Coastal Erosion at Stockton and Harrington

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ABSTRACT

The Pacific Ocean… now that's a boundary! A boundary that seems very keen to encroach for a variety of reasons. Coastal erosion along beaches in New South Wales and indeed across Australia remains a significant problem requiring attention. In some cases, the solution to mitigate erosion may be simpler than initially anticipated. This paper progresses and extends on concepts presented in the author's APAS2023 paper "Coastal Erosion: An "Elegantly Simple Solution" at Harrington". It then examines the coastal erosion situation off Stockton Beach in Newcastle following an informal request from Surveyor John McNaughton, Emeritus Lord Mayor of Newcastle. This paper compiles aerial imagery and maps of Stockton and provides commentary and suggestions on a cost-effective solution to the long-term amelioration of erosion in front of Stockton township.

KEYWORDS: *Beach erosion, Harrington, Stockton, Hunter River*.

1 INTRODUCTION

The Pacific Ocean… now that's a boundary! A boundary that appears to be very keen on encroaching for a variety of reasons. Coastal erosion along beaches in New South Wales (NSW) and indeed across Australia remains a significant problem requiring attention. In some cases, the solution to mitigate erosion may be simpler than initially anticipated. For example, at the APAS2023 conference, Calvin (2023) proposed an "elegantly simple solution" to address the continuing problems of siltation and beach erosion within the entrance of the Manning River at Harrington. This proposal has the potential to dramatically reduce coastal erosion in at least one of the coastal erosion hot spots in NSW, at a fraction of the cost of other heavily engineered solutions.

Following the APAS2023 conference, the author presented the same findings to the Mid Coast chapter of Engineers Australia at Harrington, which included a walk out on the Harrington wall to see the flows discussed in the paper. A local journalist reported this meeting in the Harrington TellEverybody newsletter. As a result, MidCoast Council initiated an investigation into breaches of the Code of Conduct. Similar to the investigation of the late Councillor Peter Epov that led to the Supreme Court case *Epov v. Midcoast Council* and the Golden Turd awards, this investigation was unfounded.

MidCoast Council has since released and adopted a Coastal Management Program (CMP) in accordance with the Coastal Management Act 2016 (MCC, 2025). It includes the coastline from Crowdy Headland, including Harrington and south to Wallabi Point, depicted as the eroding coast subject of Calvin (2023). The CMP references but ignores all points made in the APAS2023 paper and comes up with a "do nothing" result to address the erosion cycles depicted. As a result, the author remains deeply concerned that the coastline of the Manning

will remain at risk from the failed harbour works at Harrington.

At the APAS2023 conference, Surveyor John McNaughton, Emeritus Lord Mayor of Newcastle, voiced his concerns about the current beach erosion and rock wall construction at the village of Stockton on the northern shores of the Hunter River port. He informally requested that the author take a look around the Stockton erosion site and provide any commentary about what has become a major erosion issue for the people of Stockton and Newcastle.

This paper first addresses the fallout from the APAS2023 paper, outlining the Code of Conduct investigation and its outcome and providing some commentary on the exhibited CMP document and the background information used therein. It then investigates the current beach erosion and rock wall construction at the village of Stockton and provides commentary on the situation. The Stockton investigation included Parish mapping, recent aerial photography and commenting on what can be seen in or derived from these images. The commentary also formulates perhaps an "elegantly simple solution" for the long-term stability of the beaches fronting the village of Stockton and the southern portions of Stockton Beach.

2 FALLOUT FROM THE APAS2023 PAPER REPORTING ON HARRINGTON

2.1 Council Investigates Code of Conduct Breaches

The Engineering Director told the author to expect an interview with a HR consultant about some investigation into work. A Zoom meeting was arranged with a HR consultant from Newcastle. The author was joined by a union delegate from the Local Government Engineers Association (LGEA), and the first item was for both to email their compliance to not discuss the investigation until it was concluded. The presence of the union delegate thankfully tempered somewhat the very aggressive interview technique. When asked several times "What is it that I'm supposed to have done?", the answer was "I'm investigating you for breaches of the Code of Conduct." – without any further information. Questions like "Is the erosion of the coastline part of your job description?" were fired – "Erosion of 18 km of coastline is everybody's concern at Council." "Did Council approve your paper?" – "I shared the paper with just about everybody in the Engineering section of Council from the Director of Engineering, Executive Director, Managers of Transport Assets, Natural Systems and all engineers and surveyors in our section including the guy sitting beside me." Coastal erosion affects all manner of engineering, including roads and sewer assets that are being threatened. All reviewers provided positive responses to the draft paper prior to publication.

Not being allowed to discuss the matter for months on end was stressful, particularly being unaware of the specific accusation. For the first time in his working life, the author sought counselling from the Employee Assistance Program (EAP) for ways to deal with the stress. This free counselling service really can assist and is worthwhile if you are stressed at work. Eventually, Council's Governance Manager met with the author. A thick report had been written (not available to the author), and clearance of Code of Conduct breaches was given. The excessively aggressive interview was noted as well as the lack of information about the specifics of the accusation(s). The Governance Manager, who had been on leave at the start of the investigation, claimed that the author had been advised by letter. When informed "that didn't happen", he realised that the Council's own Governance section had not followed their own policy.

Eventually, the Governance Manager found a section in the report and advised that the author had written a paper contrary to the "Position of Council" relating to resolution 62/2021 (Ordinary Council Meeting on 24 March 2021). To date, the author has not received any documentation about this affair.

2.1.1 Investigation into "Position of Council" Related to APAS2023 Paper

Resolution 62/2021 at the Ordinary Council Meeting on 24 March 2021 states "*that the report be noted and that any submissions received by Council regarding the Manning River Taskforce report be forwarded on to the Local Member and the Manning River Taskforce"* (MCC, 2026).

Receiving and noting a report hardly constitutes a "Position of Council". However, upon reading the report in question, the author discovered that MidCoast Council's General Manager, former Acting General Manager of North Sydney Council only a couple of years prior, was considered the "local knowledge holder" for the Manning River Taskforce looking into Harrington Harbour and the adjoining coastline – something all those engineers that reviewed the APAS2023 paper failed to mention.

Reading further back into Council's meeting minutes, a prior resolution was uncovered that essentially accepted the outcomes of the Manning River Taskforce report sight unseen. Resolution 375/2020 at the Ordinary Council Meeting on 16 December 2020 states that Council (MCC, 2026):

1. Supports the expert taskforce and associated investigations, its processes and scientific rigour and will use the taskforce recommendations to appropriately inform our Old Bar Manning Point CMP.
2. Calls upon our state and federal members to proactively obtain sufficient funding for any actions recommended by the taskforce so that there is no burden or ongoing burden on MCC.
3. Publicise the work undertaken to date for the CMP.

