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Scope: Preliminary Geomatic and Geotechnical investigation to determine dune stability and morphology over time

Scope: Preliminary geomatic study of proposed dwellings positions to determine: Dune stability and morphology over time. Soil characterisation and DCP measurements for foundation purposes, samples to determine the soil consistency, characteristics and soil structures for the purpose of future development and the building of dwellings. Dune position and vegetation coverage in relation to coastal zone over time. Climatic factors influencing dune morphology over time, temperature, rainfall, flood zones, slope, geology and risk projections for future sea level rise with possible flooding risk at the proposed dwelling positions.

Location: Sedgefield area, Cola Beach, Garden Route, erf 79/205 Ruygte Vally

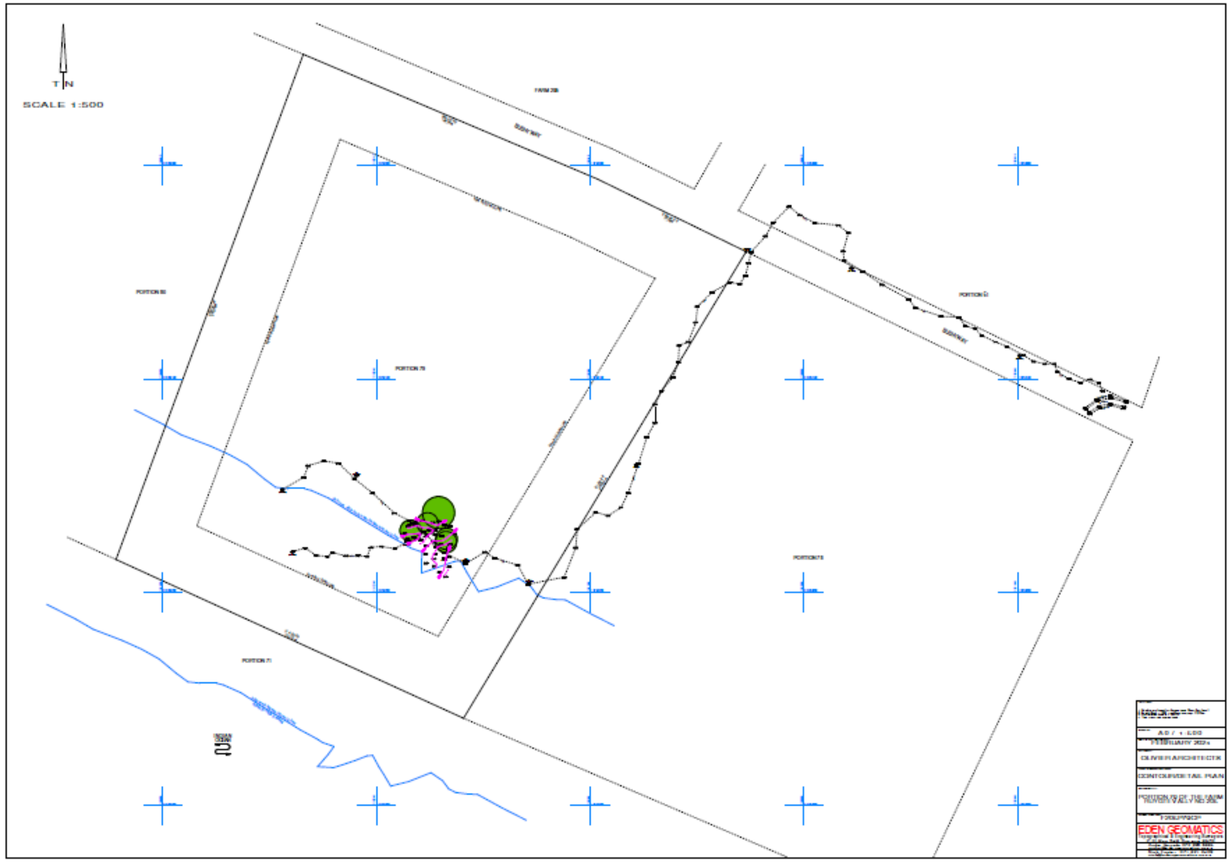
Client: Daniel Sevenster

Compiled: Dr Esmé Spicer

Report: RH160524

Index

Property diagram erf 79/205 Ruygte Vally with Overlays of proposed sites onto satellite image



Land surveyor diagram: schematic with proposed dwellings

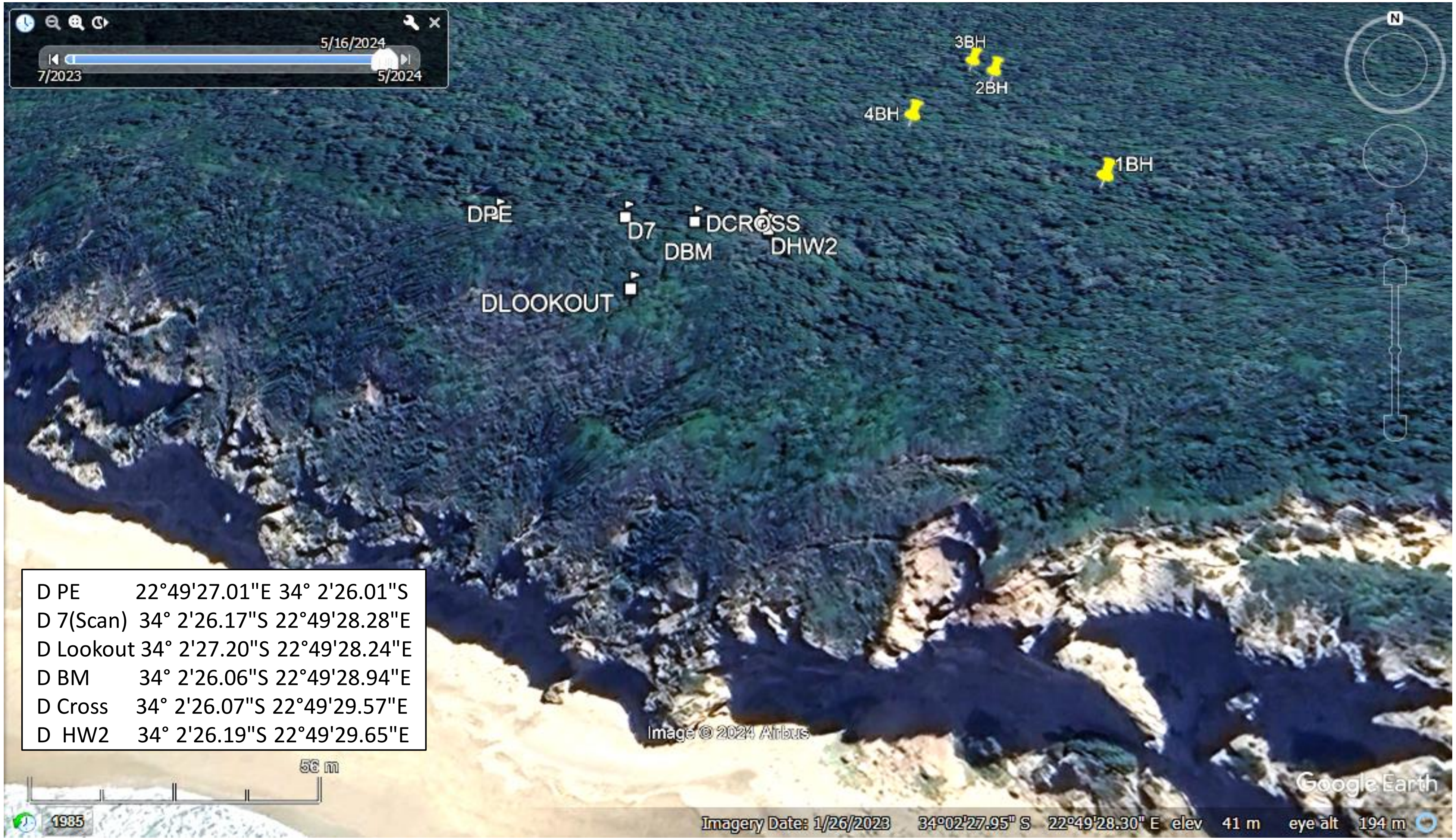
Overlays of proposed sites onto satellite image (plain 2D view) - Cape Farm Mapper (top) and Google Earth Pro (bottom)

LEGEND

- ☆ Proposed dwelling PE
- ◯ Large Trees HW2
- ● Proposed BH1 (Borehole)
- Building line
- Border line
- 100m line above high water mark

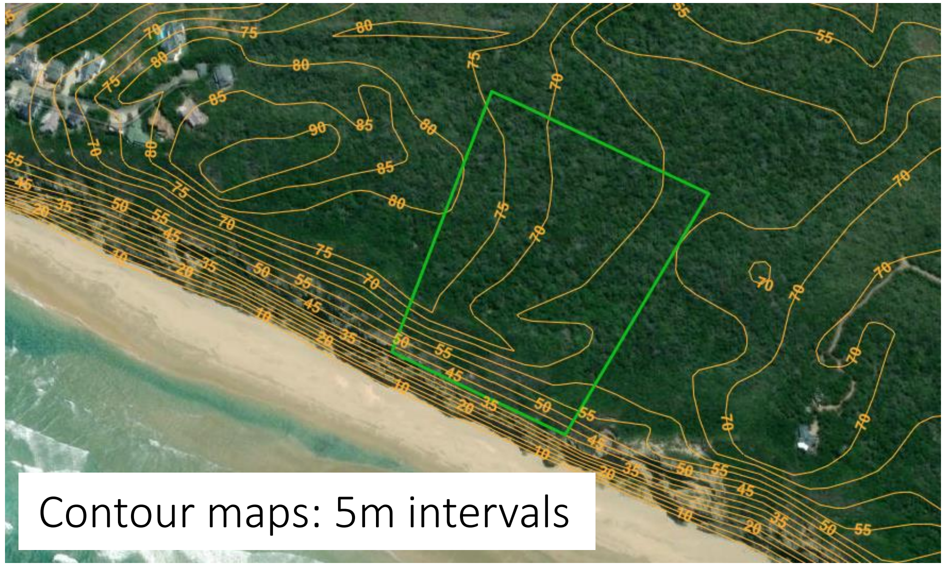
Positions of measurements (Google Earth Pro, 3D Terrain view): Positions of interest

PE- Western point on path & survey point (75m above sea level); Lookout – Path overlooking sea (76m above sea level); D7 – Position of deep fracture on scan (79m above sea level); Cross – Split in path (77m above sea level); BM – survey point (72m above sea level); HW2 – survey point & Tall trees (70m above sea level)

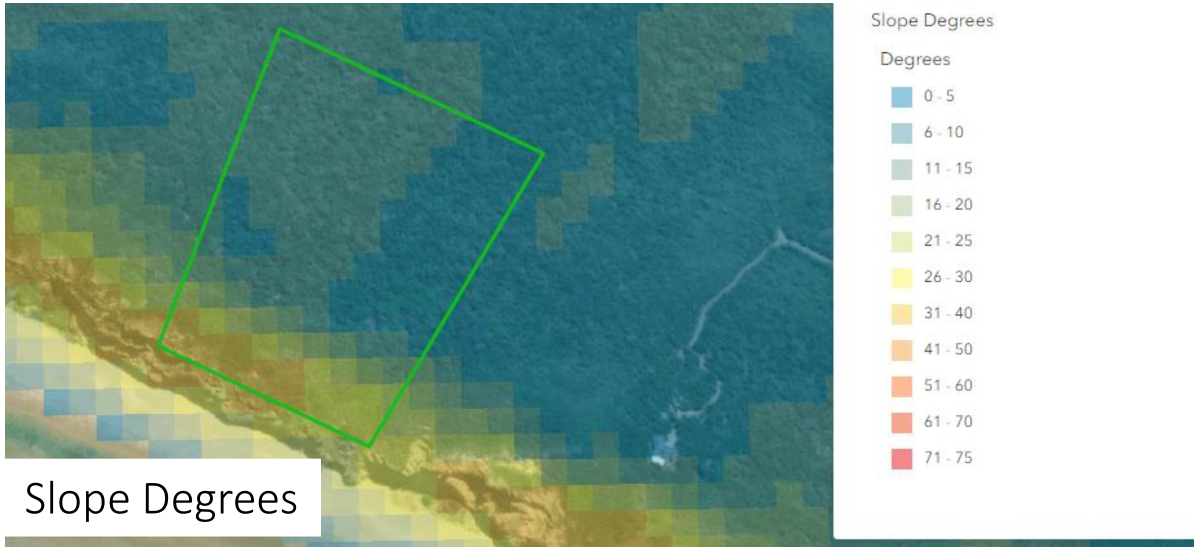


Section: Slope, soil and geology

Slope stability: The property is located on low-sloping areas behind the front dune edge, from marker HW2 inland, dipping gently from 0-21% degrees with an easterly dip. The slope changes significantly from marker HW2 towards the coast at 26-70 degrees over a 70m horizontal distance.



