IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of an application by Kaipara Ltd for coastal permits to extract sand from the coastal marine area offshore at Pakiri (CST60343373)

STATEMENT OF REBUTTAL EVIDENCE OF DR SHAW MEAD

14 May 2021

---

1. INTRODUCTION

1.1 My name is Dr Shaw Mead. I previously filed a statement of evidence on behalf of Damon Clapshaw, a submitter in opposition to this application, dated 21 February 2021.

1.2 The purpose of this statement is to respond to the expert evidence filed by McCallum Bros Ltd as a submitter on this application; the section 42A addendum report provided by Auckland Council ("**addendum report**") and the accompanying specialist reports; and the further expert evidence provided by Kaipara Ltd in response to submitter evidence and the addendum report.

2. EXPERT ROLE

2.1 Mr Hay (and others that have prepared evidence for the applicant) states in paragraph 54 that "Dr Mead, when preparing his evidence for Kaipara Ltd, did not raise with me the presence of these swales or his concerns in respect to them." My evidence for Kaipara Ltd is directed at surf break impacts due to the activity, which I comment on in my evidence and consider would have little impact on the surf breaks (due to reflection or refraction or diffraction), which Ms Hart concurs with. My evidence for FOPB is directed at the impacts of the current dredging practices that are also associated with breaches of conditions; I did not provide my surf break assessment or discuss this with the FOPB. My role is as an objective technical expert to provide impartial advice/assistance for the implementation of the Resource Management Act.

2.2 To further clarify, I was originally retained by FOPB to look into several aspects of both the offshore and nearshore dredging consents and provide expert reports to FOPB. During the existing retainer I was approached by Kaipara undertake a surf break impact assessment. As an independent expert I felt able to undertake the assessment. FOPB, the Surfbreak Protection Society and Kaipara Ltd all accepted there was no conflict (as detailed in Section 3.6 of my evidence in chief).

2.3 With respect to Mr West's Evidence in Reply (25 February 2021), he states that he sees no mention of earlier reports in my summary of experience (i.e., ASR 2003 and 2006).. My evidence is directed at primarily at coastal processes, although I am also qualified and experience in the area of marine ecology and made comments of deficiencies with respect to the proposed ecological monitoring, which were also picked up by Dr Sivaguru

and Mr Christie. It is clearly stated in my paragraph 2.6 that I "was also involved with the assessment of ecological impacts of the proposed activity at the time". The 2006 PDA that I undertook is referenced in Annex 1. Both the 2003 and 2006 PDA's are referenced and discussed in Mead, S. T., and J. Davies-Campbell, (2021), "Review of the Mangawhai-Pakiri Dredging Consents and Supporting Science and Data. Prepared for Friends of Pakiri Beach, February 2021" (Referenced in Annex 2), which is directed at the science behind the compartmentalisation of the nearshore and offshore consents and not relevant to this present Hearing.

3. TRENCHES

eCoast Findings in Comparison to Survey Worx Ltd Findings (March 2021)

3.1 Mr Healy confirmed the existence of the trenches found in Area 1 by the Mr Clapshaw's/FOPB's side-scan and bathymetry surveys (Annex 2 of my evidence in chief). These trenches are located in the area where dredging tends to start first each time and are consistent with the pattern of repeat dredging close to the western boundary, as identified by Mr Clapshaw and supported by the AIS data. This approach of repeatedly targeting the same lines has created large deep depressions, which Mr Healy has indicated are wider (at up to 20 m) than the earlier investigations (Annex 2), which is presumably why they are being described as swales[1], and are also longer (at 4.67km reported by Survey Worx or perhaps more accurately 5.46 km as discussed by Mr Clapshaw) than identified in Mr Clapshaw's/FOPB's surveys. The surveys commissioned by Mr Clapshaw's/FOPB's were constrained to the southern part of Area 1 due to cost/time, and found several trenches, the offshore one being a >2 km long trench of up to 2.7 m deep. Overall, the trenches found in Mr Clapshaw's/FOPB's surveys extended across a length of 5.46 km (as described by Mr Clapshaw in his evidence in reply).

3.2 I have not stated that these surveys by Mr Clapshaw/FOPB found 18 km of shore-parallel trenches, although I reasonably assumed they might extend further north, or be found further north. As stated in paragraph 4.16 of my evidence in chief "*It is very likely* that trenches in the offshore area of 1 to >2.5 m depth running shore-parallel for some 18 km

[1] Swales are a civil engineering term for wide grassed drainage channels, they are wide a subtle, as opposed to the deep V-shaped trenches identified in the various surveys.

along the Mangawhai-Pakiri embayment (~70% of the beach length), is greatly reducing and/or preventing transport of sediment to the beaches." Had the trenches not been identified by Mr Clapshaw/FOPB and due to the lack of correct management (through poor application of the conditions and EMMP's), then it is likely that the dredging practices in Area 2 would have been the same as Area 1 and created ~18 km of shore-parallel trenches (noting Area 2 dredging has relatively recently begun).

3.3 With consideration of the timing of the 2 side-scan sonar surveys commissioned by FOPB, and the AIS data that directed the surveys, it is evident that the trenches that were identified were not created following the August 2018 seabed survey as part of consent conditions, and are due to repeated extraction along the same run-lines for a number of years prior to August 2018. It is notable that the FOPB surveys were directed by the May 2018 AIS data (i.e., prior to the August 2018 Survey Worx survey).

