

STAFF REPORT

TO: Council

FROM: Eric Verstappen, Resource Scientist Rivers and Coast

REFERENCE:

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SUBJECT: Torrent Bay Beach Erosion - Report Prepared for 15 May 2008

PURPOSE

The purpose of this report is to familiarize and update Council regarding ongoing erosion and reserve management problems at Torrent Bay, outline Council's response to these problems in the past, propose a range of management works and funding options to address these problems into the future and make recommends on a pathway forward.

BACKGROUND

The Torrent Bay community is located within a small enclave of private land nestled in the Abel Tasman National Park (ATNP). It contains some 54 properties (including Council and DoC reserves within the community). Private land is separated from the coastline by a Council Reserve on both the eastern foreshore and within the Torrent Bay estuary. This reserve performs a number of functions. It provides a major public amenity reserve and access through the community for a large numbers of visitors to the ATNP. It also forms a critical interface and erosion/inundation buffer for the community.

The eastern foreshore is directly exposed to Tasman Bay and is particularly susceptible to coastal erosion during periods of easterly wind. This reserve has gradually reduced in width to perhaps half of that originally surveyed. In recent years, however, the combination of increasing foot traffic and adverse weather patterns has accelerated erosion of the foreshore.

In late 2005, in response to concerns over a worsening erosion problem, Council and the local community instigated a beach renourishment scheme to rebuild the beach. This was prompted in part by the presence of a large barge in the area (thus saving substantial mobilizing costs) that was required to transport a digger and 2 dump trucks to undertake the work. The beach rebuilding works were hugely successful, but as always with such "one-off" "soft engineering" solutions, could only be regarded as a short to medium term fix in an eroding shoreline environment. Beach renourishment is only successful in eroding areas if "top-up" maintenance works are programmed.

In association with beach replenishment works, Coast Care initiatives were taken with the local community to manage foot traffic and access points across the reserve, as well as undertake a reserve revegetation program. Also, in response to community demand, a low timber wall was built by the residents at the head of the beach at the northern end of the bay. This was to offset the erosion effects of significant foot traffic passage across the foreshore at this point.

THE ISSUE

Torrent Bay has experienced an unusual period of easterly and south-easterly wind patterns, particularly over the last 12-18 months. These winds have exacerbated foreshore erosion rates, to the extent that the beach is now eroded and degraded back to the 2005 state and worse. The sandspit south of the community has also suffered extensive erosion and is now overtopped by spring tides in its central section. This overtopping and potential breach does not threaten or affect the community directly. Furthermore, the timber wall built in 2005 has been undermined and failed along its southern extent, and has become well exposed and caused the beach to degrade along its northern extent. This is a totally expected outcome for vertical-faced wall structures on an eroding coastline, exacerbated in this instance by the wall being built by the locals both longer and further down the beach slope than was agreed.

With the beach having significantly degraded and retreated back to at least the 2005 location, access, amenity and vegetation management issues are again to the fore. While the reserve still has perhaps some 5-10 metres depth, reserve management works successfully undertaken since 2005 are now being undermined. Any wave action on high and spring tides causes undercutting of the escarpment between the degraded beach slope and the vegetated reserve, causing bank collapse. This has undermined beach access points, reserve fencing and planting and is threatening access paths through the reserve.

In its present degraded state, there is very little dry upper beach at high tide, either for access or amenity purposes. If no action is taken, erosion will inevitably continue and further exacerbate the above problems. Access points will need rebuilding, reserve walkways, fencing and vegetation plantings relocated landward. Amenity values for the local residents and large numbers of visitors to this shoreline will more and more significantly reduce. If erosion continues to any extent, and there is no reason to suggest that such won't be the case, essential public access along the reserve will be lost. It is also inevitable that private landowners adjacent to the reserve will take erosion protection measures into their own hands. This is considered an untenable position in the longer term.

FORESHORE RESERVE MANAGEMENT OPTIONS

Torrent Bay beach is an enclosed system with little or no source of sediment supply to the beach itself. When wave attack occurs, sand is eroded off the beach and deposited on the intertidal platform to form sand bars.. Sand is also deposited in the estuary flood and ebb tide deltas. However, the wave climate at Torrent Bay lacks the longer period waves that act to drive sand ashore and rebuild the beach. Long term erosion is the present natural trend. If the remaining reserve is to be preserved for amenity and other reasons, this requires physical intervention as it cannot rely on natural processes to achieve stability with current processes prevailing.

