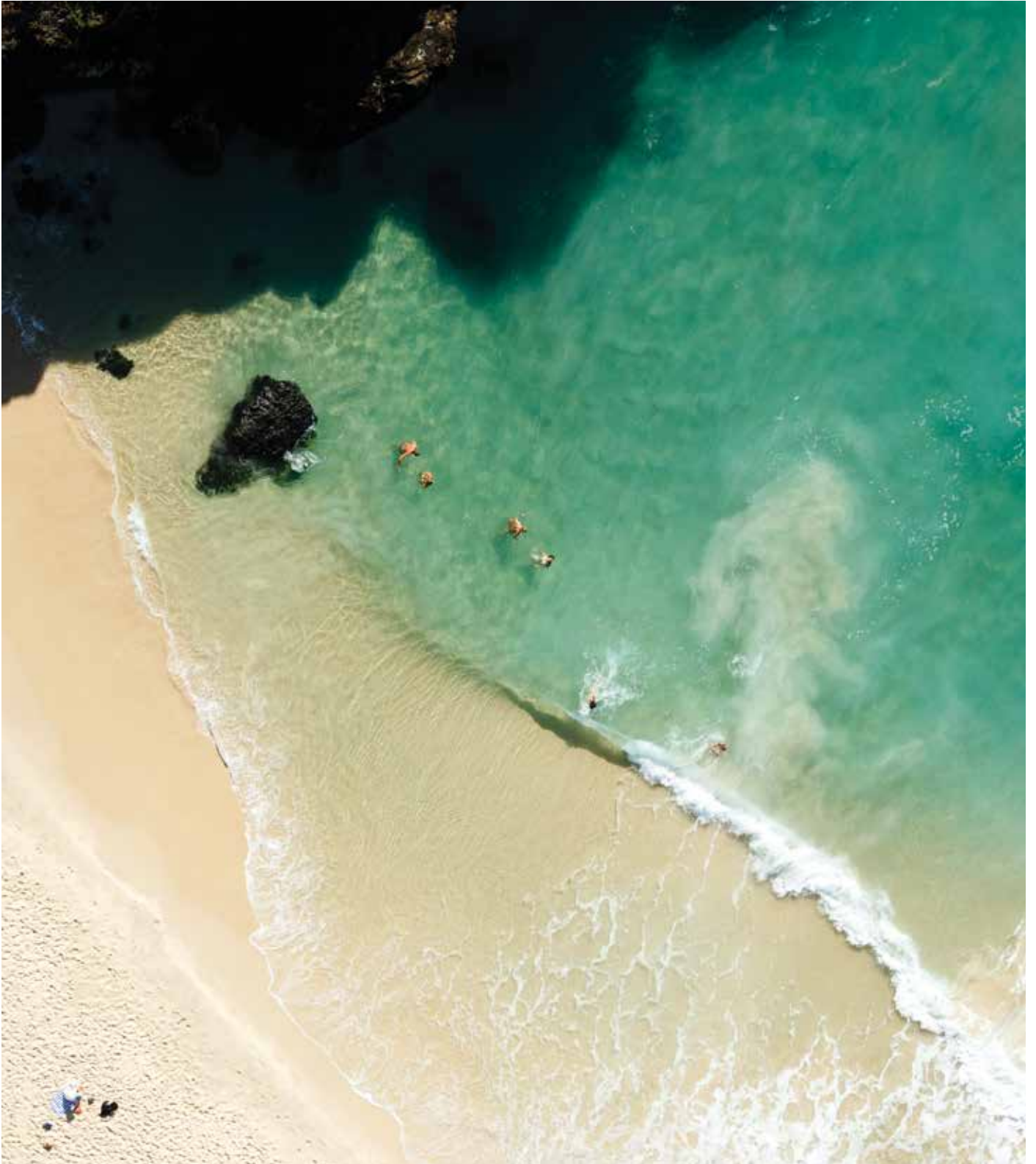


sand

TWEEDSAND
BYPASSING







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TWEED SAND BYPASSING

TWEEDSANDBYPASS.NSW.GOV.AU

Content and Design: NSW Department of Industry – Lands and Comms&Co

Photography: Natalie McComas

Aerial Photography: Wes Palmer

Illustration inside back cover: Luka Va

Printed by: Chambers Whyte Design & Print
Printed on Ecostar 100% Recycled Paper

Instagram: @tweedsandbypassing

Tweed Sand Bypassing wishes to acknowledge and pay respects to the Bundjalung People and their descendants. The Traditional Owners of the Tweed and Southern Gold Coast region.

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Understanding sand

Sand, or the movement of it, is perhaps the main reason why 85% of the Australian population lives within 50 km the sea.

There are many natural elements that make coastal living so attractive - but it is sand that keeps things interesting.

It is sand that moves with the break of each wave, the sweep of each tide and the fury of each storm.

It is sand that is moulded into castles, shaped into surfing banks, and creates beaches that allow for relaxing time spent with loved ones.

Sand is integral to our coastal lifestyle, to our identity and relationships; it changes the landscape with the ebb and flow of our lives.

Tweed Sand Bypassing has been part of the unique coastal story of Tweed Heads and Coolangatta for nearly twenty years.

Recognised around the world, the Project was created for two towns in two different States whose very identity, economy and culture depends on sand.

Sand is constantly moving; the way in which it moves is impossible to accurately predict, and the preferred configuration of sand to form beaches and sandbanks is wildly debated.

At the heart of Tweed Sand Bypassing is a desire to understand these challenges and to manage the movement of sand to enhance our coastal lifestyle.



Moving sand

Tweed Sand Bypassing has been a part of the Tweed and Southern Gold Coast community for nearly twenty years.

An ambitious infrastructure project, it is owned by both the New South Wales and Queensland State governments (with financial and executive support from City of Gold Coast), and is operated by a private contractor. The Project was designed to address the very real environmental, commercial and social impacts created by a dangerous river entrance and a sand supply interrupted by the construction of river training walls in the 1960s.

Finding a solution that would replenish the natural coastal sand drift and maintain a safe entrance to the Tweed River took time.

Implementing a solution that would support the economic and social growth of the community has involved experts from around the world, professionals from two State Governments and many passionate members of the local community.

But in the 1990s a permanent jetty mounted pumping system supported by occasional dredging at the River Entrance was decided upon, and Tweed Sand Bypassing came into being.