3.4 Uncertainty still remains with respect to the length and number of trenches in both Areas 1 and 2, however, some estimates of the volume of extraction required to create them can be made. Due to time/cost constraints, the FOPB surveys focussed on 2 areas that were known to be repeatedly targeted at the southern end of Area 1 – these surveys identified >2 km of trenches in the offshore survey, and at least ~1.75 km of trenches in the area closer to shore (i.e., Figure 3.2, Annex 2), noting that there are 2 and sometimes 3 trenches in the side-scan swath, similar to those presented by Mr Healy (evidence dated 16 April 2021). Mr Healy states that "The swales were detected in transect lines 3 through to transect line 9. The transect lines are 780metres apart hence the *length of area showing swale features is approximately 4.7km*[2] *long*.". Although there is uncertainty where the trenches terminate between transects 2 and 3, and transects 9 and 10 (Sheets 2 and 3 of 11, Mr Healy's evidence). There is further uncertainty with respect to the length of trenches, since the distances presented by Mr Healy do not align with the proposed "2021 Swale Area" (drawing by BECA 21 May 2021), which indicate an offshore polygon of ~8 km long by 800 m wide, and an inshore polygon of ~4 km long by ~600 m wide; i.e., with subtraction of the 100 m buffer zone, and total of ~11.6 km of trenches. Based on the proportion of the proposed "2021 Swale Area" and the area for the current application, I believe that it is likely that the scale is wrong on the BECA drawing.

[2] For clarification, this distance in Mr Healy's evidence was rounded down to 4.5 km by Ms Hart and Mr Riddell.

3.5 Some basic volume calculations can be made using a single trench (rather than multiple trenches as have been identified) of 2 m deep and 16 m wide (i.e. conservative with respect to the main trench dimensions between 4a and 6a in Mr Healy's evidence and conservative with respect to eCoast's findings in Annex 2) and a shore-parallel length of 4.7 km (Mr Healy's evidence). This results in 75,200 m^3 of trench volume for a single trench, which negates seabed transport and infilling of trenches which is substantial, (which I discuss with respect to potential environmental effects below); this suggests the volume of the trenches could be doubled (i.e., ~150,000 m^3). The most up-to-date extraction volumes from Areas 1 and 2 are not available. However, based on historical extraction volumes, the available AIS data, considering multiple shore-parallel trenches and incorporating sediment transport, it is my opinion that it is highly unlikely that the trenches that have been identified in Area 1 were created in the 6 month period between August 2018 (the earlier Survey Worx survey that did not identify them) and February 2019 (Mr Clapshaw's/FOPB's first side-scan survey). That is also confirmed by Mr McCallum advising the Panel in response to a question that he first learned of the deep trenches in December 2018 and they were dived in January 2019 and were found to be up to 2.5m deep. So I consider they had clearly been there for a considerable time.

3.6 With consideration to the Survey Worx recent seabed imagery survey, Mr Healy's evidence indicates that the trenches are likely not present in Area 2, although the AIS data indicates the similar approach to targeting the same dredge lines has occurred in the Area 2, it was a fair assumption that the trenches extended the full length of Areas 1 and 2. However, there remains a great deal of uncertainty with respect to the extent of shore-parallel trenches throughout Areas 1 and 2. This is because our recent analysis of the Survey Worx survey (presented by Mr Healy) includes areas of 'redacted' and 'lost' data that align well with repeat dredging runlines in the AIS information for 2015 to 2019 supplied by the Auckland Council (AC) (presented in Annex A below). Although AC did not provide eCoast the AIS data, rather screen shots of it, by overlaying the results of the Survey Worx recent survey (Annex A below) it is evident that:

- The repeated dredge lines of 2015 and 2016 (the dark blue lines underneath the overlay and closer to shore) line up with the areas of cropped data, suggesting that they are still present in some parts of Area 1 (Figures 1-7 and 1-9 Annex A);
- Figure 1-11 (Annex A) indicates that contrary to not being there prior to August 2018, the trenches identified by Survey Worx further offshore were begun at least

as early as May 2017 (an incomplete record of AIS images was supplied by the AC);

- Data has also been cropped/lost in transects 2 (Transect 1 is not presented) where the recently confirmed deep and wide trench occurs; i.e. suggesting it is longer than has been reported in the Mr Healy's evidence (Figure 1-2 Annex A), and;
- Transects 10 to 18 in Area 2 are not presented in plan form, and only low resolution vertical profiles of 5 out of the 9 transects are presented Mr Healy's evidence.

The reasons for the data omissions are not given in the survey report, although it is stated that "*Area 1 and Area 2 were surveyed on the 2nd of March 2021. There was a northerly 0.2m swell on site. The magnitude of the heave movement of the vessel was known to be within tolerances of the motion sensor. Conditions were well suited to completing the survey"* suggesting that all data could be collected.

3.7 Given these findings, and since transects 10 to 18 in this area are not presented in plan form (i.e. seabed imagery for Area 2 is not presented in Mr Healy's evidence), and only low resolution vertical profiles of 5 out of the 9 transects are presented in the Mr Healy's evidence, the full extent of trenches in Area 1 is unknown and the presence or absence of trenches in Area 2 is also questionable. In order to identify all of the deep trenches in all of Areas 1 and 2 for the '2021 Swale Area', seabed imagery would need to be undertaken that covers the whole of Areas 1 and 2 (rather than transects that cover an estimated 10-15% (Mr Healy's evidence in reply)), as specified in the EMMP's for Areas 1 and 2.

Potential Environmental Effects of Shore-Parallel Trenches

3.8 The potential environmental effects of shore-parallel trenches relates to the persistence of these features, which is clearly demonstrated in Figure 4.3 (Annex 2, page 8 of my evidence in chief), which is contrary to the commonly cited belief that they are filled during large storms and the effect of sand extraction on bathymetry will be minor. Deep trenches are able to capture shoreward moving sediment during large storm events and during any period when wave orbitals have sufficient velocity to lift sediment off the seabed for even very short periods of time (i.e. seabed creep). However, this material is then dredged from the trenches/sediment traps and the process of diabathic sediment transport is interrupted and/or stopped altogether; there are no natural physical

mechanisms to resuspend this material until the trenches are almost full and seabed wave orbitals and currents can interact with it.

