McCallum Bros Ltd Sand Extraction Operation

The purpose of this document is to outline the application and proposal description for all specialists to use (in full or in part) in their reports so that the wording of the proposal is consistent across all reports.

1. Introduction

McCallum Bros Limited® (MBL) are a New Zealand family owned and operated company founded in 1904. Apart from sand extraction, the company is involved in a range of activities that includes shipping and bulk cargo transport, trucking and quarrying.

MBL currently extracts sand from the Mangawhai-Pākiri embayment, an activity it has carried out since the 1940's.

MBL's sand extraction consent in the offshore area of Pākiri is going through a process within the Resource Management Act 1991. The application was declined by the Environment Court in April 2024. This decision is being appealed to the High Court on 9 points of law.

MBL are continuing to extract sand at Pākiri through a temporary consent granted by the Environment Court which expires in July 2026.

Historically, MBL supplied approximately half of Auckland's concrete sand demand from several Pākiri consents (now expired). Currently, MBL is supplying significantly reduced volumes from the temporary consent as it has lower permitted extraction allowances.

1.1 Why Te Ākau Bream Bay?

Through its investigations of sand resources in the upper North Island, MBL has identified Te Ākau Bream Bay as a suitable location for sand extraction. The reasons for this are that the product attributes, expected environmental effects, location, and key physical, environmental and operational requirements make the pursuit of an extraction permit worthwhile.

Of critical importance were early findings that the proposed extraction area is offshore of the calculated Depth of Closure (DoC), where sand extraction would have little to no effect on the beaches, and shoreline. No reefs or underwater structures of any ecological importance were found in bathymetric surveys of the seafloor.

Should a consent be granted, the sand will primarily be used to supply the Auckland, Waikato, Bay of Plenty, and Northland concrete markets. In particular, for the Auckland market, due to their physical and chemical properties, marine sands are well suited to the construction of high-strength concrete that is essential for major infrastructure and large commercial projects.

2. Existing Commercial Activity

Te Ākau Bream Bay is the entrance to Marsden Point and North Port. It is one of New Zealand's busiest commercial ports and main supply hub for our national oil and fuel imports.

The port hosts an average of 576 ships per annum (2014-2024 inclusive) (Northland Regional Council, 2025), resulting in an average of 1152 vessel movements transiting in and out of Te Ākau Bream Bay per annum. This does not include the passage of recreational vessels whose numbers far exceed the number of commercial vessels transiting the bay (Northland Regional Council, 2025).

There is also a commercial ships anchorage located to the north and south of the shipping channel which runs parallel to the proposed extraction area for a length of approximately 4 km with capacity for up to 7 vessels to be anchored at any one time. This anchorage area is used during most days of the year, with the commonly used inner northern anchorage site (B1) having a ship anchored for up to 9 months throughout year.

Te Ākau Bream Bay also has a large commercial and recreational fishing presence, including the use of bottom trawling techniques. Historically, the embayment was also widely dredged for scallops until the ban on scallop dredging came into effect in March 2023.

Te Ākau Bream Bay, however, does not have an untouched/pristine benthic environment. Bottom trawling outside the trawl limit line has been undertaken for more than a century. Extensive scallop dredging occurred until 2021 with a total of **160,649 scallop dredge tows** from 1990 to 2021 (Ministry for Primary Industries, 2023). Half of the proposed extraction area on the seaward side has been trawled and Danish seined for decades.

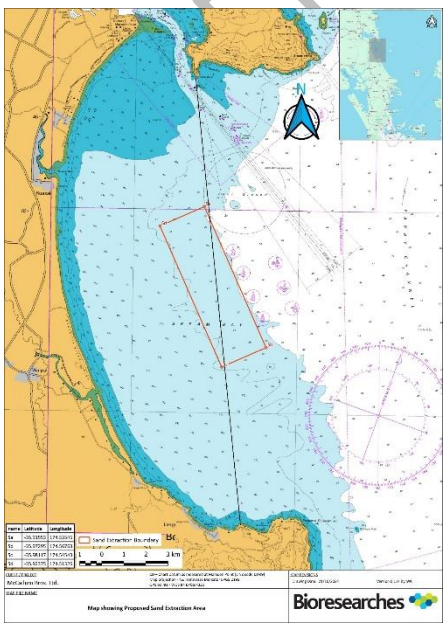

Figure 1 (left): The trawl and Danish seine limit line in Te Ākau Bream Bay. (Source: Bioresearches)

