

# Inverloch Coastal Resilience Project

## Inverloch Beach Monitoring Report

July to December 2020

February 2021 Update

South Gippsland Conservation Society Inc.



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## 1.0 INTRODUCTION

The 'Inverloch Beach Monitoring Report – August 2018 to June 2020' was released in July 2020. This report updates the findings presented, incorporating the results of beach profile laser level and drone surveys undertaken by South Gippsland Conservation Society (SGCS) volunteers between July and December 2020. It doesn't repeat the detailed analyses that are included in the July 2020 report, and should therefore be read in conjunction with that report.

The rock wall at Cape Paterson Road and sand-filled geotextile retaining wall at the Surf Club have been successful in protecting these physical assets, with no change in the extent of coastline recession at both locations. Beyond these two locations, the eroding vegetated dunes behind the rest of the Surf Beach remain unprotected. The significant coastline recession that has occurred between the rock wall and Wreck Creek (reported in the next section) is of particular concern, as is the recession that is occurring at Flat Rocks.

Based on analysis undertaken for this report, it appears that a link exists between the accelerated recession that has occurred along the Wreck Creek section of coastline during 2020 and installation of the rock wall (between April and June 2020). 'Terminal scour' effects have been reported at many other locations on the Australian coast and overseas following the installation of similar sea walls. If that is the case here, the imperative for urgent active dune management is strengthened, as without intervention, the remaining vegetated dunes, and the Wreck Creek system itself, will most likely be lost within the next 12 months.

Two new survey monitoring posts have been installed - one at Flat Rocks (SP1a), east of the entrance to the RACV resort and near the Cypress trees, and the other (SP3a), located approximately in the middle of the Wreck Creek breakthrough. The latter post is sited between SP3 and SP4 to facilitate more detailed monitoring of this dynamic location.

Two additional monitoring posts are proposed:

- SP1b monitoring post to be located west of the Cape Paterson Road rock wall - this will enable comparison of coastline changes east and west of the rock wall
- A new SP2 monitoring post to replace the reference point that is located on the wet sand fence (now located in front of the Cape Paterson Road rock wall) - this was uplifted after a storm event during 2020. The new SP2 will use existing infrastructure east of the rock wall.

## 2.0 JULY TO DECEMBER 2020 MONITORING RESULTS

### *Amazon Shipwreck to Wreck Creek section*

- The coastline recession hot spot at Inverloch Surf Beach (as reported in our July 2020 report) continued to be the Amazon Shipwreck (SP3) to Wreck Creek (SP4) section of the coastline with:
  - 1.6m dune recession at SP3 (Amazon) since June 2020
  - 3.9m dune recession at SP4 (Wreck Creek) since June 2020.
- The beach height fluctuates regularly at this location, but at the December 2020 survey, had dropped by up to 0.3m at the two monitoring posts over the period. When the beach height drops, wave energy is maintained, increasing the likelihood of dune recession. These changes brought the total coastline recession since February 2020 to 8.3m (Amazon) and 7.8m (Wreck Creek). The beach level at the two monitoring posts dropped by 0.7 – 0.9m over this same period.
- Recession at this section of the coast since laser level monitoring commenced (September 2019) is:
  - SP3 (Amazon) – 6.5m
  - SP4 (Wreck Creek) – 7.1m.

Note that at there was a period of accretion last summer (from 05/12/19 to 25/02/20) at both sites, explaining the apparent anomaly the figures quoted above.

The changes reported above are as recorded by our laser level survey at monitoring posts SP3 and SP4. In addition, the Wreck Creek breakthrough that occurred in May 2020 between these two monitoring posts has widened significantly, with consequent additional coastline recession, as detailed in Section 3 of this report.