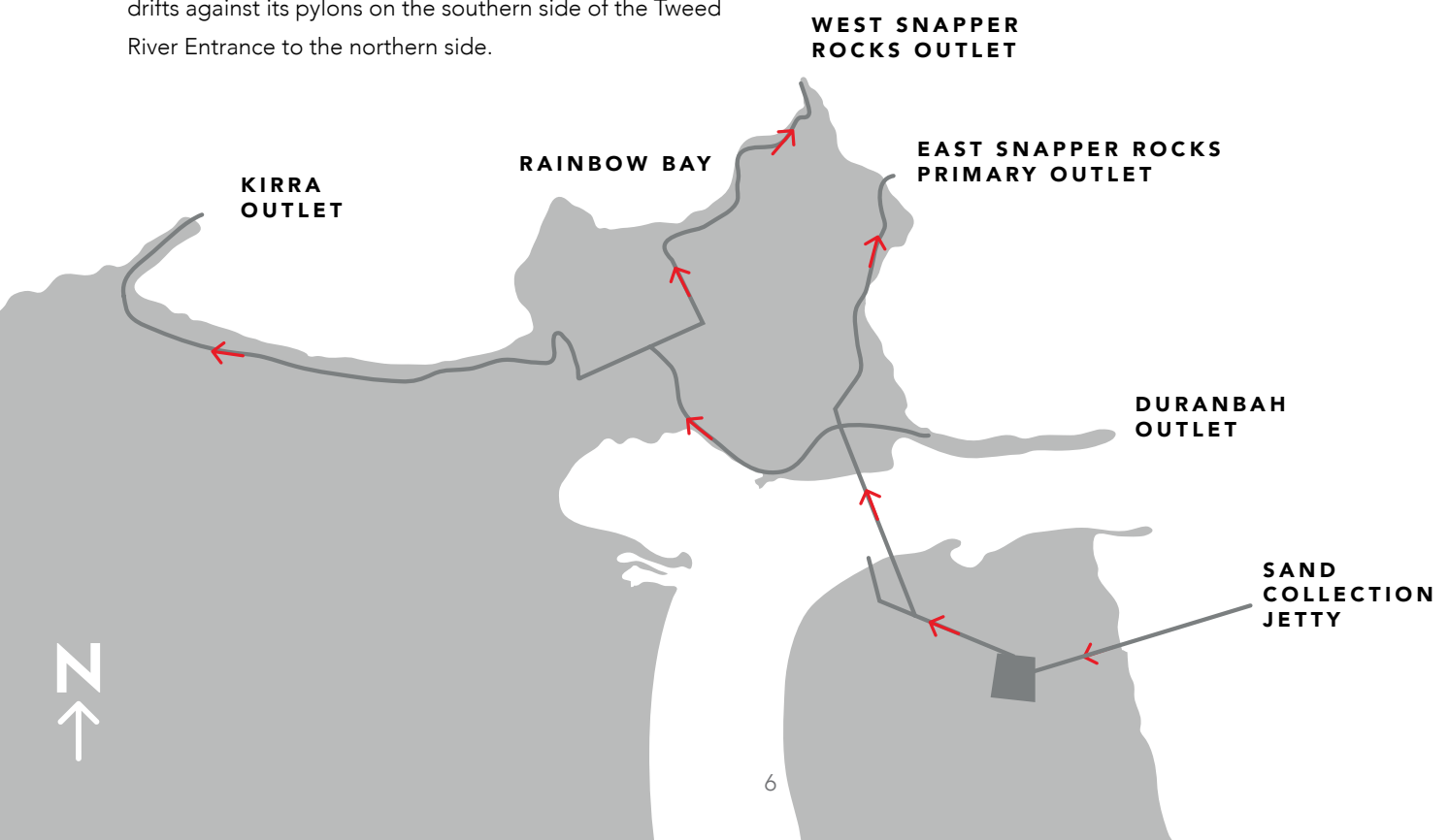
Since 2001 the Project has operated to move the sand that drifts against its pylons on the southern side of the Tweed River Entrance to the northern side.

With the occasional help from a floating dredge, the eleven submersible pumps connected to the 450 m long Jetty at Letitia Beach have ensured the majority of coastal sand drift bypasses the Tweed River training walls. This sand then continues on its journey north, feeding and nourishing the beloved beaches of the Southern Gold Coast.

The mixture of water and sand collected is pumped under the Tweed River and discharged predominantly at an outlet located at East Snapper Rocks. Intermittent outlets are located at West Snapper Rocks and Duranbah, with a fourth outlet at Kirra.

The quantity of sand moved by the jetty mounted pumps is determined by the coastal sand drift itself. The pumps do not act like a vacuum cleaner on the sea bed, seeking out and sucking up all available sand in their path. Instead, the water-powered pumps create a depression in the seabed, and as sand is forced along the seabed by coastal drift builds up in these depressions, it is then captured by the system and pumped to a designated outlet.

Tweed Sand Bypassing continues to support the very essence of the Tweed and Southern Gold Coast lifestyle – sandy beaches, a safe and navigable River Entrance and world famous surf breaks.



River of sand

WHERE DOES THE SAND IN NORTHERN NSW AND SOUTH EAST QUEENSLAND COME FROM?

The sand that forms the wave at Snapper is on an ancient journey that started high in the mountains of northern NSW over 16,000 years ago. During this time the world was in the middle of the most recent ice age and the sea level was 120 m lower than it is today. The mountains of The Great Dividing Range were higher, when compared to sea level, and eroded easily sending large quantities of quartz and other rock down the rivers to the Pacific Ocean.

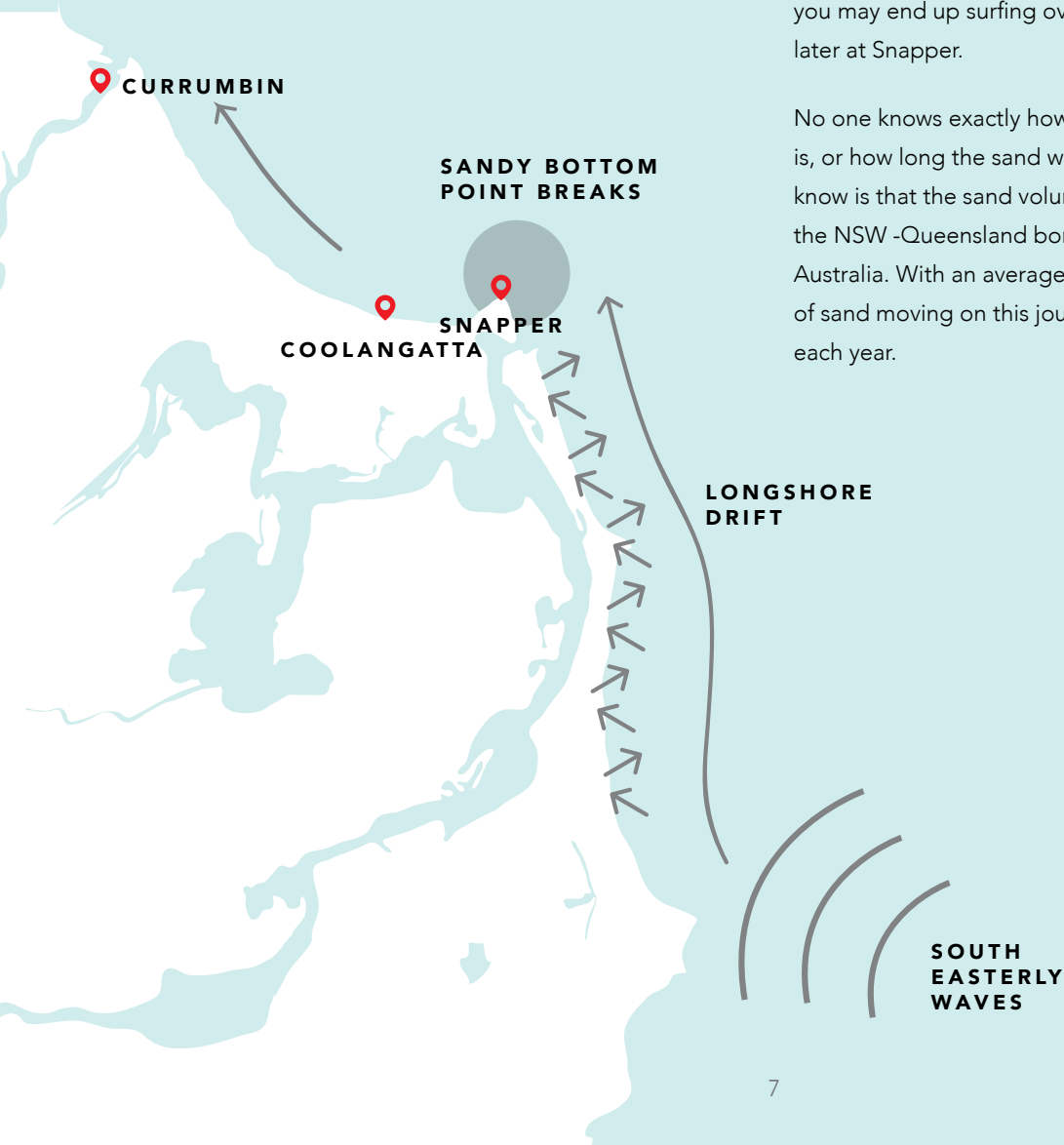
One of the largest sand reserves in NSW is just offshore of the Clarence River near Yamba. As the ice age ended and the earth's climate began to warm, the sea level rose, bringing the shoreline 20 km landward. The rising sea level, waves, tides and currents, pushed the sand that had been deposited offshore towards the land, creating the current coastal landscape.