A “do nothing” option is present but is not considered realistic in the long term. Amenity and public access issues are considered to be too significant in this “national park” context in my opinion, to allow inevitable and probably significant further reserve erosion to occur.

If erosion management is of primary concern, a variety of classical coastal engineering techniques are available. These include “hard” structural intervention on the beach (revetments or walls) or on the intertidal platform (breakwaters, groynes), to negate or modify the wave climate or sediment flow paths. “Soft” engineering solutions include further capital and maintenance beach renourishment. All of these solutions can be coupled with planned reserve management planting and foot traffic passage and access control. This latter method has been used with success at Torrent Bay in 2005, but requires an ongoing maintenance commitment through periodic renourishment to be successful in the longer term. All options have both cost, environmental and amenity implications.

A. BEACH PROTECTION OPTIONS

(i) Retaining walls

Community members have continued to suggest the building of a low timber retaining wall or parallel low walls along the head of the beach at the base of the reserve escarpment. The purpose of this wall would be to present a barrier to high or storm tide wave runup at the head of the beach, preventing further undercutting and subsequent collapse of the upper reserve.

The desire to try this option is due, in the minds of some residents, to its successful use at the northern end of Boundary Bay (immediately to the north of Glasgow-Torrent Bay), where a short wall was built at the top of the beach many years ago. This wall has and remains buried by sand, thus attesting to its success in the eyes of many. Why such a wall has succeeded in Boundary Bay is likely due to its subtle but differing wave climate, wall location and beach sediment balance.

This option was trialled in the least erosion-prone northern section of the beach, as part of the replenishment project undertaken in late 2005. Its purpose was to provide a hard edge to the top of the beach that was subject to erosion from foot traffic. It may have served that function well except for the fact that it was not only built around 1 metre further down the beach slope than was proposed, but extended further south along the beach than was agreed. Despite the replenishment works completely burying the wall in a rebuilt beach, subsequent erosion forces have not only exposed the wall but destroyed the southern half and significantly degraded the beach along the northern section of the wall. If left in its current location, it is likely that the northern wall will eventually be undermined and fail.

There are problems with such a stand-alone wall solution. As has already been demonstrated here and many similar locations elsewhere, coastal processes on an eroding coastline will progressively expose and then act upon the wall. Waves reflect off such a structure, however minimally it initially protrudes above the beach, with very little loss of energy. Wave reflection accelerates the removal of upper beach material down slope and eventually to the low tide platform. Consequently, beach profiles degrade, as has been witnessed in front of the trial structure built at the northern end of Torrent Bay in 2005. Despite local optimism and opinions to the contrary, such a wall structure in an eroding foreshore environment will either be undermined

and collapse, or if very deeply founded, be ultimately destructive of the beach and amenity values ie loss of a high tide beach.

Some Torrent Bay residents are prepared to pay for and install a similar wall at the escarpment base and upper beach at Torrent Bay. This may cost in the order of \$20,000. It is suggested, in a somewhat optimistic, positive and pioneering manner that it is “worth a go” and that it may work just like it did in Boundary Bay. If it doesn’t, then there are other options that could be subsequently pursued. While I admire the “give-it-a-try” attitude, ultimately classical coastal dynamics on an eroding shoreline is, in my opinion, sadly against them and will deliver what I believe to be the inevitable failure outcome to a well-intended effort. In my view, “giving it a go” is founded more in hope than reality, particularly if beach amenity values are considered preserving, which I do in this special location.

Resource consent would be needed for much of the wall construction, as it has been confirmed on site that much of the construction work would partially and unavoidably intrude into the coastal marine area. Given that this wall, as a stand alone work, is not supported by all residents, at least limited if not full public notification of the application would be required.

(ii) Rock Revetments

A rock revetment structure similar to that constructed on other eroding shorelines such as Marahau and Ruby Bay can also be built along the shoreline at Torrent Bay. Particularly if built well, a revetment would maintain a stable shoreline location and potentially require minimal maintenance in this relatively low wave energy environment. However, these structures have inevitable and far reaching effects on the beach fronting the work, on access from the reserve to the beach and on amenity values in general. On this retreating shoreline, little if any dry high tide beach is likely to survive, with access along the beach available only at low tide.

