

Technical Officer Report PFCG AGM, 7PM 28th September 2023



The Port Fairy Coastal Group has been very successful in providing local and state governments with timely data on beach sand movement but some years ago, it was recognised that components of our regular beach report were not meeting the needs of recreational beach users.

Idea's for a simple tool that would describe the beach status at a glance have been around since a prototype was trialled in 2018.

This report details the development and theory of operation of the current Quick Summary Table.

The Beach Monitoring Process

- Beach Monitoring Team measures sand height
 - Using Builder’s laser level and fixed elevation references
 - Using the latest drone mapping technology
- Measurements copied into a Port Fairy spreadsheet
 - Separate spreadsheets for East and South Beaches.
- Beach Profile charts produced and analysed
- Charts and other relevant data published
 - Sent to Moyne Shire and PFCG Committee
 - Published on pfcg.org web site

Beach Monitoring to measure sand levels, whether using a builder’s laser level or the latest drone mapping technology is only the first step in reporting the beach condition.

Communication of the current beach status to those who need to know and other interested parties is also a major part of the process.

We have been very successful in supplying coastal manager’s and engineers with tables, 3D images and profile charts but have not had a system that conveys a simple message about the sand level for non technical beach user’s.

The beach report of the latest monitoring needs to be timely, accurate and informative for both those with coastal management responsibilities and the ‘locals’ using the beach.

A beach report is based around sand height profiles across the beach and while these are scientifically accurate, the chart of a beach profile demands close inspection to work out what is actually happening on the beach. Coastal managers can cope with the complexities of charts and tables but technical reports are of little or no value to the recreational beach user.

A different approach was needed.

The Backshore / Foreshore Table.

This table is Read Only. To change data in this table, go to the (Transverse) **Post Profile** Tabs and select the required dates only in columns L, M and N.

