PROPOSED PREEKSTOEL BEACH ESTATE



ENVIRONMENTAL MAINTENANCE MANAGEMENT PLAN FOR THE REHABILITATION OF THE FRONTAL DUNE SYSTEM ON ERF 2341 STILL BAY EAST

SHORT-TERM ENVIRONMENTAL MAINTENANCE MANAGEMENT PLAN

APPLICANT:

VIVREN PROPERTIES (PTY) LTD.

Aubrey Withers Environmental Consultant

Compiled by: A.W. Withers
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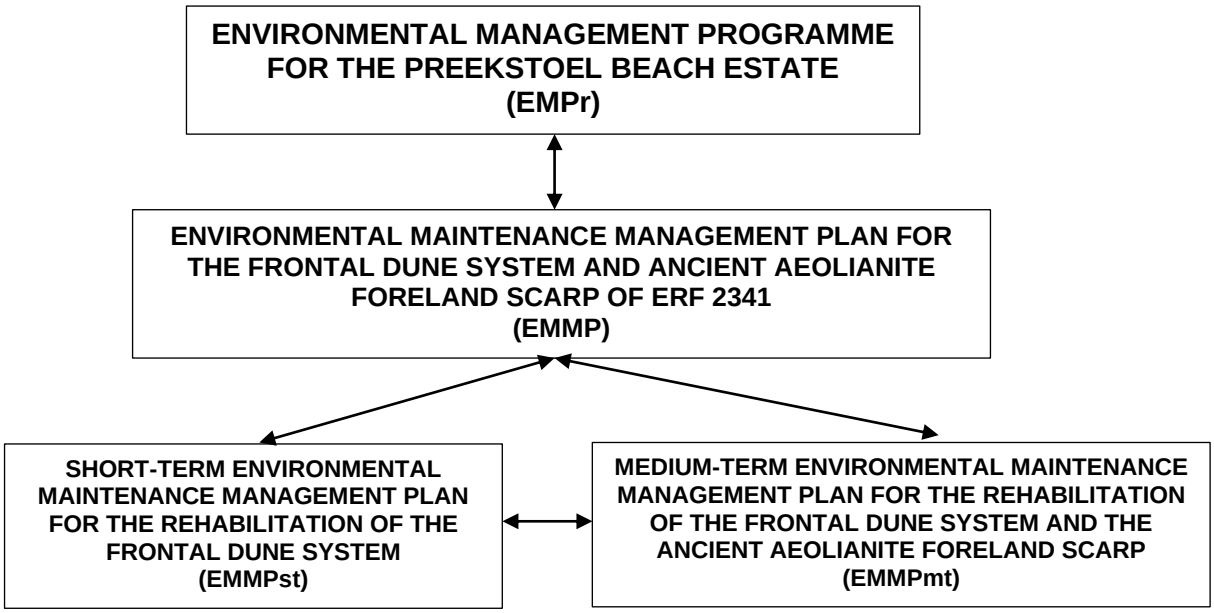
1. INTRODUCTION

This short-term Environmental Maintenance Management Plan (EMMPst) for the frontal dune system along the central portion of the ecological corridor of Erf 2341 (**Figure 1**), has been compiled as a stand-alone report to form part of the overarching Environmental Maintenance Management Plan (EMMP) for Erf 2341 (the EMMP is still to be compiled and approved by the Department of Environmental Affairs and Development Planning (DEADP)). The overarching EMMP will form part of the approved Environmental Management Programme (EMPr) of the Preekstoel Beach Estate on Erf 1028 and Portion 2 of Erf 599 (now consolidated as Erf 2343), Still Bay East (refer to the organogram below).



This EMMPst is specifically meant for providing short-term guidelines for the rehabilitation of the frontal dune system within the central portion of Erf 2341, which includes the filling in of the historic blow-outs, the reshaping of the surface of the transformed dune by adding additional sand to recreate the original 12m and 14m dune peaks in the eastern back-dune sector, and the planting of locally indigenous strand plants and the more climax Blombos Strandveld plant species on the bare surface of the dune. This EMMPst does not include the maintenance of the steep, ancient aeolianite foreland scarp which occurs further to the east of the younger frontal dune system (**Figure 1**). The maintenance and rehabilitation of the steep, ancient aeolianite foreland scarp will be included in the medium-term Environmental Maintenance Management Plan (EMMPmt) that is still to be compiled once this EMMPst has been approved.

It should be noted that the ownership of Erf 2341 has been transferred to the Hessequa Municipality. Further, the conditions of approval for the Preekstoel Beach Estate development indicate that the developer, Vivren Properties (Pty) Ltd., will be responsible for the rehabilitation of the coastal conservation corridor, i.e. Erf 2341. In addition, once this corridor has been rehabilitated and all construction of the Preekstoel Coastal Estate has been completed by the developer (Vivren Properties (Pty) Ltd.), the long-term environmental maintenance and management of this corridor will be transferred to the Preekstoel Beach Estate Home Owners Association (HOA), who will also take over the management of the development area. A legally binding document to this effect has been prepared by the conveyancing attorneys, Fairbridges Wertheim Bekker for the Preekstoel Beach Estate (**Annexure A**). This agreement supersedes the Condition of Approval No. 21 of the conditions of approval of the Environmental Authorisation issued by DEADP's Directorate: Development Management in George for this development.

This short-term EMMPst for the central section of the frontal dune system on Erf 2341 provides:

- firstly, rehabilitation guidelines for reshaping (rebuilding) of the frontal dune system by infilling of the large blow-outs and the addition of more sand to recreate the original back-dune which had peaks of 12 and 14m;

- secondly, guidelines for the revegetation of the rebuilt frontal dune system; and

- thirdly:
    - to ensure that the newly planted pioneer and more climax plant species continue to grow on the rebuilt frontal dune system;
    - continuously weed the frontal dune system to remove any rooikrans (*Acacia cyclops*) seedlings that grow;
    - since coastal processes are ongoing, the frontal dune system may need to be constantly maintained as any new blow-outs occur in the frontal dunes after storm events. Such maintenance will necessitate the rehabilitation of these blow-outs by trapping sand and their revegetation if necessary.

The medium-term EMMPmt encompasses the ongoing maintenance of the frontal dune system within the central portion of Erf 2341 and the rehabilitation of the frontal dune system to the west and the steep aeolianite foreland scarp within the eastern sector of Erf 2341. Such medium-term rehabilitation and maintenance will primarily entail firstly the removal of alien vegetation (rooikrans) and any need to in-plant Blombos strandveld plants; secondly, the continuous weeding of alien vegetation (mainly rooikrans); and thirdly, the repairs to any blow-outs that may occur during storm events in the long term future.

As climate change slowly accelerates and as anticipated sea levels rise in the medium to long term future (i.e. in the next 25 to 100 year period), the importance of maintaining the frontal dune system and retaining a large sand source locked within the frontal dunes of the property will become more important for the protection of the frontal dunes and the development infrastructure behind them. The rehabilitation and long-term maintenance of the frontal dune system along the central and western portion of Erf 2341 will ensure the integrity of the dune system into the long-term future. The steep aeolianite scarp within the eastern sector of Erf 2341 will be less affected by sea level rise due to the protection against rising sea level erosion because of the presence of aeolianite or calcarenite (which is a semi-hard rock).

Whilst an Environmental Authorisation for the Preekstoel Coastal Estate development has been issued by the Department of Environmental Affairs and Development Planning (DEADP) and the Environmental Management Programme (EMPr) for the Construction Phases has also been approved by the DEADP, the EMMP for the Frontal Dune System and Steep Aeolian Foreland Scarp on Erf 2341 still needs to be revised and approved. The DEADP indicated (in their letter of 2 February 2024) that the original EMMP for the dune system along Erf 2341, submitted to them in September 2023, should be divided into <u>two reports</u>, i.e.:

- for the short-term rehabilitation of the frontal dune system within the central portion of Erf 2341 (this report); and
- for the medium-term rehabilitation (removal of alien vegetation) and the maintenance of the frontal dune system within the central and western portions and the steep aeolianite foreland scarp within the eastern portion of Erf 2341.

These two reports will form part of the <u>Environmental Maintenance Management Plan (EMMP) for the whole of Erf 2341</u>.

The developers have appointed Aubrey Withers as their Environmental Control Officer (ECO) to assist with the environmental supervision of the construction phases of the Preekstoel Beach Estate in terms of the approved EMPr. Because of his experience with the rehabilitation of dune systems, Mr Withers has also been appointed to supervise the rehabilitation (reshaping and revegetation) and maintenance of the frontal dune system and the steep aeolianite foreland scarp of Erf 2341.

During the initial rehabilitation of the frontal dune system undertaken at the beginning of August 2022, the specialist dune rehabilitation company, Vula Environmental Services (Deon van Eden), assisted with the design and the execution of the earthworks (reshaping) of the of the frontal dunes. In addition, Mr Van Eden trained a locally sourced team of workers with the method of harvesting strand plants and the erection of shade netting to create wind-free blocks (micro-climates) for the transplanting of harvested strand plants. This dedicated team will also be responsible for the medium- to long-term removal of alien vegetation from, and the rehabilitation of any blow-out erosion, on the steep aeolian foreland scarp in the eastern sector of Erf 2341, and the follow-up weeding programmes for the whole of the conservation corridor, i.e. Erf 2341.

The purpose of the EMMP is the foundation on which all future actions are based and is in line with the overall management philosophy of the Preekstoel Beach Development in attempting to rehabilitate and preserve the fontal dune system and steep aeolianite foreland scarp of Erf 2341. Note that Erf 2341 has been rezoned to Open Space III for conservation purposes in terms of the Hessequa Municipal Planning Bye-laws.

The purposes for declaring Erf 2341 as a conservation corridor are:

a) to protect ecologically viable areas representative of the biological diversity and its natural landscapes and seascapes;

b) to preserve and enhance the ecological integrity of this area;

c) to conserve biodiversity in this dynamic coastal area;

d) to assist in ensuring the sustained supply of environmental goods and services;

e) to manage the interrelationship between natural environmental biodiversity and human settlement and economic development; and

f) to rehabilitate and restore degraded ecosystems and maintain their long-term integrity.

The steep aeolianite foreland scarp to the west of Erf 2341 is an example of a historic ecosystem that is to be found along the Western Cape's coastline between Hangklip in False Bay to Plettenberg Bay (and further east up the Eastern Cape's coastline). This small remnant of an historic coastline is important to conserve and is to be seen on the earliest coastal aerial photograph of the Still Bay coastline dated 3 April 1954 (**Figure 2**). This remnant of a naturally vegetated (with Blombos Strandveld) ancient dune was an outlier amongst white mobile dunes, devoid of any vegetation, between the Goukou Estuary and into the now Gellkrans Nature Reserve. This mobile dune system, including the artificially created frontal or primary dunes along the Still Bay East coastline, were "stabilised" with rooikrans seedlings planted by the then Department of Forestry. This stabilisation programme began in the 1928 and was completed in 1950's.

2. BACKGROUND TO THE EROSION OF THE FRONTAL DUNES ON ERF 2341

Maintaining and retaining quality coastal environments and their associated amenities is central to optimising the recreational potential of the coastline. Property values in Still Bay are directly linked to proximity of desirable environments and landscapes such as the coastline, sand dunes and coastal view sheds. It is important to recognise that the coastline is a buffer between hard infrastructure and a marine environment with its large waves, strong sea currents and high winds. The role and function of the coastal sand dunes is to act as a buffer to storm surges and predicted mean sea level rise in the future. The loss of coastal space to storm surges and sea level rise could have substantial economic impacts on the economy of Still Bay in the future. As such, the economic importance of the coastal dunes as a natural defence to storm surge must not be under-estimated.

Sand trapped by plants growing just above the spring high tide mark forms mounds called hummocks, which initiate the development of foredunes. Sandy beach systems therefore consist of a marine wave-driven ecosystem and a terrestrial wind-driven ecosystem that together make up the littoral active zone, i.e., the area in which sand exchange occurs by waves and wind. It is vitally important that the vegetation on dunes is not denuded by anthropogenic means, and if blow-out erosion does occur, such scars must be managed to prevent long term erosion of the dune system. Such anthropogenic erosion took place along the Preekstoel coastline between the 1950's and the present, which particularly denuded the frontal coastal dunes within the central portion of Erf 2341 of this section of coastline (refer to **Figure 4**).