Contour maps: 5m intervals



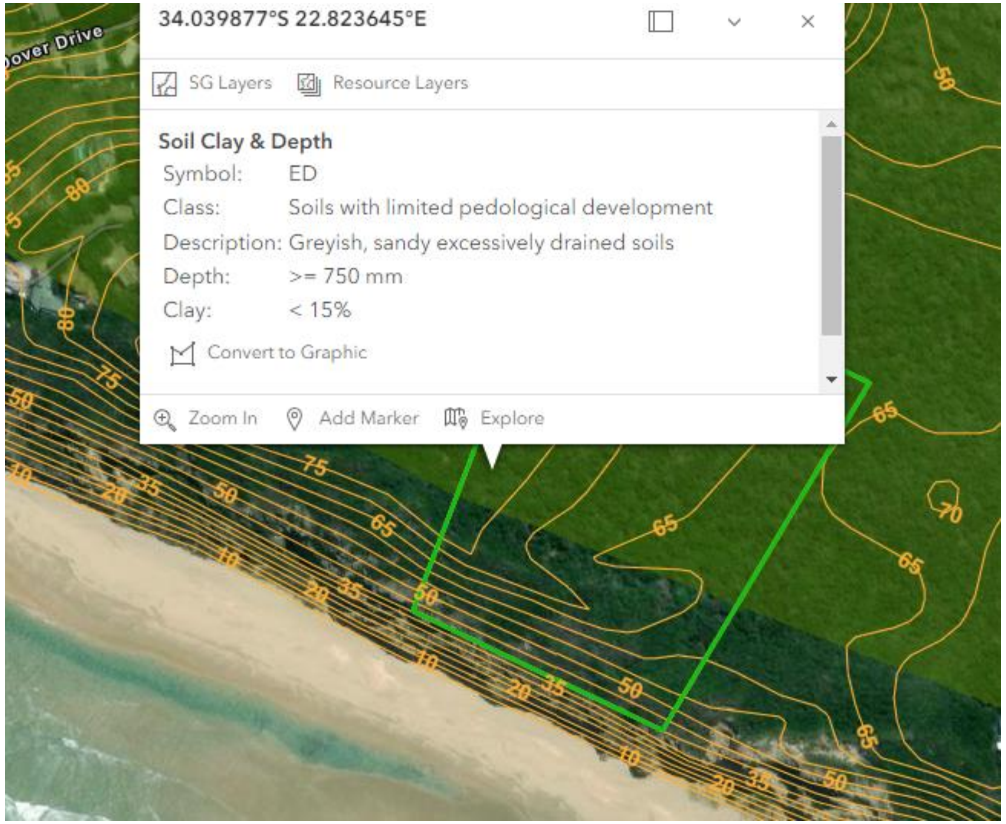
Slope Degrees

Contour maps: 5m intervals

- The property lies across the 5m contour map from 75m in the western areas to 40m height on the coastal border.
- Sudden slope changes occur at the coastal border edge from 70m to 40m, across a horizontal distance of 60-70
- Slope changes from 2 degrees in areas BM and HW2 to 32 degrees from Lookout to coastal zone

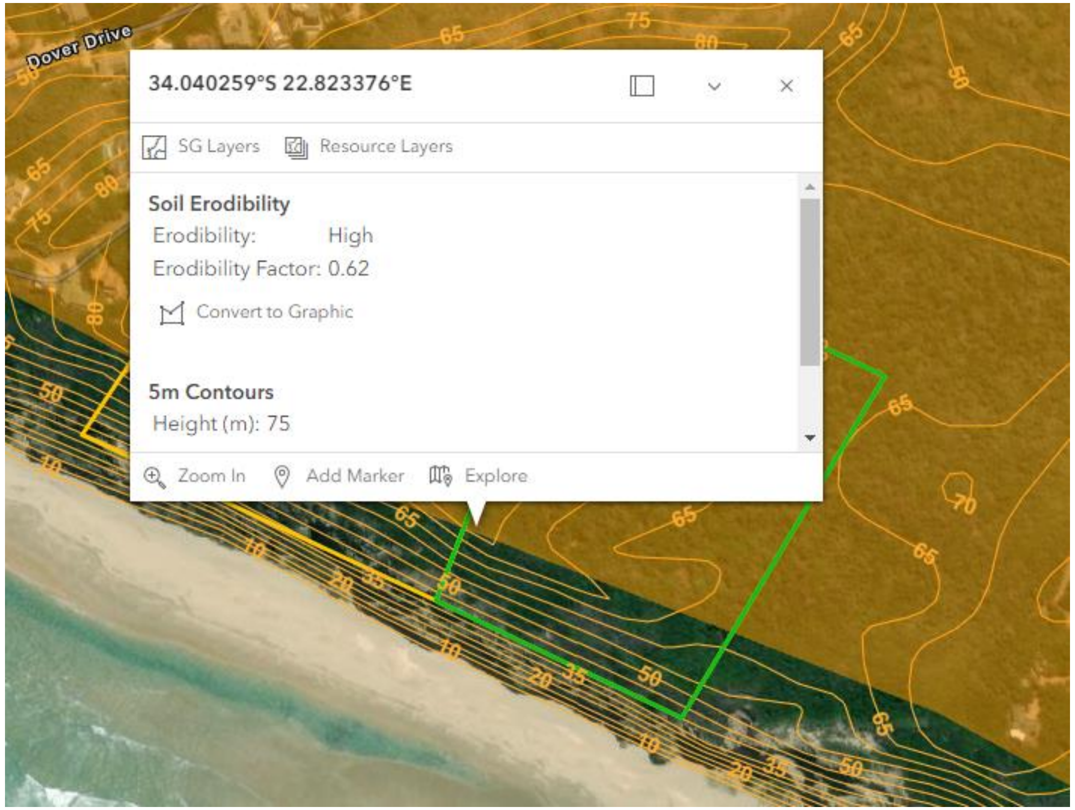
A) Soil clay and depth (CFM) 1: 1 000 000: Soil thickness is average more than 750mm deep with little accumulation of clay materials and is sandy and excessively drained. B) Soil erodibility (CFM) 1: 1 000 000: The soil in this area is highly erodible. The 0.62 factor indicator points to a high probability of a moveable soil horizon in this area, especially in conjunction with the steep slopes from the Lookout point towards the coastal zone.

A



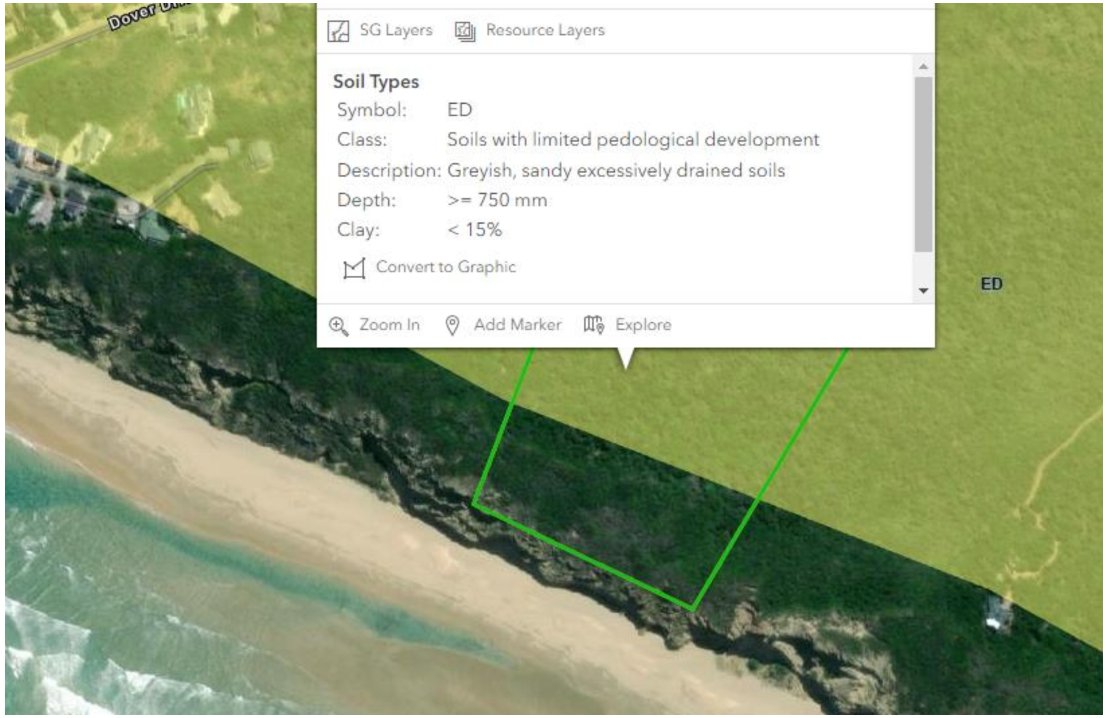
A Field observations: Sandy soil with high organic matter was present to 150 cm depth on both test pit sites. Minor Clays are present.

B



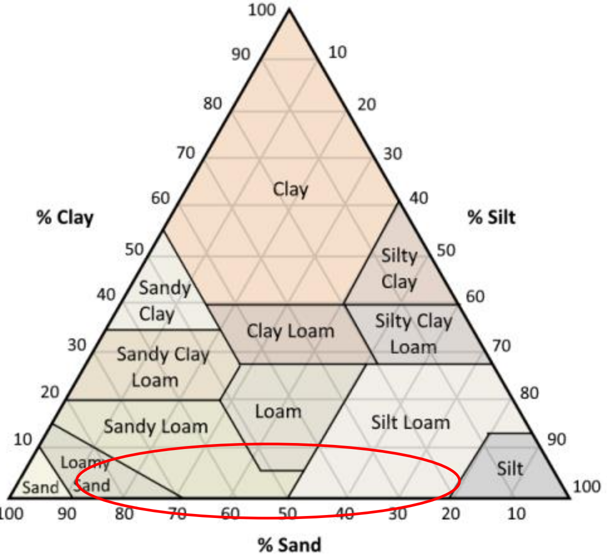
B Field observations: Soil is highly erodible in this area and loosely packed.

Soil type: CFM overlay class the soils as ED, with limited pedological development (young), with depth of >750mm and less than 15% clay content in this area.



Field observations: Soils on both properties has limited pedological development, and is a mix of predominantly organic material mixed with dune sand, with minor silt and very little clay.

Soil identification: Soils were described by field observations down to 1,5m depth, regarding colour and granularity. They were tested over 24 hours by the Mason Jar test to determine the presence of humus (organic material), %sand, %silt and %clay. Soils were identified according to the diagram below, according to the test results in Tables 1 and 2.



Soil sample description: Table 1 Coastal Lookout Point 1

Y= Yes
ND = Not visually detected

Area	**Sample**	**Depth**	**Grain size**	**Colour**	**Moisture %**	**% Large pebbles**	**% Sand test**	**% Silt test**	**% Clay test**	**% Organic matter test**
Test type	**no**	**Approximate**	**visual**	**visual**	**Moisture meter**	**Soil texture test: soil settling in water over 24hrs into layers of pebbles, sand, silt, clay, and organic material (Mason Jar Test)**				
Position 1 : Lookout	1	0-15	coarse grained	dark brown	19.6	ND	>5	>5	ND	95
	2	15-30	coarse grained	dark brown	23.5	ND	>5	25	ND	80
	3	30-45	coarse grained	dark brown	23.7	ND	>5	25	ND	80
	4	45-60	coarse grained	dark brown	13.4	ND	10	20	ND	70
	5	60-75	coarse grained	dark brown	13.1	ND	20	20	ND	60
	6	75-90	coarse grained	dark brown	11.7	ND	50	30	5	15
	7	90-105	medium grained	grey brown	12.6	ND	60	20	10	10
	8	105-120	medium grained	grey brown	9.1	ND	65	25	10	>5
	9	120-135	medium grained	grey brown	9.8	ND	75	15	10	>5
	10	135-150	medium grained	grey brown	19.9	ND	85	10	5	>5

Description: Soils at this site had no pebbles, and were course to medium grained predominantly organic rich to sandy from the top to the bottom layers. Grainsize changed gradually from course organic material to medium grained sand layers down to 1,5m depth. Soil colour ranged from dark brown to grey brown. Soil type is predominantly Organic material, to Silty loam with 10-30% silt in the top layers to Sandy Loam at 90-135cm, and sand from 135 to 150cm depth. Clay is not predominant. Moisture ranges from23% in the top layers, to 10% from the 45 to 135cm, with a moisture rich layer at 150cm.