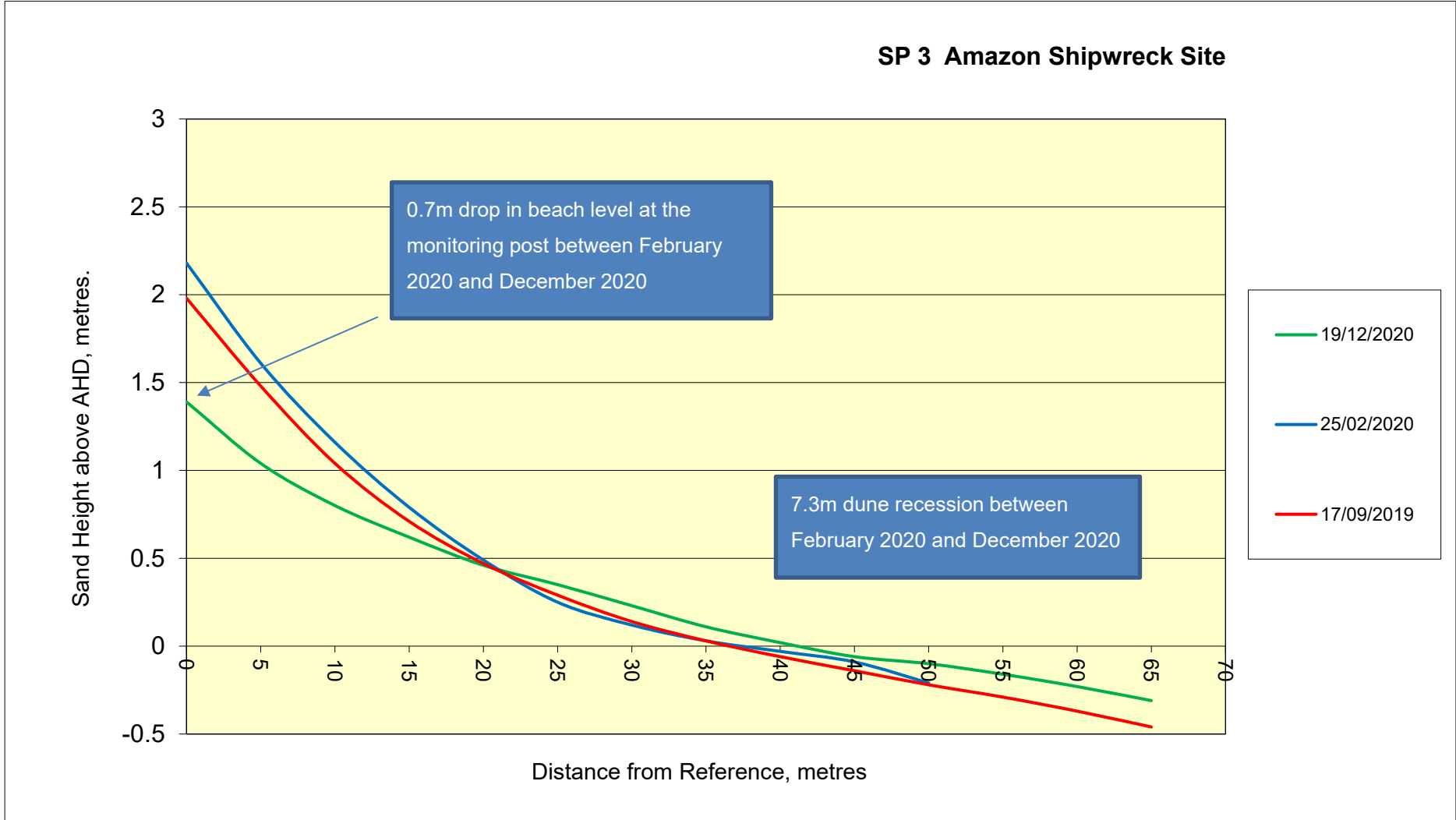


Figure 1 Laser Level Monitoring Chart SP 3 Amazon Shipwreck Site

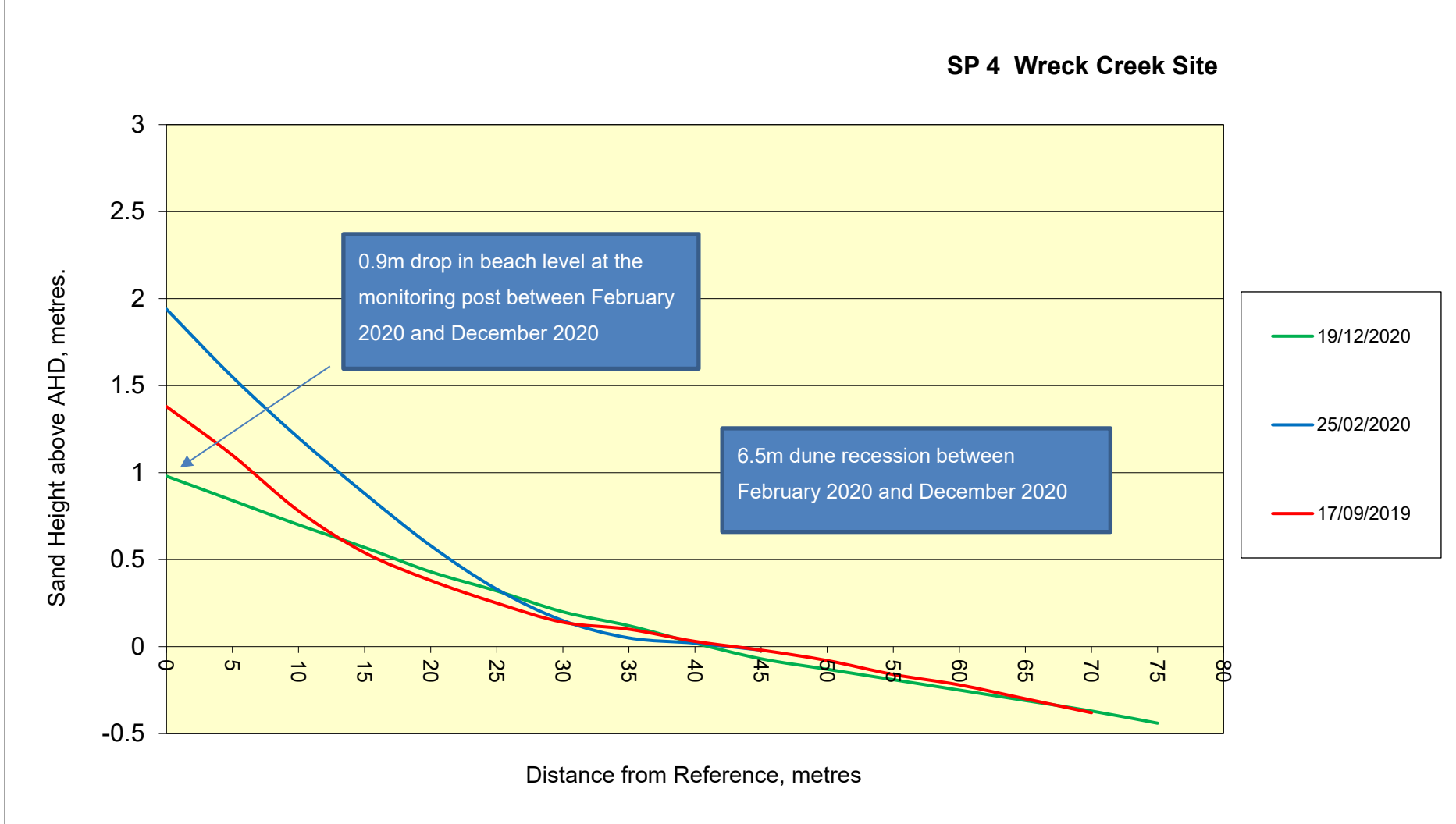


Figure 2 Laser Level Monitoring Chart SP 4 Wreck Creek Site

**Flat Rocks**

- 0.8m of dune recession was recorded at Flat Rocks (SP1) between October and December 2020, following 0.5m accretion between June and October 2020, giving a net 0.3m recession between June and December 2020.
- Offshore sand height has risen by around 0.2m between June and December 2020.

**Wave Street Access Track**

- The dune adjacent to the Wave Street access track (SP6) experienced considerable recession (1.8m) between October and December 2020, but there was a net 0.1m accretion since June 2020 due to accretion that occurred from June to September 2020.
- Since laser level monitoring began (September 2019), the dune at Wave Street has receded by 0.7m and the level of the beach has risen by 0.4m.

**Pt Norman**

- Sand levels and dune positions didn't exhibit any substantial change over the July to December 2020-monitoring period.
- Offshore sand levels at SP7 have risen by around 0.9m since June 2020. This result is consistent with the observation that the Pt Norman spit is reforming (see 'Other Observations' section).

**Other Monitoring Sites**

Monitoring was not undertaken at the monitoring posts within Andersons Inlet over the July to December 2020 period.

### 3.0 WEATHER CONDITIONS OVER THE MONITORING PERIOD

Weather conditions continued to be recorded throughout the second half of 2020 by review of Bureau of Meteorology (BoM) observations for Pound Creek, BOMs Willy Weather app and the VicWaves website, utilising results recorded by the Inverloch wave buoy.