Dune formation (in the case of vegetated coastal dunes) is initiated when aeolian sediment (entrained beach sediment) is trapped by vegetation growing above the high water mark resulting in an accumulation in the form of a foredune. Cycles of sediment deposition and accumulation, combined with the growth of vegetation adapted to the influx of aeolian sediment, eventually lead to the formation of

complex dune systems. Dunes serve as a protective buffer for the coast against storm seas and high spring tides. Under eroding conditions, sand trapped in a dune system vegetated by locally indigenous vegetation can be returned to the nearshore environment, thus preventing long term beach erosion. In the case of the Preekstoel frontal dune system, these mobile dunes were stabilised with rooikrans (refer to **Figure 2**) which permanently trapped windblown sand off the beach and from large blow-outs, the latter caused by humans trampling and removing any indigenous strand plants and the invasive rooikrans, and exacerbated by strong prevailing winds (SE and SW). Given the prolific growth of the rooikrans shrubs/trees, the frontal dune system became unnaturally high, and the sand trapped in these dunes never found their way back to the coastline.

In an attempt to rehabilitate the frontal dune system in front of the proposed Preekstoel Beach Estate, brushwood fences were erected within the large blow-outs to trap sand blown off the Preekstoel beach at the beginning of November 2021. This effort only resulted in the trapping of about 30m³ of sand within a year that the brushwood fences were in operation. Given the aeolian creep diagrams determined by the CSIR[1] during 1990 for the Still Bay coastline, a much larger amount of sand should have been trapped within the blow-outs. As a result, this method of trying to rehabilitate the frontal dune system was abandoned, as it would probably have taken another 50 years to accumulate sufficient sand to rehabilitate the dunes. It would appear as though the sand movement rates put forward by the CSIR are not accurate, as much more sand should have been accumulated in the trial period of trapping sand blown off the Preekstoel Beach. Given these poor results of sand capture in the brushwood fences, the decision was taken by Aubrey Withers and Deon van Eden to mechanically move the sand, trapped by the rooikrans shrubs in the steep and unstable back dune area, back into the blow-out scars that had taken place over a 75 year and longer period. This reshaping of the frontal dunes took place at the beginning of August 2022.

In terms of climatic conditions, Still Bay experiences a Mediterranean climate, with cool, wet winters, and warm, dry summers. The hottest month of the year is January, while July is the coolest. The average daily temperature ranges between 20°C and 28°C in the summer and between 12°C and 20°C in the winter. The rainfall for the Still Bay region is 639,2 mm per annum on average[2].

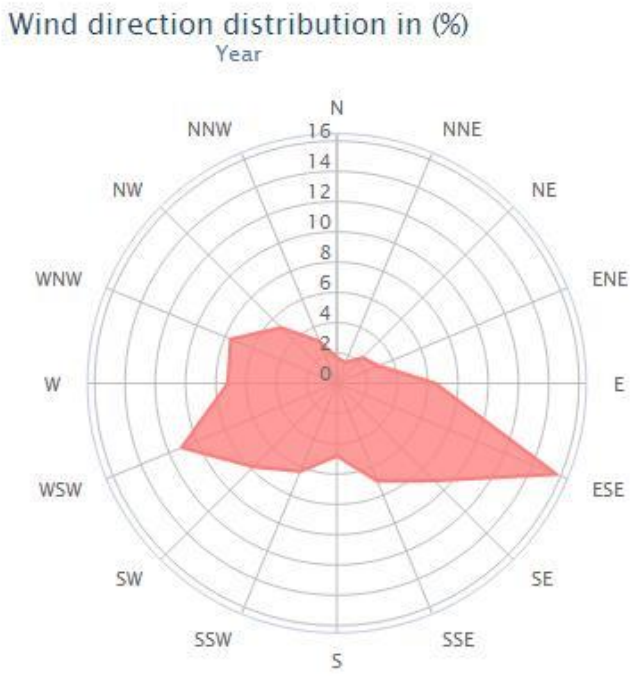


FIGURE 3: The average yearly wind distribution for Still Bay (%) (Source: http://www.windfinder.com)

In terms of frequency of occurrence of wind in the Still Bay region, westerly to south-westerly wind predominate especially in the winter to spring (**Figure 3**). Velocities can be high with the average of the

[1] Carter, R.A and Brownlie, S. (1990). Estuaries of the Cape: Part II: synopses of available information on individual systems. Rep. No. 34 Kafferskuils (CSW 24) and Duiwenhoks (CSW 23). Heydorne, A.E.F and Morant, P.D. (eds.) Stellenbosch, *CSIR Research Report* 433

[2] http://en.wikipedia.org/wiki/Stilbaai#Climate – Accessed on 09 September 2014

daily maximum strength being 54 km/h. Although secondary in frequency of occurrence, easterly to south-easterly winds have a greater maximum average speed of 64.8km/h[3].

The Still Bay coastal region, as are many other localities along the Western Cape's south coast, is also subjected to high-energy storm events, which lead to shore erosion and dune de-stabilization and wind erosion. These climatic conditions and coastal processes experienced along the Preekstoel coastline and further east can be especially harsh. These coastal processes give rise to the following impacts:

- destruction of indigenous sand-binding dune vegetation through the formation of blow-outs[4] (**Photo 1**);
- the loss of sensitive frontal dune vegetation allows the strong to gale force prevailing winds to move the unprotected, dry loose sand into the interior (in this case to be trapped by the exotic rooikrans shrubs);
- the sand movement into the interior smothers indigenous strand vegetation (**Photo 2**) which can die off resulting in more blow-out erosion and more sand moving into the interior;
- such dune erosion and sand movement into the interior, which becomes trapped by the exotic rooikrans shrubs, means that the frontal dune system has a net loss of sand;
- as more sand is lost to the interior, and more dune vegetation is lost, the frontal dune system eventually loses its ability to protect the interior from storm events, with resultant impacts on the built environment (**Photo 3**);
- with no dune sand being able to be eroded by waves during storm events and being carried offshore to build offshore sand bars, the storm wave energy is not dissipated further offshore and is allowed to cause greater erosion on the unprotected coastline. Such continued and unprotected erosion due to the lack of frontal dunes ultimately results in the transgression (migration) of the shoreline landwards. Such transgression has indeed taken place in front of the tar road providing access to the Preekstoel beach and eastwards where the frontal dune system coalesces with the aeolianite foreland scarp (refer to **Figure 1**).

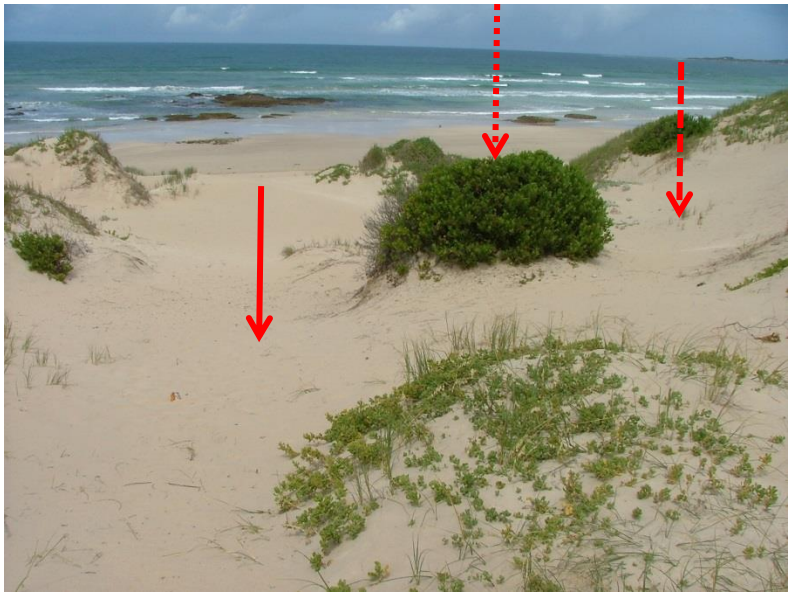


Photo 1: Shows the typical "U"-shaped blow-out on the frontal dune (red arrow). The blow-out is orientated in an approximate SW-NE direction. Note a second blow-out has occurred to the right of the first blow-out (hashed arrow) leaving the remnants of the dune as a "stack" (generally because of the presence of hardy vegetation, in this case bitou (*Crysanthemoides monilifera*) (dotted arrow)

[3] Carter, R.A and Brownlie, S. (1990). Estuaries of the Cape: Part II: synopses of available information on individual systems. Rep. No. 34 Kafferskuils (CSW 24) and Duiwenhoks (CSW 23). Heydorne, A.E.F and Morant, P.D. (eds.) Stellenbosch, *CSIR Research Report* 433.

[4] Blow-outs form as follows: strong to gale force winds winnow out sand from a windward-facing frontal dune where vegetation has possibly previously been disturbed forming a U- or V-shaped concave erosion scar. Blow-outs lead to the formation of parabolic dunes where a tongue of eroded sand advances up the dune. These parabolic dunes have seep sides. With prolonged blows, and more blow-outs occurring adjacent to the first, whole sections of the frontal dune can be removed, leaving isolated "stacks" where the dune once stood.

Photo 2: Shows the smothering of natural vegetation on the primary dune near Buffelsjachts Bay on the SW coast during one storm event (gale force winds). Such smothering can result in the indigenous strand plants dying. Note that the inundation of windblown sand over rooikrans shrubs does not result in the dying off of such plants, which grow through the sand cover.

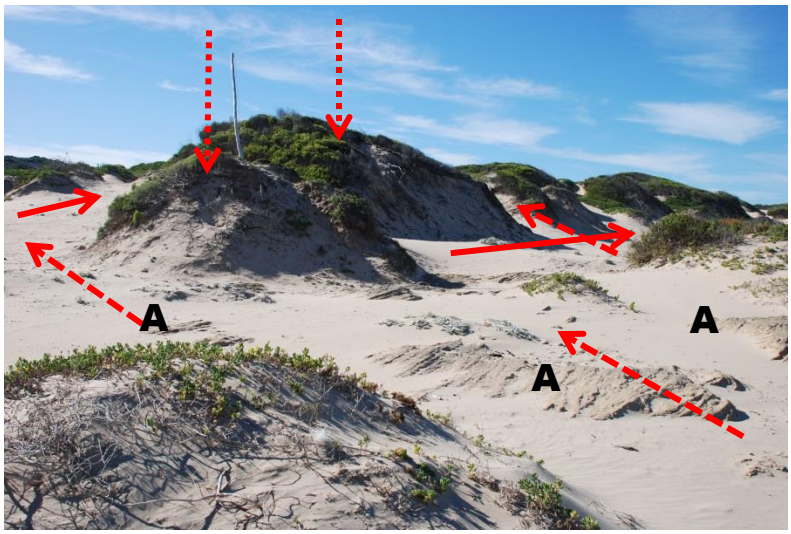


Photo 3: Shows the huge amount of dune sand lost from blow-out wind erosion on the frontal dune system just east of the access road to the Preekstoel beach. Note the typical blow-outs resulting from SW winds (solid arrows) and SE winds (dashed arrows). Such a "maturely" eroded dune system often leaves remnants of the dune system as "stacks" (dotted arrows). The winnowing of sand between the stacks has exposed the underlying aeolianite of the Waenhuiskrans Formation (**A**).

These above natural coastal processes have, however, been exacerbated by anthropogenic impacts over the past 50-75 years or more, culminating in the following impacts:

- off-road vehicles used to access the Preekstoel beach from the access road to Preekstoel East trampling dune vegetation and destabilising the dunes by churning up sand by tyres. Driving over dunes became a fun experience and a challenge to the off-road drivers.

- This action not only destroyed any sensitive indigenous dune vegetation, but also loosened the sand on the dunes, thus exposing damp dune sand which dried out and was able to be carried inland by wind erosion;
- the freedom of movement of holiday-makers from the caravan park and day visitors from the tarred access road to Preekstoel East over the frontal dune system caused trampling of vegetation with the same results as the off-road vehicles (refer to **Figure 4 an Photo 4**);

Photo 4: Shows the significant impact of human trampling on the frontal dune system between the caravan park (solid red arrow) and the tar road access point to the Preekstoel beach (blow-outs as dashed arrows). Note the thicket of rooikrans within the back-dune area (dotted red arrow) and foreground.

- given that the frontal dune system in the east between the mouth of the Goukou River and the steep aeolianite foreland scarp was artificially stabilised by the then Department of Forestry in the early part of the 1900's with marram grass and rooikrans, continued management of the frontal dunes would have been required. From all accounts, such management was never carried out.