So, in essence, it appears that Council decided in their December 2020 meeting to inform the actions of a future CMP based on the outcomes of a report, about potential harbour works, that they would not even get to see until March 2021. Apart from being extremely trusting, this seems to be very unusual even for Council. Particularly, when considering the impact the 100-year-old failed harbour works appear to have on the erosion of an entire 18 km section of coastline for the last 60 years.

2.2 Council's Coastal Management Program and the APAS2023 Paper

The APAS2023 paper (Calvin, 2023) is a primary resource document, providing an eyewitness account of the most recent erosion event (Figure 1). It provides:

1. An explanation of the erosion cycle as observed and photographed. (The absence of direct observation or local expertise may explain why earlier engineering reports overlooked the connection between the failure of harbour works at Harrington, dramatic changes in natural coastal alignment and the resulting erosion.)
2. Historic plans showing how the coastal alignment performed prior to installation of the Harrington harbour works (i.e. it remained constant).
3. Photographic records of how the coastal alignment has performed since the harbour works were installed (ca. 1900) and the boating channel dredging was abandoned (ca. 1950).

4. Observations about entrance location and sand influx into the two Manning estuaries at Harrington and Old Bar.
5. A comparison of the design plans with what has been built, showing that no rock walls currently in Harrington are built in accordance with the design plan.
6. A low-cost, "elegantly simple" solution that may prevent the erosion cycles from continuing into the future.
7. The conclusion that a "do nothing" option is not an environmentally valid option.

Overlay of the pre-construction maps from 1862, 1879 and 1888 all conform with the conglomeration of lines making up the position of the natural coastal alignment in Figure 1. That conglomeration of overlays coincides with Council's Geographic Information System (GIS) linework dotted in black. Images from 1965, 1997 and 2016 do not conform with the natural coastal alignment.

Figure 1: Compilation of tracings of maps and images in the vicinity of the Harrington estuary (1965-green, 1997-red and 2016-dark blue represent erosion cycles among the trees; all other overlays follow natural coastal alignment and Council's GIS linework dotted black).

2.2.1 APAS2023 Paper Findings

In summary, the APAS2023 paper (Calvin, 2023) shows:

1. Erosion of the coast from Harrington all the way to Wallabi Point (the next headland south) is generated by the failed harbour works at Harrington. In conclusion: "*This paper has shown that the greatest anthropogenic influence on the river entrance and very likely on the coastline compartment from Crowdy Head to Wallabi Point is the unfinished rock wall, left incomplete north of Manning Point by PWD in 1904.*"
2. Prior to the installation of the failed harbour works, the beach and natural coastal alignment around the estuary was constant and remained stable. This was mapped in 1862, 1879 and 1888 (see Figure 1).

3. The effect of the harbour works on the natural coastal alignment can be seen in aerial photographs of 1965/69, 1997 and 2011 to 2016 inclusive (see Figure 1).
4. The difference between the design plan for Harrington harbour works and what has actually been built.
5. The harbour works by the Public Works Department (PWD) around 1900 at Harrington were not constructed in accordance with the design plans provided by Sir John Coode, the same plan still being referenced in recent reports (DPI, 2018).
   5.1 No wave trap beach has been installed (i.e. a separate break wall and training wall is a feature of most successful break wall trained entrances).
   5.2 Instead, PWD built a rock wall, "north training wall 2,900 m" long down the middle of the river.
   5.3 This north training wall effectively halved the waterway area of the bottom end of the estuary and placed additional stress on the back of the important barrier beach on the south side of the river. A jet of water at "the gantry" can be seen in the sand channels, emanating from a hole in this wall. This jet of water further destabilises the estuary.
   5.4 The important southern training wall (designed to protect the barrier beach) and break wall was abandoned well short of the design length, effectively failing to protect the important barrier beach noted by both designers Sir John Coode and C.W. Darley.
   5.5 One might consider that the builders blew the budget on unnecessary work not on the plan and failed to protect the natural environment (i.e. the barrier beach).
6. The beach erosion events at Old Bar started in earnest around 1960 sometime after the PWD abandoned maintenance of the shipping channels at Harrington. This allowed unfettered interaction of the river with the incomplete rock wall. NB: Pilot services were withdrawn in 1961. Parish plans and Deposited Plans (DPs) in Old Bar provide evidence of the location of the existing natural beach profile. Reports indicate the beaches were stable 1940-1965 (section 7.8 in PWD, 1990). The Director Technical Services Report 49/96 (26 March 1996) indicates dune profiles remaining similar 1940-1965 and dramatic changes occurring in aerial photographs of 1972 and 1976, noting that "dune escarpment recession is on average 60 metres between 1965 and 1972" (Stone, 1997). This is consistent with the major erosion event recorded in the 1965-1969 aerial photographs at the tip of Mitchells Island, Manning Point and similar to that observed 2011-2016 (Calvin, 2023).
7. It is the rocks at the tip of the incomplete "south training wall 700 m" long (instead of 3,260 m long wall on Coode's plan) that cause the natural coastal alignment to shift 300 m landward.
8. This physical interaction of the river with the rocks causes erosion of the coast, not a theoretical notion of sand budgets related to historical quarrying and dredging of river channels. The coastal erosion generated mobilises millions of cubic metres of sand out of the stable dune systems, which then joins the littoral sand drift in the wave zone. The resulting attendant erosion creates the sand budget problem – this is a direct result of the interaction of the river with the incomplete southern wall.
9. Erosion of the beach all the way south to Wallabi Point is documented. The erosion occurs in a rolling fashion over several years as it tries to maintain connection to this shift away from the natural coastal alignment.

2.2.2 Council's Coastal Management Program (for the Next 10 Years)

The CMP was adopted by Council via resolution 2025/430 at the Ordinary Council Meeting on 10 December 2025 (MCC, 2026). The CMP (MCC, 2025) references the APAS2023 paper but fails to acknowledge any of the points made above in section 2.2.1. Council's CMP and "options assessment" as exhibited did not address how to prevent river flows from interacting with the incomplete abandoned southern rock wall, part of the failed (and failing) harbour works at Harrington. This would help maintain the natural coastal alignment of the area and ameliorate future erosion events. Given that coastal erosion is to be addressed in accordance with the Coastal Management Act 2016, this may be considered a significant oversight in the CMP.