3.9 As noted in my evidence in chief, if it is assumed that the trenches were present along the full lengths of Areas 1 and 2 (i.e., some 18 km), and without better monitoring and dredging practices there is potential for this to occur with continued targeted dredge-lines, then diabathic transport of sediment from the inner continental shelf (i.e., the offshore dredging area) is interrupted and/or stopped over a large area of coastline of the Mangawhai-Pakiri embayment. Depending on the source of information, this represents an average yearly deficit to the nearshore of 8,600 m^3 (Sand Study) to 103,000 m^3 (Mr Todd's first Annex states 145,000 m3 of diabathic transport into the nearshore zone (pages 55 and 56) – note this is an update on the volume in my evidence in chief) resulting in the increasing risk of negative effects to the embayment's beaches over time; capture/loss of 172,000 to 2,063,500 m^3 of sand being transported shoreward in the 20 year duration of the existing consent, which would double with the new consent without appropriate environmental management.

3.10 I do not entirely agree with Ms Hart and Ms Sharma interpretations of the depth of closure, that is, that the offshore and nearshore systems are basically separated. It can be thought of as a depth at which sediment 'leaks' both onshore and offshore. As concluded in the Sand Study "about 200-64,000 m^3/yr (with our best estimate being 12,000 m^3/yr) from *cross-shelf transport* (Hume *et al*., 1999)" that is, sediment is moving throughout the currently consented area (i.e., out to 50 m deep, and certainly beyond 30-35 m deep where the trenches have been created, noting this is to mean sea level, and so closer to 28-33 m deep). This is also supported by Dr Single, who considers that the theoretical limit of the depth of closure (25 m depth) does not isolate the offshore sand extraction from effects landward or on the shore. Therefore, as a result of targeting the same dredge lines repeatedly (i.e., the reduction/prevention of diabathic sediment transport) there is the potential for cumulative impacts on the beaches of the Mangawhai-Pakiri embayment.

3.11 With respect to Ms Hart's further evidence in response to the presence of trenches and their impacts, I find some uncertainty in the conclusions (especially paragraph 33), which are also contrary. As described in my evidence in chief and above, the continued presence of the trenches is not due to depth of closure, and in fact has little if anything

to do with depth of closure, it is due to the continued dredging of the same line to win the material that has been trapped in them. While Ms Hart acknowledges that the trenches have been repeatedly dredged (as supported by the AIS data), she considers that their persistence supports a 25 m depth of closure, which I assume means little sediment transport is occurring. For example, Ms Hart states "If large quantities of sediment movement were occurring regularly in the offshore area, this would tend to reduce the formation of such swales." To support the following statement "I am therefore not in agreement with Dr Mead's view regarding the reduction/prevention of transport of sediment to the beaches." This is because the material moving around the seabed on the inner continental shelf (i.e., Areas 1 and 2), a portion of which is destined for the nearshore sediment compartment (i.e., across the 25 m depth of closure) is being repeatedly removed by targeted dredging. As I have described above, which is supported by the Sand Study, Mr Todd's numerical modelling investigations, Dr Shand's assessment of Mr Todd's numerical modelling investigations and linear wave theory, there are significant volumes of sand moving over the inner continental shelf (~25-50 m water depth), some of which is moving shoreward; it is not an 'if', it is a fact. Since this material is being captured in trenches and then removed from the system through dredging, there is a reduction/prevention of transport of sediment to the beaches. I agree that from the perspective of an annual sediment transport budget the volume of sediment moving shoreward is relatively small (an average of 12,000 m^3/yr according to the best estimates available and as has been previously accepted by Commissioners), however, year on year this has the potential to impact negatively on the beaches of the embayment due to cumulative impacts.

3.12 I have discussed the presence of the deep shore-parallel trenches with my associates at eCoast and Dr Hume, who are in agreement that they will prevent cross-shelf transport into the beach compartment. The findings of the Sand Study (Hume *et al*., 1999), that very large amounts of sand is mobilised and in re-circulation in the embayment during periods of moderate-to-high wave activity, are further supported by Mr Todd's recent work; while I disagree that the depth of closure is likely to be further offshore (by definition of the outer depth of closure it cannot be), his investigations also show that a lot of sediment is moving across the seabed at depths of 30-35 m. While this material is not all destined for the nearshore (i.e., <25 m deep), it is very likely that a significant fraction of the 12,000 m^3/yr on average of sediment that moves into the nearshore is being

trapped and dredged, and so removed from the system, which could be compounded with each consent renewable, and a cumulative impact. The reason why the features have remained present from prior to February 2019 to March 2021 is not because there is very little sediment movement beyond 25 m depth, it is because these areas have been targeted by repeated dredging, removing the 'new' material that enters them and getting slightly deeper with each dredge.

Development of Trenches

3.13 It is my opinion that the shore-parallel trenches developed over time due to the absence of seafloor imaging, the somewhat contradictory conditions for sand extraction, and repeatedly targeting the same dredge lines. To clarify Mr West's statement in his paragraph 23 (Evidence in Reply, 25 February 2021), he has confused seabed imaging (e.g. side-scan sonar) with video camera survey; to my knowledge, seabed imagery has not been presented in reports for conditions and EMMP requirements since the initial sidescan surveys for the existing coastal permit application. As stated in my evidence in chief, it cannot be said that "*best endeavours*" have been applied to extract sand "*no deeper than the thickness of the active sand layer*" (as a requirement of Condition 3 in Annex 1 page 5), when the dredging vessels repeatedly dredged the same shore-parallel lines to depths of 1 to >2.5 m (i.e., well beyond the thickness of the active sand layer, which is mostly only a few tens of centimetres; e.g. the maximum amplitude of bedforms is ~150 mm). In Mr McCullum's evidence in reply (paragraph 23), he has stated that I acknowledge that dredging trenches of .2.5 m deep is not a breach of Condition 3 since Kaipara's current consent requires "*best endeavours to extract sand by means of smaller deeper extractions rather than large shallow extractions*". However, that is also part of Condition 3, which also states that extraction of sand should be "*no deeper than the thickness of the active sand layer*", which is a few 10's of centimetres rather than >2.5 m.