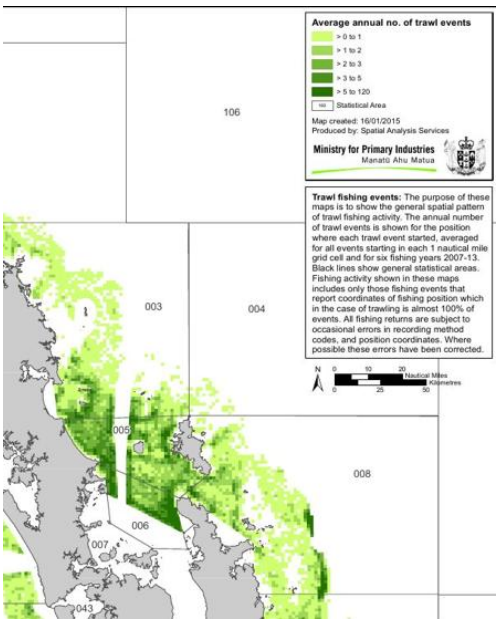

Figure 2 (right): Annual average no. of trawl tows (events). (Source: http://fs.fish.govt.nz/Page.aspx?pk=91)

The suitability of Te Ākau Bream Bay sand for high strength concrete production, combined with the extraction area being sufficiently outside the DoC, and the fact that the embayment has high commercial presence has led MBL to identify Te Ākau Bream Bay as a long-term sustainable source of sand. The source of good quality sand is integral for the construction of infrastructural, commercial, and residential projects as identified and scheduled in the recently passed Fast-track Approvals Act 2024.

3. Application Details

MBL is applying for consent (a coastal permit) to extract sand from deep water at least 4.7 km from the coast in Te Ākau Bream Bay (see Figure 3 below).

The application is a rectangular area that measures 7 km x 2.2 km. The monitoring and subsequent reports will be undertaken by independent experts and reported to Northland Regional Council.