Rock revetments are very expensive to build and even more in areas with no road access. Rock revetment costs along the Old Mill Walkway reserve exceed \$2500 and approach \$3000/lineal metre. It is inconceivable that a revetment of a similar height and design, as would be required at Torrent Bay, would be cheaper. At around 400m length, a well built revetment at Torrent Bay could very easily exceed \$1 million. Then there are the significant amenity impact issues to consider.

A full, publicly notified application process is inevitable for a rock revetment structure, particularly as it intrudes into the coastal marine area, and may also fall as a restricted coastal activity,

(iii) Beach Replenishment

Beach renourishment works somewhat mimic nature in that beach material is uplifted from offshore deposition zones (either mechanically, by dredge and pumping or similar means, rather than by wave action) and to place this material back on the beach. Such intervention is appropriate in Torrent Bay as natural movement of sand back on to the beach by wave action cannot occur due to the lack of appropriate wave climate. On an eroding shoreline, beach replenishment is an ongoing project, with maintenance top-ups necessary to offset the effects of continued erosion. How frequently such maintenance works are required depends on the

minimum beach profile that is desired, and the frequency and intensity of erosion periods. Beach replenishment maximizes retention of amenity values while providing and maintaining a relatively consistent buffer depth between prevailing coastal processes and the hinterland community.

In 2005, a successful beach replenishment project was undertaken on this beach. It initially added several metres of dry high tide beach to the vegetated foreshore, albeit with an overly steep beach face. This was done deliberately to minimize cost, but with the additional reasoning being that wave action would generate a natural beach slope over time. This occurred to some extent, but the overall intention of raising the natural beach profile approximately 1m up to reserve level was achieved. Having a relatively stable width of reserve subsequently allowed several Coast Care works to be implemented, including reserve vegetation planting, planned beach access points and roped-off “no go” areas.

As noted earlier, coastal erosion processes have removed the 5-6000 cubic metres of rebuilt beach from the 2005 exercise and begun to undermine the coast care and reserve management works. Maintenance works to re-establish a healthy beach profile and preserve reserve management works is now urgently required. A recent site visit confirms large volumes of sand present on the intertidal platform as sand bars, but these have not been surveyed for volume. There is certainly sufficient material available in the higher sand bars and above the general intertidal platform area to rebuild the 400m length of beach to the 2005 profile and beyond, as well as undertake some remedial works on the partially breached sandspit to the south of the community, if desired.

Replenishment works could be undertaken by digger and dump trucks, as in 2005, or by suction dredge operation. Recent quoted costs for a 7000 cubic metre replenishment project amount to almost \$67000, including mobilization to the site. However, mobilization costs are less than might otherwise be for a completely stand-alone project. A barge of suitable size to move machinery to Torrent Bay also undertakes works from Port Tarakohe on a frequent basis and can detour from its route from Picton to Tarakohe to uplift and return machinery from Nelson.

NOTE: A barge-digger-trucks operation can be mobilized at relatively short notice. Appropriate tide conditions for the work occur monthly (and at a push, fortnightly). Works would take up to 1-2 weeks to complete. However, it remains to be confirmed that a non-notified resource consent application could be pursued. Even if agreed, time frames are very tight for an application document to be assembled, including consent from all potentially affected parties (DoC, Iwi, local residents and possibly also the commercial boat operators) and processed, and to complete construction work this financial year. Any potentially affected party that does not give their approval would immediately trigger a public notification process and time frame that would extend well into the next financial year.

A replenishment work undertaken by suction dredge has been investigated and is entirely feasible, despite the relatively small scale of this work by such methods. However, both mobilization costs (\$75-\$100K) and cost per cubic metre shifted (nearly 3 times the truck and digger rate) make such a method completely uneconomic.

An alternate “small scale” locally driven beach replenishment project has been considered but set aside. Local residents go to their beaches for family and recreational purposes. It would be impractical to rely on a small digger and “maggot” dumper operation to nibble away at sand bars to rebuild the beach over a longer time frame. There are operational and amenity impact issues

to consider also. The suggestion is that such an operation would be unsustainable in the long term, given the sporadic and recreational intent of local visits to the bay. A defined, contracted project is preferred.