Through the process of longshore drift, this reserve continues to feed sand along the giant natural conveyor belt from northern NSW towards southern Queensland. The predominant south easterly waves push and drag the sand on and off the beach, in and out of the swash zone, moving sand north and creating the region's famous sandy bottom point breaks.

The sand spills around large headlands such as Cape Byron, flows in and out of estuaries, and tracks along the southern Queensland barrier islands until it reaches Fraser Island. Here, the sand finds its final resting place as it slips off the northern end of the Island and is lost to the deep waters of the continental shelf.

It's entirely possible that if you're surfing The Pass at Byron, you may end up surfing over the same grain of sand years later at Snapper.

No one knows exactly how large the Clarence sand reserve is, or how long the sand will continue to flow. What we do know is that the sand volumes moving along the coast of the NSW -Queensland border are some of the largest in Australia. With an average of 200 full sized swimming pools of sand moving on this journey beneath the ocean's surface each year.



YEARS OF OPERATION: 16

AMOUNT OF SAND PUMPED: 8.5 MILLION CUBIC METRES

AMOUNT OF SAND DREDGED: 2.2 MILLION CUBIC METRES

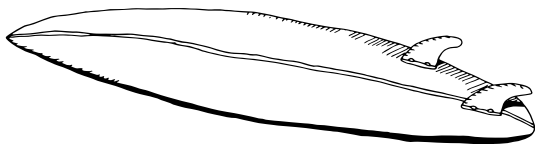
**NUMBER OF
OSPREYS
CURRENTLY
LIVING AT
THE JETTY:**

4



**10 OSPREY CHICKS HAVE HATCHED SINCE
THE JETTY NEST WAS BUILT**

OBJECTS THAT GET SUCKED UP THE JET PUMPS

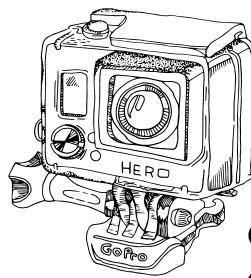
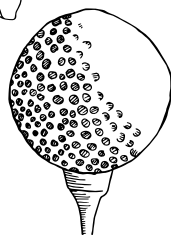


**SURFBOARD FINS
100 / YEAR**



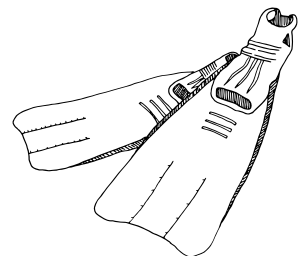
**SUNGLASSES
60 / YEAR**

**GOLF BALLS
200 / YEAR**



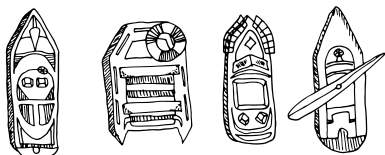
**FLIPPERS
100 / YEAR**

**GOPRO CAMERAS
4 / YEAR**



LENGTH OF THE JETTY 450 M

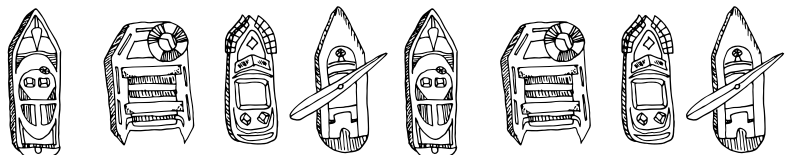
JET PUMPS: 11



11,760

**AVERAGE NUMBER
OF BOATS THAT
PASS THROUGH
THE TWEED RIVER
ENTRANCE PER
YEAR PRE-PROJECT
(<1995)**

PROJECT STAFF: 10



22,246

**AVERAGE NUMBER
OF BOATS THAT
PASS THROUGH
THE TWEED RIVER
ENTRANCE PER YEAR
POST-PROJECT
(1996-2016)**

**APPROXIMATE
DISTANCE
THE
FIRST
GRAIN
OF
SAND
PUMPED
TO
SNAPPER
ROCKS
EAST
HAS
TRAVELLED**

7km



The Bypass Surgeon

FOR CIVIL AND COASTAL ENGINEER IAN TAYLOR, WORKING ON TWEED SAND BYPASSING SINCE ITS INCEPTION IN THE 1980s HAS BEEN CHALLENGING, REWARDING AND INFINITELY INTERESTING.

How have you been involved with the Project?

I was one of the multiple brains working on solving the twin problems that had presented themselves to the Queensland and NSW Governments during the 1970s – lack of sand supply to the Southern Gold Coast beaches and a treacherous Tweed River Entrance. In 2002 I became the Project Manager for eight years, and have recently returned as a contractor, working on strategic issues for the Project.

How did the Project come about?

The Queensland Government was concerned about the Gold Coast beaches retreating. It wasn't just amenity that was at stake – it was the inability of the beaches to defend themselves against storms. They couldn't retreat landward because of roads and infrastructure and they weren't receiving nourishing sand. Damage to infrastructure was a real threat.