- The use of rooikrans was used to stabilise the newly created frontal dune system, would have had the following impacts:
    - it has an aggressive growth rate, which shades out the growth of indigenous strand plants;
    - its aggressive growth means the moisture balance of the dunes would have been negatively impacted, reducing the ability of the dunes to sustain indigenous dune strand plants and Blombos Strandveld;
    - it has a high litter rate (dropping of leaves) which prevent indigenous seed from germinating and tends to change the surface tension of the surface of the sand, resulting in rainfall run-off beading on the surface with little or no ingress into the surface of the dune;
    - it has a prolific production of seed, which forms a dense seed base in the upper horizon of the sand; and
    - given its prolific growth rate, it grows through sand cascading down the lee slope of dunes and traps such sand permanently (**Photo 5**), i.e. the sand does not blow back towards the dune system with the northwesterly or northeasterly winds.

Photo 5: Shows the cascading sand (red arrow) from a blow-out filling the lee of a dune infested with rooikrans. The rooikrans "holds" the sand at an acute angle of repose. As the blow-outs persist, the dune gets higher and higher together with the growth of the rooikrans.

The above anthropogenic impacts have amplified the formation of blow-outs and frontal dune de-stabilisation and mobility within the central and western sector of Erf 2341. These effects are clearly seen within the western sector of the frontal dune system adjacent to the Preekstoel caravan park and in front of the access road (**Figure 4**). The rehabilitation of the frontal dune system, and its long term conservation, is therefore essential to prevent further degradation of these frontal dunes and further recession of the coastline.

The following section of the report describes the two methodologies that were used to rehabilitate the frontal dune system.

3. REHABILITATION OF THE FRONTAL DUNE SYSTEM

3.1 Construction of Brushwood Fences to Trap Sand

This method was used to good effect along the Struisbaai coastline for the rehabilitation of coastal dunes for the Langezandt coastal development and it was thought that a similar methodology could work for the rehabilitation of the Preekstoel frontal dune system. Such brushwood fences were constructed within the blow-out structures of the frontal dune system within the central area on Erf 2341 (previously Erf 1028) in November 2021.

Brushwood fences comprise standard three to four–strand wire-and-wooden dropper fences where brushwood (in this case rooikrans branches) is woven between the strands of wire. Such brushwood fences were constructed within the blow-outs, at approximately right angles to the predominant prevailing wind direction (**Figure 3** and **Photo 6**). These fences should be constructed in a phased approach, starting (**Phase 1**) about 5m from the furthest landward side of each blow-out. Once sufficient sand has been trapped, new fences are constructed further back from the blow-out, and so on, until sufficient sand has been accumulated within the blow-out (**Figure 5**). At that stage, locally indigenous strand plants can be planted within the repaired blow-out to continue the process of trapping more sand with time elapsed.

Rooikrans branches (<50mm and less stem diameter and <1.5m in length and preferable without seed) were cut from the dense stands of rooikrans on the property and carried to the fences. A shallow trench should be excavated below the bottom strand of wire along each fence to bury the stems of the cut brushwood. The cut brushwood is then “woven” into each wire fence, so as to create a semi-permeable barrier to wind and hence the accumulation of sand by the fence (**Photo 7**).

The height of the brushwood should not be higher than 1.2m above ground level. Sand will build up on the leeward and windward sides of each brushwood fence.

Photo 6: This photo was taken of the frontal dunes at Preekstoel where a brushwood fence was erected in front of the dunes just landward of the hummocky dunes (red arrows). The brushwood comprises rooikrans bushes that have been removed from the backdune system to be woven between the horizontal strands of wire. The idea was that the brushwood fences would trap sufficient sand (yellow line) so that the front of the dune could be rehabilitated by planting climax Strandveld plants and various hardy pioneer strand plants (**Photo 6** was taken on 5 November 2021).

A

B

Photo 7: **A:** Shows two brushwood fences that were constructed across a large blow-out structure within the frontal dune system in the Langezandt Phase 2 project (Struisbaai) area to trap sand. **B:** Shows the same area, three months later. Note how much sand was trapped by both brushwood fences. The aim here was to recreate a stable back-dune across the blow-out as shown by the yellow lines. Once sufficient sand has been accumulated, the dune would be planted with locally indigenous strand plants (pioneers) and more climax strandveld plants.

Once the sand reaches the height of the brushwood, the windblown sand will be deposited on the leeward side. Once the "dune" has covered the brushwood, a new brushwood fence (**second phase**) should be constructed about 3m to the windward side of the first fence (**Figure 5**). If necessary, a third phase brushwood system can be constructed 3m in front of the second phase brushwood fencing, thereby building up a robust dune that would be revegetated with locally indigenous strand and Blombos Strandveld species.

This process should continue until the blow-out scar has reached a height of about 1.5 to 2m of sand. The whole process should then be repeated by trapping sand on top of the first dune to be formed within the blow-out. Once the blow-out has reached the required height (about 4m at the back of the frontal dune system), chipped brushwood and/or straw can be worked into the bare sand. The planting of the surface of the dune should ideally only be undertaken during the late autumn once the first winter rains have fallen.

It is, however, recommended that a temporary irrigation system should be installed on the newly formed frontal dune system to ensure that the transplanted locally indigenous grasses, indigenous strand plants and climax vegetation survive, namely (*Searsia crenata, Searsia crenata, Searsia lucida, Searsia glauca, Searsia laevigata, Maytenus procumbens, Euclea racemose, Carpobrotus acinaciformis, Lessertia canescens, Cynanchum obtusifolium, Tetragonia fruticose, Passerina paleacea* (dune gonna), *Chrysanthemoides monilifera* (bietou), *Otholobium bracteolatum* (skaapbostee*), Muraltia* spp*., Zygophyllum flexuosum, Geranium incanum, Ehrharta villosa, Phyllobolus canaliculatus, Thesium* spp*., Pentameris pallid, Asparagus capensis, Restio Eleocharis, Ficinia lateralis, Hellmuthia membranacea, Metalasia muricata* (blombos), *Helichrysum crispum, Helichrysum teretifolium, and Lessertia canescens*). The back dune area can be planted with more climax vegetation, namely: The Strandveld species found on the steep foreland scarp comprise *Chrysanthemoides monilifera* (bietou), *Maytenus procumbens, Searsia crenata* (dune crowberry), *Searsia glauca, Diospyros dichrophylla* (bladder nut), *Euclea racemose, Pterocelastrus tricuspidatus* (kershout), *Sideroxylon inerme* (milkwood), and *Tarchonanthus littoralis* (camphor tree).

It is strongly recommended that a nursery be started as soon as construction of the development starts to propagate sea wheat (*Agropyron distichum*), pypgras (*Ehrharta villosa*) and other indigenous strand plants as provided above. The nursery should also grow typical Blombos Strandveld species provided by the specialist botanist to be planted in the POS and private gardens of the Estate. The developer should also consider outsourcing the nursery project to existing nurseries in Still Bay, if necessary.

Given the poor results of trapping sand after nearly a year of erecting the brushwood fences, where it was estimated that only about 30m³ of sand had been trapped, a new method of dune rehabilitation was

discussed with Deon van Eeden of Vula Environmental Services on site. Mr Van Eeden is a respected specialist contractor for the rehabilitation of dunes in the Western Cape and especially in the Cape Town region. The new method entailed the mechanical movement of sand accumulated in the back dune area of the central portion of Erf 2341 (where sand from the blow-outs had been trapped by the prolific growth of rooikrans shrubs/trees (*Acacia cyclops*), towards the seashore.

3.2 Alternative Dune Rehabilitation Methodology by Mechanical Means

The alternative method of dune rehabilitation was to remove the trapped sand by mechanical means (i.e., by an excavator) that had been blown into the back dune area from large blow-outs over the past 50 to 75 years (**Photo 8**). Please note that Listed Activities Nos. 17, 18 and 19A in terms of the EIA Regulations (2014) were included in the Basic Assessment Report to take into account mechanical intervention to rehabilitate the frontal dunes. Work on the rehabilitation of the frontal dunes began on 8 August 2022.

Photo 8: Shows the movement of sand from the back dune area towards the hummocky dunes just above the spring tide mark with an excavator. The stable platform for the construction of houses is seen to the left of the photo, which has been covered with chipped rooikrans mulch. The yellow line represents the conservation setback line or ecological setback line that was determined for the development. The area between the yellow line and the high water mark represents Erf 2341. The red line represents the 5m building line.

The sand trapped and supported by rooikrans from blow-outs in the back dune area is much steeper than the angle of repose of sand, which is generally about 26º from the horizontal. In **Photo 9** below, one can see the steep angle of repose of the windblown sand is about 50º to 60º from the horizontal (to the right of the photo).

Photo 9: Shows the movement of sand from the back dune area by excavator. Note the steep angle of repose of the dune to the right which is caused by the rooikrans vegetation that holds the sand as it cascades over the back of the dune caused by wind erosion from blow-outs. Note the stabilised building platform covered in mulch from the chipping of rooikrans removed from the development area. The wooden stakes at the edge of the building platform is the alignment of the conservation setback line (8 August 2022). The area between the stabilised platform and the dune to the right was filled in with sand removed from the back area of Erf 2343.

The collection of pioneer strand plants from the sides of the back dune areas before the dunes were removed, were temporarily transplanted on the sides of the hummocky dunes (**Photo 10**) for later transplanting on the reshaped dune surface.

Photo 10: Shows the temporary transplanting of harvested strand plants on the sides of a hummocky dune which is located just above the spring high tide mark (8 August 2022)

All the back dune sand that had been trapped by the thicket of rooikrans plants was moved forward towards the hummocky dunes by excavator, just above the high water mark, filling in the large blow-outs that had occurred over the last 50 to 75 years of misuse (**Photo 11**). When all the sand had been moved down to the hummocky dunes, the rehabilitation team started erecting the specially made-up shade netting (800mm wide), with sewn in sleaves for sliding in 1.4m steel droppers to hold the netting upright (**Photo 12**). A soil-saver hessian cloth was then placed along the crest of the reshaped dune system to reduce any wind erosion (**Photo 12**).

Photo 11: Shows the filling in of large blow-outs with sand moved from the back dune area. Most of the remnant dune system had originally been stabilised by planting rooikrans in the early 1900's (8 August 2022).

Photo 12: Once all the back dune sand had been moved to the hummocky dunes, shade netting was erected near the hummock dunes. A "soil-saver" hessian blanket was pegged to the sand at the apex of the slope of the frontal dune system to prevent erosion (10 August 2022). Deon van Eeden is seen to the right of the photo, supervising the specialist rehabilitation team from Still Bay.

3.3 Revegetation of the Reshaped Frontal Dune System

Once the reshaping of the frontal dune within the central portion of Erf 2341 during August 2022 by mechanical means had been completed, the necessary netting was put in place to create a wind free microclimate and an erosion free area to give the transplanted locally indigenous strand plants a better chance of survival. After the netting had been put in place, the rehabilitation team from Still Bay started with the transplanting of the harvested strand plants (**Photo 13** taken on 8 September 2022). A temporary irrigation system was also put in place to irrigate the plants and comprised three 50mm PVC pipes with irrigation standpipes every 10m (**Photo 14**). The irrigation system was connected to the main potable water system installed for the Preekstoel Beach Estate development. The irrigation network is run for 3 to 4 hours every third day, weather dependant, i.e., once the sand surface had dried out.

By the 31st of January 2023, the transplanted strand plants were showing a good coverage of the reshaped frontal dune system and were very healthy (**Photo 15**). It was hoped that the more climax Strandveld plants could be planted between the strand plants to coincide with the winter period of 2023 (this did not transpire as the EMPr for the development had still not been approved). Within 5 months after planting the strand plants, there were signs that small hummocky-type dunes had already started forming around the strand plants. This is exactly what was hoped would happen and that with time small frontal dunes will become higher and higher once the more climax plants have been planted which will be able to hold more sand.

Once the strand and Blombos strandveld plants have fully acclimatised and are robust enough, the shade netting and steel droppers will be removed from the rehabilitated frontal dune area.

A similar frontal dune maintenance management system, initiated by the CSIR and the Hessequa Municipality was implemented more than 10 years ago along the Lappiesbaai coastline. An irrigation system was also installed on the rehabilitated frontal dune system (**Photos 16a** and **b**).

