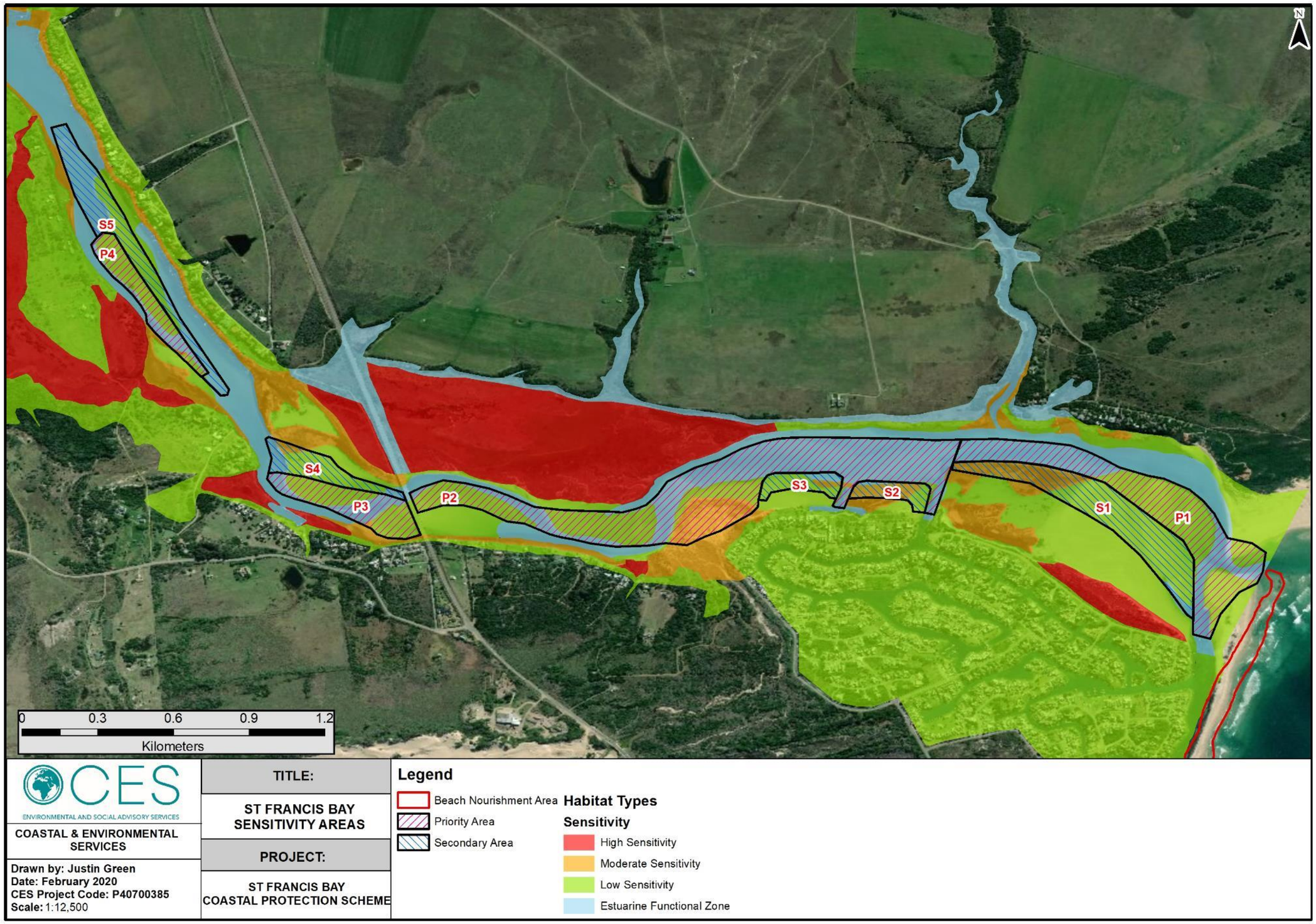


Figure 9.1: The Site Sensitivity map for the Kromme Estuary and the proposed development areas