A submission was made that clearly stated that the failed Harrington harbour works were at the crux of the erosion for the entire coastal compartment. Unfortunately, this was practically ignored. Instead, Council's CMP references and relies mainly on two other documents: "Erosion Analysis of the Manning Valley Coastal Sediment Compartment" (MHL, 2017) and "Manning River Entrance Investigations: Manning River Southern Breakwater Feasibility Study, Milestone 2" (DPI, 2018). The author of these documents is the Principal Engineer of Manly Hydraulics Laboratory (MHL), and DPI (2018) is a precursor to part of the Manning River Taskforce referred to in Council's resolution 375/2020.

MHL (2017) was initiated in 2015 by the photographic evidence contained in Calvin (2023). Greater Taree City Council's Engineering Manager at the time saw the photographic evidence of the beach erosion and called in the Principal Engineer of MHL. As a result, the MHL engineers took on a project to assess the information provided, which was managed by Council's Manager of Strategic Planning. When the first draft arrived in 2016, Greater Taree City Council's review panel was perplexed as MHL (2017) is based solely on a review of past engineering reports. It came up with a complex accounting of dredging, quarrying, and levelling of sand dunes as "anthropogenic sand sinks". It provided estimates of sand rounding headlands north and south to arrive at a complex sand budget equation (Appendix B of said report) in order to explain the beach erosion. Curiously, the report ignored the photographic or empirical evidence that prompted its creation.

Council's initial review noted that all listed quarries remain as unfilled holes, not containing beach sand, and therefore were not "anthropogenic sand sinks". The dredge hole at Harrington in front of Harrigan's Hotel, a favourite fishing hole, is still 10-12 m deep (note that the first boat survey of the Manning in October 1827 by Surveyor John Armstrong records a depth of 42 feet, or 12.8 m, in this location) and not filled with beach sand, again not an "anthropogenic sand sink". The sand budget equations should be amended accordingly. Council raised concerns that the dredge locations were too far (30-40 km) upstream – the nexus with beach erosion was at best tenuous. The early reports located the deposition of the dredged material to warn shipping of the new shoals in the river. These shoals were along the banks of the river, many still visible and marked for navigation today. As such, these dredged material volumes were not removed from the waterway and should not be included in the sand budget equations. One example in the list of dredge reports was a 40 m^3 excavation at Wingham wharf in 1982, located more than 47 km upstream of Harrington – the nexus of this small excavation as source of erosion on the beach was at best tenuous. It was considered that the data may have been included more to provide a current date, to be used in the budget equations, rather than something that caused erosion on the beach. The same applies for all three line items post 1926/27 in the dredge reports of Appendix B.

The "final" draft of MHL (2017) was an exact replica of the first. Curiously, there were no amendments to reflect the local knowledge information provided by Council's review panel. It appeared to be a report designed to absolve PWD and the failed harbour works from liability of causing the erosion for an entire length of beach and instead blaming Council-approved quarry developments, road construction, dune levelling and dredging for land development. Interestingly, the footnote on page 1 of the report explained how MHL was part of NSW Public Works...

Council considered that if the hypothesis developed by the report cannot explain the empirical photographic evidence supplied, then the hypothesis should be reassessed. The empirical evidence supplied should not be ignored. However, the authors of the report did not agree. Consequently, Council as the client insisted that the report be marked as "for internal working group discussion only – not for release." However, the very next report (DPI, 2018) repeated the findings of MHL (2017) as if it was completely reviewed and accepted.

Greater Taree City Council was merged with Great Lakes Council, Gloucester Council and MidCoast Water in 2016 to establish MidCoast Council. Many members of the review panel have since moved on. This regime change meant that the new parties dealing with the CMP were unaware of these concerns, deliberations and machinations, and failed to collaborate with other members still at Council. At 104 pages long, DPI (2018) is well written engineering prose by MHL's Principal Engineer, pointing out exaggerations and inconsistencies requiring a myriad of explanations beyond the scope of this paper. In contrast, at 50 pages long, Calvin (2023) provides many images and clear argumentation to explain the situation.

2.2.3 An Occam's Razor Review

This dilemma was discussed with an academic friend who wrote that "Occam's Razor rules!" Surveyors, not being particularly philosophical, needed a Google search. There were well over 14 pages of Google references to the 14th century philosopher William of Ockham whose principle is paraphrased as "of two competing theories, the simpler explanation of an entity is to be preferred." This philosophical razor advocates that when presented with competing hypotheses about the same prediction, and both hypotheses have equal explanatory power, one should prefer the hypothesis that requires the fewest assumptions, and that this is not meant to be a way of choosing between hypotheses that make different predictions.

When trying to collaborate with the Council officers working on the CMP, Occam's Razor was suggested as a methodology that might help Council define what is actually causing the erosion along this part of the coast. However, as they had already invested too much time in the document exhibited, they probably did not even see the two documents as competing hypotheses.

As a retired surveyor, the author remains concerned about the coastline at risk from "doing nothing" for the next 10 years as a result of the adopted CMP and feels powerless to affect any change other than to say "Look!" This section presents some thoughts or impressions of what an Occam's Razor analysis of these two competing hypotheses might look like. This is purely to record the information for future reference.

The two competing hypotheses are:
A) MHL (2017) and DPI (2018) authored by MHL's Principal Engineer.
B) Calvin (2023) and this paper, authored by a local registered surveyor.

It follows a non-extensive comparison of these papers with Occam's Razor in mind.

A1) Ignores the empirical photographic record provided at initiation (Appendix A, May 2015). Compiles significant data from dredge records, quarry records and several engineering reports, makes numerous estimates of sand migration around headlands to the north and south to create a complex sand budget equation (Appendix B). Concludes "*that past and ongoing dredging works and dune removal, superimposed on the dynamic natural system, have been the primary cause of the observed beach recession and long-term beach recession at Old Bar and Manning Point.*"

B1) Concludes "*that the greatest anthropogenic influence on the river entrance and very likely on the coastline compartment from Crowdy Head to Wallabi Point is the unfinished rock wall, left incomplete north of Manning Point by PWD.*" The photographic evidence provided shows:

- "*When the river entrance shifts to the south, it interacts with the unfinished south barrier bank rocks (see Figures 23-33).*
- *This interaction causes the beach alignment to shift westward 300 m to the northern tip of the incomplete south barrier bank rocks (see Figures 36 & 37).*
- *The remaining beach south erodes dramatically as it tries to maintain a connection to this new location at the rocks, now 300 m inland of its natural status (see Figures 38-41).*
- *Coastal littoral rainforests are destroyed (see Figures 27-35 and 42-44).*
- *The coastline south for 16 km to Wallabi Point appears to be similarly affected by this shift in the northern end of the beach alignment (see Figures 46-53).*
- *Archival aerial photographs show that there has been a cycle of this southerly shift in the river entrance, i.e. 1965-69, 1997-??, and 2011-22 and continuing (see Figures 54-58 and 62-65). This is consistent with the unstable nature of the recent erosion history of this beach.*
- *This fluctuation in the beach alignment causes erosion of the frontal dunes with mobilisation of over a million cubic metres of sand in this recent event. There is immeasurable damage to our coastline.*
- *The economic and environmental cost of this damage is not registered as part of any "do nothing" option in any of the studies listed above.*
- *This cause and effect is not mentioned in any previous studies. How did they miss it?*"

A2) Provides Sir John Coode's plan, the original design plan for the Harrington harbour works, labelled as Proposed Southern Breakwater Alignment 1889.