Photo 13: Photo shows the rehabilitated frontal dune system that has been planted with typical locally indigenous strand plants. A temporary irrigation system was also put in place (8 September 2022)

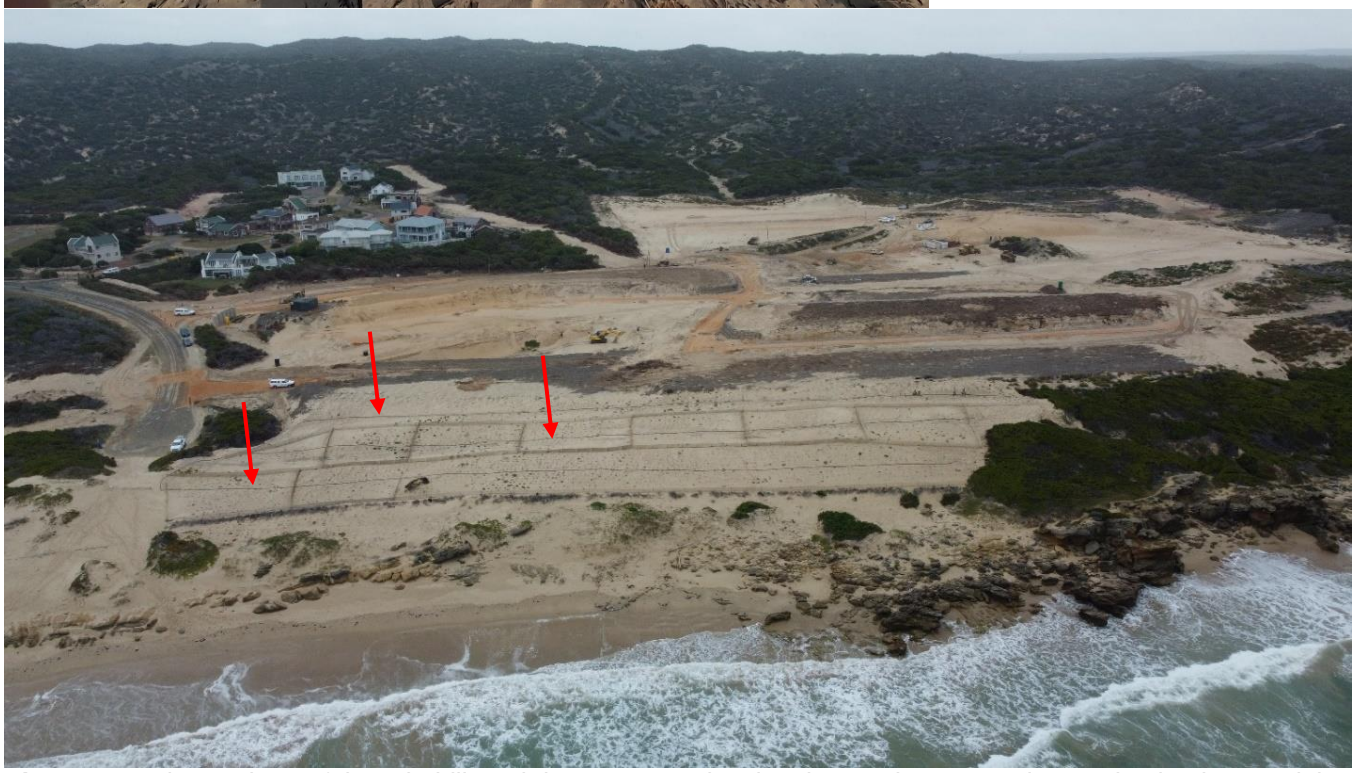


Photo 14: A drone photo of the rehabilitated dune system showing the erosion prevention netting in place and the temporary irrigation system (red arrows). Note the hummocky dunes (photo taken on 10 November 2022).

Photo 15: Note the excellent coverage of strand plants over the rehabilitated frontal dune system. It was hoped that the more climax Strandveld plants could have been planted between the strand plants to coincide with the winter period of 2023. Photo taken on 31 January 2023. Given that the EMPr had not been approved, the more climax plants were not planted. It should be noted that the current cover of the strand plants is about 99% of the rehabilitated dune (refer to **Photo 18** below).

Photo 16a

Photo 16b

Photos 16a and 16b: These photos were taken at Lappiesbaai, Still Bay East where a dune rehabilitation programme was undertaken by the CSIR to stabilise the frontal dune system. The Strandveld plants of this programme are still irrigated by the Hessequa Municipality. Note the flat dune profile.

3.4 The Potential Impacts of the Mechanical Rehabilitation of the Frontal Dune System within the Central Portion of Erf 2341

The use of an excavator to remove the rooikrans from the remnant dunes within the central sector of the frontal dune system on Erf 2341 and the infilling of the blow-outs on the frontal dune system with sand moved from the back-dune area was the most efficient way of reprofiling the frontal dune. The potential environmental impacts of using this mechanical methodology were

considered to be very low, given the high negative impacts of the blow-outs and the dense growth of rooikrans on the remnant dunes and back-dune area.

The harvesting of locally indigenous strand plants from the remnant dunes within the front sector of the dunes and their transplanting on the reprofiled dune worked extremely well as can be seen in the photographs above. The success of the use of such plants harvested from the site can be put down to their hardiness and natural climatization to this specific area. The nearly 90% coverage growth of the transplanted strand plants within six months from August to end January 2023 is considered to be a significant success, i.e. a positive outcome.

This success can also be attributed to the irrigation of these transplanted strand plants during the dry periods. A year later i.e. January 2024, the strand plant cover of the rehabilitated frontal dune, was about 99%. It should be noted that the irrigation system was decommissioned in April 2023.

As such, the rehabilitation of the frontal dune can be considered to be a positive success. The only negative consequence of the initial rehabilitation of the frontal dune system is that it is believed that insufficient sand was placed on the reprofiled dune. This will now be rectified by the implementation of the recommendations of this Dune MMPst report, i.e. paragraph 4 below.

3.5 The Roll of Hummocky Dunes in Coastal Dynamics

It is also recommended that hummocky dunes should be encouraged to form in front of the frontal dune system and above the spring high tide mark by planting *Arctotheca populifolia* (sea cabbage), sea wheat, pypgras and waxberry creepers (*Myrica cordifolia*) near the base of the primary dune. Hummocky dunes are ephemeral in nature and will erode during storm events. The sand eroded from the hummocky dunes is carried out to sea to build offshore sand bars.
These offshore sandbars assist with the breaking of waves further out to sea where the wave energy is dissipated, thereby reducing the amount of sand removed from the beach. This sand within the ephemeral sand bars will eventually be deposited back on the beach by gently breaking rolling waves after the storm has passed. Once this sand has dried on the beach, it will be blown back up the beach to form hummocky dunes again. These dunes are an integral part of the frontal dune system and form the first defence against storm erosion.

The whole frontal dune should be cordoned off so that the public does not have access to the area being rehabilitated. Permanent sign boards should be erected indicating that dune “rehabilitation is in progress” and that people are not allowed in the area (**Photo 17**).

Photo 17: An example of a sign board placed on the Lappiesbaai frontal dune system, Still Bay East.

A number of storm events battered the Still Bay coastline during 2023. This has resulted in a lot of sand having been removed from the upper beach and the exposure of aeolianite along the storm high water mark. During spring high tides, the sea reaches the base of the hummocky dunes. This has resulted in the public not being able to walk along the upper beach area, but rather walking between the hummocky dunes and the toe of the rehabilitated frontal dune system.

This has resulted in the trampling of pioneer vegetation at the back of the hummocky dunes, with resultant erosion (**Photo 18**).

Photo 18: Shows the pedestrian path between the hummocky dunes and the toe of the dune system. This is the most sensitive part of the dune system and the pedestrian path has already caused die-off of the strand plants and resulted in sand erosion. It is recommended that brushwood should be placed over the pathway to prevent access. Note the prolific growth of strand plants on the reformed lower slope of the frontal dune.

4. REHABILITATION OF THE TRANSFORMED FRONTAL DUNE SYSTEM

4.1 Introduction

The Environmental Maintenance Management Plan for the Rehabilitation of the Frontal Dune System on Erf 2341: Short-Term Rehabilitation (i.e. the Dune MMP) dated February 2024, was not approved by the DEADP: Directorate: Environmental Law Enforcement (2 May 2024). DEADP requested that it be revised and resubmitted for approval as they believe that the 12m and 14m high dunes running east west within the eastern sector of the central frontal dune system of Erf 2341 should be replaced (**Figure 6**). This east west dune was flattened during the rehabilitation of the frontal dune system in 2022 and the sand was used for the infilling of the blow-outs on the frontal dune system(**Figure 7**).

Based on the DEADP's request that the east-west trending dune be replaced, the dune high points mapped in 2012 were superimposed onto the contour plan of the transformed dune system (**Figure 8**). The proposed 10m, 12m and 14m contours were superimposed on the 2024 contour plan depicting where the east-west trending dune will be reconstructed.

The same methodology as is described in Section 3 above will be used for the rehabilitation of the transformed frontal dune system, except for the addition of more sand which will be brought onto the transformed dune from the NE corner of the development property (Erf 2343) to recreate the original dune that existed before the transformation of the frontal dune system.

To undertake the rehabilitation of the transformed frontal dune system, the following steps will need to be undertaken:

- Demarcate the area that needs to be rehabilitated by adding more dune sand to recreate the profile of the previously existing east-west dune with its 14m and 12m peaks (**Figure 8**).
- Remove the three irrigation pipelines from the rehabilitated frontal dune area.
- Remove the strand plants within the area that will be affected by the placement of more dune sand. The sand is to be obtained from the northeast corner of the development site (**Figure 1**).

- Remove the shade cloth netting and steel droppers from the whole frontal dune area and temporarily store such materials in an area that will not be affected by the rehabilitation of the frontal dune. These materials will be re-used once the reshaping of the dune has taken place.
- Add approximately 4 500m³ of dune sand to the frontal dune with dump trucks. Reshape the profile of the frontal dune with the added dune sand by using an excavator.
- Replace the three temporary irrigation pipes, with their impact sprinklers, over the reshaped frontal dune area.
- Re-erect the shade cloth over the whole frontal dune area.
- Transplant the removed strand plants over the reshaped frontal dune area. Certain Blombos strandveld plants will also be added to the strand plants on the upper, landward side of the frontal dune.

4.2 Removal and Replanting of the Strand Plants Growing on the Frontal Dune that is to be Reshaped and Rehabilitated

The area on the frontal dune to be rehabilitated will be appropriately demarcated on site by the appointed ECO (Aubrey Withers) with flagged wooden poles. The rehabilitation of the dune will be supervised by the ECO, who will be in attendance on site for the duration of the rehabilitation period, which is estimated to take between two and three weeks.

The local dedicated rehabilitation team, that has been trained by Deon van Eden of Vula, will remove the strand plants[5] from the rehabilitation area and put them into a holding area to be covered with hessian sheets. The removal of plants is envisaged to take 3 days. The hessian sheets must be kept moist with impact sprinklers.

Once the additional sand has been placed within the rehabilitation area (within 8 days), a temporary irrigation system will be placed on the area and the strand plants will be transplanted. The repurposed shade netting will be re-erected over the rehabilitated area to protect the growth of the transplanted strand plants. This will be followed by the transplanting of the strand plants. The transplanting of the strand plants is estimated to take 5 days. Ideally, the removal of strand plants and their transplanting should take place in May/June to take advantage of the anticipated ensuing winter rains.

The total timeframe for undertaking the rehabilitation of the frontal dune is estimated to take no more than three weeks.

Once the strand plants have taken root and have become more robust, which is envisaged to be by August 2024, the more climax plants belonging to Blombos strandveld should be planted amongst the strand plants. Such strandveld species will be planted higher up the slope of the frontal dune system.

The temporary irrigation system will only be removed once the first good autumn rains of 2025 have fallen. The shade netting erected within the rehabilitated area to create a protected micro-climate, should be removed in the winter of 2026, once the climax Blombos Strandveld species have established themselves.

4.3 Harvesting of Sand from the Northeast Sector of the Development Area and the Spreading of Sand over the Transformed Frontal Dune

The approximately 4 500m³ of sand to be used in the rehabilitation of the transformed frontal dune will be obtained from the unconsolidated windblown dune sand occurring within the northeast sector of the development site (**Figure 1**). This sand is ideal for the rehabilitation of the frontal dune as it is derived from sea sand blown into the interior of the area when sea levels were lower than they are today. Such sand contains weathered seashells and is geologically identical to the recent sands forming the frontal dune system. Since the sand is being obtained from the site of the development, no authorisation is required for its use as filling on the frontal dune system.