Based on observations, the weather conditions most conducive to coastline recession at Inverloch Surf Beach comprise south-westerly swells combining with strong winds from the west/south-west/south and high tides. Northerly winds tend to flatten southerly swells and easterlies traditionally assist in returning sand to the surf beach from offshore. Accordingly, BoM daily weather observations for Pound Creek were analysed for each month as follows:

- Number of days that south/south-west/west wind gusts exceeded 28 kph
- Number of days that winds occurred from the north (from north-west to north-east)
- Number of days that winds occurred from the south-east (from east to south-east).

The number of days potentially conducive to coastline recession, that is, days with south/south-west/west wind gusts that exceeded 28 kph for both 2019 and 2020, are itemised in Table 1. Over the 12-month period, 16% less days that were conducive to coastline recession were recorded in 2020 compared with 2019, with September 2020 experiencing around half of the number of days that had the potential to result in coastline recession. Over the second half of the year, northerly winds occurred frequently during July (9 days), August (12 days) and September (18 days). Easterlies and south easterlies prevailed more frequently between October (9 days), November (5 days) and December (9 days).

**Table 1 Days conducive to Coastline Recession**

Month	Number of days with meteorological conditions conducive to coastline recession in 2020	Number of days with meteorological conditions conducive to coastline recession in 2019	Month	Number of days with meteorological conditions conducive to coastline recession in 2020	Number of days with meteorological conditions conducive to coastline recession in 2019
January	16	21	July	7	8
February	15	17	August	15	16
March	16	14	September	9	17
April	11	13	October	14	14
May	10	13	November	16	22
June	6	10	December	21	21
<i>Six-month Subtotal</i>	<i>74</i>	<i>88</i>	<i>Six-month Subtotal</i>	<i>82</i>	<i>98</i>
<b>Annual Total</b>				<b>156</b>	<b>186</b>



Notwithstanding, between 6 and 21 days per month were comprised of conditions that were potentially conducive to coastline recession between July and December 2020. These conditions coincided with high tides and large south-westerly swells to cause coastline recession on the following occasions:

- 20 August 2020
- 22-28 August 2020
- 25-28 September 2020
- 5 October 2020
- 24 October 2020
- 1-3 December 2020
- 6 December 2020.

Photographs of the coastline changes that occurred during these periods are included in Appendix A, and described below.

The 20 August 2020 event included 16mm of rain. Increased flows in Wreck Creek combined with the high tide storm surge to cause a substantial widening of the Wreck Creek breakthrough and consequent loss of vegetated dunes. This damage was exacerbated by further rain and storm conditions that occurred throughout the 22-28 August period. Significant coastline recession was observed along the length of the Surf Beach over this period, from the Ozone Street access track to Flat Rocks. A substantial drop in beach level became apparent when much more of the Amazon Shipwreck was revealed at this time.

Additional dune recession resulted along the Amazon Shipwreck- Wreck Creek section of the coastline in particular, during the 25-28 September storm surge event.

Further coastline recession was observed following the 5 October storm surge. Adverse weather conditions on 24 October also resulted in dune loss at the Wreck Creek section of coastline.

During November 2020, further coastline recession was avoided when potentially-adverse meteorological conditions didn't coincide with high tides.

Storms in early December 2020 resulted in the undermining and subsequent loss of several mature Coast Banksia trees at Flat Rocks.

By the end of December 2020, the breakthrough of Wreck Creek to the ocean (which occurred in May 2020) had widened to more than 80 metres, with accompanying vegetated dune recession of 30 metres. This brought the effective coastline recession at this location to 37 metres over 2020.

Our analysis of the changes to the Wreck Creek coastline, from 2010 to September 2020, is included in Figures 3-6. Key findings are:

- The vegetated dunes along the Wreck Creek coastline have receded by up to 70 metres between 2010 and 2020 (Figure 6)

- Coastline recession along this section of coastline is accelerating (Figure 4)
- Approximately 2.8 Ha of dune vegetation has been removed between 2010 and 2020 (Figure 5)
- The width of the remaining vegetated dune between the new breakthrough of Wreck Creek and the Cape Paterson Road rock wall has reduced to between 2-5 metres.