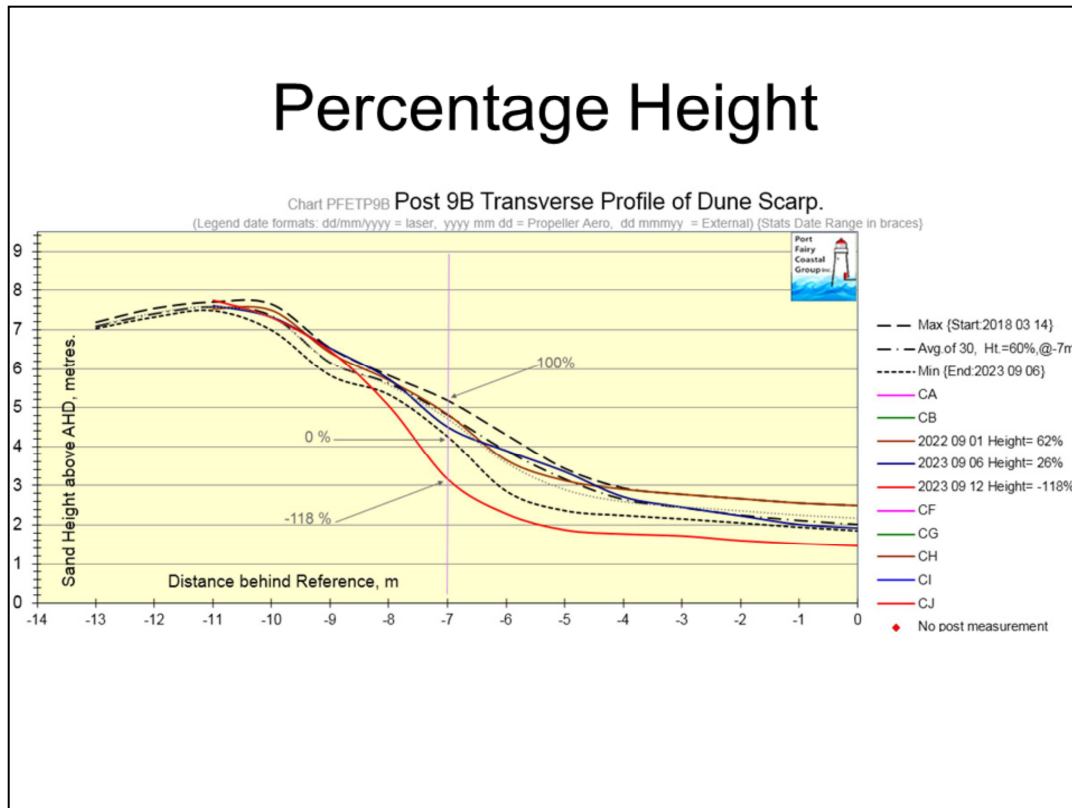
| Beach Sand Height Summary for December 2017 | | | | | | | | | |
|---|---|---------------|---------------|----------------------------|---------------|---------------|--|---------------|---------------|
| Post | % Height of sand at Backshore | | | Actual Dates for each post | | | % Height of sand at 30m Foreshore | | |
| | December 2017 | November 2017 | December 2016 | Current | Last Mnth | Last Yr. | December 2017 | November 2017 | December 2016 |
| 1 | 22 | 31 | 42 | 17/12/17 | 22/10/17 | 10/12/16 | 3 | 52 | 85 |
| 2 | 69 | 54 | 88 | 17/12/17 | 22/10/17 | 10/12/16 | 35 | 53 | 86 |
| 3 | 100 | 90 | 75 | 17/12/17 | 22/10/17 | 10/12/16 | 11 | 24 | 89 |
| 4 | 98 | 98 | 86 | 17/12/17 | 22/10/17 | 10/12/16 | 37 | 29 | 71 |
| 5 | 100 | 83 | 71 | 17/12/17 | 22/10/17 | 10/12/16 | 51 | 22 | 66 |
| 6 | 90 | 96 | 83 | 17/12/17 | 22/10/17 | 10/04/16 | 73 | 46 | 60 |
| 7 | | | | | | | | | |
| 7.5 * | | | | | | | | | |
| 8 | 93 | 95 | 83 | 17/12/17 | 12/11/17 | 10/12/16 | 75 | 57 | 42 |
| 8.5 ** | | | | | | | | | |
| 9 | 44 | 20 | 34 | 17/12/17 | 22/10/17 | 10/12/16 | 72 | 41 | 44 |
| 10 | 56 | 52 | 67 | 17/12/17 | 22/10/17 | 10/12/16 | 70 | 60 | 72 |
| 11 | 100 | 93 | 61 | 17/12/17 | 22/10/17 | 10/12/16 | 52 | 64 | 51 |
| 12 | 98 | 84 | 82 | 17/12/17 | 22/10/17 | 10/12/16 | 23 | 65 | 47 |
| | Backshore (at the Post) | | | Column N date | Column M date | Column L date | Foreshore (30m seaward of post) | | |
| 0 | Sand level is at its lowest recorded height | | | | 45, 50, 55 | | Height is below the average history value | | |
| 100 | Sand level is at its highest recorded height | | | | 45, 50, 55 | | Height is above the average history value | | |
| | This is the actual date of measurement for this post and is not the same as | | | | 45, 50, 55 | | Height equals the average history value | | |

Discontinued in 2018, the Backshore / Foreshore table was our first attempt at presenting sand height information without using a chart.

The table was of some use in writing a beach report but the fact that words needed to be written to complete the explanation meant that the table was not the complete answer.

However, the table pioneered the concept of a 'percentage height' which uses the history of measurements at each point as a reference, rather than the absolute reference of the Australian Height Datum. The percentage height of a measurement is calculated from the lowest and highest historical heights at that point.

Calculation of percentage height is explained on the next page.



Percentage Height is derived from all of the profile measurement history from April 2013 onwards.

At every horizontal measurement point, the minimum recorded sand height is taken to be zero percent and the maximum recorded height at that distance as one hundred percent.

For new low sand levels, the percentage height becomes negative. New high sand levels are shown as values greater than one hundred percent.