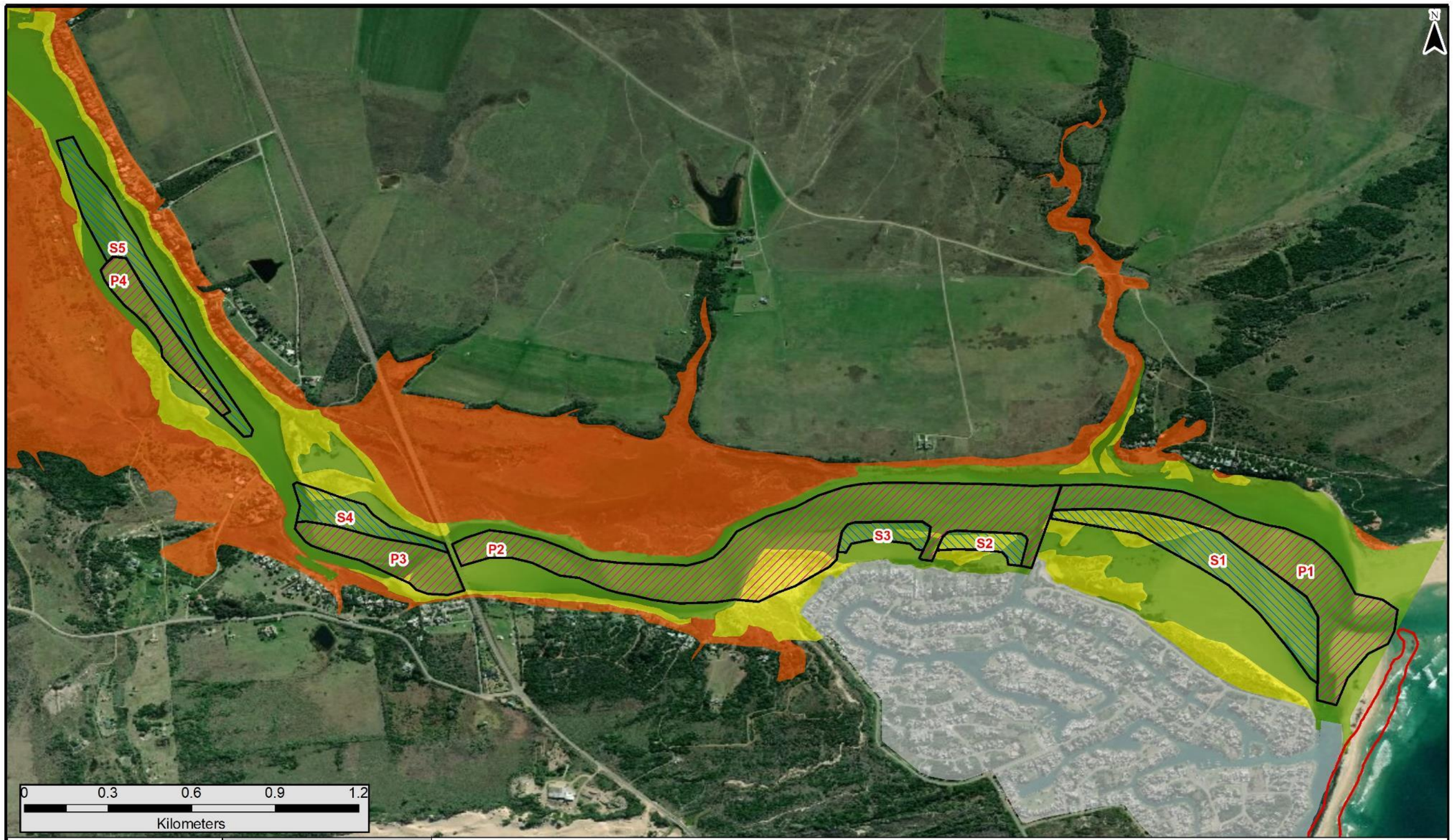


Figure 9.2: The Site Sensitivity map for the Kromme Estuary and the resultant development areas