[5] *Thinopyrum distichum* (sea wheat), *Arctotheca populifolia* (dune *daisy; sea pumpkin), Tetragonia decumbens (kinkelbossie), Ehrharta villosa (pypgras), Chrysanthemoides monilifera (bietou), Carpobrotus acinaciformis* (pink suurvy)), *Searsia crenata* (dune crowberry), and *Helichrysum ter*etifolium).

The only efficient and cost-effective method of adding additional sand to the area identified on the transformed frontal dune system for rehabilitation, is by mechanical vehicle means, i.e. the use of an excavator to load the dump trucks and a second excavator to spread the dumped sand on the area requiring additional sand.

No vehicular access to the area to be rehabilitated on the frontal dune will be allowed from the beach area.

Given that the developer does not want large, heavy earth-moving dump trucks to travel on the existing paved roads within Phase 1 of the development, for fear of damaging such roads, access to the dune will be obtained from the existing construction haul road and onto the Provincial owned Preekstoel tar road (**Figure 1**). An existing access to the hotel site is provided off the Preekstoel road. The hotel site has direct access to the frontal dune system from the north of the frontal dune area. Sand will be dumped onto the frontal dune system where required. Once dumped, the sand will be worked (profiled) by an excavator over the area to be rehabilitated. Measuring stakes will be placed over the rehabilitation area where additional sand is required to ensure that the correct volume of sand is applied.

The access route to the frontal dune area will not impact on the sea-front housing erven, which have been fenced off from the frontal dune system. The rehabilitation of the dune area by mechanical means will not have any impact on the sea-fronting erven. As such, there are no environmental reasons why the houses with approved plans from the Hessequa Municipality on these sea-fronting erven should not be allowed to be built on immediately.

The timespan for dumping the required volume of sand on the frontal dune is envisaged to take about 8 days. The spreading of the dumped sand and the reshaping of the frontal dune system should take about 8 days.

X-Sections through the original frontal dune system (2012) and for the transformed frontal dune system (2024) have been drawn every 20m along the longitudinal profile of the dune (refer to **Figures 9 a, b and c**). The X-section profiles show the original dune profile as surveyed in 2012 (black line), the transformed profile of August 2022 (red line), and the proposed profile once about 4 500m³ of sand has been added to the frontal dune system (green line).

Once the strand and strandveld vegetation has grown back, it is envisaged that with time (say in the next 10-15 years), a more robust hummocky dune system will be formed at the toe of the frontal dune and a primary dune would also have been developed by sand accumulation blown off the hummocky dunes by the dune vegetation. A generalised X-section of what the dune profile could look like in the next 10-15 years is given in **Figure 10**.

4.4 Medium-Term Rehabilitation Requirements for the Frontal Dune System

Wind erosion during storm events will have an impact on the hummocky dunes at the bottom section of the frontal dune system, where blow-outs are likely to occur (**Photo 19**). These blow-outs must be packed with seedless brushwood (rooikrans), harvested from the rehabilitation process of the steep aeolianite scarp, to trap sand and to create a sheltered micro-climate for the growth of pioneer strand plants.

Continued, vigilant checks on the formation of blow-outs must be carried out after each storm event by the Developer's permanent Site Agent of the Preekstoel Beach Estate. Should such blow-outs occur, the Site Agent is to employ the trained, dedicated dune rehabilitation team from Still Bay to implement the necessary mitigation measures as noted above.

In addition, the medium-term maintenance of the frontal dune system must include the annual weeding of the growth of exotic, invasive plants. This should be undertaken by carefully walking over the frontal dune system and hand pulling any seedlings that have grown.

The Medium-Term Environmental Maintenance Management Plan for the Rehabilitation of the Frontal Dune System and the Ancient Aeolianite Foreland Scarp will be compiled once this Short-Term MMP has been approved and implemented.

Photo 19: The blow-outs currently seen within the hummocky dunes (red arrows) must be rehabilitated before they reach the state seen in this photo. Note the exposure of aeolianite just above the highwater mark (**A**). The aeolianite occurs below the frontal dune, which will assist in reducing erosion by the sea when anticipated sea level rises. The aeolianite was exposed during the late September 2023 storm event that swept along the Southern Cape's coastline, removing vast amounts of sand from the beach and upper shore area and depositing such sand in off-shore bars just off the coastline. The bare sandy area behind the hummocky dunes must also be packed with brushwood to trap sand blown off the upper beach area.

4 CONSTRUCTION OF A BOARDWALK OVER THE FRONTAL DUNE

The construction of one wooden boardwalk (or recycled plastic boardwalks) over the sensitive frontal dune system has been approved by the DEADP and will be essential to the success of the dune rehabilitation programme[6], by allowing beach access to the Preekstoel beach. Similarly, the maintenance of this structure is essential to remain functional at all times and will also add to the success of such a programme by keeping pedestrians off the frontal dune system and hummocky dunes.

The design of the boardwalk and the orientation of the boardwalk will also be of critical importance not to exacerbate erosion of the frontal dune system. For example, the orientation of the boardwalk should be as near to right angles of the prevailing winds as possible. Given that the prevailing winds are from the southeast and southwest, the ideal orientation of the boardwalk will be in a north-south orientation. The appointed ECO will supervise the construction of the boardwalk.

If the boardwalk is parallel to the prevailing winds, the boardwalk will funnel the winds beneath it resulting in blow-outs and its eventual collapse. In addition, the boardwalk should be raised on wooden (or plastic) poles about 400 above the dune surface. This will allow wind to blow beneath the boardwalk and for vegetation to continue growing beneath it.

The construction of the boardwalk is envisaged to take 2 weeks.

Continual maintenance of the boardwalk will be required, not only to check its structural integrity but also to keep any windblown sand from covering it. Should any sand start to build up against the boardwalk, it must be immediately removed by hand (spades). The sand should be spread on either side of the boardwalk and back towards the sea.

The Developer's Site Agent will continually assess the status of the boardwalk and if need be, maintain the good order of the boardwalk.

[6] The boardwalk will provide a conduit for pedestrians to gain access to the beach and help to prevent pedestrians trampling dune vegetation on either side of the proposed boardwalk.

5 CONCLUDING REMARKS

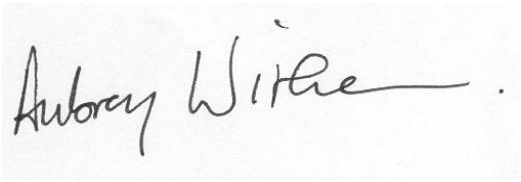
The long-term success of the Preekstoel Beach Estate lies with the successful implementation of the rehabilitation of the frontal dune system and its long-term management. The same is true for the management of the steep aeolianite foreland scarp. These coastal features are the first defences against coastal erosion. The maintenance of the indigenous vegetation on these two dune systems is vitally important. Any blow-out erosion noted on the dunes must immediately be rehabilitated to prevent large scale loss of sand to the interior (i.e. higher up the dunes). Such management of the dune's natural defences is especially critical based on future climate change and anticipated sea level rise and increased coastal erosion.

Once the frontal dune system has been rehabilitated, a wooden or recycled plastic boardwalk must be constructed over the frontal dune system to provide the public and residents of the Preekstoel Beach Estate access to the beach. The maintenance of the boardwalk will be crucial for keeping the public and residents off the sensitive frontal dune system, including its hummocky dunes.

Sufficient signboards should be placed near the hummocky dunes of the frontal dune system and along the base of the steep aeolianite foreland scarp to warn pedestrians of the dune rehabilitation programme and request such pedestrians to keep off these sensitive areas.

The diligent hands-on training of a dedicated dune and alien vegetation rehabilitation team and the running of a dedicated nursery, for the propagation of indigenous dune grasses, typical strand plants and Blombos strandveld species, will also be vitally important to the success of the rehabilitation and maintenance management programmes of the frontal dune system and the steep aeolianite foreland scarp. In addition, the nursery will be able to propagate the necessary strandveld plants for the landscaping of the development area within the Preekstoel Beach Estate.

The ultimate success of the rehabilitation of the frontal dune system to a functioning ecosystem will be the unwavering commitment from the developer and later the HOA of the Preekstoel Beach Estate. Regular monitoring, follow-up management and implementation of the recommendations outlined in this Dune MMP and the overarching EMMP and any future adaptive management refinements to the EMMP, will ultimately determine the success of this proposed development.



A.W.WITHERS
Aubrey Withers Environmental Consultant
15 May 2024

ANNEXURE A

MEMORANDUM OF AGREEMENT

between

HESSEQUA MUNICIPALITY

and

VIVREN PROPERTIES PTY LTD

and

PREEKSTOEL BEACH LIFESTYLE ESTATE

RESIDENTS' ASSOCIATION

TABLE OF CONTENTS

ANNEXURES

1 **PARTIES**

1.1 The Parties to this Agreement are –

1.1.1 Hessequa Municipality;

1.1.2 Vivren Properties Pty Ltd;

1.1.3 The Trustees for the time being of the Preekstoel Beach Lifestyle Estate Residents Association, herein represented by the Developer, being Vivren Properties Pty Ltd;

1.2 The Parties agree as set out below.

2 **INTERPRETATION**

2.1 In this Agreement, unless the context indicates a contrary intention, the following words and expressions bear the meanings assigned to them and cognate expressions bear corresponding meanings –

2.1.1 "**Agreement**" means this agreement;

2.1.2 "**Attorneys**" means, Fairbridges Wertheim Becker, reference, A Heiberg;

2.1.3 "**Developer**" means Vivren Properties Proprietary Limited, registration number 2011/008459/07, a limited liability private company duly incorporated in accordance with the Company Laws of the Republic of South Africa;

2.1.4 **"Development"** means the development to be undertaken by the Developer on the Development Property as set out on General Plan 2345/2022 and attached hereto as Annexure B;

2.1.5 **"Development Property"** means Erf 2343 Still Bay East;

2.1.6 "**Developer Trustee**" means a Trustee appointed by the Developer;

2.1.7 **"Environmental Authorisation"** means the notification of decision for environmental authorisation dated 06 February 2018 and issued to the Developer in respect of the Development, in terms of the National Environmental Management Act, attached hereto as Annexure A;

2.1.8 "Environmental Management Plan" means the environmental conservation maintenance management plan approved by the Western Cape Department of Environmental Affairs and/or the Municipality requiring *inter alia* alien (plant) management and maintenance of the Dunes;

2.1.8 **"Hessequa"** means the Hessequa Municipality established in terms of section 12 of the Local Government: Municipal Structures Act, No. 117 of 1998;

2.1.9 **"HOA"** means the Preekstoel Beach Lifestyle Residents' Association;

2.1.10 "**Signature Date**" means the date of signature of this Agreement by the Party last signing.

2.1.11 **"The Property"** means Erf 2341 Still Bay East;

3 INTRODUCTION

3.1 Whereas as part of the Development approval Vivren was to transfer the Property (Erf 2341 Still Bay East) and another Erf to Hessequa in exchange for other property on which the Development was to be constructed;

3.2 And whereas the transfer of the Property to Hessequa was finalised on the 13th December 2022;

3.3 And whereas condition 21 of the Environmental Authorisation (set out below) imposes certain obligations on Vivren, as the holder of the said Environmental Authorisation, to be carried out on the Property, which is not owned or controlled by Vivren;

Condition 21:
The holder must, prior to the activities commencing on site, register the following legally binding provisions or obligations on the land between the development setback line and the high water mark of the sea (i.e. private and public open space) to limit the use of the proposed open space area for a conservation use.

Such provisions must as a minimum be a —

21.1. "Non-User Conservation Servitude" The holder is required to register, in favour of the Hessequa Municipality and the Home Owners Association, a conservation servitude over the identified land which requires protection from development in perpetuity and in order to secure the conservation of the site. The conditions of the conservation servitude must inter alia address the following measures –
- (a) No earthworks or any form of development is permitted within the area, except if environmental authorisation is granted and in accordance with an approved conservation management plan;
- (b) No landscaping; encroachment by gardens (albeit deliberate or inattentive) or planting except for rehabilitation in terms of an approved management plan;
- (c) No collection or damaging of fauna and flora;
- (d) No vehicles of any type are permitted, unless ORV permit has been issued by the competent authority for the purpose thereof;
- (e) Access points and access control.