The build-up of sand that has occurred at the new Wreck Creek breakthrough in early 2021 has increased the likelihood of further creek breakthroughs east of the Cape Paterson Road rock wall. Without intervention, this would likely lead to the loss of the remaining vegetated dunes and this section of Wreck Creek itself.

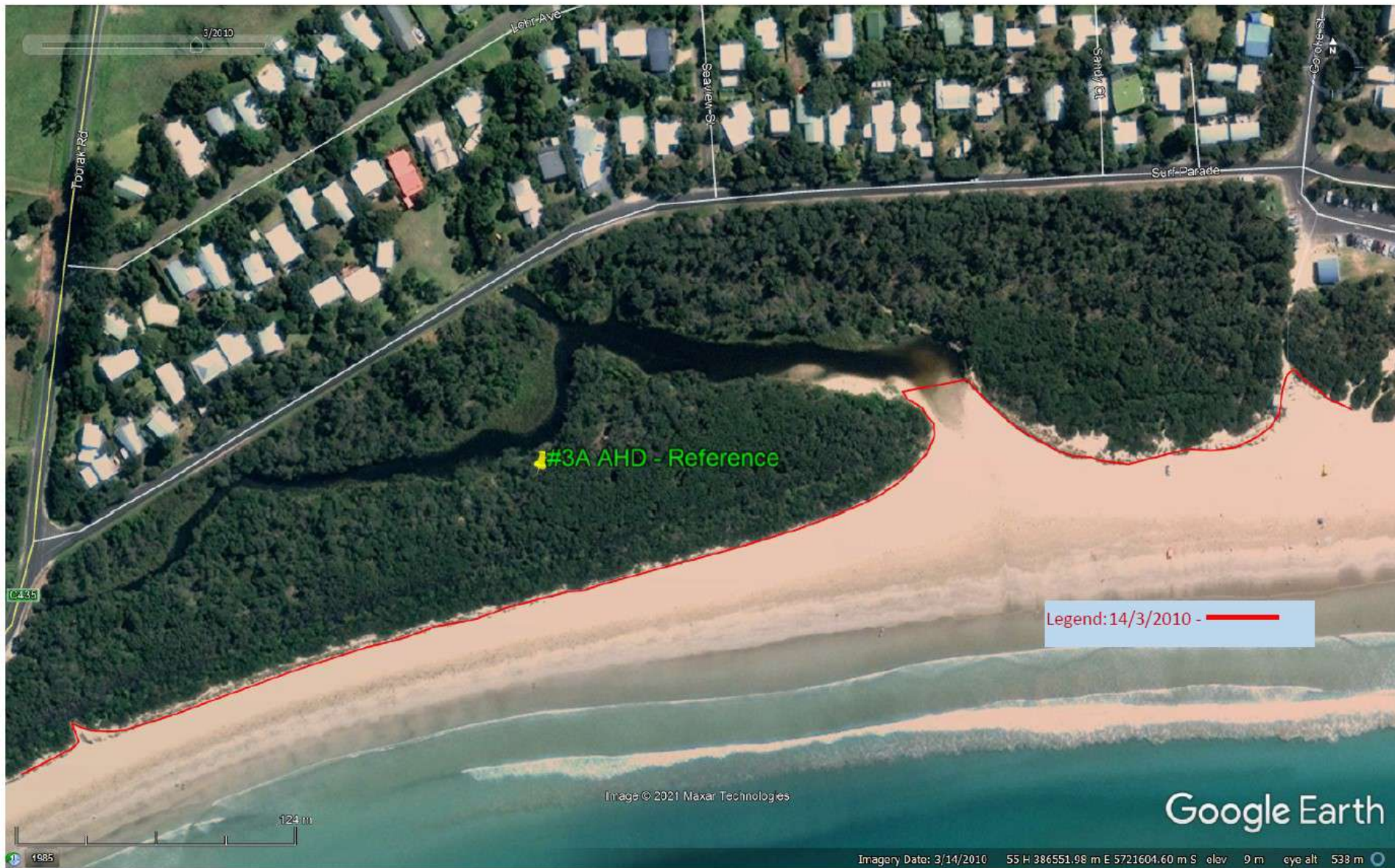


Figure 3 Annotated Google Earth image of the Wreck Creek coastline (SLC to Eastern end of Rock Wall) 14/3/2010