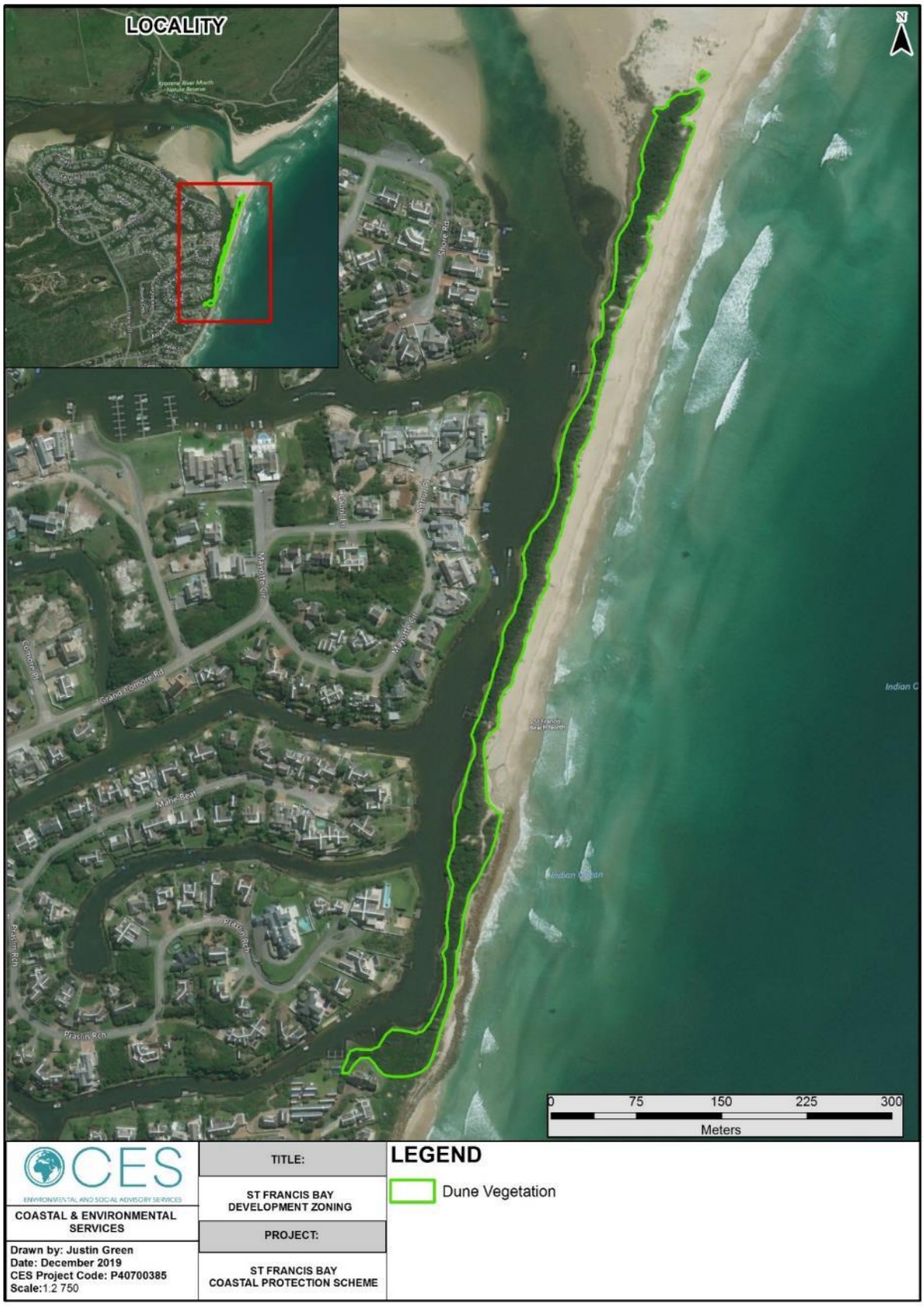


Figure 9.3: The Site Sensitivity map for the St Francis Bay frontage and the resultant development area. The sensitivity was considered high prior to the breaching events in 2020. While vegetation cover is low, the indigenous vegetation should remain intact.

9.8 Environmental Authorisation Requirements

The Environmental Authorisation (EA) for the construction of the proposed development is required for a period of 10 to 20 years to cover the development of each of the phases as the funding becomes available. This will allow sufficient time for the applicant to undertake the procurement process to appoint a contractor, to furnish the appointed contractor with the details of the EA and the conditions included in the EMPr, to complete the construction of the groynes and nourishment of the beach. The activity related to the construction is subject to available funding and, therefore, construction will most probably be undertaken in a phased manner. All phases of the proposed project will only commence once sufficient funds are made available.

An Environmental Site Officer (ESO) must be appointed for the duration of the construction period, full time, and must complete daily check-sheets and the Environmental Control Officer (ECO) must submit monthly audit reports to the DEDEAT. The potential phasing of the project would mean that there would be discreet construction periods for each of the phases.

The operational phase of the proposed development is predicted to continue into perpetuity. It is recommended that an ECO is appointed to conduct quarterly monitoring for the first year following the completion of construction (or per phase) to ensure that the construction has progressed in line with the methodology and the EMPr. Following that, and based on the results of the first year of monitoring, annual monitoring should be considered.