On the NSW side of the border, even though the training walls had been extended once already, nature was doing what it does best and trying to overcome that. Sand was building up at Letitia Beach and again blocking the River Entrance, creating a dangerous navigation problem.

The problems were two sides of the same coin – creating a mutual need between Queensland and NSW to take action and find options for dealing with this. There was a suspicion about the impact of the extended river training walls on natural sand supply to Queensland, and it was clear that alone, they were no longer effective in providing improved boating conditions at the entrance. So the question was asked – 'What can we do?'.

After years of studies, investigations and review, it was agreed that a Jetty mounted pumping system plus dredging system would be implemented. The Jetty pumping system isn't 100 % efficient meaning that despite operating continually it doesn't capture all of the sand moving northwards, so a dredging component was also required.

When it was turned on – a lot of things happened. Some good, some not so good.

A larger than natural amount of sand was moved to the Southern Gold Coast beaches in the early days of the Project and it sat there for a long time. This was done to replenish sand that had been removed by extreme storms and prevent further erosion at the beaches.



It remained there because of the nature of the coastline and a drought of cyclonic swells which meant we were confronted with a problem that the community and Project management were unhappy with.

We always knew that the sand would be dispersed – but Nature does it in its own time and despite our best predictions that indicated it should have moved quicker than it did – it took a lot longer and was a cause of great community anxiety and concern.

At the end of the day, the Project does more than just pump and deliver sand in isolation. The need to deliver outcomes to different user groups – surfers, fishers, tourists, is built into the Project alongside technical operational outcomes, and we're continually monitoring the environment in order to respond and improve. It's not a stagnant beast like a tunnel or bridge; it's dynamic and needs to be constantly fed knowledge.

Nearly two decades on, how is the Project doing delivering those outcomes?

Time has shown that Nature responds to this system in its own timeframe. I believe the first fifteen years of the Project were an adjustment phase – which seems an enormously long time for adjustment in terms of community anxiety levels and expectations, but in terms of affecting morphological change on the coastline, it's miniscule.

Looking back on the Project's life, we had a period of oversupply, then a period of undersupply to try and correct, and now we are where we always wanted to be. You can't precisely manage Nature but the Project hasn't given up –

we're constantly gathering knowledge and refining, always trying to make it better, but there's no question it is doing what it is intended to do.

What keeps drawing you back to the Project?

On a professional level it's a tremendously interesting and rewarding project. The complex coastal processes of the area such as a River with a powerful tidal exchange, the almost 90 degree change in the coastline alignment at Snapper Rocks, and possibly the largest volume of sand movement in Australia means from a technical perspective it is hugely challenging.

Then the Project's interaction with a large population, two State Governments and iconic famous beaches adds another layer that makes the technical aspect look like the easy part.

Personally, I feel proud and privileged to work on it. It hasn't just been a job; I have to pinch myself that I work on such a magnificent and unique coastline. I'm always thinking about it, and how we can improve it. The challenges and changes are almost constant, so there is always so much to do.

**“It's not a stagnant beast
like a tunnel or bridge,
we're constantly gathering
knowledge and
refining, always trying
to make it better.”**

Ian Taylor



Cook Island

JUTTING OUT OF THE PACIFIC, SIX HUNDRED METRES OFFSHORE OF FINGAL HEAD, COOK ISLAND IS AS UNAPOLOGETIC ABOUT ITS ROLE AS A PHYSICAL WAVE BARRIER AS IT IS ABOUT BEING A STUNNING EXAMPLE OF THE TWEED COAST'S NATURAL BEAUTY.

When Wollumbin, also known as Mt Warning, erupted 23 million years ago lava flowed towards the ocean. As it cooled, the distinct hexagonal rock formations that make up Fingal Head and parts of Cook Island today were created.

The island's rock formations openly play host to a deafening mutton bird colony, and protect ancient turtles as they swim between the coral and seagrass meadows below. But the island's significant role in influencing Fingal and Letitia's swells is not as obvious.

As swell energy travels up the Tweed coast, waves hit the shallow water around the Island, slowing down, bending and changing direction in a process called wave refraction. During large swells, this process can cause wave energy

to focus on particular locations along Fingal Head Beach, causing erosion.

Because Mother Nature likes balance, when waves are forced to bend around Cook Island, a fickle, yet surfable, little right hand break is formed on the northern side of the island.

To capture the unique wave conditions caused by refraction around Cook Island, Tweed Sand Bypassing has a wave buoy just offshore of Letitia. This provides live information on wave height and period and is used by the Project to track the effect that Cook Island has on ocean swells and estimate sand movement.







Crossing the bar

FOR COMMERCIAL FISHERMEN, THE TWEED RIVER ENTRANCE BAR CAN BE MORE THAN JUST AN INCONVENIENCE – IT HAS A DIRECT IMPACT ON IF THEY CAN OR CAN'T GO TO WORK THAT DAY.

Jenny O'Connell is a second generation commercial fisher. Her Dad fished in the Iluka area all his life, and now she's married to John Pile, a current member of Tweed Sand Bypassing's community Advisory Committee. Together they run a commercial fishing trawler out of the Tweed River marina, until John retired in 2010.

Jenny stays involved in the industry as Secretary of the Tweed Heads & Coolangatta Professional Fisherman's Association.

The rhythm of commercial fishing can depend on not only the condition of the Tweed Entrance bar and the weather, but type of vessel.

"If you have a larger boat, and can store the catch on board, it means you don't have to burn diesel getting in and out of the Tweed Entrance so often," she explains.

"Larger boats can be out for 21 days and there is less risk because you don't need to cross the bar so often".

But some have to go out and back in each day, making the bar conditions an even greater factor.

"It doesn't matter how big your boat is. When you're on the bar and there's a lot of sand on it, boats can get damaged" said Jenny.

"If the River has been dredged, and conditions are good, it means we can go about making a living and contributing to the area, along with the tourism operators and commercial yachts".

Image top left, opposite page: Jenny O'Connell, Secretary of the Tweed Heads & Coolangatta, Professional Fisherman's Association.





"The sand dredging makes it a lot safer for us to get across the bar when you want to and you can get more work in then because you're not restricted by the bar so much." Matt Duncombe, 34



"If the bar hasn't been dredged it limits us on how many nights we can fish because we cant get out or cant get in. When it's running all the time, and it's dredged all the time you get a nice deep channel, everyone is happy" Ron Ible, 49



"When they start doing the dredging the bar is nearly flat you know, there can be a swell and you can just cruise out through the middle."

Tyrone Foster, 23



"I've been fishing in this area for seven years. You notice when it's so shallow and it doesn't take much swell to not be able to get across it. It's been better since they dredged it".