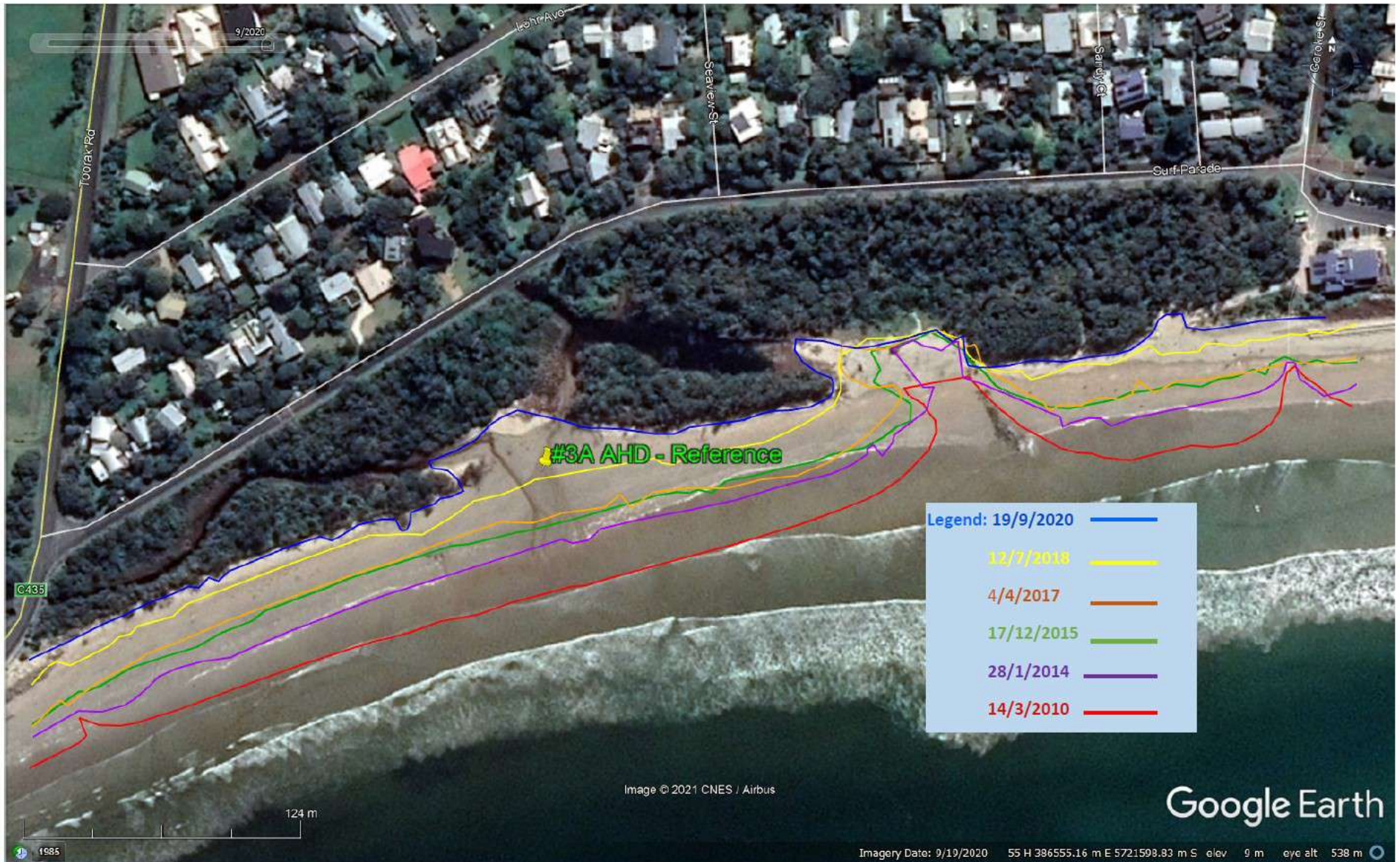


Figure 4 Annotated Google Earth image of the Wreck Creek coastline (SLC to Eastern end of Rock Wall) 7/12/2020



*Vegetation Loss: From 14/3/2010 to 19/9/2020 is approximately 2.8 Ha between the SLC and eastern end of the rock wall to the west.*

Figure 5 Annotated Google Earth image of the Wreck Creek coastline (SLC to Eastern end of Rock Wall) showing Vegetation Loss from 14/3/2010 to 19/9/2020



Figure 6 Annotated Google Earth image of the Wreck Creek coastline (SLC to Eastern end of Rock Wall) showing Dune Loss from 14/3/2010 to 19/9/2020

#### 4.0 OTHER OBSERVATIONS

The revegetation of the remaining dune between the Surf Club building and the sand-filled geotextile wall appears to have been at least partially successful (refer photographs in Appendix A). SGCS supports Bass Coast Shire plans to supplement the initial plantings with Spinifex in late Autumn/early Winter 2021.