3.4 Now therefore in order to comply with the said condition 21 the Parties wish to record in writing their agreement regarding their respective rights and obligations regarding the Property going forward.

4 RESTATEMENT OF RIGHTS AND OBLIGATIONS REGARDING CONDITION 21

By unanimous consent the Parties agree as follows;

4.1 As the Property is now zoned Public Open Space III, it is zoned for nature conservation and hence the first part of condition 21 has been met.

4.2 The Parties hereby undertake to ensure in perpetuity that no future development will be allowed on the Property and they undertake to ensure that conservation is secured on the Property.

4.3 In fulfilling their obligations as set out in 4.2 above, the Parties agree and undertake that;

4.3.1. No earthworks or any form of development is permitted on the Property, except if environmental authorisation is granted and in accordance with an approved conservation management plan;

4.3.2 No landscaping; encroachment by gardens (albeit deliberate or inattentive) or planting except for rehabilitation in terms of an approved management plan shall occur on the Property;

4.3.3 No collection or damaging of fauna and flora on the Property shall be permitted;

4.3.4 No vehicles of any type are permitted on the Property, unless an ORV permit has been issued by the competent authority for the purpose thereof;

4.3.5 The Parties shall control and manage access points and access control to the Property as required by legislation.

4.4 From the Signature Date, Vivren and the HOA agree to be responsible for the day-to-day management and implementation of the Environmental Management Plan in respect of the Property, including the costs thereof and more specifically for the rehabilitation, maintenance and management of the of Dunes on the Property.

4.5 Vivren and the HOA hereby indemnify Hessequa from any claim that may be lodged against it in respect of the non-fulfilment of any portion of the Environmental Management Plan relating to the Property.

4.6 Hessequa hereby gives Vivren and the HOA unrestricted access to the Property in order that they can carry out their responsibilities in implementing the Environmental Management Plan.

4.7 Once the HOA has been established and the Developer no longer holds an interest in the Development, the Developer shall cede and assign all its rights and delegate all its obligations in terms of this Agreement to the HOA, who shall, from that date be solely responsible to fulfil the responsibilities and the duties imposed on the Developer and the HOA in terms of this Agreement.

5 GENERAL

5.1 Whole Agreement

5.1.1 This Agreement constitutes the whole of the agreement between the Parties relating to the matters dealt with herein and, save to the extent otherwise provided herein, no undertaking, representation, term or condition relating to the subject matter of this Agreement not incorporated in this Agreement shall be binding on either of the Parties.

5.1.2 This Agreement supersedes and replaces any and all agreements between the Parties (and other persons, as may be applicable) and undertakings given to or on behalf of the Parties (and other persons, as may be applicable) in relation to the subject matter hereof.

5.2 Variations to be in Writing

No addition to or variation, deletion, or agreed cancellation of all or any clauses or provisions of this Agreement will be of any force or effect unless in writing and signed by the Parties.

5.3 No Indulgences

No latitude, extension of time or other indulgence which may be given or allowed by any Party to the other Party in respect of the performance of any obligation hereunder, and no delay or forbearance in the enforcement of any right of any Party arising from this Agreement and no single or partial exercise of any right by any Party under this Agreement, shall in any circumstances be construed to be an implied consent or election by such Party or operate as a waiver or a novation of or otherwise affect any of the Party's rights in terms of or arising from this Agreement or estop or preclude any such Party from enforcing at any time and without notice, strict and punctual compliance with each and every provision or term hereof. Failure or delay on the part of any Party in exercising any right, power or privilege under this Agreement will not constitute or be deemed to be a waiver thereof, nor will any single or partial exercise of any right, power or privilege preclude any other or further exercise thereof or the exercise of any other right, power or privilege.

5.4 No Waiver or Suspension of Rights

No waiver, suspension or postponement by any Party of any right arising out of or in connection with this Agreement shall be of any force or effect unless in writing and signed by such Party. Any such waiver, suspension or postponement will be effective only in the specific instance and for the purpose given.

5.5 Provisions Severable

All provisions and the various clauses of this Agreement are, notwithstanding the manner in which they have been grouped together or linked grammatically, severable from each other. Any provision or clause of this Agreement which is or becomes unenforceable in any jurisdiction,

whether due to voidness, invalidity, illegality, unlawfulness or for any other reason whatever, shall, in such jurisdiction only and only to the extent that it is so unenforceable, be treated as *pro non scripto* and the remaining provisions and clauses of this Agreement shall remain of full force and effect. The Parties declare that it is their intention that this Agreement would be executed without such unenforceable provision if they were aware of such unenforceability at the time of execution hereof.

5.6 **Continuing Effectiveness of Certain Provisions**

The expiration or termination of this Agreement shall not affect such of the provisions of this Agreement as expressly provide that they will operate after any such expiration or termination or which of necessity must continue to have effect after such expiration or termination, notwithstanding that the clauses themselves do not expressly provide for this.

5.7 **No Assignment**

Neither this Agreement nor any part, share or interest herein nor any rights or obligations hereunder may be ceded, delegated or assigned by either Party without the prior written consent of the other Party, save as otherwise provided herein.

6 COSTS

If applicable, Vivren will bear and pay the legal costs and expenses of and incidental to the negotiation, drafting, preparation and implementation of this Agreement.

7 SIGNATURE

7.1 This Agreement is signed by the Parties on the dates and at the places indicated below.

7.2 This Agreement may be executed in counterparts, each of which shall be deemed an original, and all of which together shall constitute one and the same Agreement as at the date of signature of the Party last signing one of the counterparts.

7.3 The persons signing this Agreement in a representative capacity warrant their authority to do so.

7.4 The Parties record that it is not required for this Agreement to be valid and enforceable that a Party shall initial the pages of this Agreement and/or have its signature of this Agreement verified by a witness.

SIGNED AT **ON** **2023**

FOR AND ON BEHALF OF

HESSEQUA MUNICIPALITY

_____
Signature

_____
Name of Signatory

_____
Designation of Signatory

SIGNED AT **ON** **2023**

FOR AND ON BEHALF OF

VIVREN PROPERTIES PTY LTD

_____
Signature

_____
Name of Signatory

_____
Designation of Signatory

SIGNED AT **ON** **2023**

FOR AND ON BEHALF OF

THE HOA

_____
Signature

_____
Name of Signatory

_____
Designation of Signatory

SIGNED at Riversdale on 20 June 2023

For and on behalf of
Hessequa Municipality

Signature

HS USER

Name of Signatory

Director : Development Planning

Designation of Signatory

SIGNED at Riversdale on 20 June 2023

For and on behalf of
Vivren Properties Pty Ltd

Signature

Bruce Ladegaard

Name of Signatory

Director

Designation of Signatory

SIGNED at Cape Town on 22 June 2023

For and on behalf of
THE HOA

Signature

T van der Walt

Name of Signatory

Trustee

Designation of Signatory

FIGURE 4: Google Image of the Badly Eroded Preekstoel Beach Estate Frontal Dune System (10 April 2019)

FIGURE 1: Preekstoel Beach Estate, showing the stabilised building platforms, the transformed Frontal Dune System, the Sand Harvesting Area, the Dump Truck Access Route to the frontal dune and the Coastal Conservation Corridor (Erf 2341).

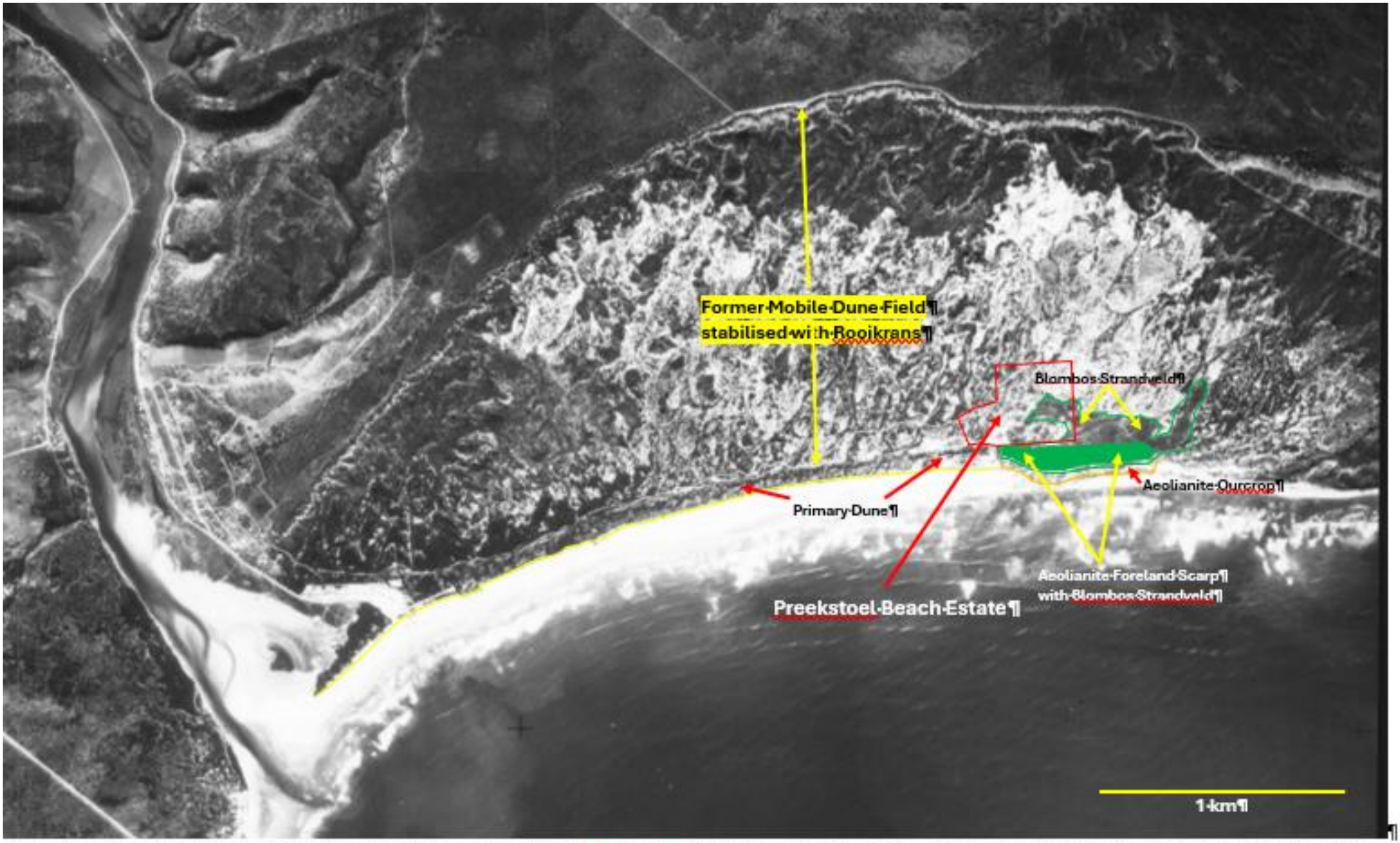


FIGURE 2: Aerial photo of the mobile dune field that was stabilised with rooikrans seedlings from 1928 to 1950's (photo taken on 3 April 1954). Note the remnant outlier of Blombos strandveld (within green polygon) which today only occurs on the steep aeolianite foreland scarp. The back-dune area has been completely inundated by rooikrans. Note the artificial created primary dune along the coast. Also, note the darker grey/black tone of the back-dune area which shows the more prolific growth of rooikrans.

FIGURE 5: Phased Approach for the Rehabilitation of the Preekstoel Frontal Dune System (Google Image dated 10 April 2019) (Note: this methodology was abandoned because of the low accumulation of sand by the erected brushwood fences.