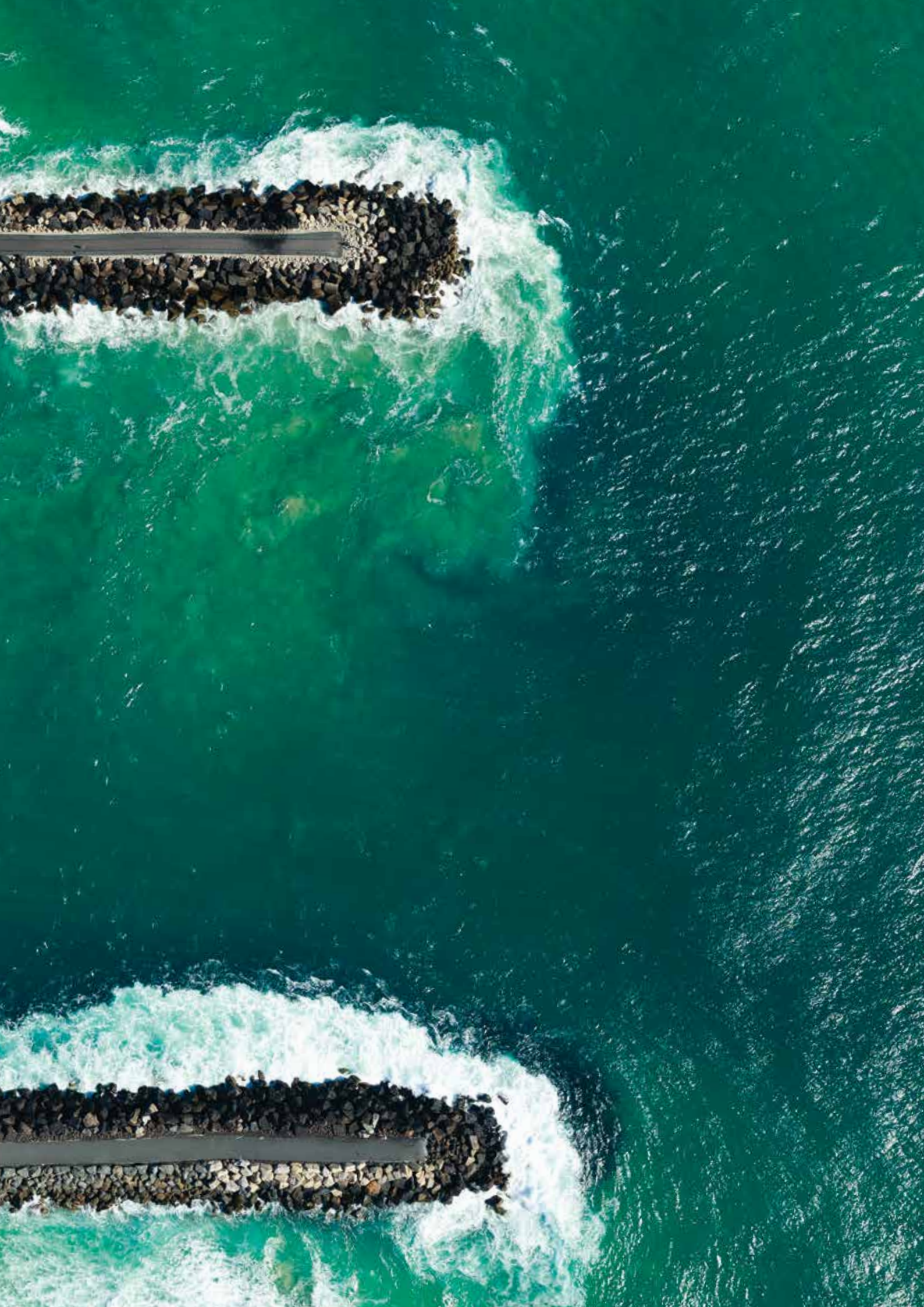
Gary Solway, 24



"The bar changes all the time but there's a long history of it silting up. I've read articles that said that in the early 1900s there was three foot of sand on the bar and there were ships locked into the river because they couldn't get out. That was well before the walls went in."

Kevin Solway, 60







Tickets please

TOURIST ATTRACTIONS COME IN ALL SHAPES AND SIZES, AND AREN'T ALWAYS WHAT YOU THINK.

Tweed Sand Bypassing has inspired similar systems all over the world. The jetty and surrounding area are regularly visited by coastal engineers who are keen to see if sand bypassing might offer a possible solution to the coastal erosion issues they are tackling in their own countries.

Fukude Fishing Port, Japan

The Fukude Fishing Port, just south of Tokyo, shifts 80,000 cubic metres per year from one side of the port to the other. To prevent disturbing turtle nesting sites, the system only operates for six months of the year.

Barra do Furado, Brazil

In a similar fashion to Tweed Sand Bypassing, Brazil's Barra do Furado system was commissioned by two neighbouring counties. The Bypassing system has been operating since 2012 and uses a 360 m long jetty with nine jet pumps, two pumping stations and an underwater pipeline to move sand from one side of the river to the other.

Figueira da Foz, Portugal

Members of the Figueira community in Portugal have been seeking support for a bypassing system after the Mondego River training walls were extended by 400 m in 2009. Extension of the walls resulted in a large buildup of sand on the northern side of the river, and a loss of beach and surfing amenity to the south.

South Korea

With a huge coastline and the ongoing risk of typhoons, South Korea has many coastal erosion and flooding problems. Tweed Sand Bypassing featured in a South Korean television documentary on Australian coastal erosion solutions.

Adelaide, South Australia

Constructed in 2012, nine km of pipeline collects sand from locations where it has naturally accumulated due to longshore drift, and transports it to eroded areas to the south. The system has replaced the practice of moving 11,000 truckloads of sand between Adelaide beaches by road each year.



**Surfing icon.
World champion.
Born and bred local.**

WAYNE BARTHOLOMEW REFLECTS ON HOW A LIFETIME OF KNOWLEDGE AND OBSERVATIONS ABOUT THE SURF BREAKS THAT HE BELIEVES ARE THE BEST IN THE WORLD BECAME AN INTEGRAL PART OF TWEED SAND BYPASSING.



Wayne 'Rabbit' Bartholomew – three time world champion, godfather of professional surfing and Southern Gold Coast local has some hard and fast thoughts about the value of sand to Coolangatta, which he reduces down to a simple formula.

Sand+Surf = success for Coolangatta

"Sand supply is what our bread is buttered with around here – it doesn't just impact on the surf breaks, it directly affects our economy, our businesses, our enjoyment of the area," said Rabbit.

Changing flows

In the mid sixties and seventies, even while Snapper and Rabbit were making their mark on the world surfing stage, the supply of sand to the surf breaks and beaches of southern Gold Coast was changing.

A prolonged period of cyclonic activity, combined with the extension of the Tweed River training walls in 1962 resulted in severe coastal erosion all along the Southern Gold Coast – taking beaches and surf breaks with it.

"By the end of the sixties, and after a few good storm seasons, it was hard to ignore the niggling thought that the walls had impacted the sand flow to the detriment of the surf breaks," Rabbit remembered.

Over the next two decades sand continued to build up behind the training walls and on the Bar at the Tweed River entrance, meaning its normal course of travel around Point Danger was interrupted and intermittent, starving the surf breaks and beaches to the north.

"I remember in the early nineties we had a period of two years without sand coming around to Snapper," said Rabbit. "We'd been waiting and waiting and finally I saw a sand slug released off the bar that started moving around the point like blood moves through a heart valve – bringing life to Snapper."