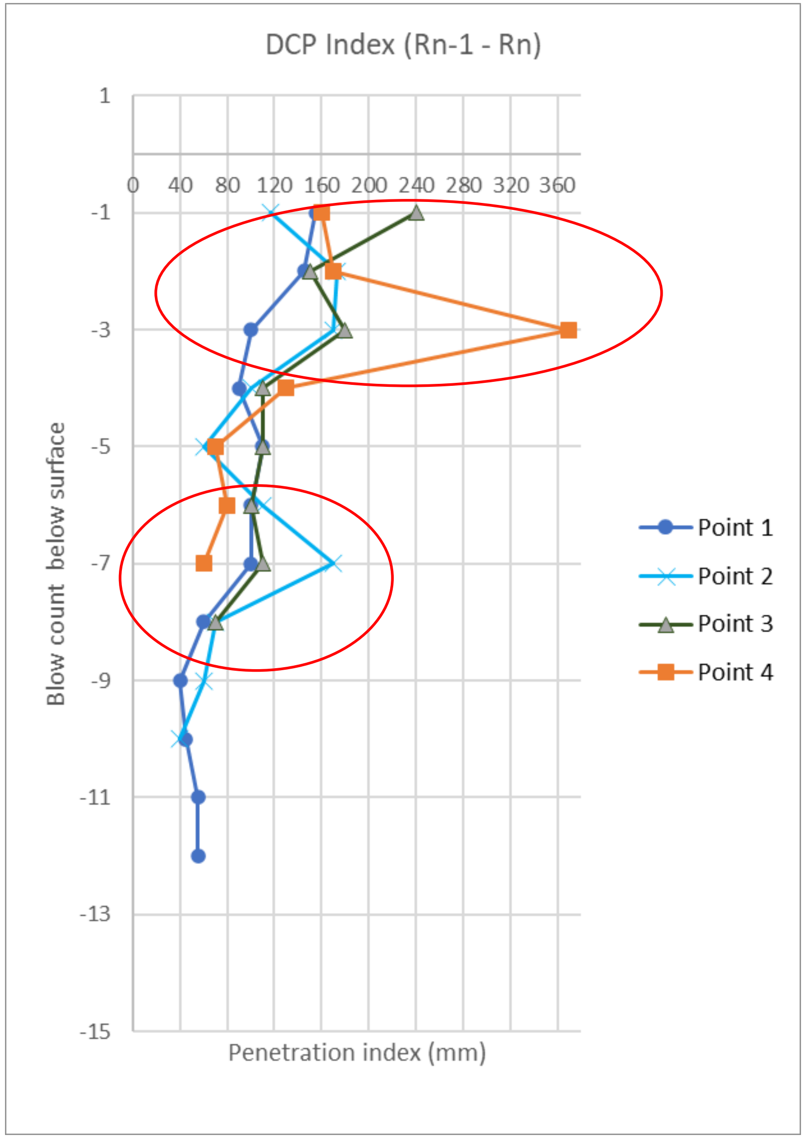
Soil sample description: Table 2 Large Trees HW2

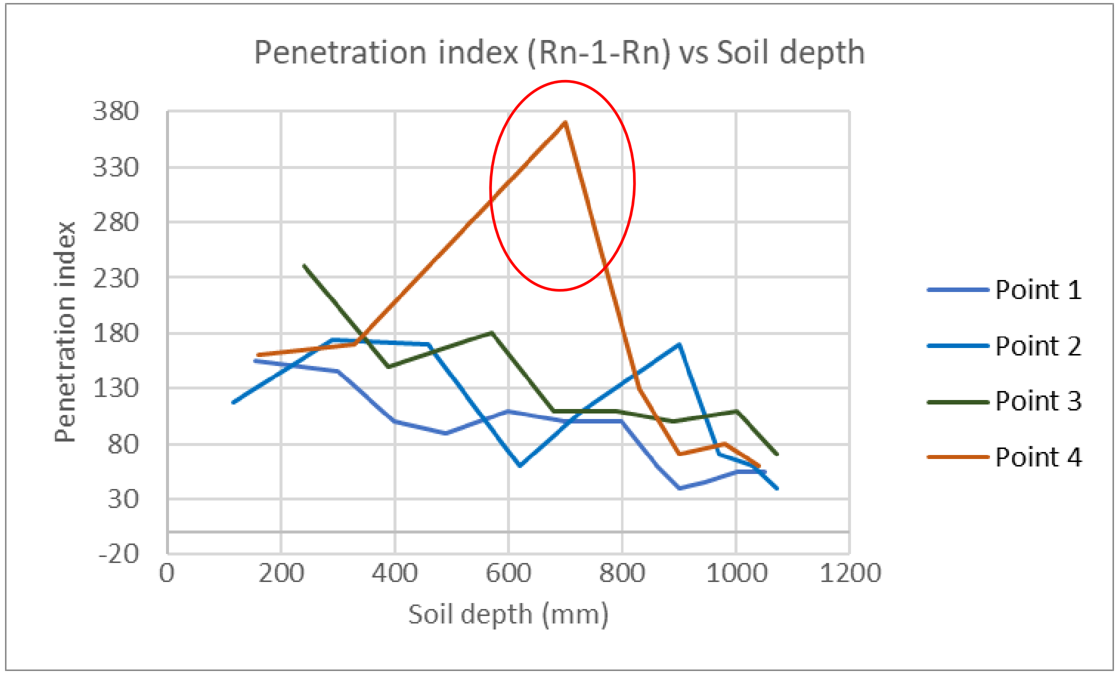
Y= Yes
ND = Not visually detected

Area	Sample	Depth	Grain size	Colour	Moisture %	% Large pebbles	% Sand test	% Silt test	% Clay test	% Organic matter test
Test type	**no**	**Approximate**	**visual**	**visual**	**Moisture meter**	**Soil texture test: soil settling in water over 24hrs into layers of pebbles, sand, silt, clay, and organic material (Mason Jar Test)**				
Site 2 Large trees HW2	1	0-15	coarse grained	dark brown	25.1	ND	20	40	ND	40
	2	15-30	coarse grained	dark brown	10.5	ND	20	40	ND	40
	3	30-45	coarse grained	dark brown	8	ND	20	40	ND	40
	4	45-60	coarse grained	dark brown	6.1	ND	30	30	ND	40
	5	60-75	medium grained	grey brown	4.9	ND	60	30	ND	10
	6	75-90	medium grained	grey brown	6.2	ND	60	20	5	5
	7	90-105	medium grained	grey brown	4.7	ND	60	30	5	5
	8	105-120	medium grained	grey brown	5.5	ND	70	20	5	5
	9	120-135	medium grained	grey brown	5.5	ND	70	20	5	5
	10	135-150	medium grained	grey brown	8.2	ND	60	30	5	5

Description: Soils at this site had no pebbles, and were course to medium grained predominantly organic rich to sandy from the top to the bottom layers. Grainsize changed gradually from course organic material to medium grained sand layers down to 1,5m depth. Soil colour ranged from dark brown to grey brown. Soil type is predominantly Organic material to 90cm, to Silty loam with 20-40% silt in the top layers to Sandy Loam at 60-150cm depth. Clay is not predominant. Moisture ranges from25% in the top layers, gradually changing to 5% from the 15 to 135cm, with a slight moisture increase at 150cm.

DCP – Results plotted as Penetration/DCP index (Rod reading Rn+1 – Rn on x-axis) across a 1,2m depth rod length (blow count) and Penetration index vs Soil depth. Note that graphs axes were all scaled to the maximum blows and DCP index results to show the difference in compaction between points. Weak area depths are indicated in red blocks on each graph.

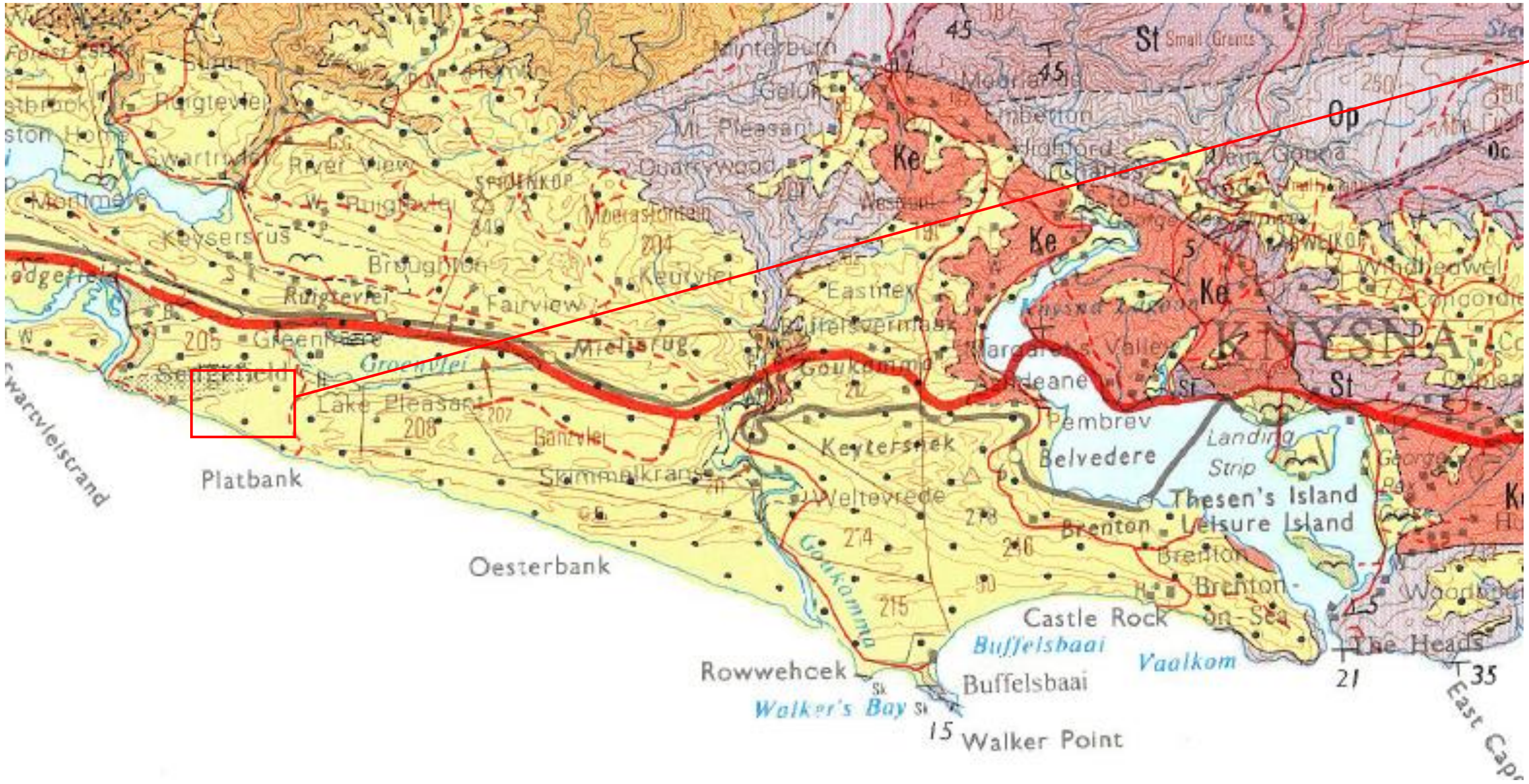




Legend:
Point 1: Lookout path
Point 2: BM & Path split
Point 3: PE Western end
Point 4: HW2 Tall trees

Results : The Lookout and PE dune areas within the 70m from coast line, on the 65m contour, is evenly compacted with weak areas only in the top 240mm, rich in organic matter. Blow number range from 8 to 12 across the 1m rod indicating very soft uncompacted material. DCP index of 0 to 240, averaging around 100 from 200 to 1000mm depth. There is no outliers, indicating even soil consistency, typical of sandy soils.
Point HW2 and BM, in the tall tree areas, on the 100m line from coast line, 60m contour line, is not evenly compacted with weak areas in the top 160 and at 360mm. Blow numbers are low, 7 to 10, across the 1m rod indicating very soft uncompacted material. DCP index of 0 to 360, averaging around 160 from 200 to 1000mm depth. There is no outliers, indicating even soil consistency.
Note: The areas in the tall trees, 100m from the coast zone, has lower consistency than the areas 70m from the coast zone. Weaker areas are circled in red.

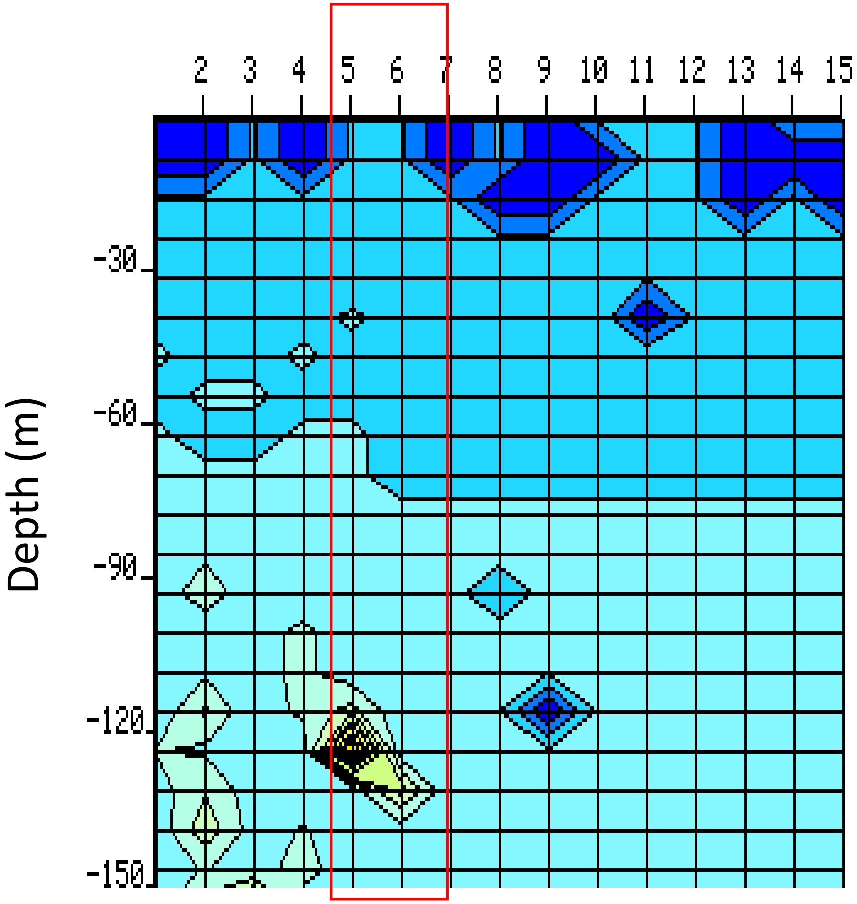
Regional Geological Map 1:250 000 map (Council for Geoscience)