It is recommended that additional sections of dune be revegetated as part of an active dune management program. The active dune management program should also consider the possibility of extending the trial sections of wet sand fencing, as well as dune renourishment. SGCS has identified two priority sections of coastline that require active dune management during 2021 (refer Appendix B). The dune management program should be designed to try and 'hold the line' until the outcomes of the Inverloch Coastal Hazard Assessment/RaSP/Cape to Cape Resilience Project processes are ready to be implemented.

At the eastern end of the Surf Beach, the south-easterly sand spit has begun to re-form off Pt Norman, most likely due to the main channel into the Inlet having moved back closer to Pt Norman, with reinstatement of the hydraulic groyne effect at Pt Norman (as described in detail in our Inverloch Coastal Resilience Project report and the Coastline in Crisis documentary). This has resulted in the rock shelf at Pt Norman having been covered in sand. A forthcoming report prepared for SGCS by Emeritus Professor Rodger Tomlinson, Foundation Director of the Griffith Centre for Coastal Management, analyses the link between changes at the entrance to Anderson Inlet and Inverloch Surf Beach erosion.

A channel has formed between the Abbott Street Lagoon and the ocean, and the Pt Norman-Pt Hughes sand barrier (as described in our ICRP report) has receded due to wave action in the Inlet. It is possible that sand eroded from the sand barrier has added to the sand spit that has formed off Pt Norman.

There is also evidence of coastline recession adjacent to Pensioner's Point, with the rock shelf at that location visible at low tide.

## 5.0 KEY FINDINGS – FEBRUARY 2021 UPDATE

The vegetated dunes behind Inverloch Surf Beach have receded by between 60 to 70 metres since 2013, while the coastline at Pt Norman has receded by 80 metres since beach monitoring commenced in 2018.

With protection works having been installed in front of the Surf Club and at the Cape Paterson Road/Toorak Road intersection, the most vulnerable, unprotected locations on the Inverloch Surf Beach continue to be at Wreck Creek and Flat Rocks:

- At Wreck Creek, west of the Surf Club, the August and September 2020 storms increased the width of the new opening to the ocean to around 80 metres, with associated vegetated dune recession at this location of approximately 30 metres. The remaining dune width between the creek and the ocean now varies between 2-5 metres. Without protection, and if the current general Wreck Creek coastline rate of recession (7 metres per year) continues, further breaches are likely to occur within the next 6 months, resulting in additional loss of dune vegetation and threatening the ecological values of the Wreck Creek system itself (refer Appendix B of our July 2020 Monitoring Report for details). This would also leave Surf Parade and adjoining residences vulnerable.
- At Flat Rocks, the additional 0.8 metres of coastline recession has led to the loss of several mature Coast Banksia Woodland trees, with the remaining trees increasingly vulnerable to undermining within the next 18 months without protection. Loss of the remaining Coast Banksia trees would leave the adjacent section of Cape Paterson Road at risk.

These updated monitoring results support the findings and recommendations that SGCS presented in its 'Inverloch Coastal Resilience Project Report' released in August 2019 and our 'Coastline in Crisis' documentary of May 2020 ([www.sgcs.org.au](http://www.sgcs.org.au)). As well as providing further input to the long-term planning for the Inverloch coastline, the analysis highlights the need for an active dune management program to be implemented beyond the Surf Club and Cape Paterson Road sites while the Victorian Government's Inverloch Coastal Hazard Assessment / RaSP/ Cape to Cape Resilience Project processes continue. High priority management actions include regular dune renourishment, as well as consideration of additional dune revegetation, extension of the trial sections of wet sand fencing, improved signage to better control activity on the dune faces and more effective management of beach access tracks. Such short-term measures will be necessary to avoid irreversible changes to coastline values over the year ahead.

The possible link between operation of the Cape Paterson Road rock wall and the accelerating coastline recession that occurred along the Wreck Creek section of coastline during 2020 strengthens the imperative for active dune management to be undertaken during 2021 and beyond.