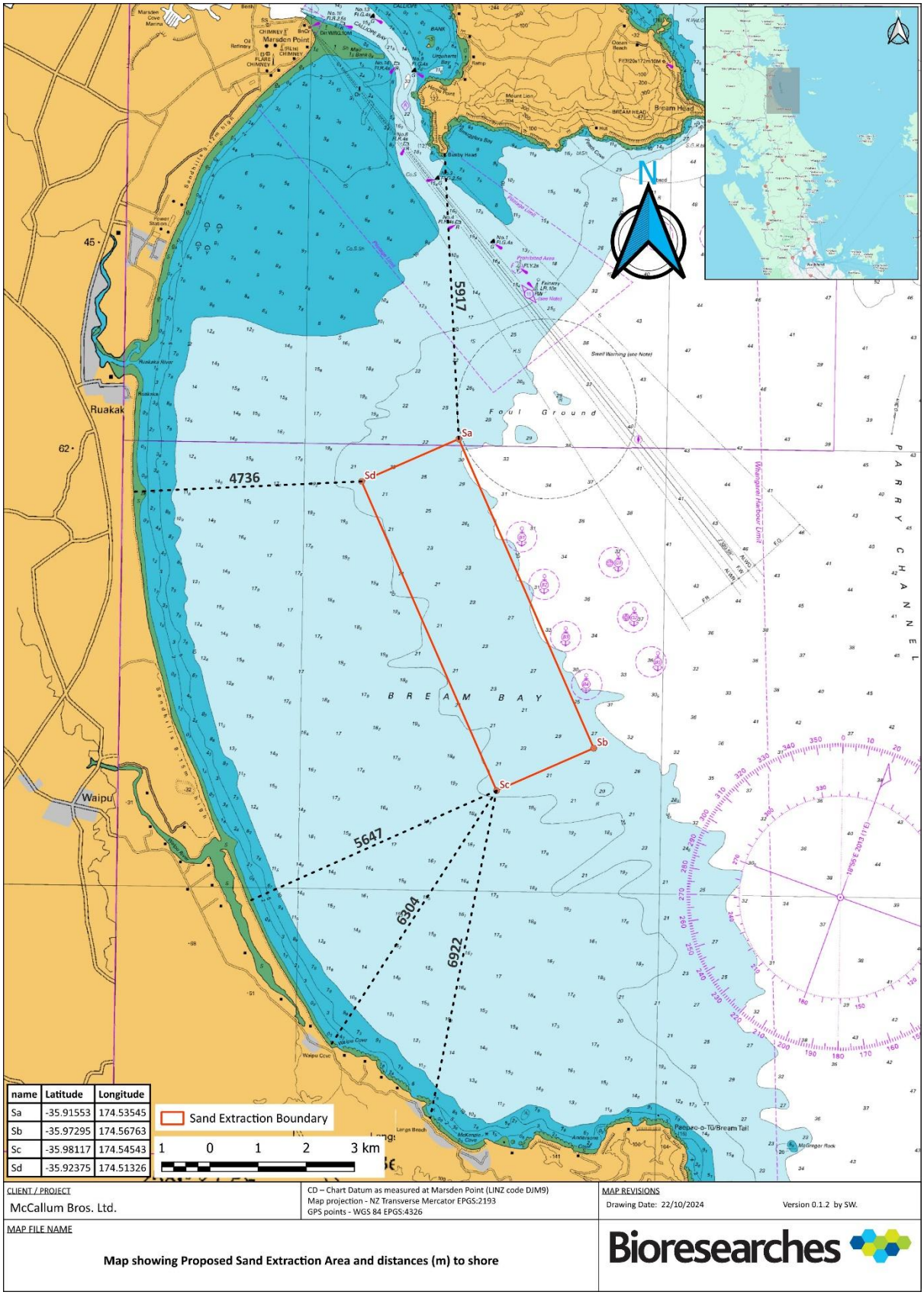

Figure 3: Map showing the proposed sand extraction area

A 35-year consent period is being applied for, and the implementation of the consent is proposed as follows:

- An annual sand extraction volume of up to 150,000 m^3 per annum for the first 3 years of the consent.
- An annual sand extraction volume of up to 250,000 m^3 per annum for the remaining 32 years of the consent.

A comprehensive monitoring plan is proposed from the onset of the consent so that effects from the activity can be understood.

The proposed monitoring plan includes:

- Bathymetric surveying
- Topographic surveying
- Ecological monitoring
- Marine Mammal monitoring

The monitoring and subsequent reports will be undertaken by independent experts and reported to Northland Regional Council.

4. Sand Extraction Operations

Sand extraction occurs using an extraction vessel with the sand being transported directly from the embayment primarily to MBL's depot at the Port of Auckland but also to Ports in Whangārei and the Bay of Plenty. The extraction vessel that will be used for sand extraction in this proposal is the *William Fraser* which contains a motorised trailing suction hopper dredge. This vessel was purpose built for MBL in 2019 at a shipyard in Malaysia. The *William Fraser* has a number of improved technologies over other extraction vessels currently operating in New Zealand which include:

- Euroclass, ACERT marine propulsion engines that meet both EPA Tier 4 and IMO II emission regulations to minimise fuel use and reduce emissions.
- Acoustically lined engine and pump rooms to reduce engine noise from the vessel.
- A draghead designed to minimise seabed disturbance and take a wider and shallower extraction furrow to an average of 100 mm deep and 1600 mm wide.
- An electric pump that reduces underwater noise which eliminates any possibility of hydraulic oil leaks or spills from the dredging equipment.

- A Dutch designed sand screening deck, rather than flume pipes, which reduces damage to live animals passing through the draghead and increases the screening efficiency.
- Moon pools to deliver the over-size material and sediment discharge below the hull line to minimise turbidity.
- Reduced lighting - the vessel uses subdued and downward facing lighting whilst still complying with Maritime NZ lighting and safety requirements.

Figure 4: *William Fraser* extracting sand at Pākiri

The *William Fraser* has the ability to extract sand in water depths up to 38 m which allows for extraction to be spread across the whole application area, no matter the tide or prevailing weather conditions.

The *William Fraser* has a crew of four, with crew on watch during dredging operations to ensure that there are no navigational issues with other vessels despite the vessel displaying RAM (Restricted in Ability to Manoeuvre) day shapes and lighting where required which gives navigational priority to the vessel.

4.1 Method of Extraction

The sand extraction operation is expected to occur as follows:

- During the morning of an extracting day, the *William Fraser* will leave the Port of Auckland for Te Ākau Bream Bay and will follow a route through Tiri Passage, outside Kawau Island, past the Mangawhai-Pākiri embayment to arrive at Te Ākau Bream Bay in the early to mid-

afternoon. This route is shown on the Map in Figure 5. The *William Fraser* cruises at a maximum speed of 9.5 knots, in compliance with the Hauraki Gulf Transit Protocol for Commercial Shipping which reduces the risk of marine mammal strike while under way.