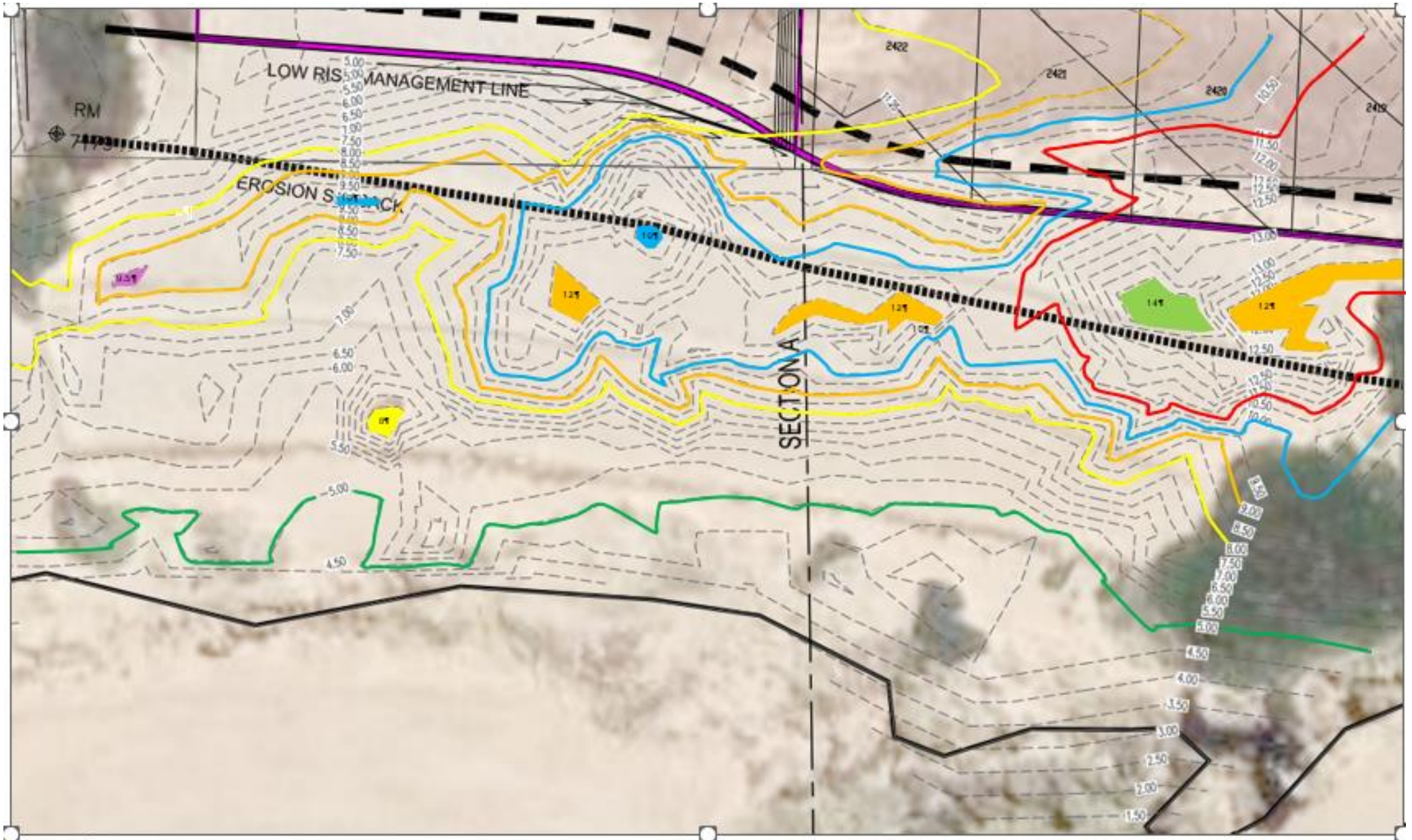


Figure 6: Depicts the surveyed contours of the frontal dune system (June 2012), with the highlighted 10m (blue) and 11m (red) contours, and the orange polygons (12m) and the green polygon (14m). Note the blow-out scars that are shown on the contour plan.¶

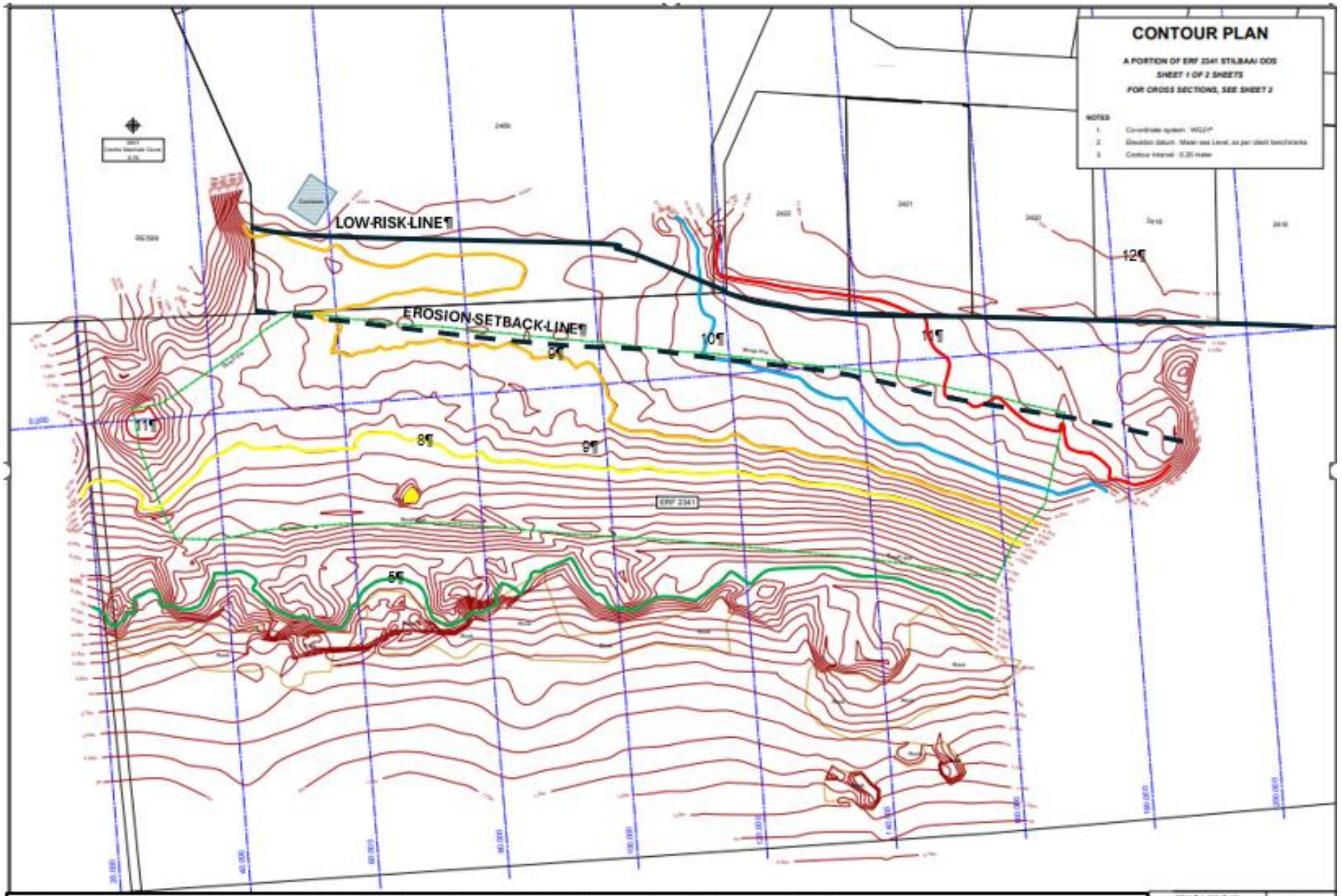


Figure 7: Depicts the survey contours of the transformed frontal dune system (February 2024)

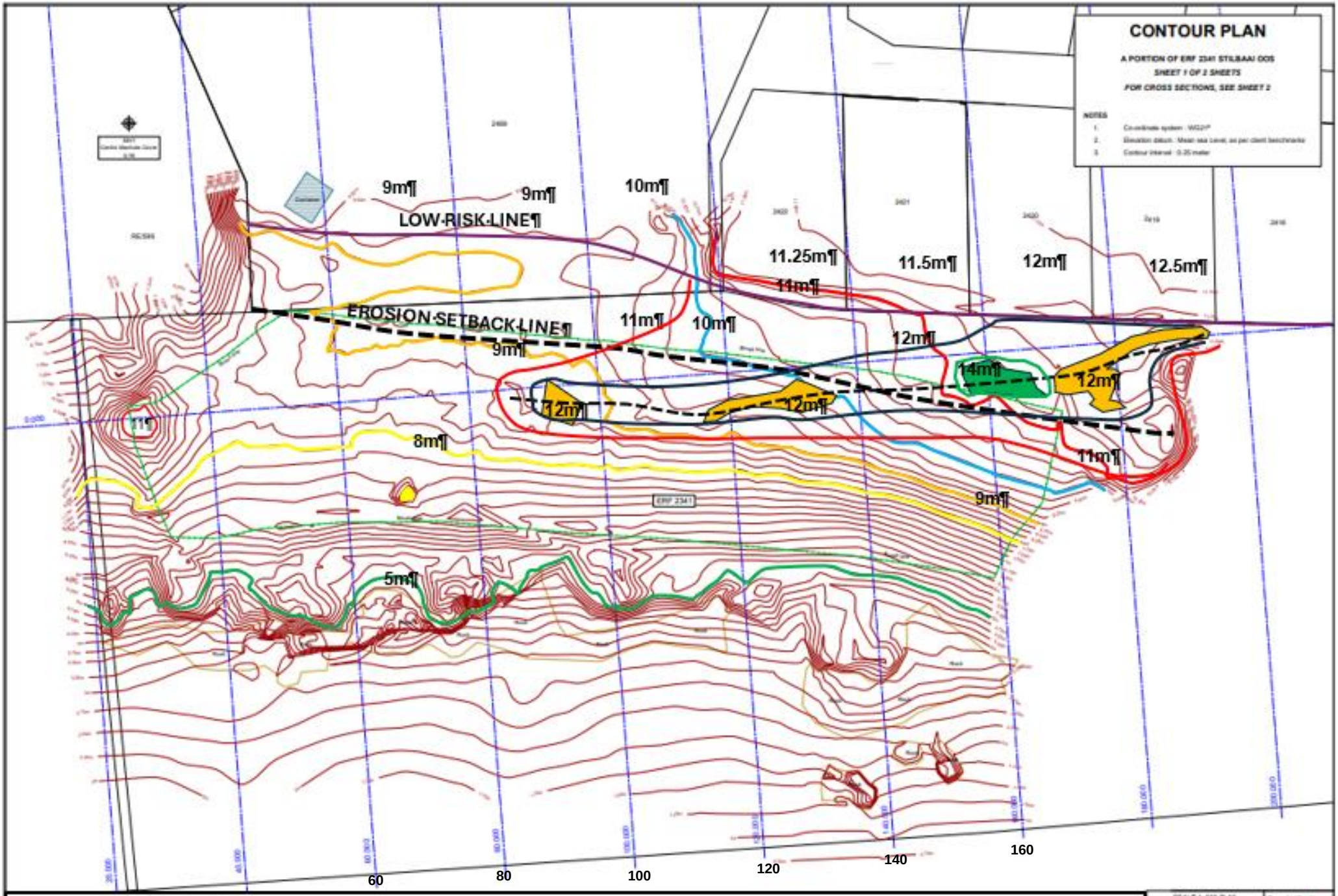


Figure 8: Depicts the transformed frontal dune system (February 2024) and the superimposed east-west dune from 2012 survey