"With every tide the bank built up and surfing was great. Then after waiting two years and enjoying only a week of great surfing, a storm came through and washed it all away, and there was no surf again for over a year."

And the new behaviour of the local surf breaks wasn't just a downer for surfers.

"I remember people in town would say 'why are all these businesses failing?' It was simple to me - you could correlate it with no sand and no surf."

The Project takes shape

Rabbit went to the first public meeting of the Tweed Sand Bypassing Project in 1992 because he was "a mixture of interested, curious and concerned about what the new plan for sand in the area would mean."

"I went along with fellow member of Snapper Rocks Surfriders Club, Bruce Lee," he said. "We raised enough questions that the Project Management saw us either as troublemakers or perfect examples of community stakeholders, so decided to get us involved, and I've been involved ever since."

While not disagreeing with the nuts and bolts of what the Project was tasked with doing – removing sand from the entrance of the Tweed River and using it to replenish Southern Gold Coast Beaches, Rabbit was committed to ensuring protecting wave quality was a recognised outcome.

"I don't know why people won't accept it's always going and responding to the natural sand drift."

Lift off

The Project started moving sand off the Tweed Bar in 2000, and had an immediate impact – but it just wasn't one the locals were largely happy with.

"I can kind of see that it was nearly inevitable that it was going to have a rocky start," said Rabbit. "With 30 years of build up, the sheer volume of sand being moved off the Bar meant it appeared to be a dump job."

"There was so much sand being pushed into the Bay there were like sea mounts, waves were breaking a long way out in the Bay and all sorts of unfavourable rips and currents and sand formations were created and that created a lot of fear and concern that it was going to be that way forever."

Rabbit says understanding about just how the Project operated with the Jetty, dredge and discharge points was often confused, leading to a worry that whoever was in control didn't have their particular interest at heart.

"No matter what you said when it started, and even now, there is a misperception there is a little guy sitting in a little box, pedalling away pumping sand. If people weren't happy with the sand at their particular beach they'd say 'Can't you get that guy pumping sand, or we've got enough sand, can't you turn it off?'

"I don't know why people won't accept it's always going and responding to the natural sand drift."

Balance

The Project is an exercise in balancing competing needs. But Rabbit believes the biggest balancing act for the Project is the different impacts it has on different beach users.

"There are so many different users it is inevitable that serious debates about whose interests the Project needs to be serving arise," he said.

"For instance, I've seen how amongst surfers, the impact of the sand bypassing on waves in the area, and your view of the Project's success depends on your preference.

"In my opinion, historically waves in the area have been great for long boarders, but the waves after the Project started pumping were what I call young man's waves - hollow, powerful.

"So, if you are an expert tube rider like Mick Fanning and his gang, life was unbelievable, but on the flip side, as a long boarder, it was terrible.

"Surf Life Savers were unhappy about losing the scalloped out beaches that had made swimming areas safer. Sand off the bar meant that fishing boats could tackle the River Entrance with more certainty to make a living, but the massive amount of sand on some of the beaches annoyed holiday makers."

Life after bypass

"The sand bypassing turned the old Snapper into Snapper on steroids kind of like Alpha Snapper with a more

consistently higher quality wave, 300 days a year," said Rabbit. "And of course we got the Superbank."

"But Snapper and Kirra have almost always been two sides of a coin - the same storm surge that would take the bank away from Snapper would build it at Kirra, and Kirra likes a much deeper bay.

"If the major upside to the sand bypassing was greater consistency and the Superbank at Snapper, the major downside was that Kirra and its perfect waves have been buried with sand.

"The curvature of the beach at Kirra meant that the extra sand was acting like a chook caught in a boa constrictor's neck - the sand was moving very, very slowly, so Kirra became the casualty - the sand got stuck at Kirra and it just kept building up and building up.

"The bypassing was introduced under a long term contract so I accepted a while ago that the Project is here for a long time and that is the reality I have been working in.

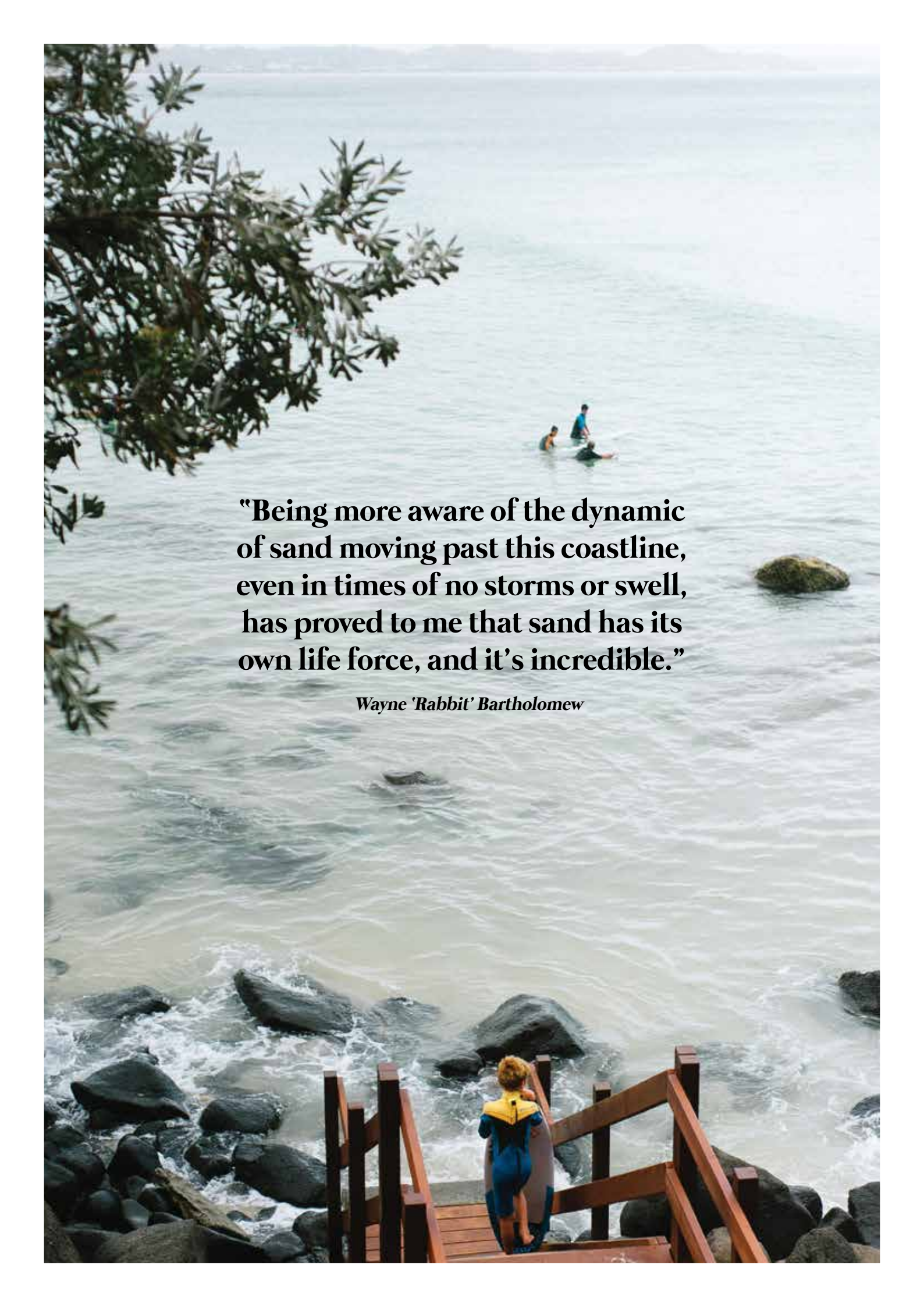
"I understand a lot of people my age mourn the passing of the uncrowded era of the 1970's, but for the youngsters here who have been introduced to the joys of surfing, right here and right now is the 'good old days'," he said.