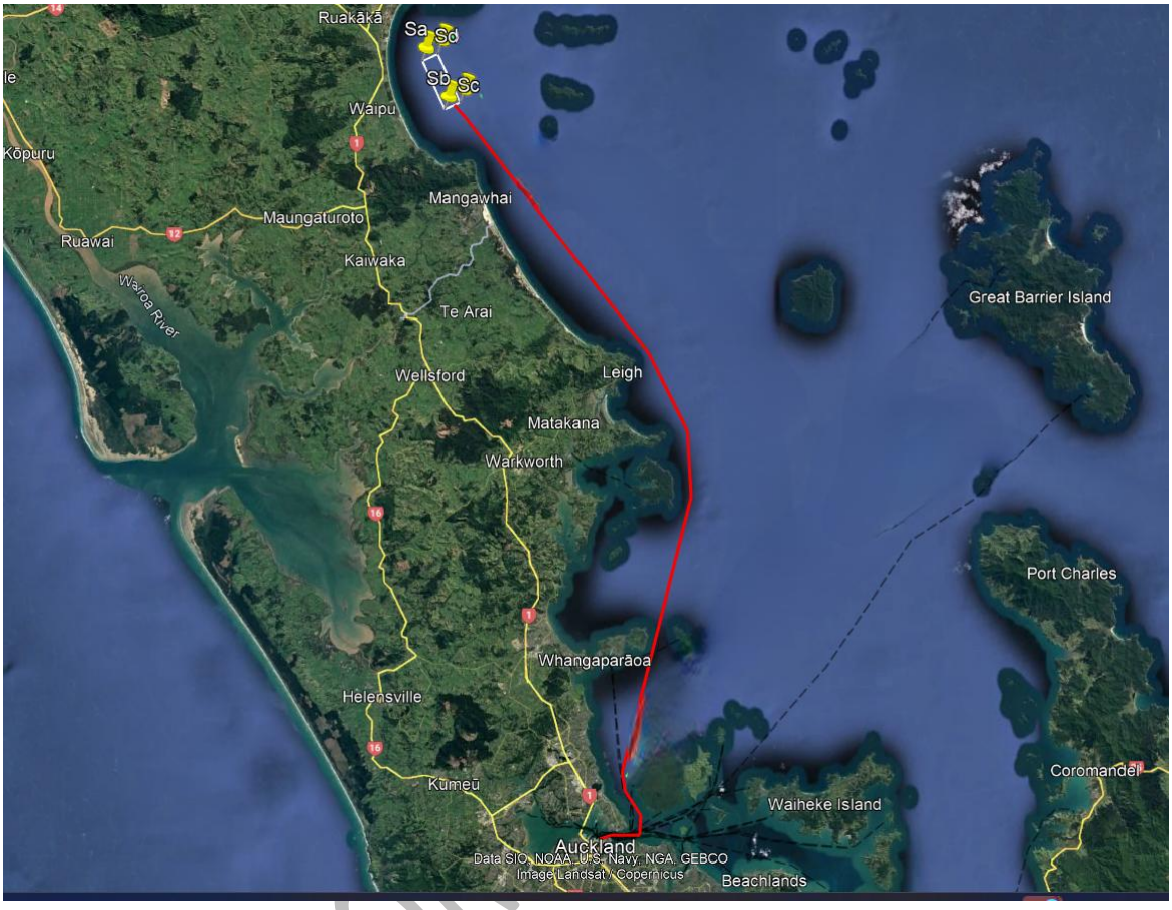

Figure 5: Map showing the proposed trip plan to Te Ākau Bream Bay from the Port of Auckland

- Once the vessel reaches the extraction area, it will slow to a speed of 1.5 to 2.5 knots as the sand extraction equipment is prepared. This is the speed the vessel travels at while extracting sand.
- The draghead is unsecured from the vessel, the davits extend the pump and dredge pipework over the starboard side, then they are slowly lowered to the seabed (see Figure 6 to demonstrate where this equipment is located).