9.9 Opinion of the EAP

Based on the outcomes of the current EIA process, it is the professional opinion of CES and specialists that:

- The project results in no negative impacts of HIGH significance, and only 3 of MODERATE significance following mitigation. The majority of the negative impacts 28 can be mitigated to LOW significance.
- The project results in 8 MODERATE to VERY HIGH positive impacts.
- There are no fatal flaws are associated with the proposed development and all impacts can be adequately mitigated to reduce the risk or significance of impacts to an acceptable level.
- The significance of the benefits associated with the proposed development outweigh the significance of the negative impacts.

It is the opinion of the EAP that this report contains sufficient information to allow the DEDEAT to make an informed decision. It is therefore recommended that the application for Environmental Authorisation should be approved on condition that the recommended mitigation measures stated herein are effectively implemented.

9.10 Recommendations of the EAP:

All mitigation measures, which have been outlined in this report, in the specialist reports, as well as in the Environmental Management Programme (EMPr), must be fully adhered to and implemented.

It is recommended that the following conditions are included in the Environmental Authorisation for the proposed coastal protection project:

1. A regular monitoring programme should be developed and implemented to include the following:
    - Beach profiles must be completed along the St Francis Bay beach, preferably at the same locations that have been measured in the past;

- Profiles of the river bank should be undertaken to monitor erosion of the banks of the Kromme River;
- It is understood that a dredging contractor would carry out regular bathymetric surveys of the lower Estuary area. These are likely to be pre-dredging, once dredging commences, and post-dredging. This monitoring data will provide valuable information on the sediment distribution, accumulation and transport within this dynamic estuarine system, which can be used to assess the volumes of sediment entering this flood-dominated system and any future modifications to the dredging scheme that need to be implemented; and
- A detailed log of sediment discharge quantities must be maintained by the dredging contractor in order to track the volume of sediment that is removed from the estuary.

2. The monitoring regime included in the Estuarine Impact Assessment report (CES, 2020) must be incorporated into the project Environmental Management Programme (EMPr).
3. An adaptive management plan must be developed prior to the start of construction. Adaptive management is a formal, systematic approach to learning from the outcomes of management actions, accommodating change and improving management. It involves synthesizing existing knowledge, exploring alternative actions and making explicit forecasts about their outcomes. Management actions and monitoring programs are carefully designed to generate reliable feedback and clarify the reasons underlying outcomes. Actions and objectives are then adjusted based on this feedback and improved understanding. In addition, decisions, actions and outcomes are carefully documented and communicated to others, so that knowledge gained through experience is passed on. To be effective, adaptive management requires a commitment to learn and adjust, adequate resources (e.g., for monitoring and data analysis), and access to necessary expertise. In this case the adaptive management should be implemented for the dredging of the estuary and the nourishment of the beach frontage.

Please refer to the Environmental Management Programme (EMPr) for detailed environmental management measures.

Environmental Monitoring

The following baseline data needs to be collected prior to construction, certainly for Phase 1. The outcomes of these studies must be used to inform subsequent monitoring.

- *Sediment contaminant testing* – while it is anticipated that the sediment suitable for dredging is unlikely to contain harmful contaminants testing of the sediment is required to establish this. Having collected data prior to construction, sediment tested during the dredging would allow comparison to a pre-dredge condition. It is anticipated that samples be taken from those areas to be dredged. A sample of surface and depth should be taken and analysed for *E. coli* and heavy metals. This is anticipated to be carried out by the dredging contractor periodically throughout the dredging process.
- Ground truthing the distribution of the habitats identified as part of this study should be considered. Following this, monitoring the sensitive habitats in close proximity to the dredging activities should be carried out to determine die-back as a result of smothering, dredging, loss of habitat. Should these areas be determined to be reducing correction measure should be implemented. This should be carried out by a suitably qualified specialist with the emphasis being on the ability to accurately replicate the activity during the construction phase.

Similarly, during operation understanding the changes to the estuary and hydrodynamics as a result of the dredging of the Kromme would facilitate comment on how the habitats might evolve as a result. It

is understood that a dredging contractor would collect bathymetric data during the works. However, it should be provided to a suitably qualified and experienced ecological/environmental expert, in a format that can be easily interpreted, to be able to verify the impacts. It is recommended that this monitoring takes place at least annually.

Similar to the bathymetric surveys, habitat distribution should be monitored during construction. Initially, monitoring should be fairly regular (i.e. once every 3 months) to ensure that any suspended sediment that may be settling is not settling in sensitive habitats at a rate unsustainable for the continuation of that particular habitat. This should be done through the collection of fixed-point photographs and updated distribution mapping.