In the profile chart above for post 9B, (Behind post 9 and up the face of the dune) inspection of the profiles determines the horizontal distance behind the post that will provide the most relevant data about this beach location. In this case a distance of -7 metres was chosen. There are rules about factors determining how to select the distance in the profile to use in the percentage height calculation. These rules are discussed later.

Note the vertical line drawn upwards from the -7m distance. Where this intersects the Minimum and Maximum charts, the points are calculated as zero and one hundred percent height respectively. Then where the current measurement intersects the -7m line, its percentage height is calculated relative to the zero and one hundred percent positions.

The percentage height is recorded in the legend of each profile chart when the date of that measurement is selected on the Chart page of the PF spreadsheet.

Percentage heights are calculated for every profile date selected on the Chart page for each post.

The horizontal distance where this height is calculated is set in the Control Panel for each post in the PF spreadsheet. It is one of the Control Panel variables that can be changed at any time.

Sign convention on profile charts.

Standing on and facing along any Port Fairy beach with the sea on your right hand side, distances to the right of the post are positive while distances to the left of the post are negative. This convention is selected as it conforms to the horizontal axis labels used in the charts derived from the spreadsheet data.

The Elevation axis (Metres) on a Profile Chart is relative to the Australian Height Datum; sand elevations below the datum are negative values.

The Quick Summary Table (QST) on the following page is based on the values of percentage height determined from the profile charts for East Beach.

The Quick Summary Table

| Quick Summary Table for East Beach | | | | | | |
|--|------------------------------------|------------------|---------------|--------|-------------------------------|----------|
| Percentages of sand height vs historic maximum (100%) and minimum (0%) | | | | | | |
| PFCG ID | Nearest Physical Location | Last Measurement | Average % Ht. | Recent | Previous | 12 Mnths |
| 10 / 0 | West of Parks Vic Car park | 12 Sep23 | 57 | -3 | 14 | 50 |
| 9b / -7 | Dune Face behind Post 9 | 12 Sep23 | 60 | -118 | 26 | 62 |
| 9 / 0 | North East of Tip site | 12 Sep23 | 43 | -36 | 22 | 94 |
| 8.1 / 12 | General waste tip site + 22m NE. | 12 Sep23 | 64 | 49 | 36 | 51 |
| 8 / 15 | General waste tip site | 12 Sep23 | 61 | 50 | 28 | 45 |
| 7 / 5 | South West of Tip site | 12 Sep23 | 47 | 15 | 39 | 55 |
| 6 / 20 | North East end of Night Soil site | 12 Sep23 | 58 | 65 | 71 | 53 |
| 5 / 25 | South West end of Night Soil site | 12 Sep23 | 59 | 65 | 73 | 40 |
| 4 / 15 | Beyond the last house | 12 Sep23 | 34 | 28 | 43 | 32 |
| 3 / 5 | Manifold St. | 12 Sep23 | 71 | 29 | 45 | 58 |
| 2 / 15 | East Beach Car Park, Hughes Ave. | 12 Sep23 | 58 | 41 | 52 | 21 |
| 1 / 20 | Little East, Rogers - Lydia Place. | 12 Sep23 | 66 | 45 | 69 | 100 |
| Legend | Out of Date | < 20% | 20%-60% | >60% | ~ Dates: 12 Sep 06 Sep Sep 22 | |

Recently we introduced a new way to report the sand level results from beach monitoring.

In order to be more effective than a whole series of profile charts, some type of graphical display was proposed.

Objective #1 for the Quick Summary Table (QST) was to provide a summary of the sand levels at a glance for each section along the beach.

Dividing the table into rows of beach locations and columns of data for the most recent measurement, the 'traffic light method' using Red, Green and Amber gives an instant display of the approximate sand height at each location. For the casual recreational user, this is all they want to know. From personal experience of people asking me "How is the beach"? I suspect they are only looking for a one word answer.

For those who need a little more detail, other columns provide similar information about the **previous** measurement and a third column also applies the colour coding to the data from **about one year ago**.

Objective #2 for the QST was to have readily available supporting data for the most recent, previous and historic measurements.