B2) Also provides the plan and notes that not a single rock wall at Harrington is built in accordance with Sir John Coode's plan (see Figures 11 & 12).

A3) Makes significant reference to anthropogenic dune levelling/flattening and construction works at Badgers Beach (30,000 to 100,000 m^3), Old Bar Beach near Racecourse Creek (60,000 to 80,000 m^3) and near caravan park (30,000 to 76,000 m^3) as if there were bulldozers knocking down and mining the dune systems. Highlights that anthropogenic dune levelling/flattening creates a negative in the overall sand budget equation, which is causing erosion of the beaches.

B3) Provides photographic evidence of dune levelling occurring, not as a cause of the erosion but as a symptom of the erosion. Shows that the erosion is caused by the 300-metre fluctuation of the natural coastal alignment, generated by the failed harbour works at Harrington. Dune levelling or flattening occurs because the erosion scarp, driven by the fluctuating natural coastal alignment, eats away the otherwise stable dune system. Estimates 1,600,000 m^3 of sand was

mobilised in the most recent erosion event commencing around 2011. This dune levelling or flattening is the erosion occurring, not generating the erosion.

A4) Makes unsubstantiated opinion statements, e.g. referring to the relocation of the gantry: "*While it has been suggested by others that this option may contribute to improving navigation of the entrance, MHL is of the opinion that the likely effects of relocating the gantry would only be small. The tidal prism of the back channel behind the gantry is small compared with that of the upstream main channel and hence flow rates through the gantry opening are expected to remain small and have limited influence on sediment transport within the estuary in comparison to other more dominant drivers. The processes primarily responsible for the southward migration of the entrance channel are the nearshore littoral sediment transport processes (dominated by wave action and tidal flow through the main channel), which are orders of magnitude greater in their influence than tidal influence of the gantry*." NB: Council used this quotation to dismiss the submission to the public exhibition of the CMP, all the while neglecting all commentary about erosion.

B4) Provides photographic evidence (see Figures 59-61) how the damming effect of the gantry flow causes meandering of the main channel tidal flow in the upstream channels. The main channel meander eats away at the barrier beach from the inside. This leads to the total collapse of 2 km of the barrier beach off the northern tip of Mitchells Island (see Figure 62). In short, the gantry flow destabilises the entire lower estuary. Concludes that there is a possible solution, which according to Engineer Bruce Collins in 1999 "*is elegantly simple and utilises existing structures without major works. The work involved in implementing this solution means that costs will be limited*." This includes:

- The evidence for the hydraulic energy, proposed to be redirected in the "elegantly simple solution", is found in the photographs provided.
- The sand plume in the backwater locates the gantry. The energy in the flow coming out of the gantry interacts with the river and forms flow channels through the sand shoals (can be seen in the images provided).
- Imagine how different those figures may look if these flow channels were relocated near the notch in the corner, rather than at the current gantry location.
- The construction should be performed while the proposed location is in quiet backwater. Waiting until this section is part of the full river flow will make the job much more difficult.
- The "elegantly simple solution" consists of three parts (see Figures 3, 4, 18 & 19), designed to impart downstream direction to the main stream of the river and maintain it against the northern training wall. The tidal prism of the much smaller lagoon maintains a channel against the littoral sand drift (see Figure 17).
- Regardless of how future interaction with the failed harbour works is achieved, "do nothing" is not considered a valid environmental option.

A5) Calculates the erosion has been occurring since 1889 or for 126 years in 2015 (137 years today), using this time period in the sand budget equations (Appendix B). Re-interprets source information to fit it into the above timeline of the sand budget hypothesis rather than rewriting the hypothesis to reflect the data provided. The source information is contained in report 49/96 (Stone, 1997) with the introduction: "*Greater Taree City Council has recently received up to date data from the Department of Land & Water Conservation detailing beach profiles between the southern end of Farquhar Inlet and Harrington Inlet along Mitchells Island. A total of 50 profiles have been taken in this region for the dates 1940, 1965, 1972, 1976, 1982, 1986 and 1993. The cross sections (refer to Figure 1), show sand movements and whether erosion or accretion has occurred over this time*."

MHL (2017) and DPI (2018) comment about Stone (1997): "*Southern section near Farquhar showed little change until 1972, when dune indicated to recede 60 m and lowered by 7 m between 1965-1972. These equate to 0.5-1 m/yr recession. SKP (1982) reported 1-2 m/yr dune barrier lost in 150 years.*" In contrast, report 49/96 (Stone, 1997) states: "*The profiles of 1940 and 1965 are generally similar, being high and rounded. The profile is dramatically changed by 1972, becoming very flat and lower in elevation (by up to 7 m). The dune escarpment recession is on average 60 m between 1965-1972.*"

The Department of Land and Water Conservation measured profiles of the dunes at a series of cross sections using photogrammetric methods, reporting 60 m of dune recession in 7 years (i.e. just over 8.5 m/yr over this period). These measurements recorded a significant erosion event around 1965, something SKP (1982) perhaps failed to recognise. It is unclear how many times these "re-interpretations" occur in A as a whole.

B5) The 1924 Harrington Parish map (LRS, 2026) shows the first interaction of the river with the incomplete northern wall, along with attendant adjustment of the natural coastal alignment, occurred ca. 1924, only 20 years after the northern wall construction was abandoned (and 102 years ago today). The 1932 Parish map shows significant recovery of the natural coastal alignment, likely a result of dredging the boat channel at the time and thus maintaining a channel directed to sea for shipping and not southward along the beach. The dredge spoil, likely dumped along the southern shore, potentially ameliorated erosion south along the beach. The erosion event linked to the 1924 Parish map only reached mid-way along Mitchells Island because of the channel dredging and deposition (Stone, 1997). Dunes along the southern shore of Mitchells Island remain high and rounded 1940-65, indicating that a natural dune profile still existed midway along Mitchells Island until after the 1965 imagery. NB: Channels depicted on these old Parish maps are also indicative of the power of the jet of water emitted from the gantry as discussed in B4 above.