The outcome of the monitoring should be compiled into an annual monitoring report comparing the monitoring against the baseline data that was collected prior to construction. In addition, there should be comment on the observations and whether they are in line with the impacts identified during the EIA. Should the impacts observed through the monitoring differ from that of the EIA and particularly if adverse, additional mitigation measures should be implemented.

10 REFERENCES

Adams, J.B. and Talbot, M.M.B. 1992. The influence of river impoundment on the estuarine seagrass *Zostera capensis* Setchell. Botanica Marina 35: 69-75.

Adams, J.B., Bate, G.C., O'Callaghan, M.O. 1999. Primary Producers. In: (B.R. Allanson and D. Baird, eds.). Estuaries in South Africa. Cambridge University Press. pp 91-117.

Adams, J.B. 2001. The importance and freshwater requirements of South Africa's estuaries. SA Water Bulletin 23(6): 16 – 19.

Advisian. 2020. St Francis Bay Estuary Hydrodynamic Modelling Study. C00729-01-PMT-PRE-0004. 70pp.

Advisian. 2020. St Francis Bay Beach Long-Term Coastal Protection Phase 2. Supplementary Shoreline Modelling Report. 154pp.

Advisian. 2018. St. Francis Bay Beach Long-Term Coastal Protection Phase 2. Preliminary Design Report 22/02/2018.

Advisian. 2019. St. Francis Bay Beach Long-Term Coastal Protection Phase 2. Spit Protection: Preliminary Design Report 04/02/2019.

ARSC Kromme River Structure Plan. 1992. Algoa Regional Services Council.

Baird, D., Marais, J.F.K. and Bate, G.C. 1992. An environmental analysis for the Kromme River area to assist in the preparation of a structure plan. Institute for Coastal Research. Report Number 16.

Bate G.C. and Adams, J.B. 2000. The effects of a single freshwater release into the Kromme Estuary. 5. Overview and interpretation for the future. Water SA 26(3): 329-332.

Bezuidenhout, C. 2011. Macrophytes as Indicators of Physico-Chemical Factors in South African Estuaries. PhD Thesis, Nelson Mandela Metropolitan University.

Bickerton, I.B. and Pierce, S.M. 1988. Estuaries of the Cape Part II: Synopses of Available Information on Individual Systems. Report No. 33 Krom (CMS 45), Seekoei (CMS 46) and Kabeljous (CMC 47). CSIR Research Report 432.

Birdlife South Africa. 2019. Accessed following website in October 2019 https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/what-we-do/iba-map/

Coastal and Environmental Services. 2006. Kromme/Seekoei Catchments Reserve Determination Study. Technical Component. EWR Estuary Report: Seekoei. DWAF Project Reference Number 26/8/3/10/4.

Colloty, B.M. 2000. The botanical importance rating of the estuaries in former Ciskei/Transkei. PhD Thesis. University of Port Elizabeth, South Africa. pp. 202.

Den Hartog, C. 1977. Structure, function and classification in seagrass communities. In: (C.P. McRoy and C. Helfferich, eds.). Seagrass ecosystems: A Scientific Perspective. Marcel Dekker Inc., New York. pp. 90-122.

Eastern Cape Vision 2030 Provincial Development Plan (2014). Eastern Cape Planning Commission. Available at: http://www.ecdc.co.za/media/1643/ec-vision-2030-plan_271014-2.pdf. [Accessed January 2019].

Emmerson, W.D. and Erasmus, T. 1987. The nutrient status of the Kromme River estuary, South Africa. Hydrobiologia 148: 87 – 96.

Hanekom, N. and Baird, D. 1984. Fish community structures in Zostera and non-Zostera regions of the Kromme estuary, St Francis Bay. South African Journal of Zoology 19: 295 – 301.

Harding, J. 2017. Knysna Seahorse in dire straits. Available at: http://oceanadventures.co.za/knysna_seahorse/ [Accessed 28 January 2019].

Harrison, T.D., Cooper, J.A.G., Ramm, A.E.L. and Singh, R.A. 1996a. Application of the Estuarine Health Index to South Africa‟s estuaries, Groot (Wes) – Great Fish. Technical Report, Coastal and Catchment Environmental Programme, CSIR, Durban.

Harrison, T.D., Cooper, J.A.G., Ramm, A.E.L. and Singh, R.A. 1996b. Application of the Estuarine Health Index to South Africa‟s estuaries, Groot (Wes) – Great Fish. Executive Report, Coastal and Catchment Environmental Programme, CSIR, Durban.