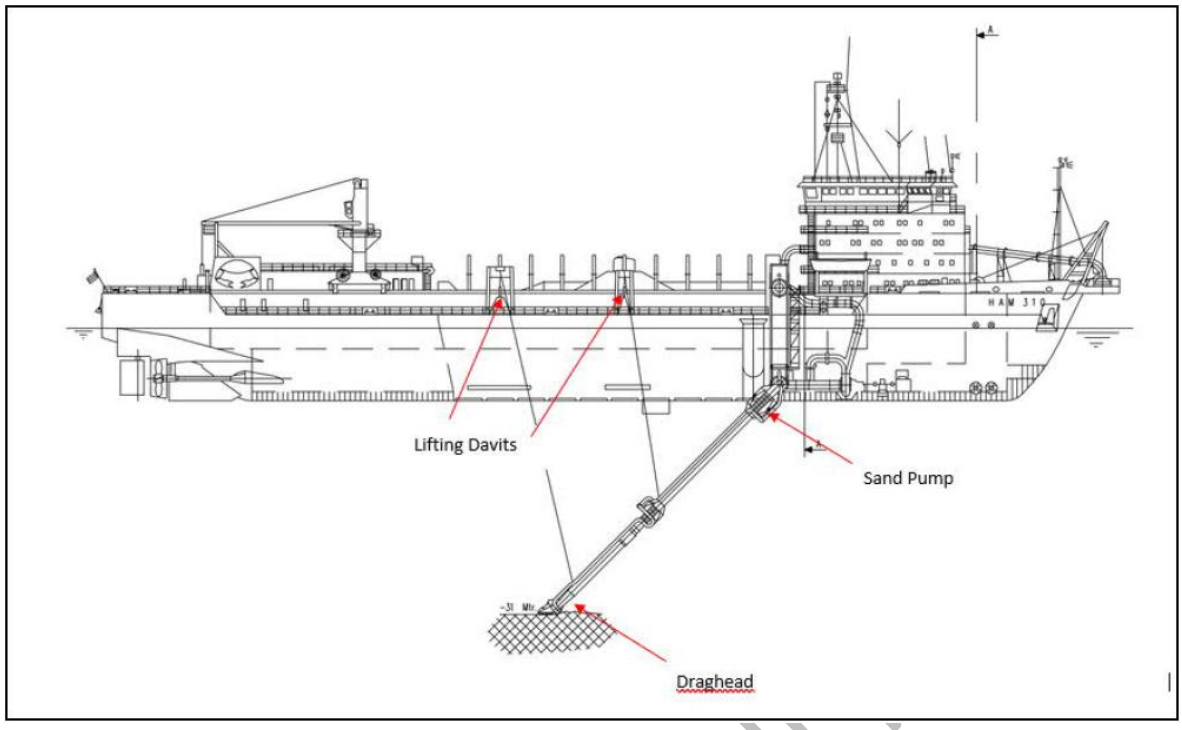

Figure 6: Schematic diagram of a Trailing Suction Hopper Dredge (note not an actual MBL vessel)

- When the draghead is less than 3 m above the sea floor, the pumps will be engaged, and water will start to pump through the system.
- After the pumps have been primed with water, then the draghead can be lowered fully to the sea floor to begin extraction. At this point, the position of the vessel is started on the MAXSea navigational software, and a track will begin to be recorded. At the same time, a switch on the swell compensator is triggered that is independent of the crew that starts recording an independent location, this cannot be tampered with by crew on board and verifies the position of the vessel. Recording will continue until dredging has ceased and the pump is lifted off the seafloor.
- When the vessel has finished loading, the pump will be lifted to no greater than 3 m off the sea floor and water will be pumped through the system to ensure that all the sand has been flushed from the pipes and screen deck. Once complete, the pump will be turned off and the draghead raised and stowed back on board the vessel.
- The tracking software will turn off once the draghead is lifted from the seafloor and the skipper will turn off the vessel tracking on the Maxsea navigational software.
- The sand slurry is fluidised as the water is pulled through the draghead when it is on the seafloor. This helps mobilise the top 100 mm of sand where suction from the pump pulls the sand and water through the draghead and up through the pump (Figure 6).