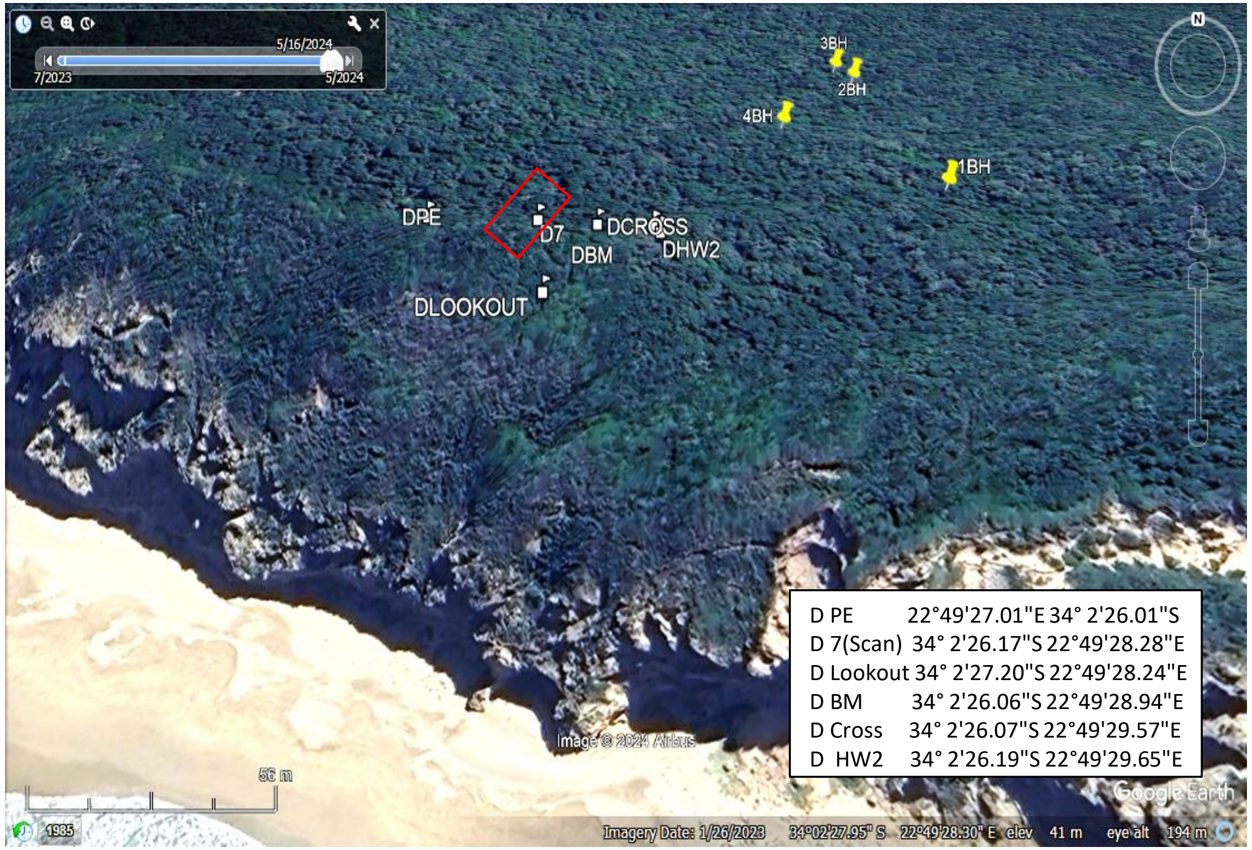


Area: The property (approximately in red block) is located within the Cape Supergroup rocks, on thick sand (light yellow Bredasdorp formation). Kirkwood formation conglomerates (Ke dark orange) might be present in thin layers under the sand. Peninsula sandstones (Light pink Op) underly the sand and conglomerates at depths of typically approximately 70-90m. Steep topographical features are present due to the formation of high wind-blown recent sand dunes and semi-consolidated fossil sand dune.

Geophysical Telluric survey along path from markers PE to HW2:

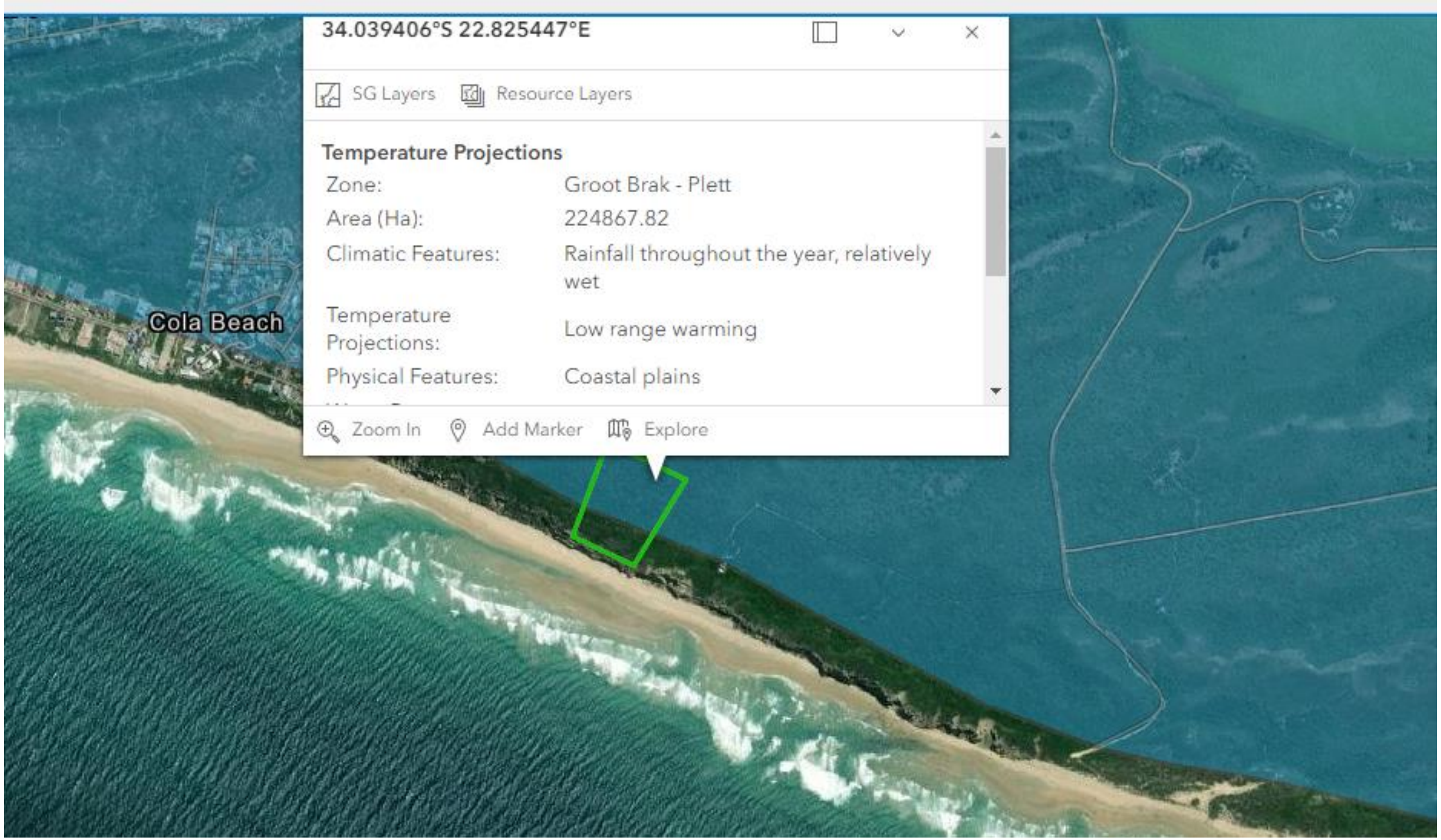
Data indicates moist soil and sand (dark blue to 40m), deep sand and fossil sand dune (medium blue to 60-80m) and harder rock formation sandstone (light blue with yellow patches from 60-80m and deeper) .
The red blocks indicate a weak zone at line 6-7 with a step in the sandy overburden present from more resistant material (line 1 to 5, 15m deep) to less compacted material (line 6 to 15, 25m deep). Position D7 indicate the less compacted material and a large fracture at 120m depth, indicated by black diamond shapes on the scan.





Section: Climate and environmental risk factors

Temperature projections indicate a low range warming can be expected in the area

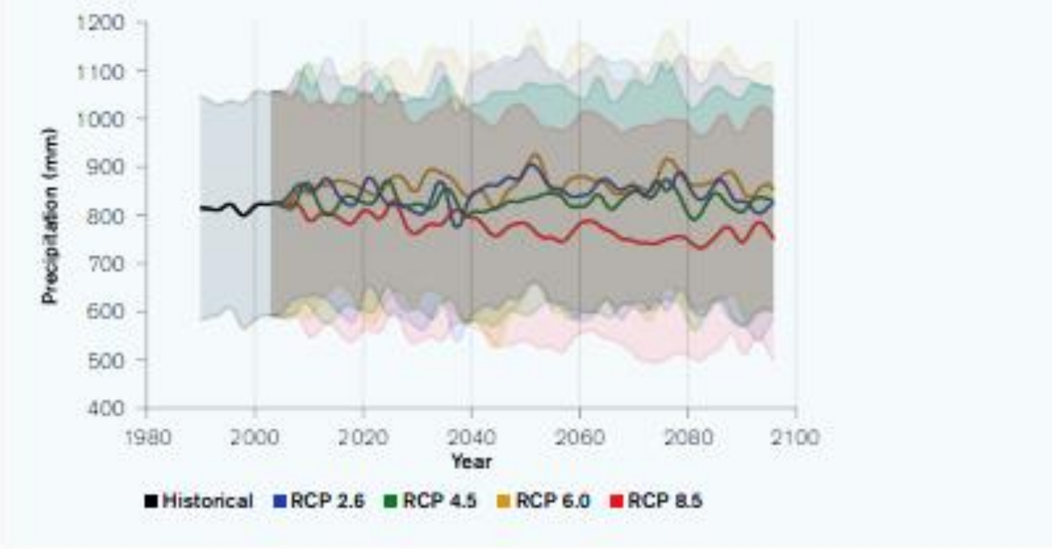


Climate data: Projected precipitation graphs indicate minor seasonal increases with a decline in projected rainfall for Knysna and average precipitation for South Africa.

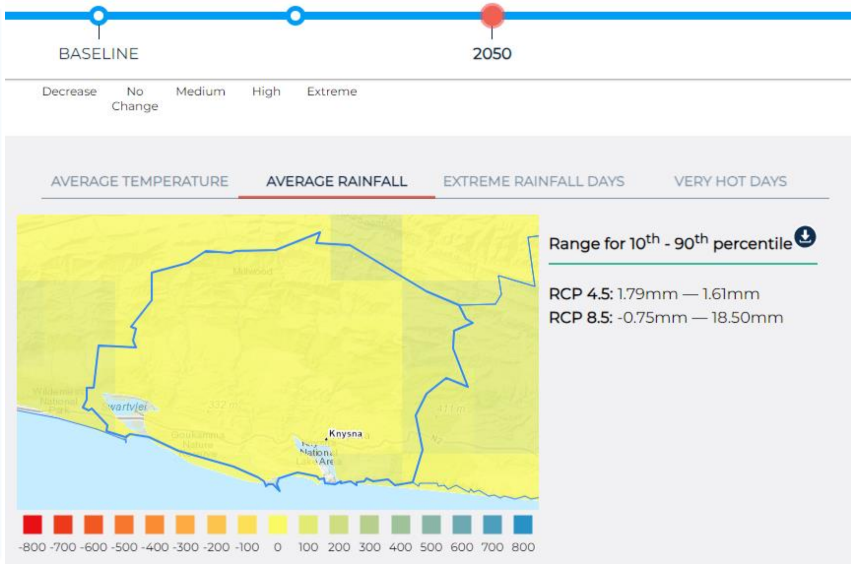
Observed Seasonal Precipitation

	1991-2020				1961-1990				1931-1960				1901-1930			
Units:mm	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
South Africa	201.66	108.43	39.72	112.79	197.03	122.48	46.73	121.66	199.7	123.27	40.83	118.66	196.18	122.18	42.16	118.16

DJF = Dec; Jan; Feb
MAM = Mar; Apr; May
JJA = Jun; Jul; Aug
SON = Sept; Oct; Nov

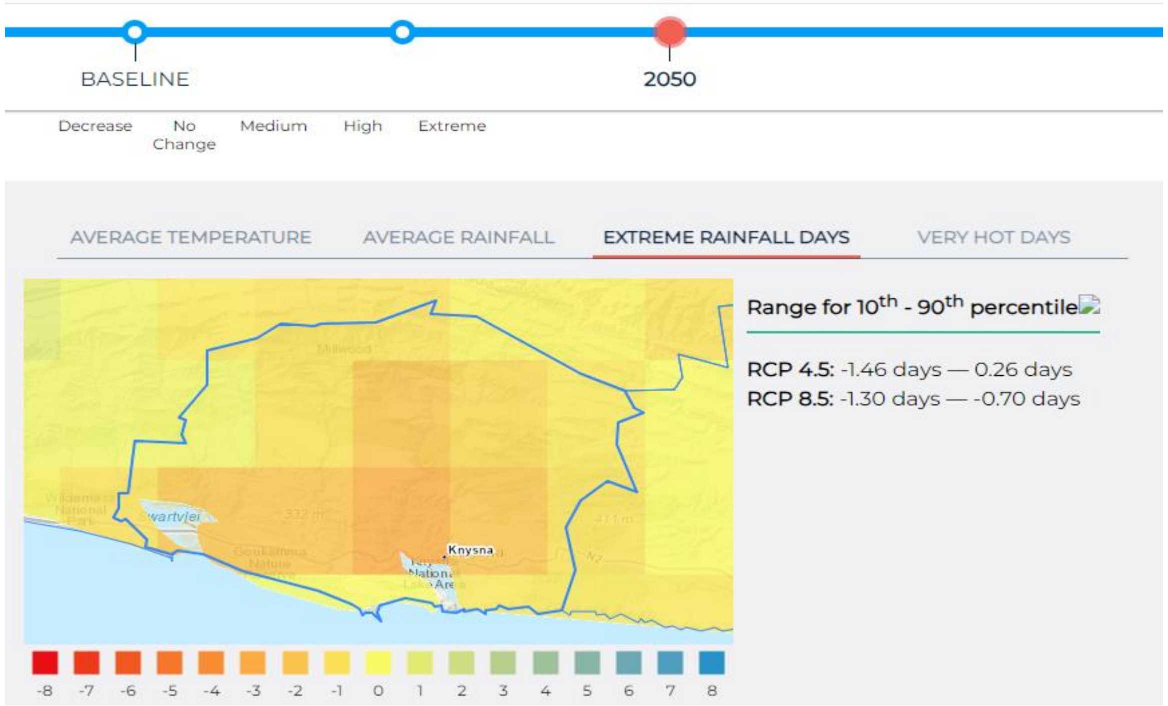


Projected annual average precipitation in South Africa (1986-2005) projected to 2100