ICF Jones and Stokes. 2008. Hamilton Wetlands Restoration Project Dredged Material Aquatic Transfer Facility Draft Supplemental EIS/EIR. October. Prepare for the U.S. Army Corps of Engineers and California State Coastal Conservancy. Oakland, CA.

Jerling, H.L. and Wooldridge, T.H. 1994. The effect of periodic inlet closure on recruitment in the estuarine mudprawn, Upogebia africana (Ortmann). In: Changes in Fluxes in Estuaries: Implications from Science to Management. Pp. 301 – 306. K.R. Dyer & R.J. Orth (eds). Olsen & Olsen, Fredensborg, Denmark.

Kouga Local Municipality Draft Integrated Development Plan 2017-2022 (2017). Resolution No. 17/03/AME&SP5.

Kouga Municipality Spatial Development Framework (2015). Report EC03/2014/7.

Marais, J.F.K. 1983. Seasonal abundance, distribution and catch per unit effort of fishes in the Krom estuary, South Africa. South African Journal of Zoology 18(2): 96-102.

National Development Plan 2030 (2013). *Our Future – Make it Work*. National Planning Commission. Available at: https://r7h9p6s7.stackpathcdn.com/wpcontent/uploads/brandsa/2015/05/02_NDP_in_full.pdf [Accessed January 2019].

Newman, B.K. 1993. Aspects of the Biology and Ecology of the Estuarine Cirolanid Isopod Cirolana fluviatilis in two Eastern Cape Estuaries. MSc Thesis. University of Port Elizabeth, South Africa.

O‟ Callaghan, M. 1992. The ecology and identification of the southern African Salicornieae (Chenopodiaceae). South African Journal of Botany 58(6): 430-439.

Porter, S. Hutchings, K and B.M. Clark. 2012. Baseline Marine Report: Marine aquaculture development zones for fin fish cage culture in the Eastern Cape. Prepared for: Directorate Sustainable Aquaculture Management: Aquaculture Animal Health and Environmental Interactions Department of Agriculture, Forestry and Fisheries. 28 pp

Reddering, J.S.V. and Esterhuysen, K. 1983. Research on sedimentation in estuaries. Sedimentation in the Kromme estuary. University of Port Elizabeth. Rosie Report No. 6. 92 pp.

SA Explorer (2017). St. Francis Bay Climate. Available at: http://www.saexplorer.co.za/south-africa/climate/st_francis_bay_climate.asp. [Accessed January 2019].

Sale, M.C., Hosking, S.G. and du Preez, M. 2009. Application of the contingent valuation method to estimate a recreational value for the freshwater inflows into the Kowie and Kromme Estuaries. Water SA 35(3): 261 – 270.

Scharler, U.M., Baird, D. and Winter, P.E.D. 1997. Diversity and productivity of biotic communities in relation to freshwater inputs in three Eastern Cape estuaries. WRC Report No. 463/1/98: 196 pp.

Scharler, U.M. and Baird, D. 2000. The effect of a single freshwater release on the physico-chemical properties of the freshwater-starved Kromme estuary, St Francis Bay, South Africa. African Journal of Aquatic Sciences 25: 227-228.

South African National Biodiversity Institute (2006- 2018). The Vegetation Map of South Africa, Lesotho and Swaziland, Mucina, L., Rutherford, M.C. and Powrie, L.W. (Editors), Online, http://bgis.sanbi.org/SpatialDataset/Detail/18, Version 2018

Sowman, M.R. and Fuggle, R.F. 1987. Assessing recreational carrying capacity: A case study of the Kromme River Estuary, South Africa. Journal of Shoreline Management 3: 53-75.

Stats SA (2011). Census 2011. Available at: http://www.statssa.gov.za/?page_id=3839 [Accessed January 2019].

Wallace, J.H., Kok, H.M., Buxton, C.D. and Bennet, B. 1984. Inshore small-mesh trawling survey of the Cape south coast. Part 1. Introduction, methods, stations and catches. South African Journal of Zoology 19: 155-164.

Whitfield, A.K. and Bate G.C. 2007. A Review of Information on Temporarily Open/Closed Estuaries in the Warm and Cool Temperate Biogeographic Regions of South Africa, with Particular Emphasis on the Influence of River Flow on These Systems. Interim report to the Water Research Commission on the Project "The freshwater requirements of intermittently open Cape estuaries". WRC Report No 1581/1/07.

Wooldridge, T.H. 2007. Biotic response to altered freshwater inflow patterns to the Kromme River Estuary, South Africa. Transactions on Ecology and the Environment (1): 687-696.