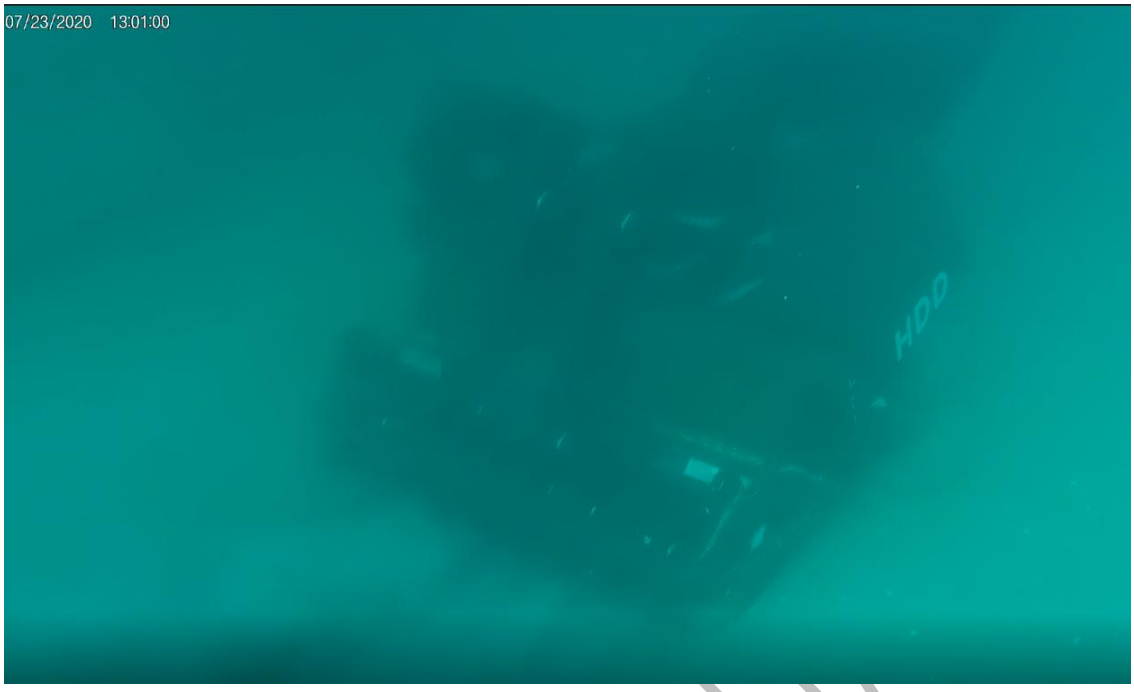

Figure 7: *William Fraser* draghead operating

- This results in a 1.6 m wide x 100 mm deep track being created on the sea floor (Figure 8). The duration of the trench is temporary and dependent upon wave conditions at the time of and following extraction.
- The sand slurry moves up the draghead pipe, through the pump and then on board the vessel where it is discharged onto a double deck screening tower that utilises a 2.5 mm screen mesh to prevent larger material going into the load of the hopper.
- Oversized material passes across the top of the screen and drops via a pipe into the forward port side moon pool and exits at keel height under the vessel. Having the oversize material pass through the moonpool and enter the sea at keel height reduces the aeration of the sediment (compared to pumping over the side of the vessel) which accelerates the descent of the suspended sediment in the water column and reduces the impact on the water quality.

Figure 8: 80-100 mm extraction track measured 5 minutes post extraction

Figure 9: Plan of sand 'screening deck' on the *William Fraser*

- The sand passes through the screen deck (Figure 9) and into two pipes that run along the sides of the holding hopper and discharge into the hopper on board. As the slurry drops into the sand hopper the water velocity slows, the sand settles out. The water and any finer sediment in the load then pass out of the hopper into moon pools which discharge under the vessel's keel. There are six moon pools in total, three along each side of the hopper on the vessel.
- The barge slowly fills with sand with excess water flowing into the moon pools. As the level of sand increases in the hopper, boards are used to retain it in the hopper whilst still allowing the sediment laden water to pass out over these boards.
- The vessel will travel up and down the application area until the hopper is full. For the Te Ākau Bream Bay application area it is expected that 2 full passes will be needed on average to fill the hopper with an average of 923 m^3 of sand.
- MBL expects the time it will take to fill the hopper with sand will be between 2.5 and 3.5 hours.
- This results in an average 13 km of extraction track for each load.
- A typical return trip from the Port of Auckland ranges from 16-20 hours, depending on the weather.
- When the vessel returns to the Port of Auckland (or other destination Port) the sand is unloaded via excavator onto a stockpiling barge to drain, and after a day or so is loaded into trucks for distribution to our customers or to a land-based stockpile.

4.2 Operating Hours

Sand extraction will be limited to the following operational windows:

- 12:00 pm to 6:00 pm during the months of April to September (inclusive).
- 12:00 pm to 8:00 pm during the months of October to March (inclusive).

Sand extraction will be limited to 3.5 hours maximum on any given day. It is estimated MBL will spend ~6.5% during the first 3 years of the proposed consent (with an annual sand extraction volume of 150,000 m^3 per annum) and less than 11% for the remaining 32 years (with an annual sand extraction volume of 250,000 m^3 per annum).

4.3 Extraction Management

Extraction of sand will be managed across the proposal area via the use of extraction cells to prevent over-extraction which could result in the formation of trenches. This will also

provide the maximum possible timeframe for the biota living in a previously extracted track to recover.

These cells measure 1000 m x 200 m and there will be 77 in total across the proposal area. The cells form part of the operational plan in terms of how extraction will be managed as well as the ecological and geophysical monitoring over the site. Figure 10 (below) shows a map of the proposed area with these cells included.