3.14 It is well known that the Hauraki Gulf is in an increasingly poor state of environmental health due to numerous different impacts, often termed 'depth by a thousand cuts'; this loss of nearshore sediment exchange represents more cuts. This impact would not occur if sediment were extracted in thin 'skims' over large areas, since when sand is mobilised it will still be able to move shoreward and replenish the beach without becoming trapped in trenches and dredged/removed from the system.

4. AIS DATA

4.1 In paragraph 21 (Evidence in Reply, 25 February 2021), Mr West questions the assumption made with respect to breaches of dredging outside the consented areas; i.e., that when the vessel is moving at less than 3 knots (determined from the AIS), dredging is underway. As noted in my evidence in chief and Annex 1 of my evidence, in order to consider on-water breaches, it was assumed that when the vessel is moving at less than 3 knots (determined from the AIS), dredging is underway – as described in Mr Riddell's primary evidence in paragraph 46 of his evidence in chief. Mr West's concern is that the assumption that when the vessel is going straight and less 3 knots could be when the dredge head is needs to be lowered or raised at slow speed. I agree that there is the potential that this may be the case at certain times, which Mr McCullum has further described in his evidence in reply (paragraphs 21 and 22).

4.2 Based on Mr McCullum's description of dredging actually occurring under 2 knots, we reanalysed the AIS for the dredge runs presented in his Appendix 1. Vessel speeds of below 2.25 knots and below 1.9 knots were assessed, which are presented in Figure 1 below. Figure 1 shows that a) the vessel passes into Northland, using Mr McCallum's alignment of the boundary, at speeds of below 2.25 knots and 1.9 knots, b) the vessel continues past the Northland boundary at both those speeds (which according to McCallum includes their dredging speed) for ~1 km, and c) the vessel is up to more than 200 m shoreward of the Area 2 western boundary. For completeness, dredge runs under 1.75 and 1.5 knots were also analysed for the whole month of June 2020. Only one dredge line was identified in the Kaipara's offshore areas under 1.75 knots in the month, although several are present in the McCallum's nearshore consent areas, and no dredge lines were found under 1.5 knots. Given the numerous tracks the dredger vessels were making during this month, it cannot be the case that dredging was only occurring on one line in the Kaipara area and on none of the other lines was dredging taking place. Given the results of this analysis, similar to the actual extent of deep dredged trenches, there remains a lot of uncertainty with respect to on-water behaviour.

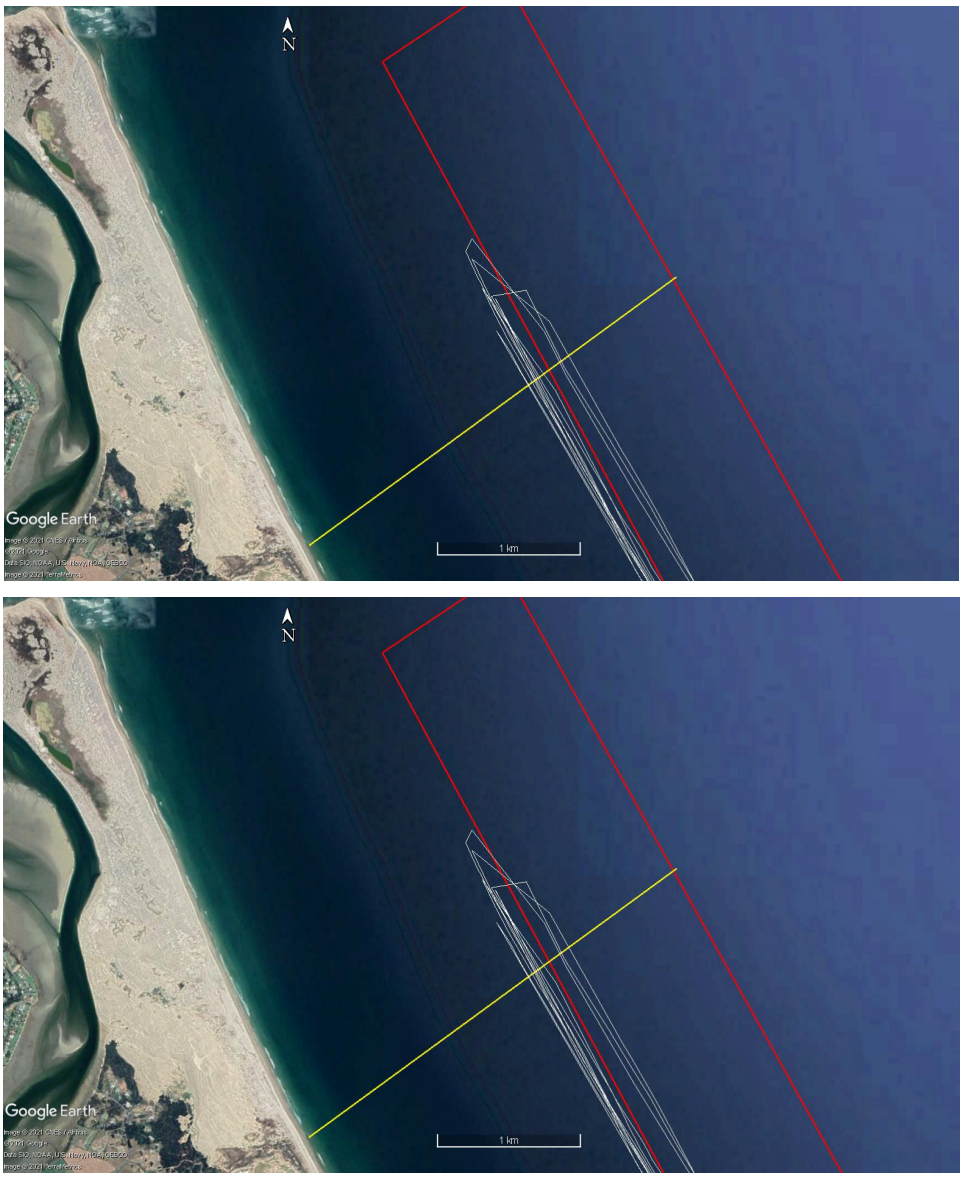


Figure 1. Top) dredge locations under 2.25 knots, and (Bottom) dredge locations under 1.9 knots.