Rabbit is positive about the Project's place in the community, believing it has no choice but to just keep moving forward and making adjustments as the natural conditions change.

"I think the sand bypassing is settling into the natural rhythm I always believed it was capable of, and I think there is a begrudging belief in the community that it kind of works," he explained.

"I stay involved with the Project because I feel I am representing the unspoken majority - the young surfers, who have been by default the main beneficiaries of the Project and as a result are living in a free surfing version of Disneyland. They love life - they don't agitate, they don't write letters, they don't ring the local politician, and they don't go to meetings, so I feel they need to be represented.

"You just have to look at the Superbank. When you see the lines of swell making the ocean look like corduroy, it is just one of the wonders of the world."



**"Being more aware of the dynamic
of sand moving past this coastline,
even in times of no storms or swell,
has proved to me that sand has its
own life force, and it's incredible."**

Wayne 'Rabbit' Bartholomew



Snapper

FROM FICKLE TO FANTASTIC

On any given day, the regular supply of both pumped and natural sand ensures that Snapper is one of the most reliable surf breaks in the country. But this has not always been the case.

Pre 1960s – free flowing

Before the Tweed River training walls were extended in 1962 sand flowed freely across the shallow Tweed bar, moving around Point Danger in large shoals. “Snapper Rocks was a fickle wave, Rainbow Bay was traditionally a longboard wave and Greenmount Point was a very separate longboard wave on the point, right on the rocks. They were three separate breaks,” says Peter Turner, long term Gold Coast resident and member of the Project’s Advisory Committee.

1960s to 1990s – obstacles and erosion

The effects of extending the Tweed River entrance walls in 1962 weren’t fully evident until five years later when the Gold Coast experienced several cyclones in short succession. The next 30 years saw an ongoing battle with erosion with seawalls built at Coolangatta and Kirra, groynes at both Kirra Point and Miles Street, and several large attempts at beach nourishment.

During this time Snapper had the occasional great surf break – but you could wait two years for it! Instead, during the 1970s, and particularly 1980s, with Kirra Point groyne and the severely eroded profile and nearshore reef, the real action was at Kirra.

Post 2001 – pumping

Tweed Sand Bypassing commenced in 2001, with the river of sand once again flowing from south of the Tweed River entrance and onto the Southern Gold Coast beaches. The Superbank was born out of sand pumped to the Snapper Rocks East outlet that was then shaped by waves and currents into a shore parallel beach bar extending from Snapper Rocks all the way through to Kirra. Ian Taylor who was the Project Manager at the time describes the

impact of the Superbank on the Coolangatta community: “There was a lot of contest – some people loved it – I had people ringing me from Honolulu saying ‘Is the Superbank working?’ because they wanted to fly out and have a wave, but many of the local surfers were disappointed. It was about change – the Superbank came along as nature’s response to a huge injection of sand after such a long period of low sand and changed how the area operated.”

Today

The catch-up quantity of sand has been shifted north and Tweed Sand Bypassing only delivers the natural supply. The sand supply from both natural offshore drift and bypassed sand now experience a more natural variance.

“What we’ve gained from the sand bypass is good beaches; plenty of sand and an incredibly consistent surfing wave,” says Peter. And as for Kirra –now that the natural supply of sand has been reinstated it will never break as it did in the 1980s when heavily eroded. But with the right swell and seasonal erosion around the point, Kirra will certainly find its way back on the surfing map.

“The river walls at the Tweed, the groyne at Kirra, the sand bypass, were about creating better beaches, saving foreshore infrastructure, and better navigation. Improving surf quality has been a ‘happy accident.’

Peter Turner

Kirra Reef

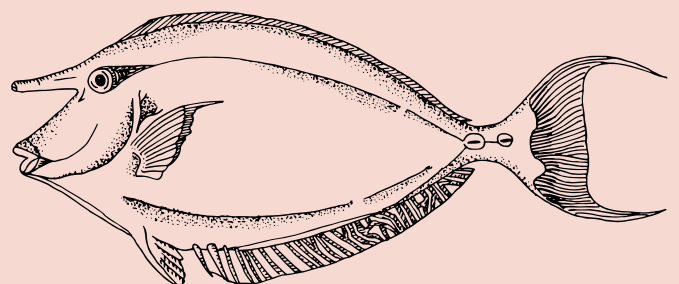
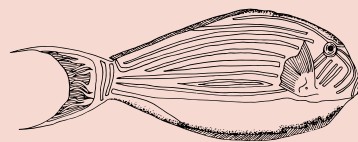
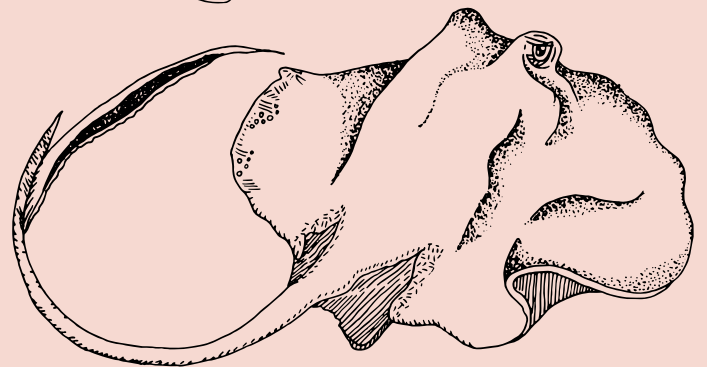
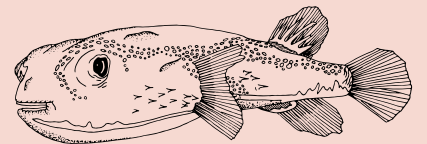
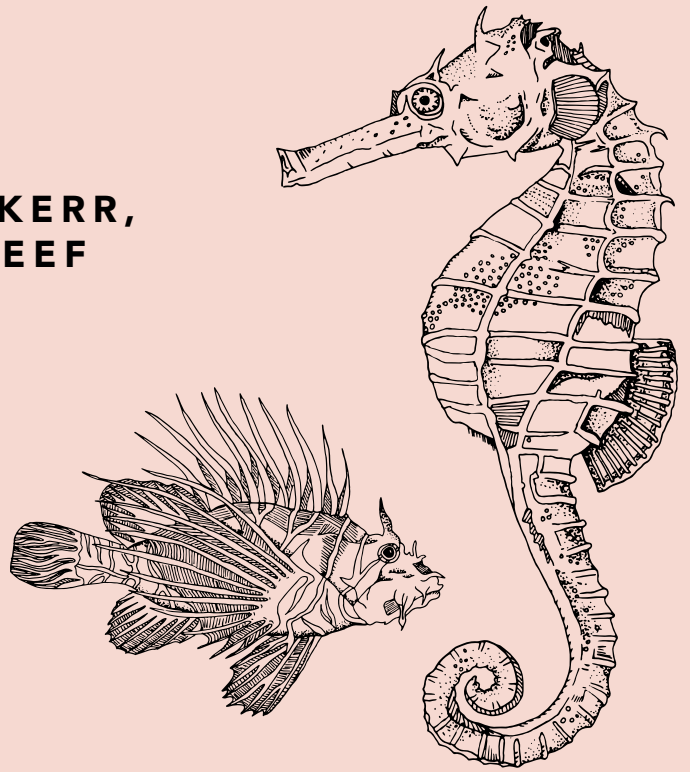
OUR EDITOR, CATHERINE KERR, PADDLES OUT TO KIRRA REEF