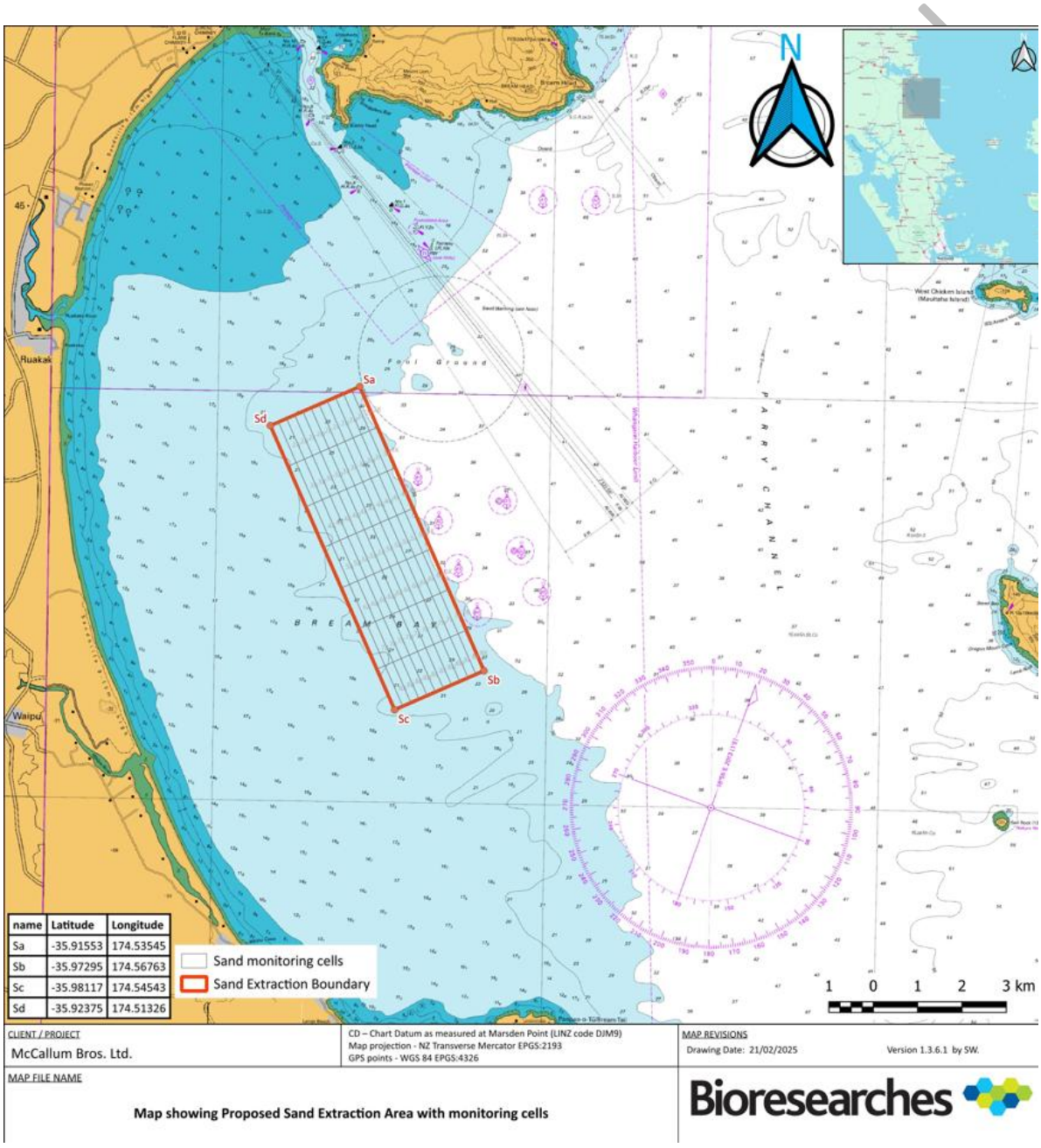

Figure 10: Map showing the extraction and monitoring cells of the Proposal Area

An Extraction Management Plan is proposed to be used which will direct how the vessel extracts sand across the site so that it is undertaken as evenly as possible and monitored to minimise effects. Track plans will dictate to the crew where on the site they will extract. As mentioned, the actual track undertaken for that trip is recorded and entered into GIS software so that volumes per cell can be monitored and reported.

The monitoring of extraction will come in several parts:

1. Recording volumes of sand removed from each cell to ensure it is evenly spread across the whole site on a monthly and annual basis.
2. Benthic ecological sampling to measure and look for potential change in biota across the site and relating this to extraction intensity and the control cells.
3. Bathymetric surveying to look for seafloor height changes.

A finer scale map of the extraction and monitoring cells is provided below as Figure 11 (below).