## 6.0 CONCLUSIONS AND RECOMMENDATIONS – FEBRUARY 2021 UPDATE

1. Coastline recession along the Wreck Creek section of Inverloch Surf Beach is accelerating and, if the rate of coastline recession recorded over the monitoring period (August 2018 to December 2020) is maintained or exceeded, the remaining dunes at this location will most likely be removed within the next 6 months. Removal of the remaining dunes would not only result in the loss of the ecological values of the Wreck Creek system, but would leave Surf Parade and adjoining residences vulnerable.
2. The remaining mature Coast Banksia Woodland trees at Flat Rocks are in varying degrees of vulnerability, with more than 25% of the stand already having been undermined and swept away by coastline recession since 2013. If the rate of recession is maintained or accelerates, the majority of the remaining Coast Banksia trees will be lost within the next 18 months. Removal of the mature Coast Banksias and associated understorey will leave Cape Paterson Road vulnerable to undermining adjacent to Flat Rocks.
3. With the outcomes of the Inverloch Coastal Hazard Assessment/RaSP/Cape to Cape Resilience Project processes unlikely to be implemented within the next 2 – 3 years, active dune management is urgently required to strengthen the buffer provided by the remaining dunes in the two priority protection zones of Wreck Creek and Flat Rocks (refer Appendix B for details). Recommended active dune management actions include regular dune renourishment, dune revegetation, rationalising of access tracks, enhanced signage and consideration of extending the trial sections of wet sand fencing.
4. Changes to the shape of the Pt Norman-Pt Hughes sand barrier have been detected and further monitoring is recommended, particularly in the vicinity of Pensioner's Point.
5. Based on the analysis of weather conditions undertaken over the monitoring period, late summer/early autumn and late spring/early summer represent the times when the coastline is most vulnerable to recession. Short-term protection measures (including dune renourishment) need to be planned for these periods, until such time that the outcomes of the Local Coastal Hazard Assessment/RaSP/Cape to Cape Resilience Project processes are known.
6. With the acceleration of coastline recession that is occurring west of the Surf Club, drone monitoring surveys being undertaken under the Victorian Coastal Management Program need to be extended to cover the coastline between Flat Rocks and the Surf Club. To date, only one drone survey has been undertaken along this section of coastline (in August 2020). Regular drone surveys are currently flown east of the Surf Club.

**APPENDIX A - Coastline Impacts July – December 2020**



Wreck Creek coastline - looking east from CPR rock wall, 23 August 2020



Wreck Creek – at old creek opening, 23 August 2020



Wreck Creek coastline recession and vegetation loss, 23 August 2020



Coastline recession at Flat Rocks – eastern side of new rock wall at boat ramp, 23 August 2020



Wreck Creek breakthrough, 27 August 2020



Wreck Creek coastline recession and vegetation loss, 27 August 2020



Coastline recession 50 metres west of CPR rock wall, 28 August 2020



Coastline recession at western end of CPR rock wall, 28 August 2020



Coastline recession and vegetation loss at Flat Rocks - east of boat ramp, 28 August 2020



Vegetation loss at Flat Rocks - east of RACV entrance, 1 September 2020



Coastline recession at Flat Rocks - western side of new rock wall at boat ramp, 2 September 2020



Flat Rocks coastline recession at 7 September 2020



Wreck Creek breakthrough at 14 September 2020



Flat Rocks Coastline Recession at 28 September 2020





Wreck Creek breakthrough at 8 October 2020



Pt Norman reef sand bank at 31 October 2020



Dune recession at Surf Club in early December 2020



Surf Club sand bag wall and dune revegetation at December 2020



Dune revegetation at Surf Club at December 2020



Flat Rocks vegetation loss at December 2020



**Undermined Coast Banksias at Flat Rocks in early December 2020**



**Mature Coast Banksia at Flat Rocks in early December 2020**



Undermined Coast Banksias east of Flat Rocks boat ramp in early December 2020



Aerial view of Wreck Creek breakthrough – July 2020



Aerial view of Wreck Creek breakthrough – July 2020

**APPENDIX B - Priority Protection Zones**





**Priority Protection Zones Inverloch Foreshore**

(note: priority protection zones have been added to one of the series of maps of Ecological Vegetation Classes prepared by Oates Environmental Consulting (2018))