Projected average rainfall in Knysna projected to 2050

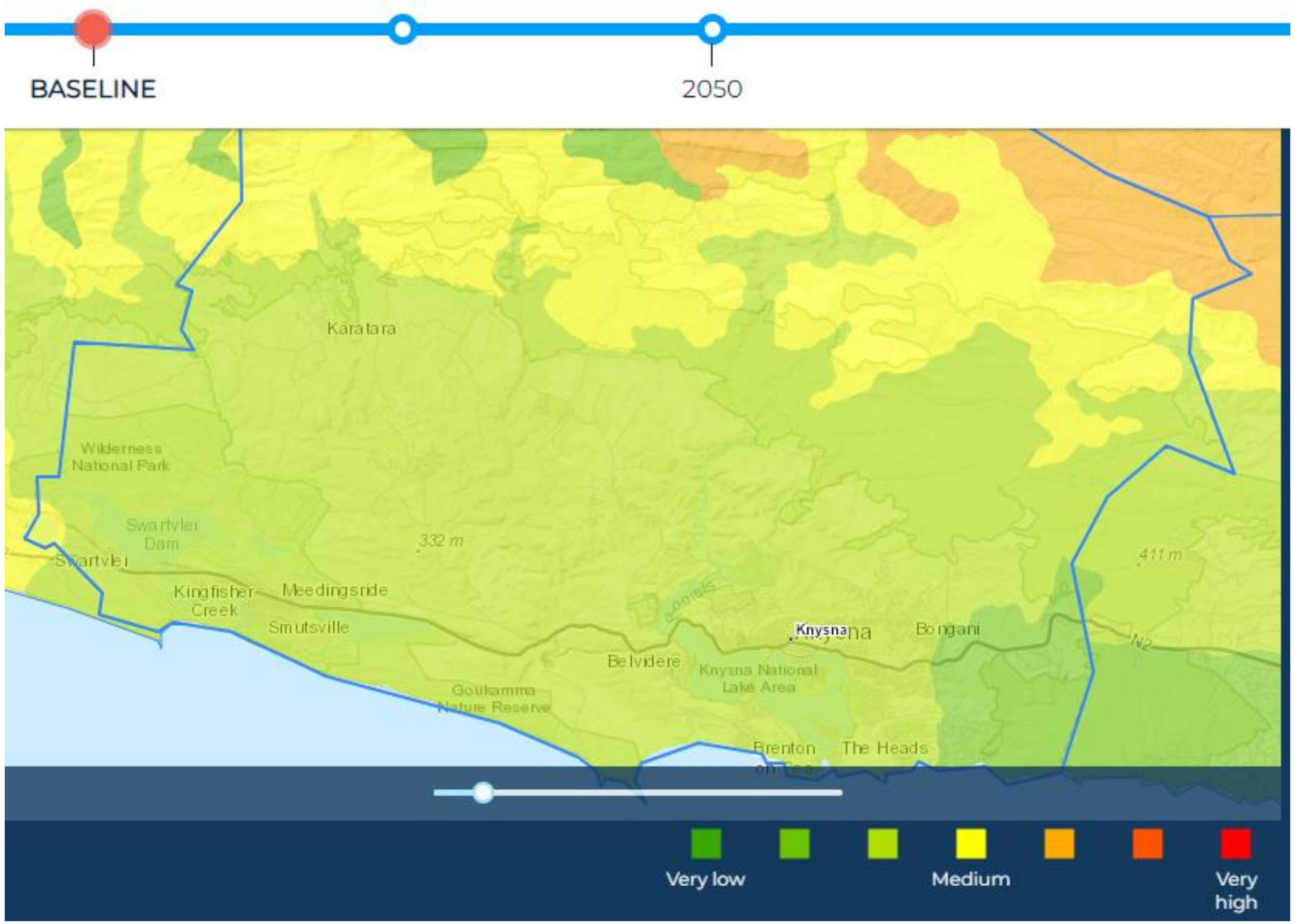
Extreme rainfall predictions that can influence Coastal surface erosion (sediment dynamics)



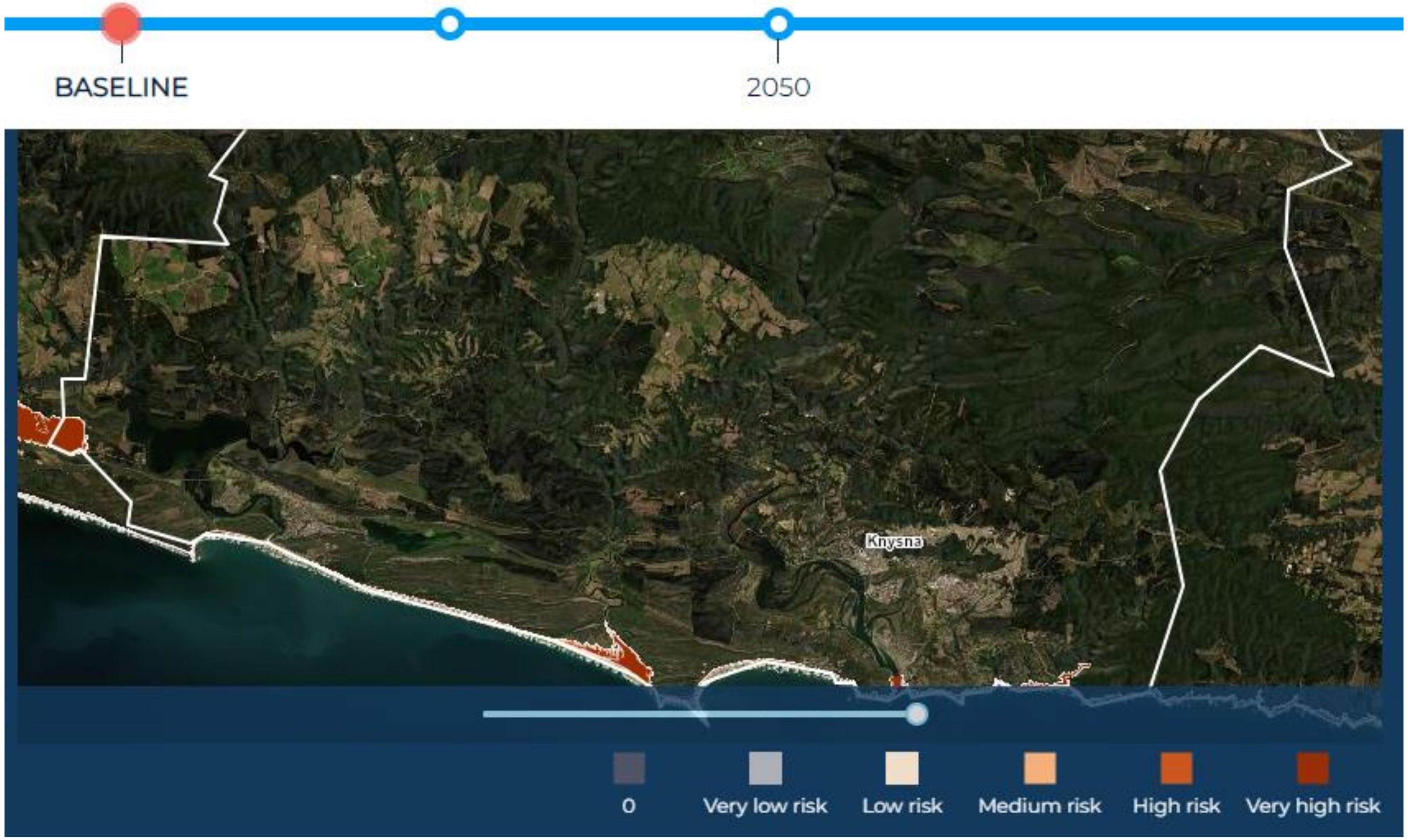
The area is located in a zone with less extreme rainfall days projected by 2050.

**An extreme rainfall event (including severe thunderstorms and lightning) is defined as 20 mm of rain occurring within 24 hours over the 8 x 8 km grid point.

Coastal flooding (CSIR): Baseline (current) and projected (2050) exposure to flooding indicate that the property is located currently in a low risk and in 2050 in a very low risk area for coastal flooding.

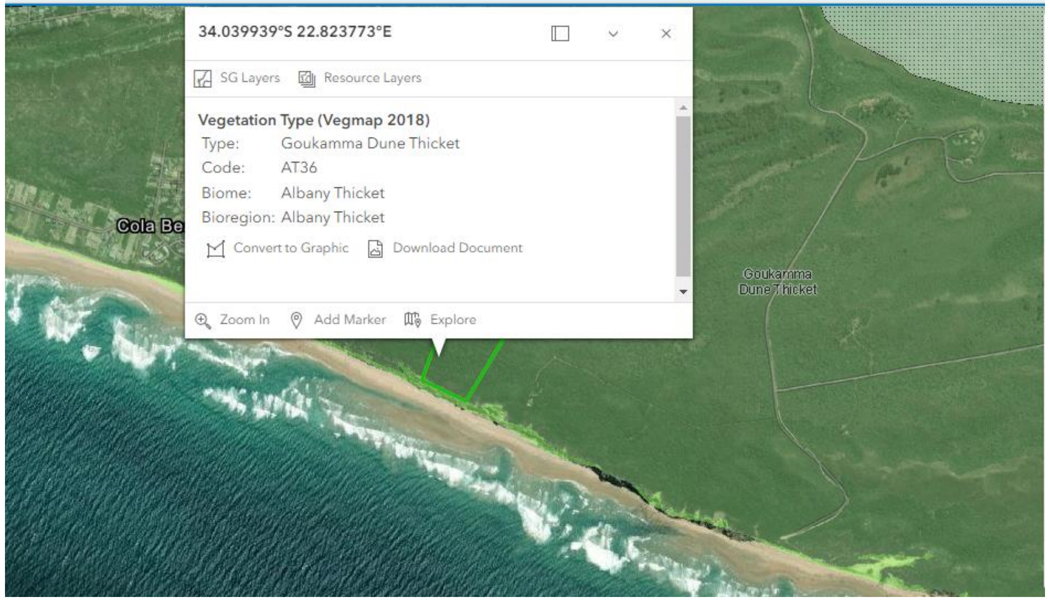


Coastal zone flooding: Municipal risk areas (CSIR green book), Hazard rating for Knysna Coastal zone flooding indicate that the property is in a low risk area for coastal flooding



Definition
Coastal zone:
Area between the high water mark and the 30m elevation contour

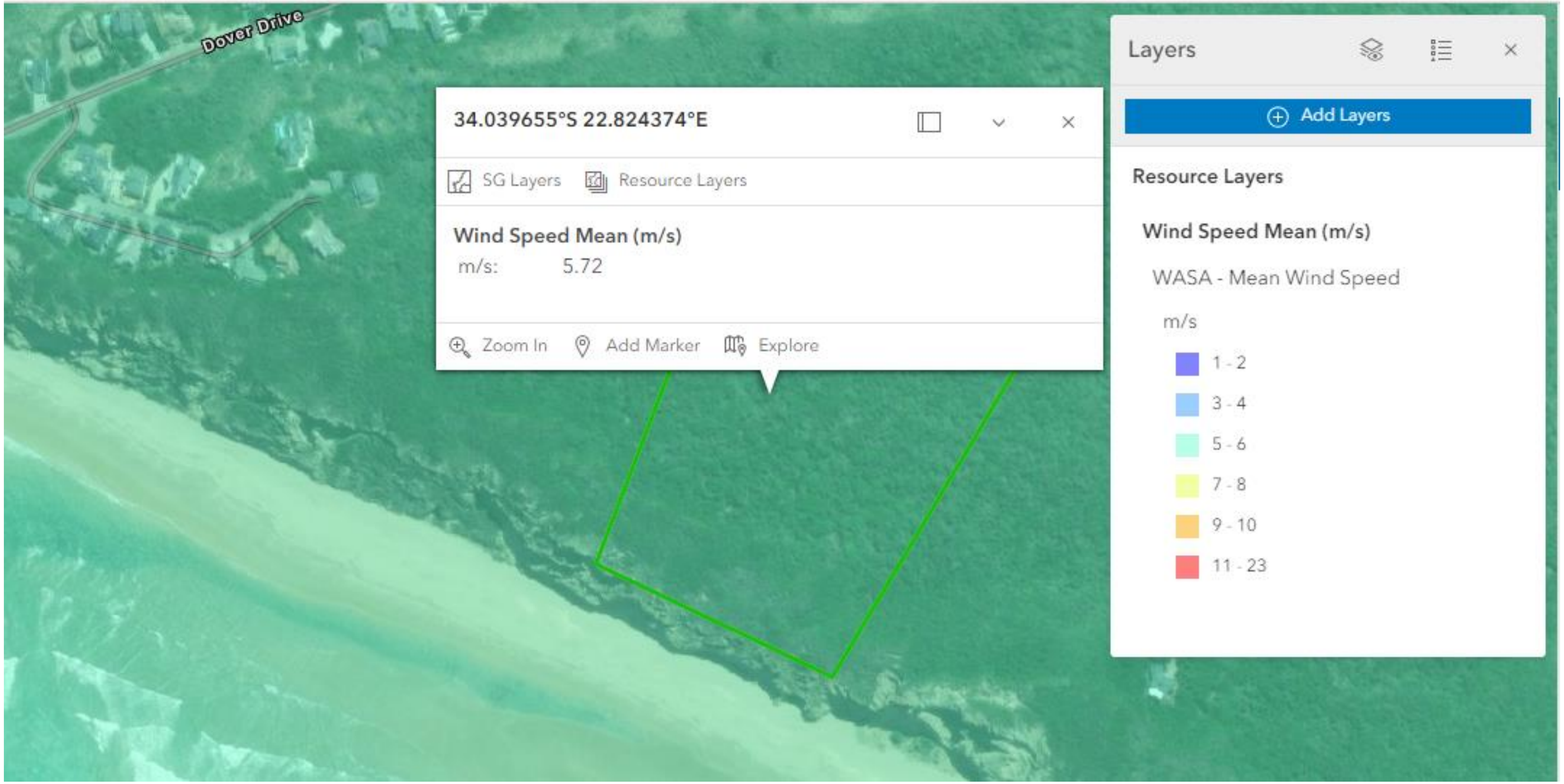
Vegetation type (CFM)