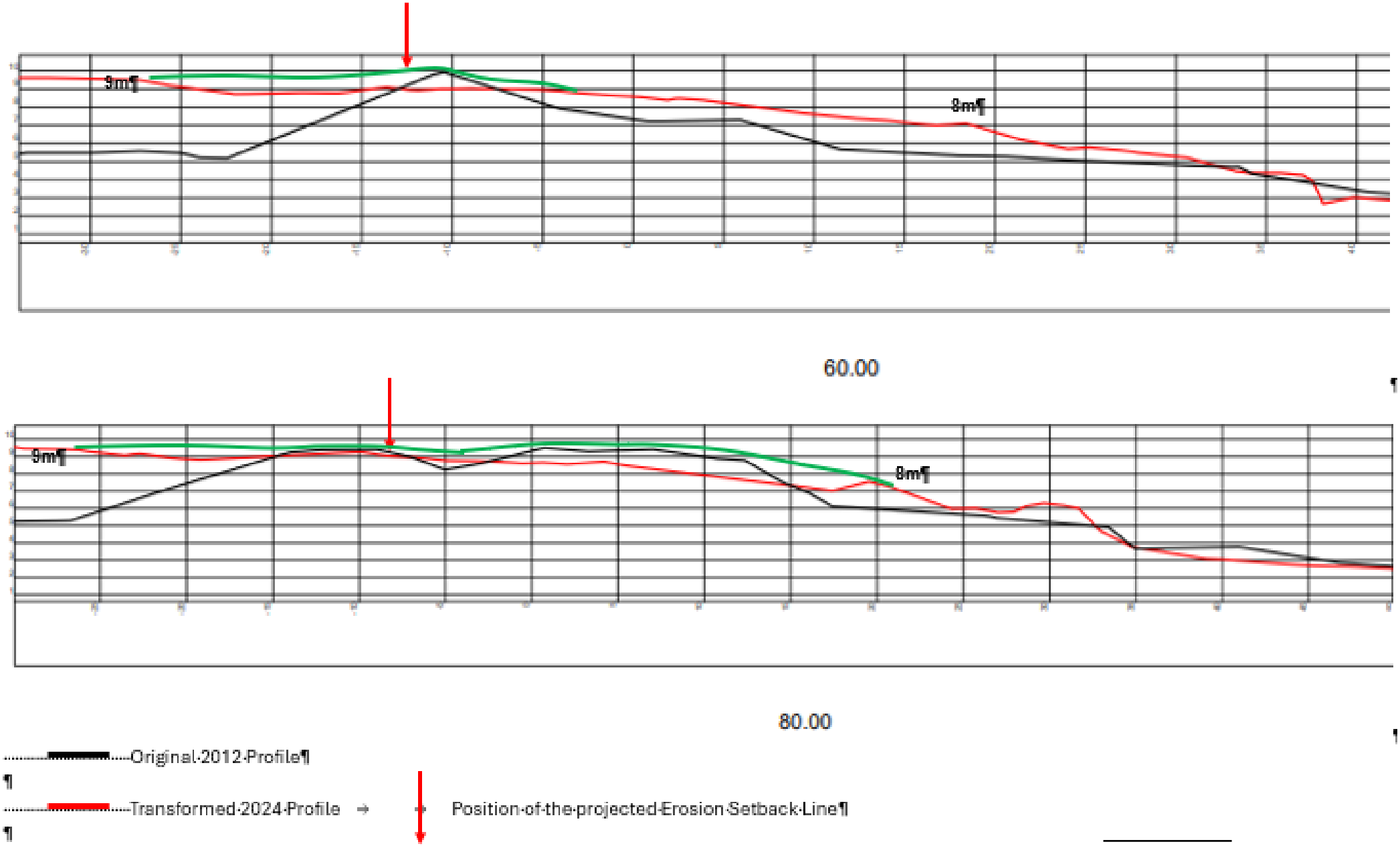


FIGURE 9a: Depicts the transformed frontal dune system (February 2024) & the superimposed east-west dune from the 2012 survey

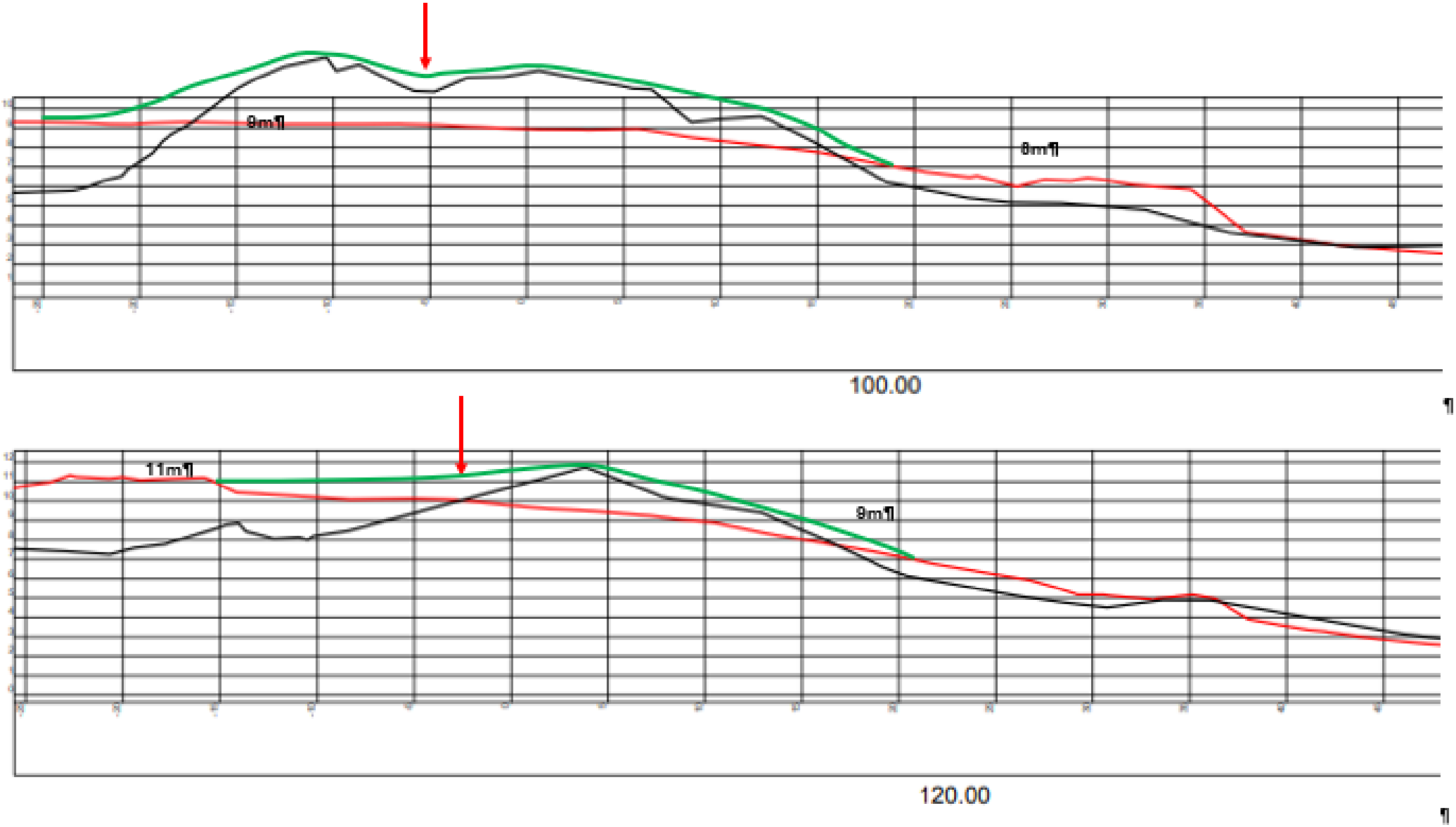


FIGURE 9b: Depicts the transformed frontal dune system (February 2024) & the superimposed east-west dune from the 2012 survey

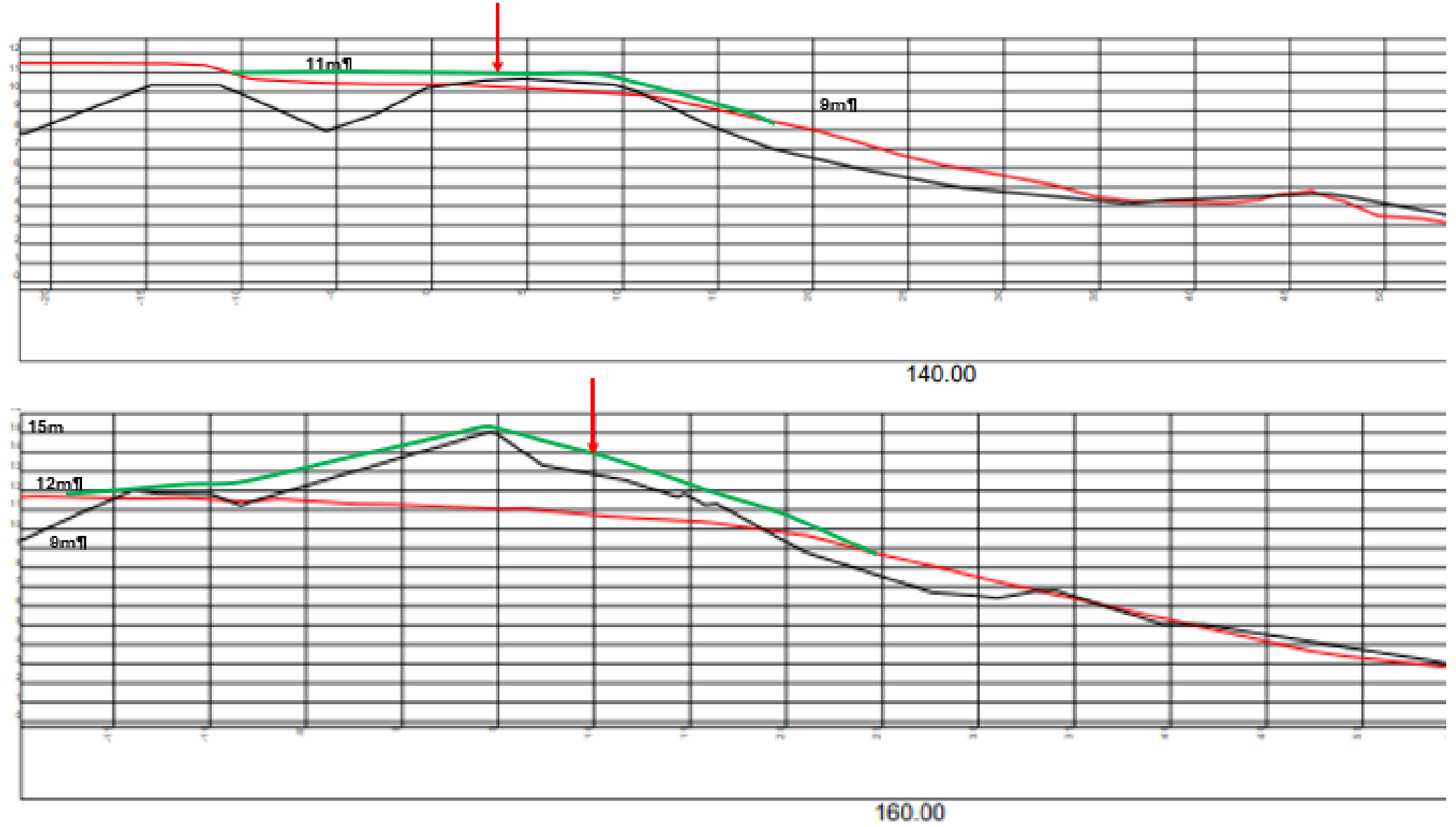


FIGURE 9c: Depicts the transformed frontal dune system (February 2024) & the superimposed east-west dune from the 2012 survey

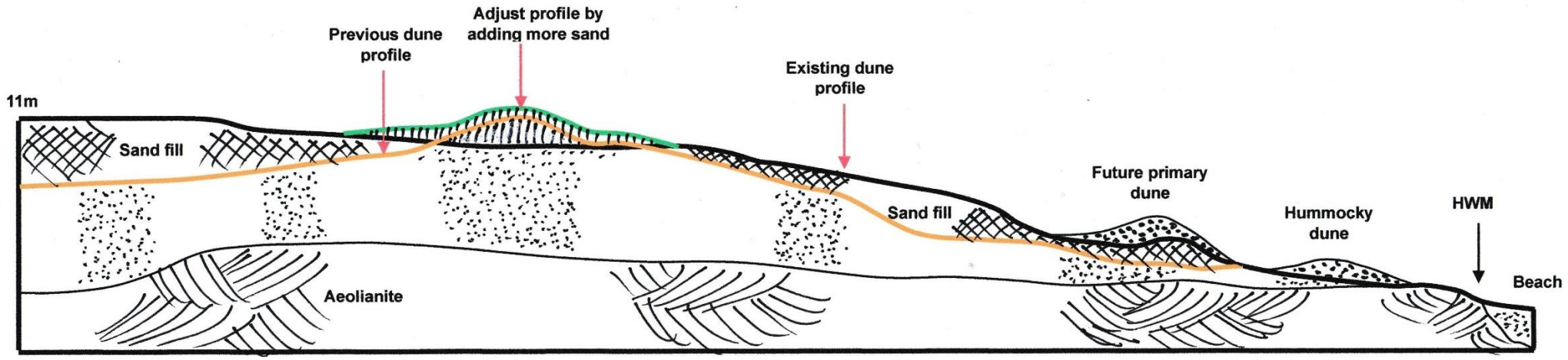


FIGURE 10: Generalised X-Section through the Frontal Dune System of Preekstoel Beach Estate, showing the previous dune profile before transformation (as drawn from the contour survey of June 2012), the dune profile after transformation (2024), the proposed adjusted dune profile and the anticipated profile in the next 10-15 years.