It's a beautiful summer day as I launch out from Kirra Beach on my longboard, snorkel and mask around my neck, paddling towards Kirra Reef. Four hundred metres, I'd calculated from the map, but figuring out exactly which way to paddle was proving to be far more difficult. After about 10 minutes, the water below suddenly became much darker as the rocky reef emerged from the sand. I had reached Kirra Reef.

Kirra Reef has been experiencing a sort of renaissance since a series of storms in 2009 shifted the catch up quantity of sand that had been sitting at Kirra Beach. This northern movement of sand combined with Tweed Sand Bypassing only pumping the natural supply, has allowed the reef to emerge, and its inhabitants to move back in.

I snorkelled around the reef, longboard in tow, and was surprised by how big it was and how many fish there were. I saw plenty of striped barracuda and black-spotted porcupine fish swimming among the various surgeonfish, even a tawny nurse shark. The distinctive gnawing sound I could hear underwater was oddly relaxing as the fish nibbled on the seaweed and coral that covered the rocky outcrops.

Back on the surface I had forgotten how far from the beach I actually was and it took me far longer to paddle back in. A few little waves up against Kirra Point provided a welcomed transition back to land. I'm looking forward to my next Kirra Reef adventure.



Illustrations from top to bottom:

Spotted seahorse (*Hippocampus kuda*)

Zebra Lionfish (*Dendrochirus zebra*)

Black-spotted porcupinefish (*Diodon hystrix*)

Green turtle (*Chelonia mydas*)

Cowtail stingray (*Pastinachus sephen*)

Striped surgeonfish (*Acanthurus spp*)

Unicorn fish (*Naso unicornis*)



Rainbow Bay

QUEENSLAND'S SOUTHERNMOST BEACH, RAINBOW BAY, IS KNOWN FOR ITS ICONIC BEAUTY AND WORLD CLASS SURFING CONDITIONS. IT IS ALSO ONE OF THE FEW BEACHES ON THE EAST COAST OF AUSTRALIA THAT FACES NORTH.

The shoreline at Rainbow Bay is constantly moving but the overall beach width and shape generally fall into two distinct patterns.

In the first half of the year, the wave direction is more southerly. After being captured by the Jetty and discharged on the northern side of the River Entrance, or travelling offshore of Letitia in deeper water, large quantities of sand makes its way northward around the headland at Snapper Rocks.

Once sand has moved around Snapper, it slows down and temporarily builds up at Rainbow Bay. The beach continues to increase in width until sand at the northern end of Rainbow starts to flow around Greenmount headland.

In the second half of the year the average wave direction typically shifts more to the north, accompanied by strong northerly winds. This means that less sand moves around Snapper Rocks and into Rainbow Bay, and the beach begins to wash away. This creates a deeper Bay with a large separation between the swimming and surfing areas. As

slugs of sand begin to move back around Snapper Rocks, a lagoon is sometimes seen as the sand migrates from the seabed to the beach.

Rainbow Bay, although always beautiful, naturally fluctuates with the changing seasons. Tweed Sand Bypassing has captured beach conditions on the southern Gold Coast beaches since the late 1990s. This information is used to track changes to the beaches caused by the impact of the seasons, storms, and sand delivery.

Image: Rainbow Bay's seasonal pattern of retreat was clearly evident in January 2017. The almost constant stream of northerly winds and lack of swell throughout late 2016 and early 2017 reduced the natural northward flow of sand around Snapper Rocks. As a result, Rainbow Bay continued to change shape with the ocean moving closer to the dunes. Rainbow Bay should begin to increase in size once wave conditions become more south easterly, and sand is pushed along the coast and around Snapper Rocks.







Duranbah

"IT'S A SURFER'S BEACH"

Duranbah is a unique example of a truly man-made surf break. World surfing champion and community advisor to Tweed Sand Bypassing Rabbit Bartholomew recounts what it used to be like when he was a young boy.

"My father used to drive to the top of Point Danger, before the river walls were extended, and we used to look down on Duranbah and the big sweeping current where the river would come out. There was a massive big deep blue lagoon with a lot of current near Lovers Rock at North Duranbah. And my father did not have to tell me to never put a foot in the water at that beach. It was an absolute no man's land and very dangerous."

Duranbah was forever changed when the Tweed River entrance walls were built and Duranbah was separated from the river. Sand started moving into the beach from the Tweed Bar, bringing with it the surf. With serious erosion on Queensland's beaches just around the corner and the beginning of the shortboard revolution, long term Gold Coast resident Peter Turner described Duranbah as the beach that "kept everybody sane".

"It faces east, it's got a cliff at one end, a big hill around the back of the beach, and then you've got six metres of rocks so it's got incredible wind protection that's where the waves were!"

Rabbit also has fond memories of Duranbah at this time and was one of the first vanguards to start surfing it on a regular basis.

When planning for Tweed Sand Bypassing was underway in the 1990s, members of the Project team and community became concerned it would starve Duranbah of sand. To prevent this from happening, the Project's Environmental Management System was designed to include management of both the sand flow and surf quality of Duranbah. This continues today and regular consultation takes place with the community Advisory Committee and other interested stakeholders before sand is either piped to Duranbah Beach or deposited offshore via dredge. Surfing amenity is always at the forefront of these discussions.

Fortunately for Duranbah, the sand bypassing jetty isn't 100% efficient at capturing the longshore sand drift. This means that sand continues to naturally flow from the Tweed bar and shape the A-frames that Duranbah has become so well known for. Duranbah is arguably one of Australia's most successful man made surfing creations. "It's not a family beach; but it's definitely a surfer's beach," said Rabbit.







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