Contends that the beach erosion at Old Bar commenced around 1960 after the dredging of boat channels at Harrington was abandoned and the river interacted with the failed harbour works long term (i.e. 66 years ago today). This is supported by:

- PWD (1990) indicating that the beach alignment is stable 1940-1965 and erosion significantly occurs post the 1965 aerial imagery.
- Personal communication with Christine Riddell (nee Sorby) who lived at the southernmost house in Lewis Street, Old Bar (now gone). In her youth, beyond the front yard of their house, were several dunes before you got onto the beach (i.e. a standard dune profile existed at south Old Bar prior to erosion in the late 1960s to early 1970s). Her father, a soil conservation officer and prolific correspondent, wrote on many occasions concerned about the undue erosion that was occurring in otherwise stable sand dunes in front of his house.
- Report 49/96 (Stone, 1997) confirms this timing, with Block X profiles on northern Mitchells Island Beach, the southern part of the island's beaches. As observed in the erosion event starting ca. 2011, the northern sections of the beach eroded first and the erosion scarp rolled south over time, taking several years before arriving at Second Corner ca. 2015 and Old Bar Waste Water Treatment Plant ca. 2022. The report shows some erosion on the northern end of the island in the 1972 imagery (i.e. consistent with a significant 1965 erosion event). Further south closer to Farquhar Inlet, "*the profiles of 1940 and 1965 are generally similar, being high and rounded. The profile is dramatically changed by 1972, becoming very flat and lower in elevation (by up to 7 m). The dune escarpment recession is on average 60 m between 1965-1972.*" This is consistent with the erosion rolling south from

Manning Point observed and noted during 2011 when dune recession in the 5 m/yr range was recorded.

- Personally, the author recalls, as a young fellow, running around and playing in a large area of rainforest among several rows of dunes between the carpark and the high beach dune while his grandfather and father fished Smiths Beach at the end of Beach Road, Mitchells Island. The multiple dunes and the long track through the rainforest to the beach are now gone.
- DP21901 by Surveyor Tom Turner of Newcastle shows sand hills and beach with a 30 m wide road reserve seaward of the rear boundaries of the properties and an extensive beach seaward of that road reserve at Lewis & Rose Sts, Old Bar.
- Aerial photographs of Old Bar taken on 12 April 1956 show extensive dunes remain south of Racecourse Creek, confirming PWD (1990) and the personal communications above.

A6) Refers to "do nothing" options, relating costs involved with building the full rock wall. Notes that "*compared with the previous economic scoping study, benefits were drastically reduced and, given the significant total cost, the net benefits are no longer positive and this option does not appear more cost-effective than the 'do nothing' option. Detailed comparison with the 'do nothing' option is summarised as part of the multi-criteria analysis in section 4*." The "do nothing" option in the multi-criteria analysis indicates a neutral change for all criteria in the analysis.

B6) Estimates mobilisation of sand out of the dune system from the 2011 erosion event as photographed and recorded to be around 1,600,000 m^3 worth a whopping $128,000,000 at current retail rates. Notes: "*However, the coastal foredunes have a much greater intrinsic value to the people and environment adjacent to the coast. Surely, it is worth a small investment to protect them.*" Continues: "*This fluctuation in the beach alignment causes erosion of the frontal dunes with mobilisation of over a million cubic metres of sand in this recent event. There is immeasurable damage to our coastline. The economic and environmental cost of this damage is not registered as part of any "do nothing" option in any of the studies listed above. One can only hope that the author does not find himself revisiting this same situation again in another 20 years. This paper has clearly shown that "do nothing" is not an environmentally valid option. It would be a shame to have to continue witnessing the destruction of our beaches and coastline environment into the future*."

As per Occam's Razor, "of two competing theories, the simpler explanation of an entity is to be preferred." The photographic evidence presented in the APAS2023 paper, along with the clear and thorough commentary given to make sense of the situation and provide an "elegantly simple solution" appears to be pretty simple.

2.2.4 Current State of Play

Council's position seems to be that the entrance works are not its responsibility, and the rock walls built at Harrington belong to Crown Lands. In developing the CMP, Council has relied on MHL (2017) and DPI (2018), avoiding recognition of the possibility that the failed harbour works are causing erosion of the coastline all the way to Wallabi Point as presented by Calvin (2023). When queried about this lack of recognition, the Councillor chairing the CMP committee wrote: "*The Manning River entrance was not ignored, it was included in the draft CMP as an action for Transport for NSW which is the appropriate agency. The report to today's meeting says TfNSW asked for that action to be removed which is disappointing*."

It appears yet again that “do nothing” is the order of the day. Since Council’s own CMP fails to recognise the situation, there is no reason why Crown Lands or Transport for NSW would consider any action to ameliorate the ongoing erosion. As an eyewitness to the previous erosion event starting around 2011, the author’s disappointment in this outcome is distressing. It is impossible to unsee the previous erosion event or the nexus it revealed between the failed harbour works at Harrington and destructive erosion of the Manning River coastline. This nexus has been the subject of an enormous number of engineering reports, but it was missed because nobody was there, walking along the beach when it was happening.

The Pacific Ocean is the largest energy source on the planet. The next erosion event is likely to break through the already greatly diminished dune systems and flood extensive areas of the coastline and downstream estuary. Council will lose important infrastructure, including its otherwise successful sewer treatment works and sand infiltration systems. The cost of replacement and/or ocean outfall systems should be factored into the “do nothing” option. Similarly, houses and other private property including accommodation, clubs and caravan parks will be lost to the sea as the erosion continues unabated as a result of the failed harbour works at Harrington being left unattended.

3 INVESTIGATION INTO BEACH EROSION AT STOCKTON

3.1 Stockton Beach

At the APAS2023 conference, Surveyor John McNaughton, a former Lord Mayor of the City of Newcastle, voiced his concerns about the current beach erosion and rock wall construction at the village of Stockton on the northern shores of the Port of Newcastle on the Hunter River. Given the repercussions of the APAS2023 paper, it took a while to get down to Newcastle and have a look around.

Initial thoughts were “What the hell happened here?” as we drove onto Mitchell Street and the beach front. There is a rock wall along the beach side of the road and spray from waves was blowing over the road. This was my first visit to Stockton since my university days in the late 1970s, when there had been parties at student houses in Stockton and at the surf club. Vaguely recalling some flat lawn in front of the club house and then some dunes through which you followed sandy tracks down to the beach, today the Stockton Surf Club sits on a rocky promontory overlooking the beach (Figure 2).