Each of the coloured blocks also shows the percentage height previously calculated from the profile chart for each of the three time periods. Adjacent to the 'Recent' column are the average percentage heights of all of the records from April 2013 which can be compared to the individual readings at that location.

The QST also contains some information that is useful for engineers:

- * A column listing the PFCG ID for each measuring location and the distance selected at that location to calculate the percentage height.
- * The exact date most recent measurements were taken.
- * The date when the next measurements are due (Currently 42 days later). After this date expires, colours in the 'Recent' column turn Grey.

The QST has twelve rows, one for each location of the twelve measuring posts. It also has its own Control Panel where individual monitoring points can be selected. As no measurements at posts 11 and 12 have been made since March 2023, two special monitoring's known as 8.1 and 9B that highlighted erosion after the September storm event were substituted in place of old data for posts 11 and 12.

Individual control of the table display allows all of the monitoring points to be displayed in geographical order to assist with situational awareness.

Getting the most from the QST

- Look at the colours
 - Find locations that are **Red** or **Green**
- Compare **'Recent'** column with **'Previous'**
 - See the change from last measurement
- Compare **'Recent'** column with **'Average'**
 - See the difference from historical average

Look at the colours: Red indicates low sand levels, Green is for high sand levels and Amber covers the levels in between. The break points between these colours are adjustable in the QST tab of the PF spreadsheet and are nominated in the Legend at the bottom of the Quick Summary Table.

Compare the Recent height with the Previous height to see how the sand level is changing. Also compare with this time last year; if its different, further proof that seasonal changes are less predictable. Scientists have noted that cyclic changes in sand movement have become less cyclic and more random.

Compare the percentage height with the average percentage height to provide more detail about the current status of the beach.

A positive number in a Red square is usually not a concern but if the number is negative, it indicates that a new low sand level has been detected and further consideration of all the data at that point should be investigated, usually by referring back to the profile chart.

If any of the Recent colours have turned Grey, it indicates that a new measurement is due, however you can still see the percentage height and determine what the condition was at the date of measurement but be aware this condition may not be typical of the current beach status.

The QST is regularly updated on the PFCG web site after each VCMP drone mapping is processed or any laser measurements are carried out so make www.pfcg.org.au your link for information about Port Fairy beach status.

Rules used to select distance

- Sand loss has precedence over sand gain
 - Sand flow from Backshore to Foreshore may need to be discounted
 - Select the backshore value if it lost sand
- Profiles with large range more variable.
 - More likely to need distance adjustment
- Profiles available for 'Recent' and 'Previous' measurements.
 - History needs to be available
- Dry posts in secondary dunes are not always representative
 - After a storm surge, this may change
- The measurement must be from a repeatable area
 - Profiles through the WEDs are variable and cannot be used.

The purpose of the distance setting is to select that part of the beach to calculate the percentage height that shows a typical response to sand movement.

Sand loss (Bad news) has precedence over sand gain.

Profiles that have a large range in elevation (The range envelope) over most of the profile will be more likely to require a change of the percentage height distance.

There must be a Recent and a Previous measurement available, otherwise there cannot be a comparison.

Where there is loss in one part of the profile and accretion in another part, set the distance to record the Loss unless there is a special cause identified for the loss.

Dry posts that are located high on a secondary dune should not normally be included. For these locations, a percentage height distance of >10m - 15m is more typical. An exception is when only a few readings are available and a large change at the post has been identified.

Profiles through the Wave Energy Dissipation structure (WEDs) are variable and this area between the rocks cannot give reliable sand heights.

Just for the Record!

- The Port Fairy East Beach spreadsheet has:
 - 7882 readings in history
 - Average of more than 7 readings / profile
 - Fourteen active reference points
 - 4.5 km of beach & dunes in survey area

These values were counted at the time of publication and increase with each monitoring or mapping session.

They recognise the immense amount of time our members have spent in measuring Port Fairy's beaches. Without them, this report would not exist and without the WEDs and the sand fences, both tip sites would have been exposed to the beach.

How to ..?



www.pfcg.org.au

You can find the latest QST or a copy of this report on the Port Fairy Coastal Group web site