Well established coastal forest (Albany thicket),

2024 satellite image: Well established coastal forest (Albany thicket), gradually tapering from the 65m contour towards the 30m coastal zone to shrubs

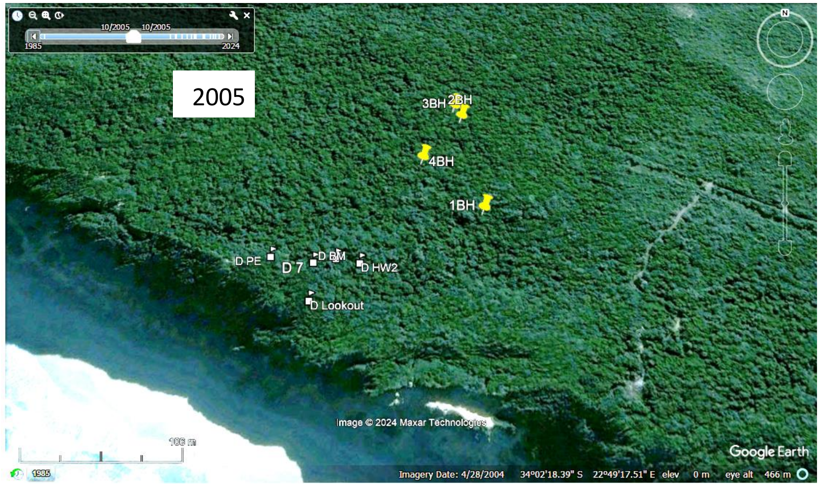
Wind Speed Mean (m/s): Average wind speeds can be expected in this area

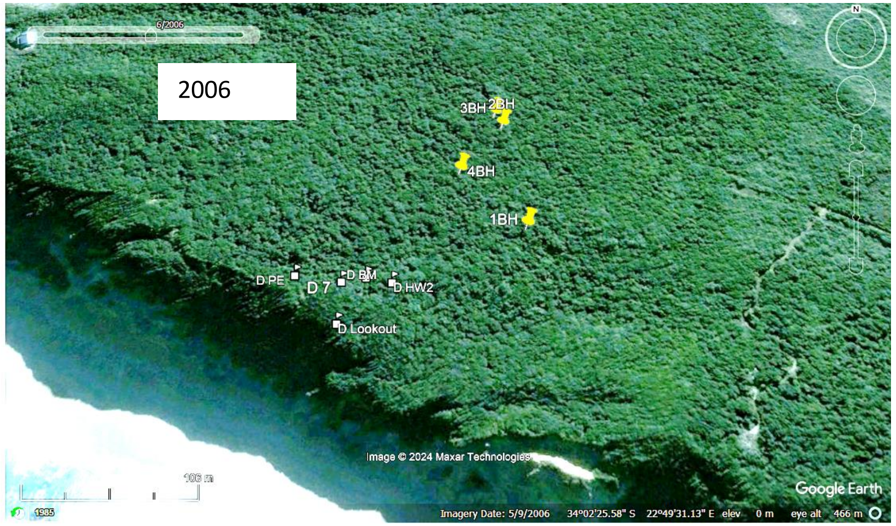


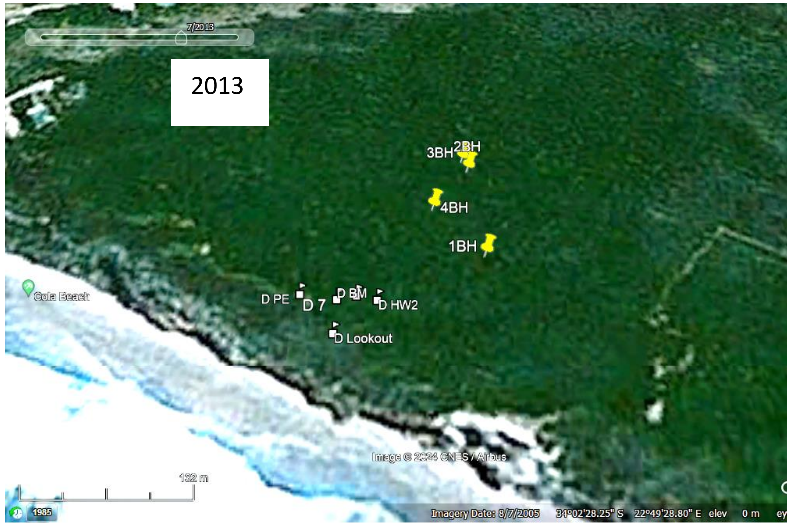
Section: Satellite imagery

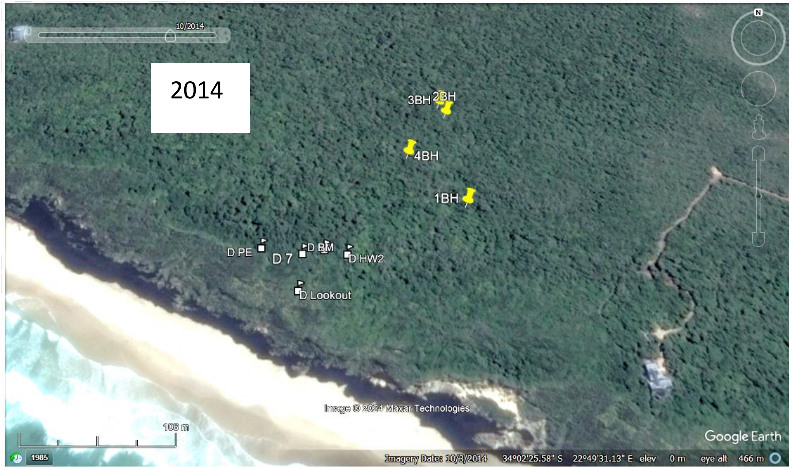
Current satellite image: 2024

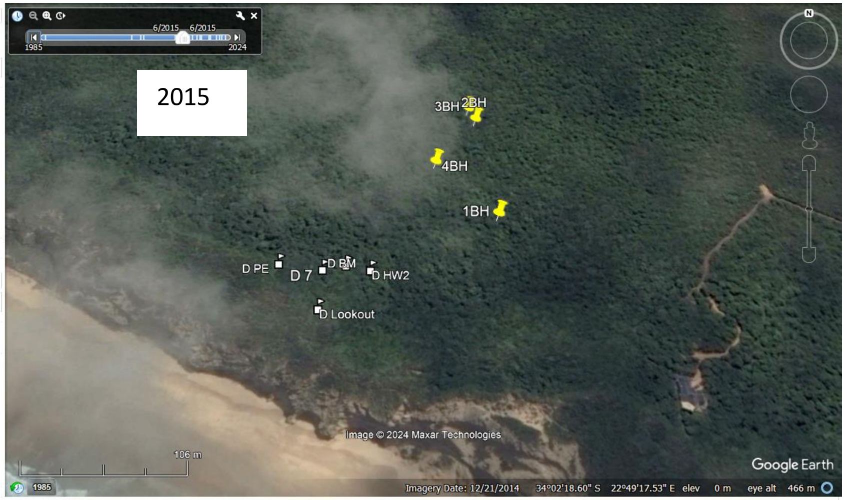
Historical satellite imagery 2005 to 2015: Indicate a significant sea erosion episode in 2013-2014 that caused an overhang in the fossil dune. The soft beach sand were removed by wave action at sea level and created hollows under the dune.





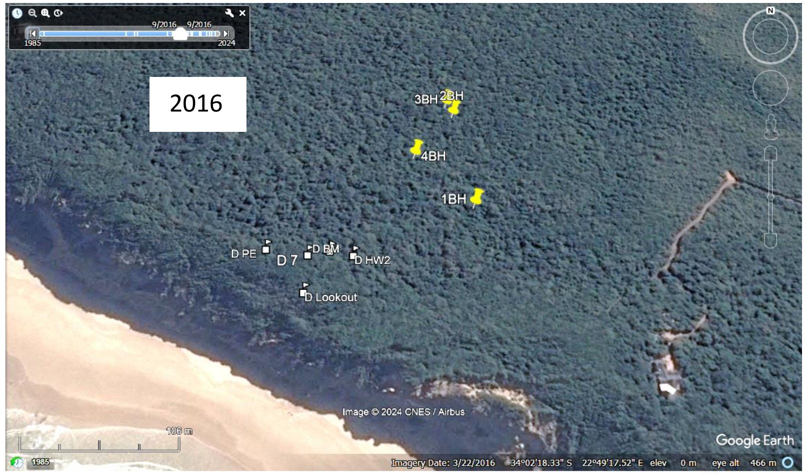


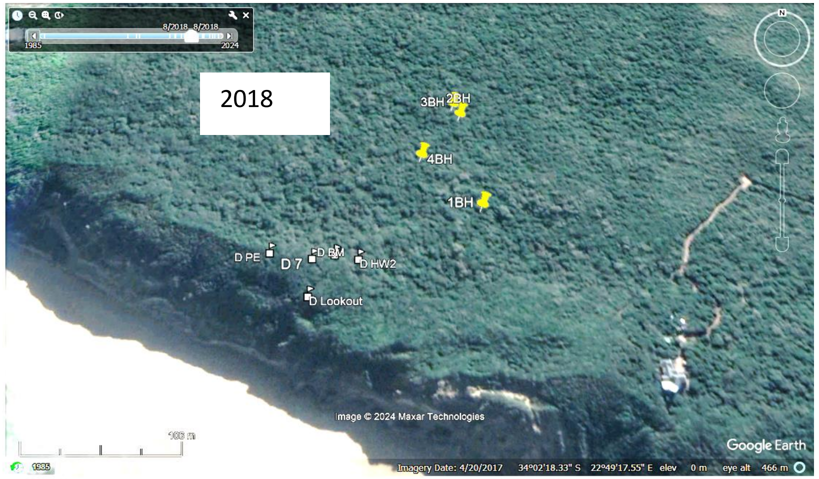




Note: Images has been adjusted to highlight the area from the high water mark to the coastal zone, 30m contour line

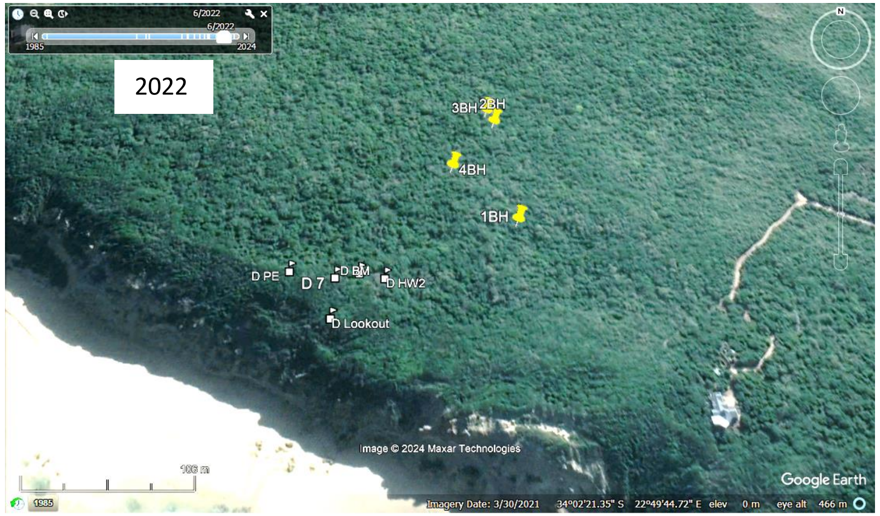
Historical satellite imagery 2016-2020: 2016 to 2018 indicates a dune build episode, with sand deposited at sea level at the foot of the fossil dune and a recovery in vegetation on the top of the dune. Wave erosion episode in 2019 caused an overhang in the fossil dune. The soft beach sand were removed by wave action at sea level and created hollows under the dune.





Note: Images has been adjusted to highlight the area from the high water mark to the coastal zone, 30m contour line

Historical satellite imagery 2021-2024: 2021 to 2022 indicate a significant dune build episode, with sand deposited at sea level at the foot of the fossil dune and a recovery in vegetation on the top of the dune. Wave erosion in 2023 caused an overhang in the fossil dune again. The soft beach sand were removed by wave action and created hollows under the dune. The top of the fossil dune were moderately eroded in 2023 by rainfall, visible as exposed ragged edges on the vegetation edge.