NSW historical imagery runs 2314-1975, 3384-1984 and 3731-1990 were used to confirm my vague recollection that there were some dunes in front of the surf club with vegetation lines some 50-70 m seaward of the surf club, although the vegetation immediately in front of the surf club itself is barely visible. The NSW Historical Land Records Viewer (LRS, 2026) provided imagery of town plans telling another story. For example, the 1924 town plan of Stockton shows lines annotated as high and low water marks (HWM & LWM), a stippled zone labelled beach and a fringed alignment, probably depicting the face of dunes (Figure 3).

The HWM and plan boundary appears to be about 90 m seaward of Mitchell St on the prolongation of Flint St at the northern limit of the town plan. Today, the HWM appears to be about 15 m seaward of the Mitchell St eastern boundary. On the prolongation of Hereford St, the HWM appears to be about 115 m seaward of the eastern boundary of Mitchell St. At the location of the surf club in front of Monmouth St, the original HWM was about 215 m seaward

of Mitchell St and about 65 m seaward of the club house wall. Today, the HWM at the toe of the rocks is about 15 m from the club house wall. These measurements were taken using the measuring tool in the SDT Explorer map viewer (DCS Spatial Services, 2026).

Figure 2: The Stockton Surf Club with its shark tower in the foreground on a rocky promontory. In the background waves break against the rock wall beside Mitchell St (Apple Maps).

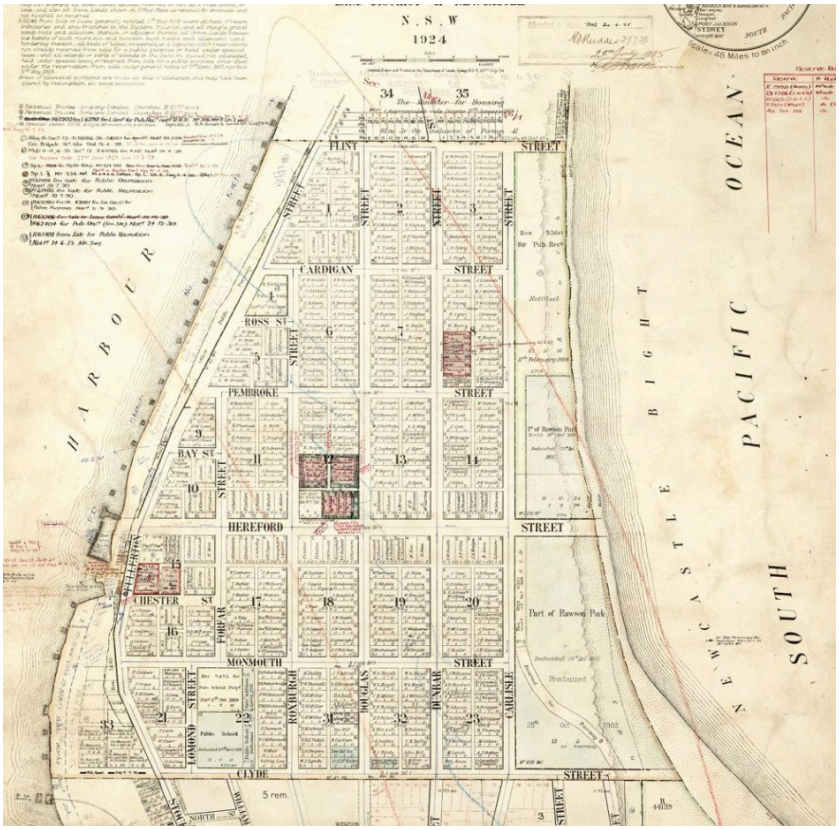

Figure 3: 1924 town plan of Stockton showing high and low water marks and the approximate dune line (LRS, 2026). The lines noted above can be found and measured via SDT Explorer.

It is clear that significant erosion has been evident at the village of Stockton, and numerous articles have reported on the situation in the Newcastle Herald. The loss of amenity along this section of coastline is obvious with the beach virtually unusable at high tide (Figure 4).

Figure 4: Mitchell St parallel to the coastline with the intersections Stone St, Flint St and Cardigan St north to south. The yellow linework approximates the cadastre and the LWM & HWM of the seaward boundary (NearMap).

One solution might simply be to truck a lot of sand back from further around Stockton Bight (Figure 5). The Hunter, a mining area, would have easy access to big “moxy” trucks capable of hauling large quantities of sand along the beach. For the cost of more revetment walls, significant amounts of sand might be trucked back to the southern end of the beach, but it would require a significant haul exercise to reclaim the missing dunal systems. This may be considered an interim fix only. A long-term methodology may be required to ameliorate future erosion concerns.

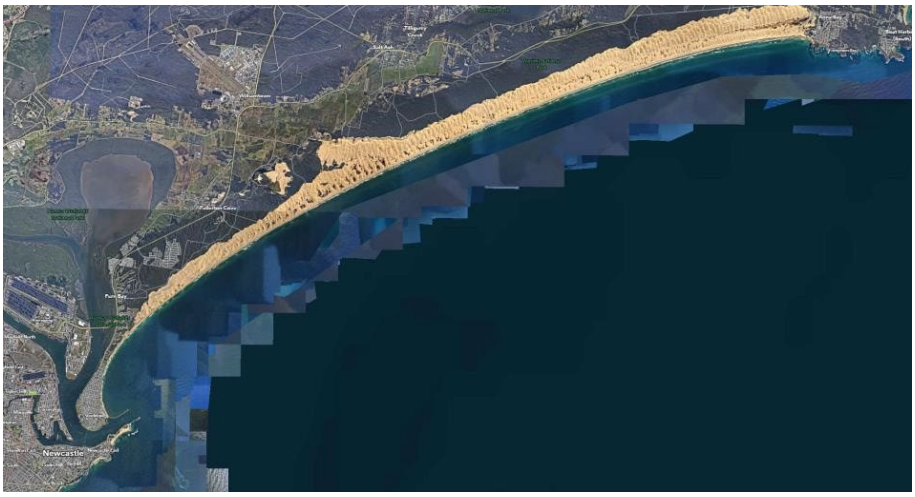

Figure 5: Stockton Bight could be a significant source of beach sand. The village of Stockton is located at the southern extent of the beach by the Hunter River entrance.

3.2 Historical Coastal Alignment

The yellow linework shown in Figure 6 as per historical mapping shows that the recession of the beach is not constant for the length of the beach. The coastal alignment and historical mapping linework are only variant south of the northern boundary of the old Stockton Hospital site, which is about 3 km north of the Hunter River north wall. North of this location the historical mapping and coastal alignment are mostly coincidental, indicating the stability of the coastal alignment to the north. South of the hospital site, significant erosion can be seen with yellow lines representing the historical mapping of the beach front well out in the ocean.