Further understanding of dredging activity into the Northland region in recent times could be gained from the recent Survey Worx survey in the area where the seabed imagery overlaps with the dredge runs in Figure 1 above. This area is denoted by the dark blue ellipse in Figure 1.1 of Annex A below. However, the recent survey for this area is not well presented in Mr Healy's evidence; no imagery for the Area 2 is presented, and only a low-resolution profile for every second transect is provided (Figure 1-14), so it is uncertain what is actually present on the seabed north of the Northland/Auckland boundary.

4.3 In terms of other aspects of Mr McCallum's reply asserting inaccuracies by using AIS rather than MAXsea, the AIS data is acquired from a GPS and has accuracy of 2-3 m, so this is not relevant. . As can be seen when the times of breaches presented in Annex 1 of my evidence in chief and the 'actual track record' are compared in Mr McCullum's Appendix 1, in many instances there are large differences; i.e., they are not comparable. This is likely due to the AIS data being in UTC time and the MAXsea data being in NZ time, which means the dredge run comparisons of the 2 systems presented in Appendix 1 of Mr McCullum's are not between the same dredge run. Mr Clapshaw provides further detail in Appendix 1 of his evidence in reply.

4.4 Mr McCallum also considers inaccuracies in the location of AIS data analysis with respect to mean high water springs (MHWS) (paragraph 13c), stating that is does not relate to any identified datum point. The analysis presented in Annex 1 of my evidence in chief uses the high tide mark from satellite imagery, which is the industry-standard for locating the MHWS. This does incorporate some error of several metres or so in this methodology. Given that some dredge runs are >200 m west of the extraction zone, this small error becomes irrelevant. In addition, we can consider the vessel location in relation to the boundary of Area 2, as plotted on Figure 1 above from the EMMP coordinates (red box). As can be seen, there are multiple dredge runs 100's of metres west of this boundary.

5. REPORTING FOR CONSENT CONDITIONS AND EMMPS

5.1 In paragraph 45 of his evidence in reply, Mr Hay states that I did not request monitoring report produced and provided to the Auckland Council. This is correct, we (eCoast) made our own requests to the AC for monitoring and compliance reports (which also included AC internal requests for missing information with respect to monitoring requirements), and received reports historical reports from FOPB. In paragraph 45 of his evidence in reply, Mr Hay also lists 7 specialist reports and concludes in paragraph 46 that he is unaware of any outstanding reports (with respect to conditions of consent and the EMMPs).

5.2 Since submitting my evidence in chief, we have again followed up with the AC with respect to the reports they have received for the Kaipara offshore dredging consents

The number of missing reports described in Annex 1 of my evidence in chief remains the same, that is, a total of 5, possibly 6 required reports are not available.

5.3 Special Condition 12c), Area 1, EMMP 1 requires multibeam bathymetry survey and seabed imaging every 250,000 m^3 of extraction. Reports for 500,000 m^3 and 1,500,000 m^3 are available, although they do not include seabed imaging. However, the AC does not hold reports for 250,000 m^3, 750,000 m^3, 1,000,000 m^3 and 1,250,000 m^3 extraction milestones. 4 out of 6 reports are not available, while there is uncertainty whether a report for the 1,750,000 m^3 milestone has also been produced or indeed requires production.

5.4 Special Condition 14 requires a full EIA every 500,000 m^3. The AC hold reports for 500,000 m^3 and 1,500,000 m^3; the EIA for 1,000,000 m^3 is not available.

5.5 For Area 2, a biodiversity report was required to be filed prior to commencing any dredging. This report has not been located by the AC.

5.6 Mr Hay discusses my concerns with respect to the condition breach with respect to areas of the seabed being lowered by more than 1.5 m triggering Tier 2 monitoring, and points out that at no time did monitoring surveys undertaken show an average depth change exceeding 1.5 m, and that the AC has never sought the Tier 2 monitoring. This is my point, the conditions were breached (by dredging deeper than 1.5 m) although the breaches were not identified since seafloor imaging was not undertaken since the initial work for the current consents. If seabed imaging had been undertaken in the 2018 EMMP 1 survey (and potentially early EMMP's based on the 2015 and 2016 AIS data lining up with redacted/lost seabed imaging in Mr Healy's evidence) as required, it would have picked up the >1.5 m trenches. However, as it was not done, and so no second tier monitoring was undertaken.

6. CONCLUSIONS

6.1 The existence of deep, wide and long trenches in offshore dredging Area 1 identified by Mr Clapshaw/FOPB have been confirmed by Mr Healy through the recent Survey Worx seabed imaging survey.

6.2 Review of the Survey Worx seabed imaging survey presented in Mr Healy's evidence indicates areas of 'redacted' and 'lost' data that align well with repeat dredging runlines

in the AIS information for 2015 to 2019 supplied by the Auckland Council (AC), and that the seabed imaging of Area 2 is not presented. It is my opinion that it is very likely that there are additional large trenches in Area 1 and potentially in Area 2 that are not included in the '2021 Swales' area that is to be excluded from dredging until these dredged features fill back to natural levels.

6.3 The theoretical limit of the depth of closure (25 m depth) does not isolate the offshore sand extraction from effects landward or on the shore. Therefore, as a result of targeting the same dredge lines repeatedly (i.e., the reduction/prevention of diabathic sediment transport) there is the potential for cumulative impacts on the beaches of the Mangawhai-Pakiri embayment.