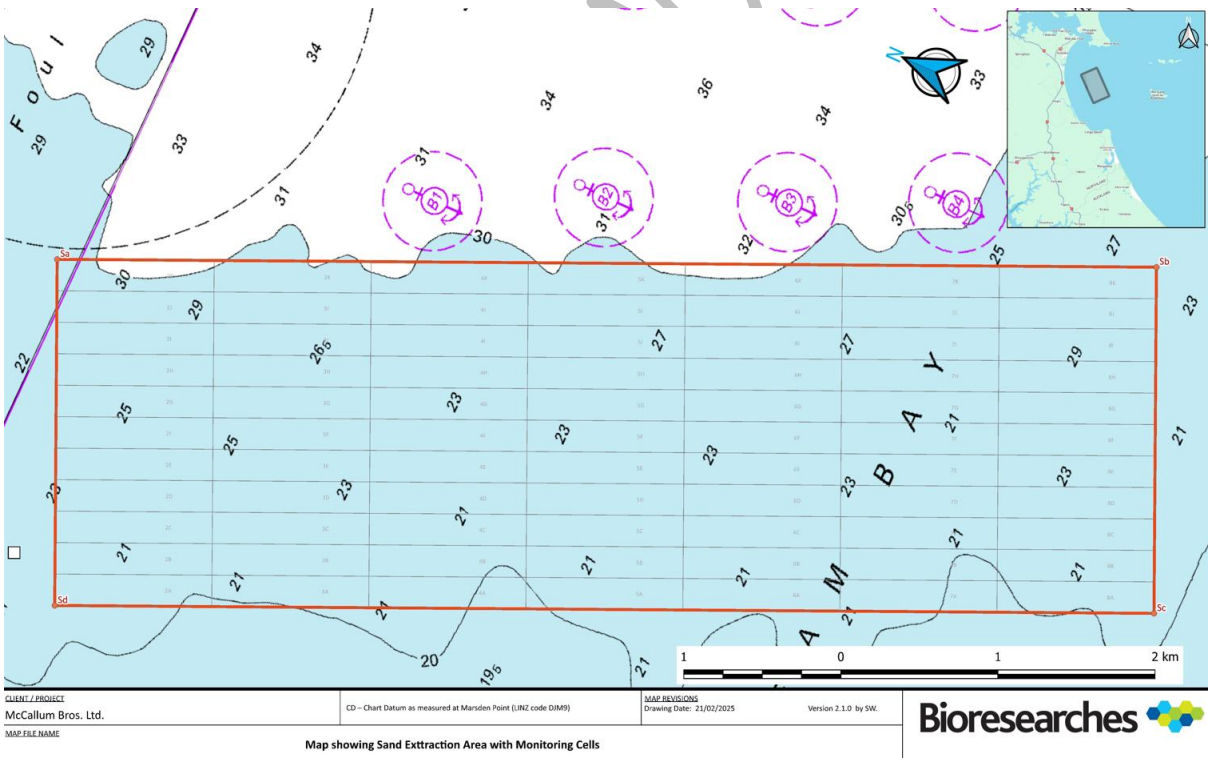

Figure 11: Extraction and monitoring cells (each cell is 1000 m x 200 m)

5. Oil Spill Prevention and Management

MBL have not had an oil spill in over 80 years of sand extraction in the Mangawhai and Pākiri embayment's.

The *William Fraser* is designed to reduce the risk of oil spills through the following:

- All of the engines, pumps, machinery, fuel, and oil tanks are held within a double bunded system inside the vessel. This is designed to prevent contaminants being released from a vessel.
- The sand pump is fully electric so uses no oil in its operation.
- The only external points above the deck which could potentially release oil are from the two davits that lift the sand pump and drag head, and the sand screening deck. Both lines are run by hydraulic pumps with reservoirs inside the vessel. Should a leak occur, alarms are immediately raised in the engine room, bridge and by the pump itself. The alarms will shut the pump off immediately so no further oil could escape. In the unlikely event that an oil spill occurs, the scuppers of the vessel retain the spilled oil so that it does not enter the marine environment.
- The risks are further mitigated by MBL using biodegradable synthetic oil instead of standard hydraulic oil.
- No refuelling is carried out in the Te Ākau Bream Bay embayment as part of our operating procedures.

6. Characteristics and uses of Te Ākau Bream Bay sand

The sand in the application area has the same mineralogical properties and a very similar particle size distribution compared to the sand that has been previously extracted from the Mangawhai-Pākiri embayment by MBL in water depths of greater than 25 m. Sand samples taken from the Te Ākau Bream Bay application area have been tested at Stevenson Resources Laboratory for source properties and performance to the New Zealand Standard – Aggregates and concrete samples were made by Firth's Concrete Laboratory to determine its suitability to manufacture concrete. The results of this testing are included in the Concrete Suitability Report.

Te Ākau Bream Bay sand is predominantly made up of quartz feldspathic particles which are classed as non-reactive in concrete. This becomes increasingly important as higher cement

proportions are used in high strength concrete. Cement is highly alkaline and as more is added to the concrete mix the alkali level increases. Unlike many sands, Te Ākau Bream Bay sand does not contain minerals that contribute to the risk of alkali reactivity in concrete which can lead to the breakdown of the concrete's structural properties over time. Good quality sand is highly sought after for making high strength concrete mixes, especially where a high degree of consistency in the raw materials is desired and 100-year lifespan is required in the finished concrete product.

Sand extracted from Pākiri is well known and high in demand for its suitability for ready mix concrete in infrastructural, commercial, and residential construction in and around Auckland. In general terms the qualities of Pākiri sand make it most suitable for high strength concrete mixes and this is where it has been used. This is particularly so where the characteristics of the local sand are non-compliant with the specifications in the concrete mixes required for infrastructure projects.

Projects Pākiri sand has historically been used in include:

- The Auckland Harbour Bridge
- Development of the Port of Auckland
- The new and the original Newmarket Viaducts
- Sky City
- Johnston Hill Tunnels (Puhoi)
- New Tauranga Harbour Bridge
- The Waterview Tunnel
- The Central Rail Link
- The Central Interceptor

The sand at Te Ākau Bream Bay is of the same high quality as Pākiri sand and will be used to satisfy the same construction and growth needs that Northland, Auckland, Waikato, and the Bay of Plenty require.

References

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