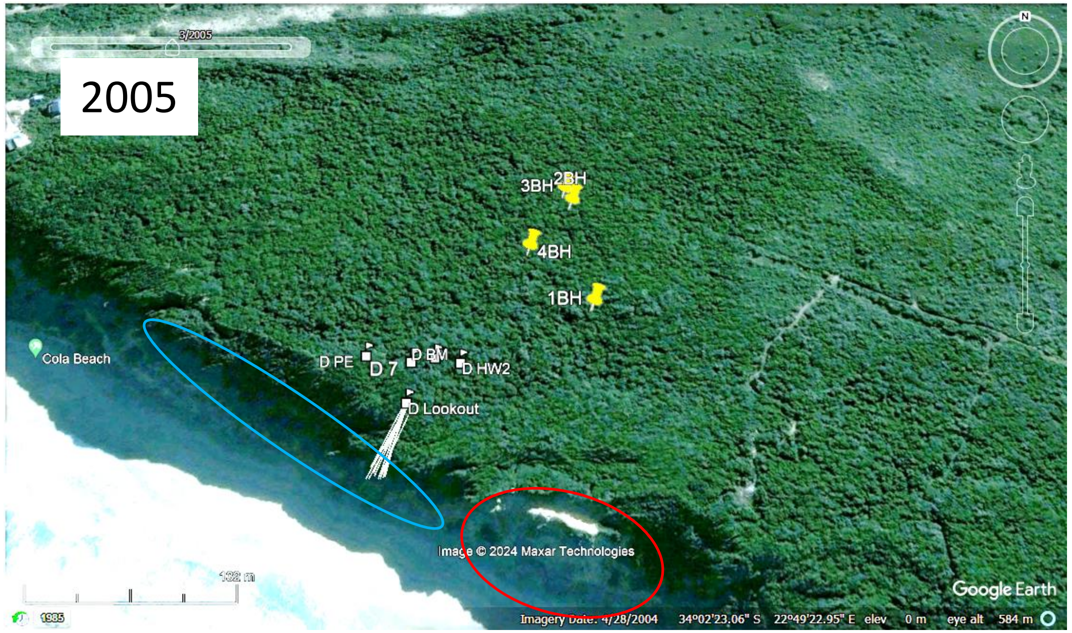
Note: Images has been adjusted to highlight the area from the high water mark to the coastal zone, 30m contour line

Google Earth Pro measurements: Horizontal distance of the Lookout towards the fossil dune edge

Year = Distance (m)
2005 = 57m
2006 = 57m
2013 = 53m
2014 = 54m
2015 = 57m
2016 = 56m
2017 = 52m
2018 = 57m
2019 = 49m
2020 = 52m
2021 = 52m
2022 = 54m
2023 = 52m
2024 = 47m

Total retreat 4m-6m +-2m over 19 years in the 10-25m contour area

- Distances were measured from the Lookout GPS Point towards the top edge of the fossilised dune 10m-25m contour line, at a 90 degree angle to the coast. Measurement error is approximately 2m.
- Measurements are superimposed on both images (white lines)
- *The data indicate a absolute horizontal retreat of the fossilised dune from 57m (2005) to 54m (2022), 4m total, or 53m (2013) to 47m (2024), 6m total, over a time span of 19 years. Note that the dune builds and erodes approximately every 5 -6 years. See red datapoints, indicating erosion events.*
- *Image observations*: Loose sand covered the fossil dune base, along the high water mark (red circles) in 2005, 2015, and 2022 compared to 2013, 2019 and 2024 where the fossil dune is more exposed and eroded at sea level than in 2005, indicating increased erosion over time and caving in at sea level, creating overhangs, ie geotechnically unstable. Then the dune building cycle repeats and sand is deposited in the hollows again.
- Fossil dune top surfaces has been eroded from the top in the 20-30m contour, due to wind and rainfall (blue circles) in 2024, compared to 2005. This gives the area a more exposed image in 2024, compared to 2005 and makes it more prone to further rain damage



Note: Images has been adjusted to highlight the area from the high water mark to the coastal zone, 30m contour line

Section: Risk analysis and projections

Risk analysis notes regarding sea level rise and coastal flooding : South Africa, Western Cape as a province

Sea level rise projections:
Sea level rise is mainly due to ocean thermal expansion and ice melt. The mid-range scenario projects 0.5-1.2m . The pessimistic scenario adds mechanisms of ice-sheet melting, estimates sea level rise at 1-2.5m in the year 2100, with a projection of 10m in the year 2300

Coastal flooding:
More frequent coastal flooding is a direct impact of sea level rise. Based on the global tides and surge analysis, it is estimated that the extreme coastal water level could be from 0.2 to 2.8m above the current mean level. Coastal local flood level is added on top of the projected sea level rise data.

Source of the above data:
Climate Central database, World bank climate knowledge database and Earth Org Data databases and risk profile analysis programs

Land projected to be below annual flood level at 2030, 2070 and 3100
Low risk scenario projection with parameters indicated below:

PROJECTION TYPE

sea level rise + annual flood

POLLUTION PATHWAY OR SEA LEVEL SCENARIO

moderate cuts

LUCK

medium

AREAS TO SHOW AS THREATENED

- ○ All land below water level
- ◉ Exclude areas isolated by higher land

SEA-LEVEL-PROJECTION SOURCE

- ○ Leading Consensus (IPCC 2021)
- ○ More Comprehensive and Less Certain (IPCC 2021)
- ○ NOAA 2022 (U.S. only)
- ◉ Mid-range Legacy Projections (Kopp et al. 2014)
- ○ Pessimistic Legacy Projections (Kopp et al. 2017)

Definitions

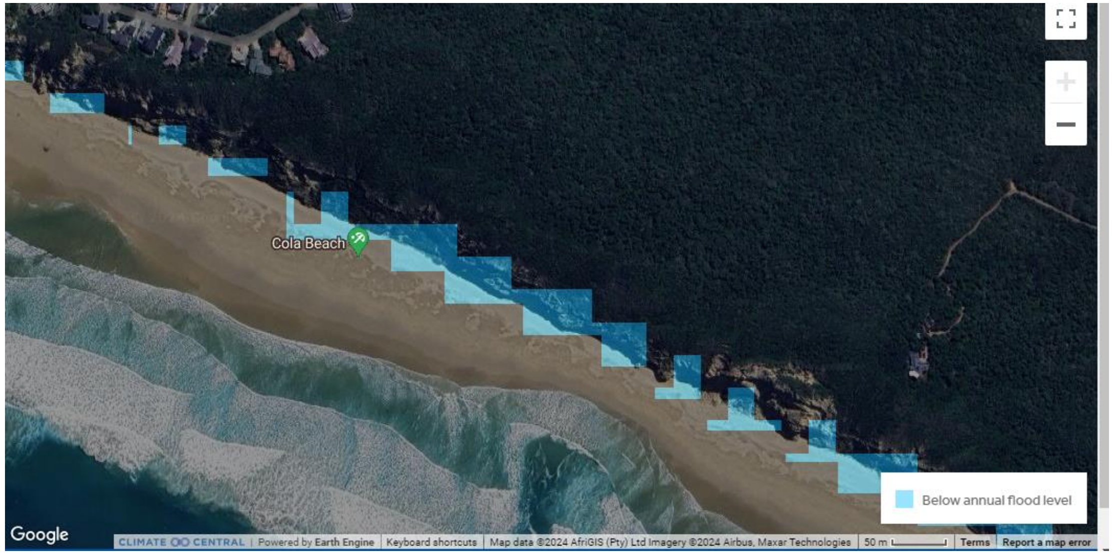
"**Tideline**" is used to denote the recent historical average of the highest daily local tide level or, technically, the mean higher high water (MHHW) line. Within the United States, NOAA's VDatum tool is used for MHHW values; elsewhere, modeled tidal increments are added to recent historical average sea surface heights measured by satellite. Tideline projections add projected sea level rise.

Satellite images: Low risk scenario
Land projected to be below annual flood level at 2030, 2070 and 3100

Low risk scenario projection
Property zoomed in

2030

2100



2070

Land projected to be below annual flood level at 2030, 2070 and 3100
High risk scenario projection with parameters indicated below:

PROJECTION TYPE

sea level rise + 100-year flood

POLLUTION PATHWAY OR SEA LEVEL SCENARIO

moderate cuts

LUCK

medium

Definitions

"**Tideline**" is used to denote the recent historical average of the highest daily local tide level or, technically, the mean higher high water (MHHW) line. Within the United States, NOAA's VDatum tool is used for MHHW values; elsewhere, modeled tidal increments are added to recent historical average sea surface heights measured by satellite. Tideline projections add projected sea level rise.

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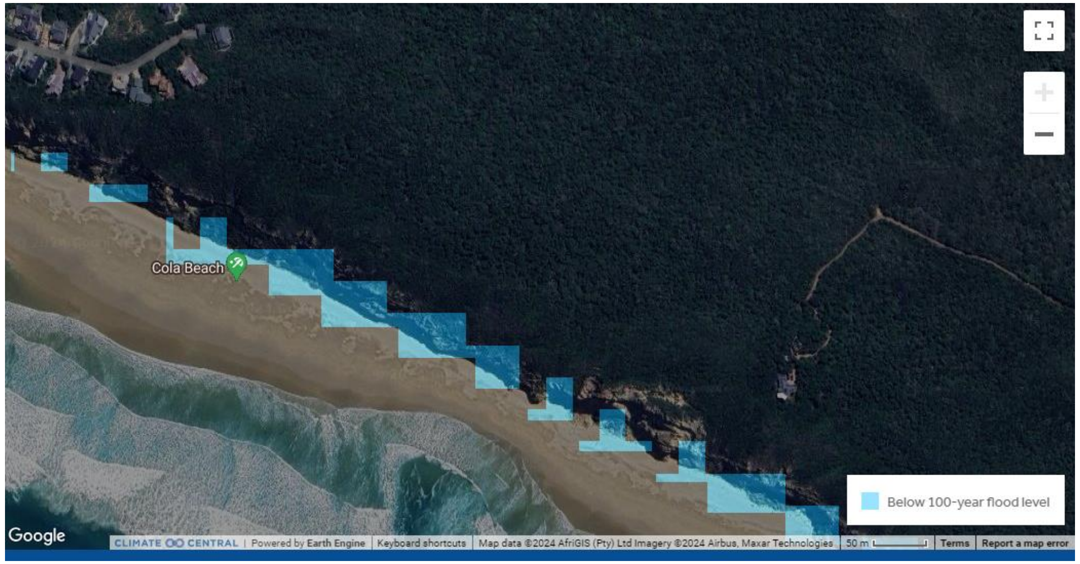
SEA-LEVEL-PROJECTION SOURCE

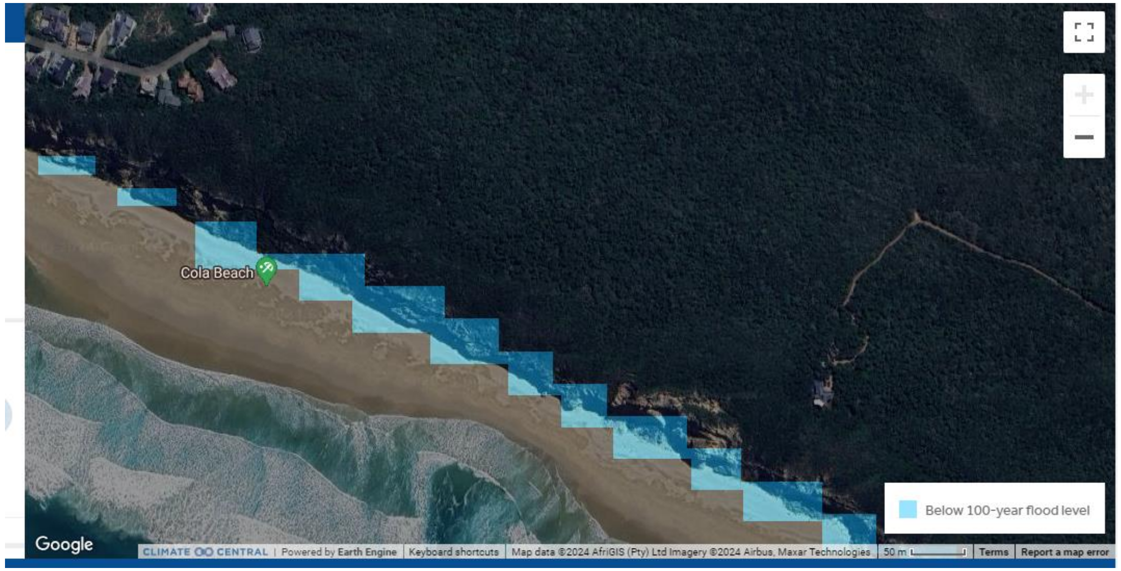
- ○ Leading Consensus (IPCC 2021)
- ○ More Comprehensive and Less Certain (IPCC 2021)
- ○ NOAA 2022 (U.S. only)
- ○ Mid-range Legacy Projections (Kopp et al. 2014)
- ◉ Pessimistic Legacy Projections (Kopp et al. 2017)