6.4 The AIS data for June 2020 was reanalysed to consider a range of dredging speeds of under 3 knots to investigate the assertion that dredging actually occurring under 2 knots. When vessel speeds of <2.25 knots, <1.9 knots, <1.75 knot and <1.5 knots are considered, it is found that the dredging vessel passes into Northland for ~1 km at speeds of below <2.25 knots and <1.5 knots. At the lower speeds of 1.75 knot and <1.5 knots, Only one dredge line was identified in the Kaipara's offshore areas under 1.75 knots in the month, although several are present in the McCallum's nearshore consent areas, and no dredge lines were found under 1.5 knots. It is therefore my opinion that, similar to the actual extent of deep dredged trenches, there remains a lot of uncertainty with respect to on-water behaviour.

6.5 With respect to monitoring and reporting requirements as specified in the conditions of consent and the EMMPs for the offshore coastal permits, 5 reports (4 surveys and 1 EIA) are not held by the AC. In addition, at no time has seabed imaging been undertaken since consent was granted (as specified in Special Condition 12c), Area 1, EMMP 1), which is why Tier 2 monitoring was not triggered even though trenches of >1.5 m deep are present.

Dr Shaw Mead
14 May 2021

Annex A – Survey Worx Seafloor Imagery Related to AIS Tracks

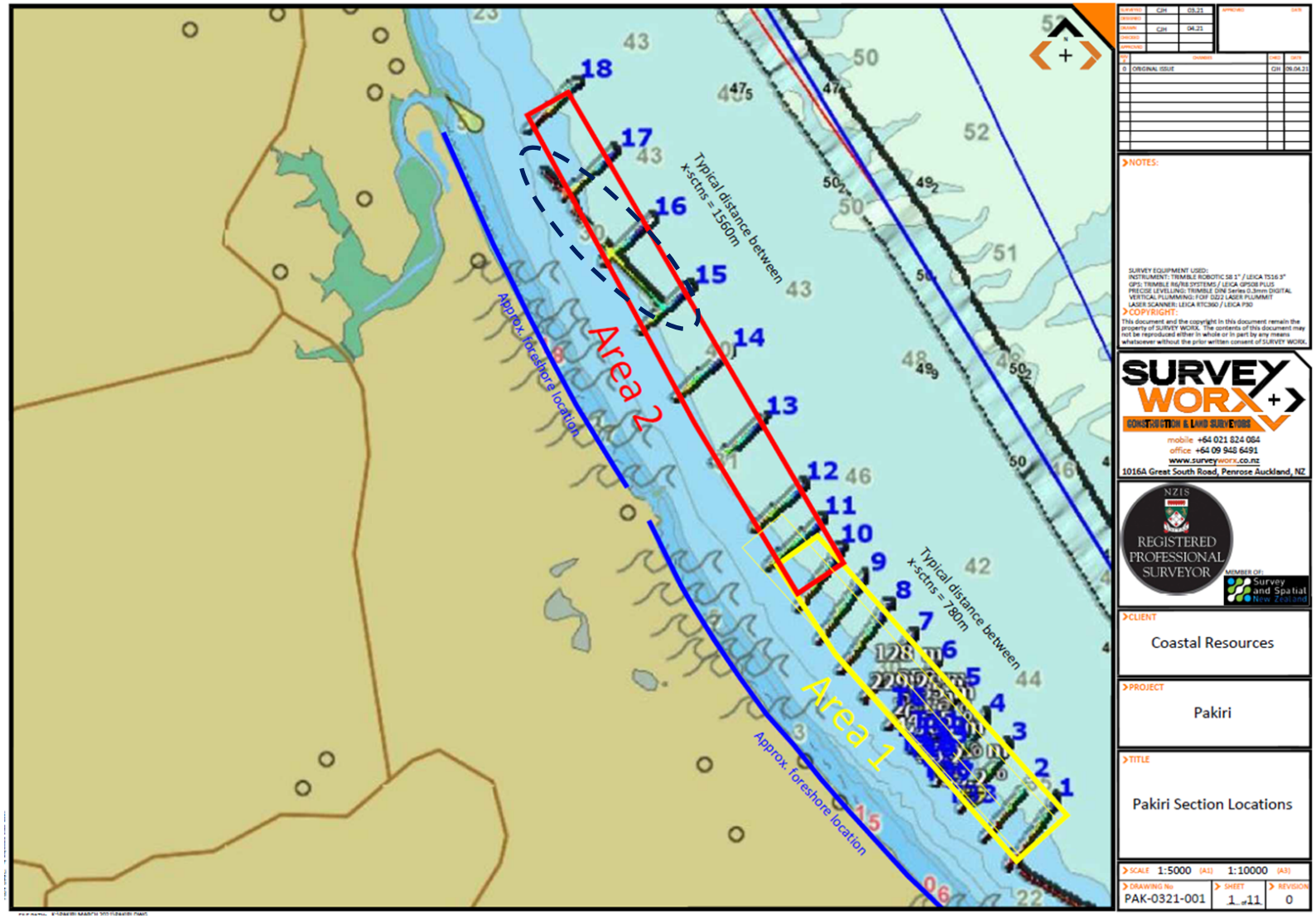


Figure 6-1 Shows the 18 surveyed cross-sections in Areas 1 and 2, conducted on the 02/03/2021 (SWX, 2021). The dark blue ellipse indicates the area of northern boundary dredging.