Resource consent (coastal permit) for uplifting sand from the coastal marine area to place on the beach is required. However, it is anticipated that such consent may be able to be obtained without public notification, as was the case in 2005. An ongoing replenishment scheme and maintenance work program has not been formally discussed as yet with the local community, DoC and Iwi representatives, but there is every hope that all parties would be supportive of a rebuild and ongoing maintenance proposal.

A replenishment and maintenance work project has been discussed with one of the key local residents, as a more sustainable alternative to a wall-building solution. He confirmed that if Council embarked on a program of beach rebuilding accompanied by maintenance as required, so as to provide a stable beach front to the vegetated reserve (within agreed parameters), then there would be no need or point in the local residents building an upper beach wall at their cost. However, money has only been pledged to build a wall and it cannot be assumed at this point to also be available for a beach replenishment and maintenance scheme without a wall.

To get the greatest value for money from a beach replenishment project (and the availability of the barge), as much sand should be placed on this beach as is reasonably available from the intertidal platform. This will maximize the beach restoration opportunity and reduce the future need for, and frequency of, further maintenance renourishment works. While a project scale of around 7000 cubic metres has been quoted, it may be more economic and sustainable for the next capital project to be a little larger, with maintenance works ongoing at a smaller scale. Quoted costs for a larger initial project have not been obtained, but would likely be of the order of \$75-77,000.

B. FUNDING ALTERNATIVES

There are a number of funding arrangements that could be implemented to cover the costs of this project. The project could also be viewed as an immediately required “capital” renourishment project, but then followed by future maintenance works, triggered by some agreed threshold of erosion.

(i) 2005 model

The 2005 beach replenishment works were almost entirely funded from an annual Council “grant” to the local community for local project purposes (drawn from their rate contribution, for which few normal ratepayer services are received). The present level of that grant allocation is such that it would be insufficient to pay for capital and maintenance replenishment works, let alone serve to undertake other works as necessary, unless that grant were to be increased.

(ii) Ruby Bay model

This is an existing funding model used for funding Ruby Bay foreshore protection works. In this model, a percentage of the cost would come from the general rate, with the remainder of the cost absorbed by a special rate on directly adjacent landowners and wider group of the local

residents, apportioned according to “protection benefit” received by property owners. The Ruby Bay model splits the project cost in the proportion of X:Y:Z between Council general rate, immediately adjacent landowners properties having a “community of interest” ie in this case, rear property owners. At Ruby Bay, the applicable proportions have been variable but are very approximately 20-25%, 45-55% and 20-35%. However other proportions may be more deemed reasonable in the Torrent Bay situation. Once a Council proportion X has been decided, Council could either set the Y and Z proportions for the community, or ask the local community to propose an alternate apportionment or payment proposal for their balance share.

(iii) Ruby Bay model and Visitor Levy

This model recognizes the fact that the Torrent Bay foreshore and reserve is subject to significant visitor traffic volumes. All these non-resident, non TDC rate paying visitors enjoy and benefit directly from a maintained amenity of a beach and reserve. This reserve and beach lies outside the National Park, but is an inseparable part of the unique ATNP coastal experience. It seems entirely reasonable to explore some funding contribution from those who benefit from national park uses (eg a visitor levy) or to tap into the levy extracted from users of the Abel Tasman foreshore reserve. Given that visitor traffic through Torrent Bay exceeds 26000 people per year (Torrent Bay toilet use count), even a \$1 surcharge per head for Torrent Bay management purposes (beach maintenance, toilet facilities etc) would generate sufficient funds to potentially make ongoing maintenance replenishment works self-funding, as well as contribute to other Council services (eg toilets) that visitors use.

Such a funding model may be possible, given the joint Council-DoC foreshore management regime in the ATNP. A visitor contribution would need to be equitable and would therefore complement, rather than replace, an ongoing (but reduced compared to a Ruby Bay funding model) contribution from the Council general rate and rate from the local residents. Thus the funding model would expand to W:X:Y:Z apportionment between visitor levy, Council general rate, front property and rear property owners. This levy as a potential funding source will take time to investigate and is unlikely to be available to fund the immediately needed works, if at all.

(iv) “River Z” funding model

The foreshore reserve is a Council road reserve. As such, any remedial measures that may be implemented fall most appropriately to Engineering Department awareness, if not involvement, in much the same manner as river works are administered. A similar model for funding miscellaneous river works could be applied to this foreshore road reserve. Council would fund typically up to 50% of the project cost, with the remainder of the cost borne by adjacent landowner(s). In some respects, this funding model is similar to the “Ruby Bay model”, in that project costs are met from a general rate and specific landowner contributions.