Land projected to be below annual flood level at 2030, 2070 and 3100

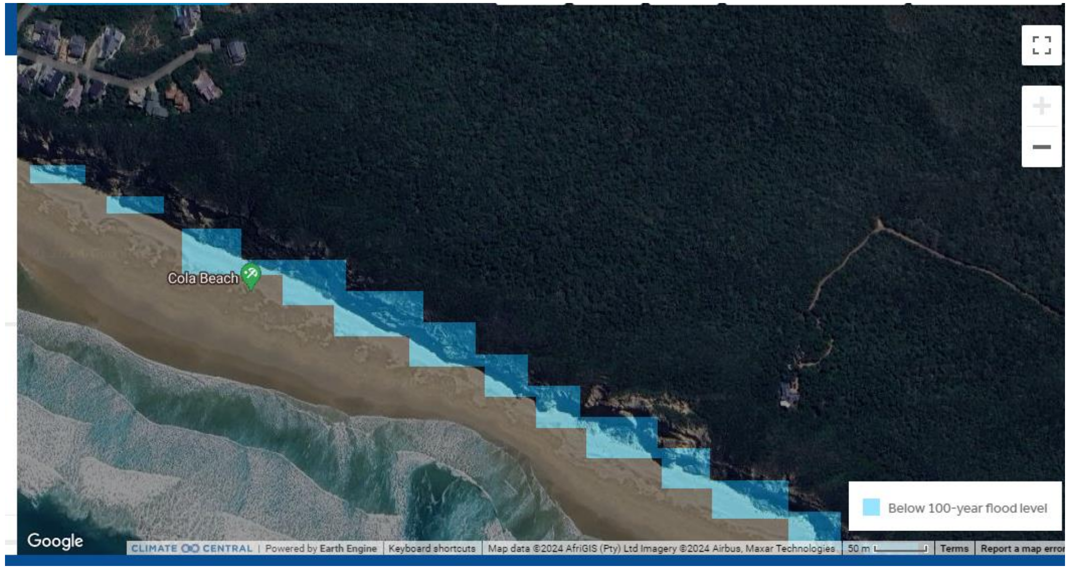
High risk scenario projection
Property zoomed in



2030



2100



2070

Section: Data discussion and observations

Data discussion and observations:

- **Geology and geophysical scan**: The area is located on coastal sand dune with underlying fossil dune. The soft and semi-consolidated material is overlying east-west striking, 45 degrees southernly dipping peninsula sandstone at depths of 60-80m. Position D7 on the geophysical scan indicate a step change in sandy overburden, from 15m to 25m deep, and a structurally weak point at 120m depth.
- **Slope**: The area is classified as low sloped area in the areas of PE, BM and HW2 inland, covered in tall trees from the 65m contour at 0-21 degrees , with high slope values from the BM area towards the Lookout point and toward the coast, covered in coastal shrubs, from the 75m contour to the sea level, at 26 to 70 degrees over 50m. The area from the lookout to the coastal zone is a high risk area due to the high slope values.
- **Soil**: Soil is predominantly silty loam , sandy loam and sand at depth at the Lookout point test pit. Silty loam and sandy loam is present at the HW2 test pit. Both sites have organic rich top layers, but the organic layer is deeper at the HW2 site, indicating an older soil profile with in-situ development of a soil profile. The top soil in this area is loose and therefore highly erodible. The combination of high slope and high erodibility value does pose a major indicator for probable movement. Moisture content is not alarming, and expected along the coast in high organic layers. Clay content is minor. Note: The Lookout has a younger, rapidly changing soil profile compared to the more developed, gradually changing HW2 test site, indicating a stable soil environment at HW2.
- **DCP tests:** All areas tested had low blow numbers, range from 7 to 12 indicating very soft uncompacted material. DCP indexes range from 0-240 on the 75m contour and 0-360mm on the 70m contour. Area HW2 in the tall trees, on the 80m from coast zone line is not evenly compacted with weak areas in the top 160mm and at 360mm. The areas in the tall trees, 80m from the coast zone, has lower consistency than the areas 70m from the coast zone due to thick organic matter zones.

Data discussion and observations: continued

•**Vegetation**: Well established coastal forest, gradually tapering from the 65m contour towards the 30m coastal zone to shrubs, is present in all historical satellite images. Roots were present in soil samples to depths of 60cm and deeper, indicating well-established plant growth that helps to stabilise the dune. Vegetation has consistently grown from 2005 to 2024 from the 25m contour inland, indicating dune stability over time.

•**Climate and environmental**: low range warming is expected , seasonal rainfall minor increase from 196 to 202mm over 100years, with a projected downwards trend in average rainfall. The area is located in a zone with 4 days less extreme rainfall day events by the year 2050. The Coastal flooding at the property is currently low and projected to very low in the year 2050 and wind speeds are average at 5,75 m/s.

•**Measurements satellite images**: The data indicate a absolute horizontal retreat of the fossilised dune from 57m (2005) to 54m (2022), 4m total, or 53m (2013) to 47m (2024), 6m total, over a time span of 19 years. Note that the dune builds and erodes approximately every 5 -6 years. The dune morphology (shape) builds (sediment deposition) and erodes in cycles of approximately every 5 -6 years. Erosion at sea level occurred in 2013, 2019 and 2024. Building (sediment deposition) of the dune occurred in 2005,2015 and 2022 where sand was re-deposited by wave action at sea level. Total observed change is 4-6m inland horizontal movement over 19 years in the 10-25m contour area. The property border is on the 40m contour line, 10m away from the 30m coastal zone contour line. Fossil dune top surfaces between 20-30m contours has been eroded from the top, due to wind and rainfall in 2024, compared to 2005. This gives the area a more exposed image in 2024, compared to 2005. Vegetation has consistently grown from 2005 to 2024 from the 25m contour inland.

•**Projections sea level rise and coastal flooding:** The 100 year low risk projection indicates that the coastal zone will be level with the 40m contour (property border) and the high risk projection indicates that the coastal zone will be level with the Lookout point, 50m from the current coastal zone.

Summary image of exclusion zones for proposed erecting of structures
Terrain view: 3D features enabled

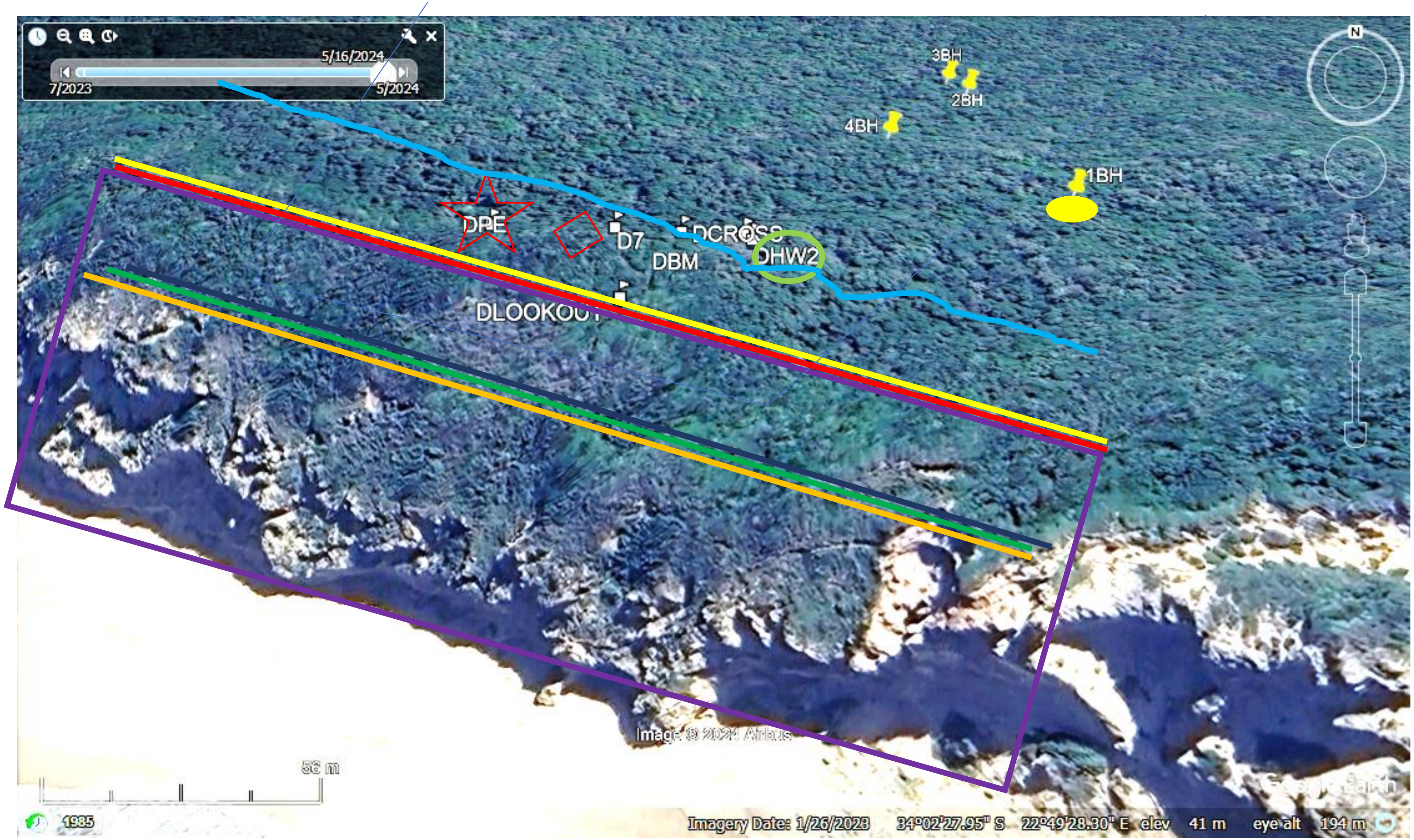
LEGEND

Proposed dwelling PE

Large Trees HW2

Proposed BH1 (Borehole)

Building line
Border line
100m line above high water mark



1. Yellow line: High risk 100 years flood line, as per high risk projection to the year 2100
2. Red block: Current Structurally weak zone, as per geophysical survey data.
3. Purple block: Current high risk zone due to steep slope values
4. Orange line – low risk projection for coastal flooding and sea level rise for the next 100 years corresponding to the current property border.
5. Green line indicates calculated 100 year coastal zone movement inland, as per measurements of the historical satellite images.
6. Note: The border (dark blue line), low risk projection 100 year coastal flooding (orange line), and the measured 100 year coastal zone movement (green) overlaps. The building line (red) and the high risk projection 100 year coastal flooding (yellow line) overlaps.

Observation summary and conclusion

- *Geologically*: A structurally weak area is located on position D7. Do not place weight-bearing structures on this position, or design structures around it. Position PE is far enough, but be aware not to place excessive weight bearing pillars on this position when designing foundations for the dwelling
- *Foundations*: Lookout, BM path split and PE sites have soft, but consistent highly erodible soil profiles. Sites HW2 in the tall trees has weak areas at 160 and 360mm depth due to high organic matter content. All sites consist of soft material that needs special foundation and compaction designs to carry weight for proposed dwellings. The area is low-risk for soil movement due to the low slope from BM to HW2. However the zone south of the lookout is high risk due to high slope changes.
- *Climatic conditions* is projected to be low risk for rainfall, temperature, wind and vegetation cover is well established indicating dune stability.
- *2100 flooding high risk projections* indicate that the 100 year coastal flood line may be level with the lookout point coordinates. Satellite image measurements from 2005 to 2024 indicate that the coastal zone might move inland 30m over 100 years (based on 6m inland movement every 20 years), this is in line with the low risk coastal flooding projections, in line with the 40m contour line, or on the current property border.

Conclusions:

- The dune morphology is stable north of the property's coastal border, as indicated by well established vegetation and thick organic layers in the soil. Thick vegetation protects the dune from wind erosion. Cyclic wave erosion is present at the high tide mark in the coastal zone and it is projected to move 30m inland over 100 years.
- Foundation design has to allow for soft, uncompressed highly erodible sandy material at all sites, allow for a compacted zone of 1,5m around the foundations of any outside walls, and has to be designed and signed off by an ECSA registered structural engineer
- The proposed dwellings at location PE, is not in the current erosion zone, nor in the projected low or high risk 100 year coastal flooding zones, nor in the measured projected 100 year zone and not located on position D7. It is located 15m north (inland) of the 100 year high risk projection zone.
- The border line, low risk projection 100 year coastal flooding zone, and the measured 100 year coastal zone movement overlaps. The 30m building line and the high risk projection 100 year coastal flooding overlaps.
- The 100m line above the high water mark is located north of location PE. Locations BM and HW2 is north of the 100m line above the high water mark.
- Existing dwellings in the adjacent developed areas of Sedgefield have been built between the 100 year low and high risk projection lines, and south of the 100m high water mark.
- Should the local authority change building regulations and move the 30m building line to the 100m line above the high water mark, the municipal authority has to first give permission for the proposed dwelling at the PE location, irrespective of the above findings and observations, Then the BM location is the next best option for a dwelling as it is located on the 100m line above the high water mark and above all the other risk projection lines.

References

The author acknowledges the use of the following resources:

- Satellite images and measurements: Google Earth Pro
- Cape farm mapped: information
- Verbal information and proposed dwelling positions supplied by the client
- Climate Central database and Earth.Org Data: Provides data for risk analysis regarding coastal flooding internationally, and here focussed on South Africa, Western Cape
- Riskprofiles.Greenbook.co.za risk scenarios
- ClimateKnowledgePortal.worldbank.org risk scenarios

Disclaimer: *This preliminary report and opinions expressed therein is solely for the use of the client, study designed as per scope per erf section, prepared by Dr EM Spicer. The study did not cover the full site for investigation, with DCP areas and soil tests picked as sample areas, per locations in this report. Soil conditions may differ in between the sampled areas. Data, opinions and field observations are the intellectual property of the owner and may neither be distributed in part or whole, copied in any way, nor used for other purposes other than the intended scope of study, as specified in this report. Final structural foundation design, depth, recommendations, precautions and corrections are the accountability of an appointed structural engineer. Photo evidence of soils are available upon request. Municipal approval is required for the erection of the proposed buildings, irrespective of findings in the report.*

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