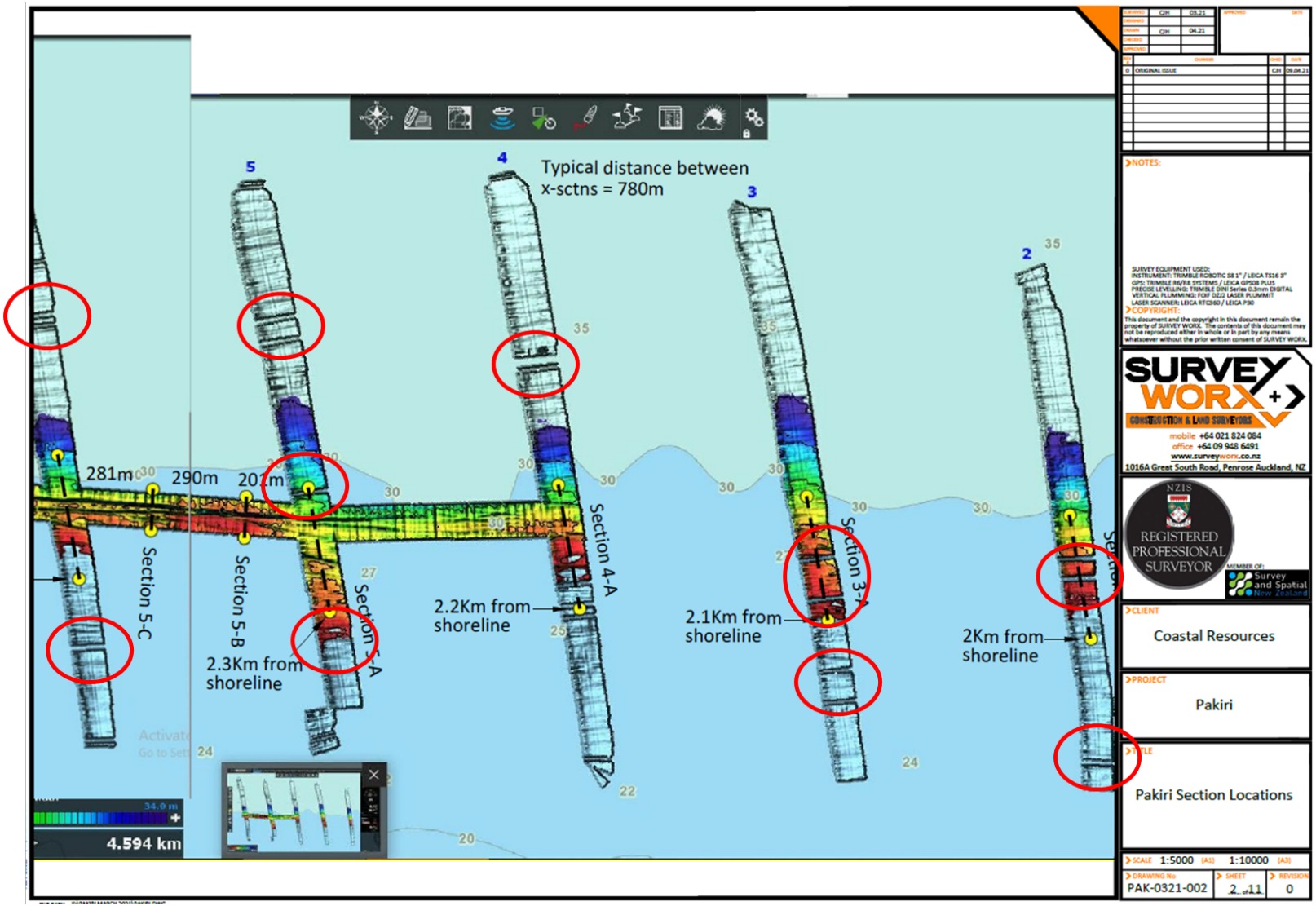


Figure 6-2 Shows surveyed cross-sections 2 - 5, conducted on the 02/03/2021 (SWX, 2021). Red circles highlight the areas of the cross sections where data has been redacted and/or not analysed in the SWX (2021) report.