ONGOING RESERVE MANAGEMENT

In association with any remedial works decided to be taken (or not), an integral aspect of beach management is the stabilization, revegetation and foot traffic management on the reserve. This involves continuing revegetation programs on the upper beach with sand-binding species such as pingao and spinifex, isolating beach revegetation works from foot traffic until the vegetation is established (or permanently), limiting uncontrolled access along the reserve and across the

upper beach-reserve interface to specific locations, and providing a “running surface” (such as timber sand ladders) at access points so as to minimize foot traffic erosion of the head of the beach.

These “Coast Care” reserve management measures are now enthusiastically supported and implemented by the local community in association with Council. Some of these measures have already been successfully implemented, but require ongoing input, development, maintenance and management.

SUMMARY

In late 2005, the local residents and Council were sufficiently concerned by the degraded and eroded state of the Torrent Bay beach and foreshore reserve, to implement a beach replenishment scheme. Some 6000 cubic metres of sand was uplifted from the adjacent intertidal platform area and deposited back onto the beach, from whence it had come. In addition, a program of Coast Care reserve management works was implemented, rationalizing beach access points and reserve walkways, and undertaking revegetation planting for amenity and beach stabilization purposes. This project was deemed very successful.

However, since 2005, coastal erosion processes have continued and been exacerbated by an unusual period of easterly and southeasterly winds, which cause direct wave attack on this shoreline. The beach has eroded and degraded to at least the 2005 profile, and further works of some nature are urgently required if the reserve and beach amenity is to be preserved.

To do nothing is to invite the loss of a Council-administered reserve having enormous amenity and public access values at the very least. It also provides an interface and buffer to a sizeable local community enclave in a national park setting. If erosion continues unabated, and there is no reason to suggest that it will not, it is inevitable that foreshore residents will eventually take erosion control matters into their own hands to protect their investment.

The need for and frequency of maintenance replenishment is completely dependent on erosion rates, dictated primarily by the frequency of easterly winds. These winds are not the prevailing winds on this shoreline, but are the most destructive. Prevailing wind and wave climate is incapable of naturally rebuilding the beach with erosion sediments deposited on the adjacent intertidal platform.

To my mind, the most sustainable (and most economic) method of protecting and preserving the qualities of this beach and reserve is to implement a program of replenishment works, as a continuation of works originally undertaken. This option was universally supported by Council, local residents, DOC and Iwi at that time and this support is unlikely to have changed. The only facet of the original project was defining an ongoing maintenance program, to preserve a beach profile within a prescribed state. This is necessary for the long term and ongoing preservation of a reserve and beach amenity on an eroding coastline.

Urgent initial capital works can only be realistically funded by a “River Z” type model, or some form of the 2005 model. The Ruby Bay and Ruby Bay plus visitor levy models cannot be used to fund immediate works as they require investigation, public consultation and notification of any targeted rate proposal in the draft annual plan to be undertaken. The earliest LTCCP notification

opportunity occurs in 2009/2010. Future ongoing maintenance works can be funded by any of the funding options proposed. A contribution from the wider visiting public to the ATNP and Torrent Bay towards this work is a reasonable concept, and should be explored with vigour. A very small levy on the large numbers of visitors to this area would conceivably provide most (if not all) of the funding required for maintenance works on an ongoing basis.

RECOMMENDATIONS

- (i) That the Torrent Bay foreshore road reserve be actively managed by Council incorporating a beach renourishment program and CoastCare works.
- (ii) That a beach renourishment program for “capital” and “maintenance” works be designed so as to maintain the current vegetated reserve amenity and provide and maintain a beach profile within prescribed lateral limits in front of this road reserve.
- (iii) That Council urgently expedites a “capital” beach rebuilding works for placement of up to 10000 cubic metres of sand up to \$80,000 total (including resource consent costs), to be funded from Council’s reserves and local Torrent Bay residents on a 50:50 cost share basis.
- (iv) That Council investigates a funding model for ongoing “maintenance” beach renourishment works, to maintain an agreed minimum beach profile envelope.
- (v) That Council investigates a funding model incorporating a levy on visitors to the Abel Tasman National Park for beach renourishment maintenance work and for service and amenity management purposes at Torrent Bay.