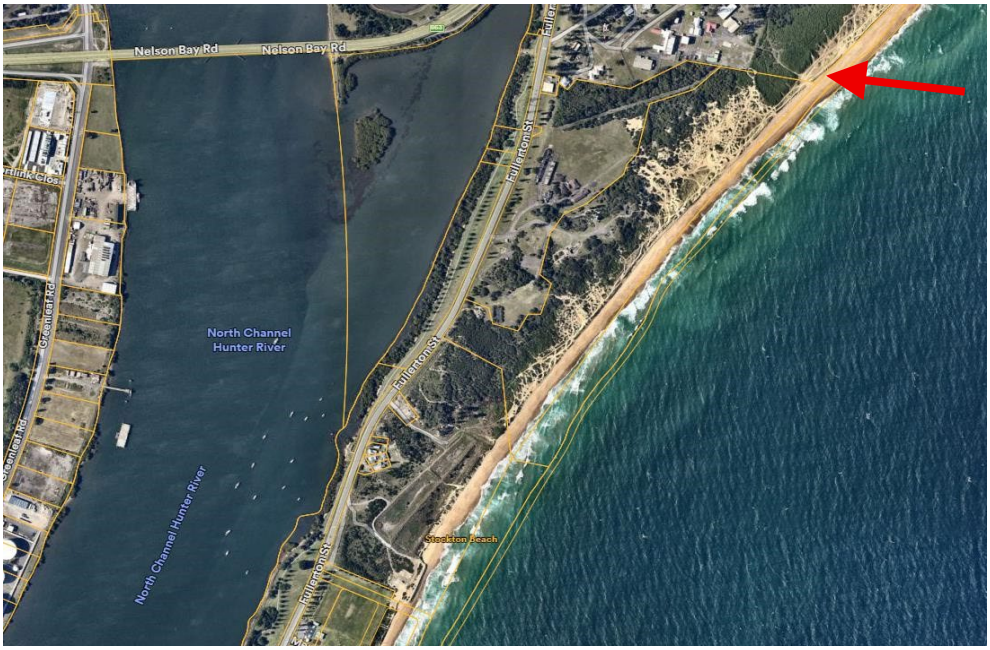

Figure 6: Apparent northern limit of erosion or beach recession adjacent to the northern boundary of the old Stockton Hospital site.

3.3 Observation of the Harbour Dredging

Newcastle has an excellent cycle path network. The cycleways are well marked and follow old coal train lines and a few old stream lines. The Throsby Creek cycleway connects along the foreshore and out onto the southern break wall of the harbour beyond Nobbys Headland. On a recent ride, the harbour dredge the David Allan steamed through the entrance, headed off in a south-easterly direction and returned a short time later (Figure 7). The track left in the ocean south-east of the entrance, visible in Figure 8, is indicative of the dump site of the dredge.

Figure 7: The David Allan steaming out of the Hunter River in a south-easterly direction, viewed from the end of the southern break wall.

Figure 8: Apparent track of the dump site south-east of the harbour entrance.

3.4 Commentary from the Previous Study

Investigations into the APAS2023 paper (Calvin, 2023) provide the following commentary:

1. Sand along the east coast flows generally northward. Fraser Island in Queensland is considered the eventual location of much of the sand from the NSW coast.
2. Sand on beaches is mobilised by wave actions and generally follows this trend. It is finite in volume and needs to be constantly fed along the coastal system.
3. At a river entrance, sand mobilised by wave action tends to enter the entrance of the river with the tide. In the absence of wave action, the sand settles out of the water column within the first 1.2 km of the entrance and remains there, only removed by significant flood flows in the river or mechanically. Hence the need to dredge the harbour entrance.
4. The deposits in this 1.2 km range from the ocean tend to be primarily beach sands, say downstream of Stockton ferry route and in the outer channels.

As depicted in Figure 9, the Stockton ferry route (red arrow) and the northerly flow from the dump site (yellow arrow) generally bypass the scene of the beach erosion at the southern end of the beach and make landfall north of the old Stockton Hospital site. This may be a significant observation (cf. Figure 6)!

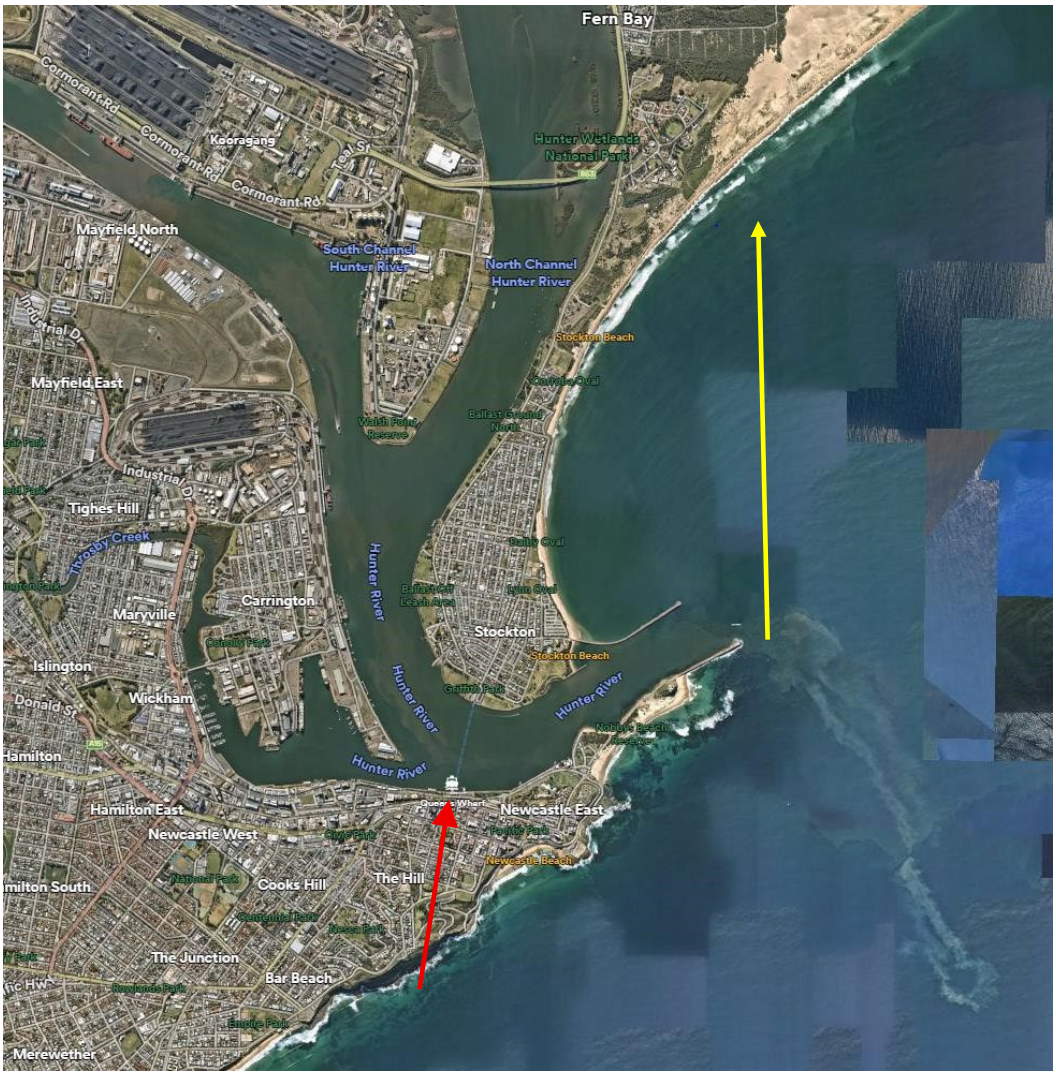

Figure 9: The Stockton ferry route (red arrow) and the northerly flow from the dump site (yellow arrow) generally bypass the scene of the beach erosion at the southern end of the beach, making landfall north of the old Stockton Hospital site.

3.5 A Potential Long-Term Affordable Solution

Based on these findings, a potential long-term solution can be proposed:

- Dredging of the Hunter River appears to drop spoil in a location that bypasses the southern end of Stockton Beach.
- Beyond the site of the old Stockton Hospital, where potentially the northerly drifting dredge spoil makes landfall, the beach has maintained a coastal alignment consistent with historical mapping.
- The continual dredging over many years has potentially depleted the sand that may have normally sustained the beach width and may have contributed to the erosion obvious along the southern sections of Stockton Beach, generally in front of the village of Stockton.
- The dredge spoil from the lower 1.2 km of the entrance, say downstream of the Stockton ferry route and any material from clearing the outer channels, is likely to be mainly beach sand.

- If sand dredged as above were to be placed on the beach, then the depletion of sand at the southern end of the beach may be supplemented and the erosion situation potentially ameliorated.
- If the northern movement of beach sand can be supplemented in this way through the dredging program, a single haulage program as noted above that re-establishes the coastline may allow a cost-effective amelioration of the situation long term.

To achieve this, a contractual arrangement is required for the dredging of the harbour. Minor changes in the dredging contract may be possible and could result in the desired amelioration of the long-term erosion evident on the southern end of Stockton Beach. Not being privy to the details of the dredging contract and being unfamiliar with the David Allan and its capabilities, it should be emphasised that the following commentary is exploratory only.

3.5.1 Dredging Separation

Dredge spoil from downstream environs will need to be separated from spoil originating upstream. Primarily this is to separate beach sands, downstream of say the Stockton ferry route and in the outer channels, from the muds and river silts that may be encountered further upstream. It appears that this may be directly monitored from onboard the dredge (Figure 10). The sandy material and spoil taken from clearing the outer channels beyond the harbour entrance may be used to supplement the beach adjacent to the village of Stockton.

Figure 10: This view of the David Allen shows how the material in the hold may be monitored from the bridge.

3.5.2 Dumping Spoil onto the Beach

There are several information boards along the southern break wall between the surf club and Nobbys Head. These indicate there is a shoal north of the entrance called Oyster Bank. These shoals may be a barrier to dumping spoil out the belly of the dredge, which is the usual clearing method. Dumping spoil via this method beyond the surf zone may also be problematic as currents along the beach may prevent the spoil from supplementing the beach sands as desired.

A mooring may be created adjacent to the Stockton wave trap beach. The sandy spoil could be pumped over the wall directly into the wave zone north of the northern break wall (Figure 11). Modifications to the dredge may be needed in order to achieve this, but it may be well worth upgrading the dredge should these ideas be considered favourably.

Figure 11: The red arrow shows where sandy spoil may be pumped directly into the wave zone. The current workings of the dredge may need to be modified to achieve this.

As discussed, these initial observations may provide a different way of looking at the erosion situation on Stockton Beach along with a suitable and economic solution to the current depletion of the beach sands adjacent to the village of Stockton and this section of coastline. Copies of the original commentary have been provided to Surveyor John McNaughton for his purposes, and Newcastle City Council has also received the same as part of a recent public exhibition for a CMP.

4 CONCLUDING REMARKS

Coastal erosion along NSW beaches and indeed across Australia remains a significant problem requiring attention. In some cases, the solution to mitigate erosion may be simpler than anticipated. This paper has discussed the mechanisms of coastal erosion at Harrington and Stockton and proposed simple solutions for both cases. It has first outlined the fallout from the previous study centred on Harrington (Calvin, 2023), the ensuing Code of Conduct investigation and provided additional commentary on the exhibited CMP and the background information used therein.

It then investigated the current beach erosion and rock wall construction at the village of Stockton and provided commentary on the situation. This investigation included Parish maps, recent aerial photography and commenting on what can be seen in or derived from these images. It concluded with suggesting a potential, simple solution for the long-term stability of the beaches fronting the village of Stockton and the southern portions of Stockton Beach. However, it needs to be emphasised that this paper only provides an initial, simplistic analysis based on freely available information and a more thorough analysis is required before any decisions can be made. Nevertheless, it shows that taking the time to visit the site in person, look, analyse and document your findings in a logical manner can provide a completely different approach to solving a particular problem.

This paper and the previous APAS2023 paper (Calvin, 2023) should not be considered the work of MidCoast Council, although it is believed that many of the surveyors and engineers in the section previously led by the author would privately agree with and support the logic of the findings presented. Similarly, it is anticipated that members of the local chapter of Engineers Australia would also be supportive of this work.

Several papers are now based on MHL (2017), including DPI (2018) and MidCoast Council's CMP (MCC, 2025). An alternative view is presented and explained in Calvin (2023) and this paper as a reference to guide future decision makers. The reader is encouraged to make up their own mind, comment on the arguments put forward and potentially advocate an "elegantly simple solution" for the benefit of the NSW coastline and its residents. When the next erosion cycle starts, and it will, it may really be too late for the recently retired author to say "I told you so!"

ACKNOWLEDGEMENTS

Surveyor John McNaughton, Emeritus Lord Mayor of the City of Newcastle, is thanked for having the civic consideration for the city and its residents, asking the questions and supporting and promoting these findings.

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