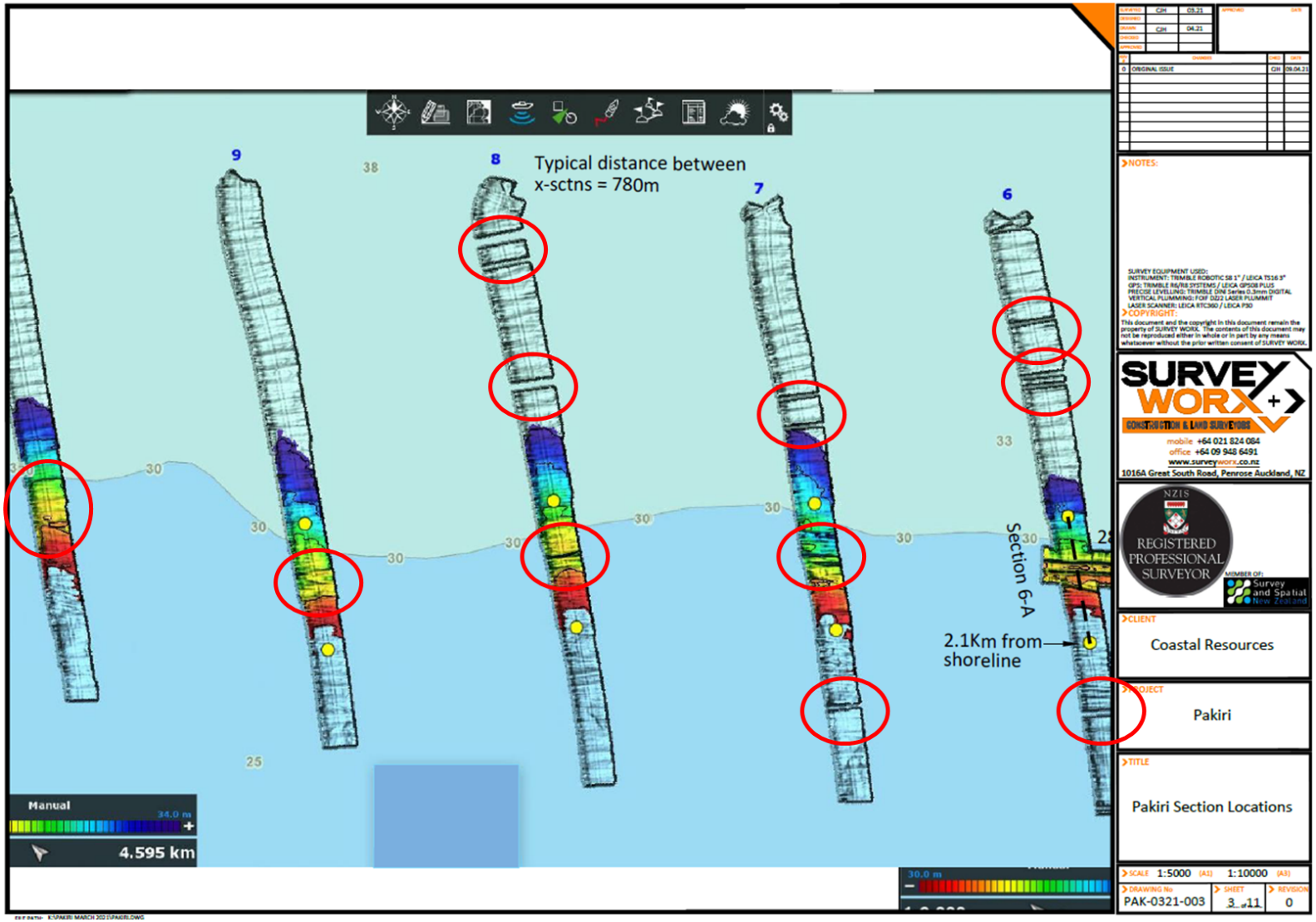


Figure 6-3 Shows surveyed cross-sections 6 - 9, conducted on the 02/03/2021 (SWX, 2021). Red circles highlight the areas of the cross sections where data has been redacted and/or not analysed in the SWX (2021) report.

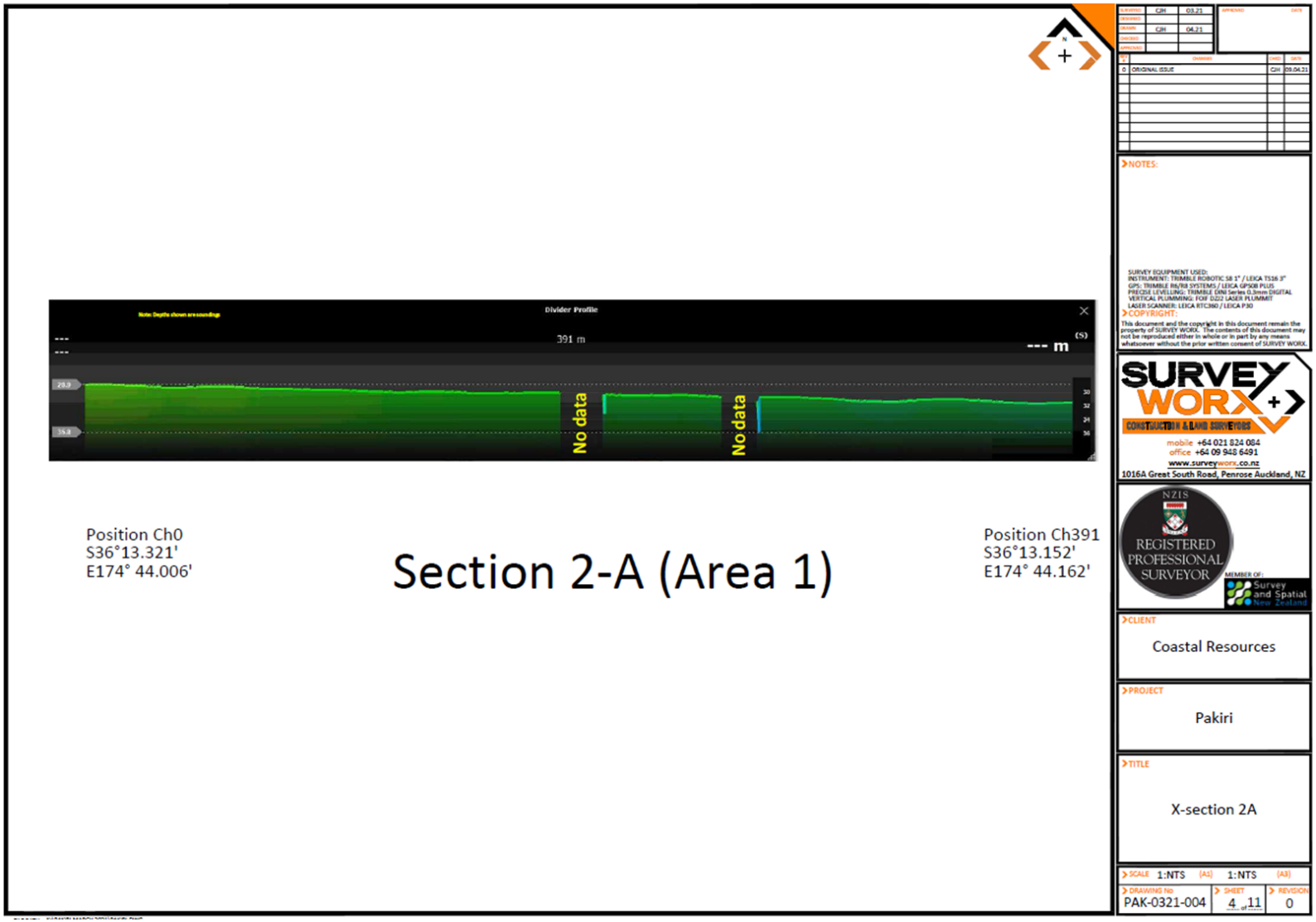


Figure 6-4 SurveyWorx Ltd image showing areas of no data along cross-section 2 to surveyed on 02/03/2021. Note, this is only a snippet of the entire cross section.

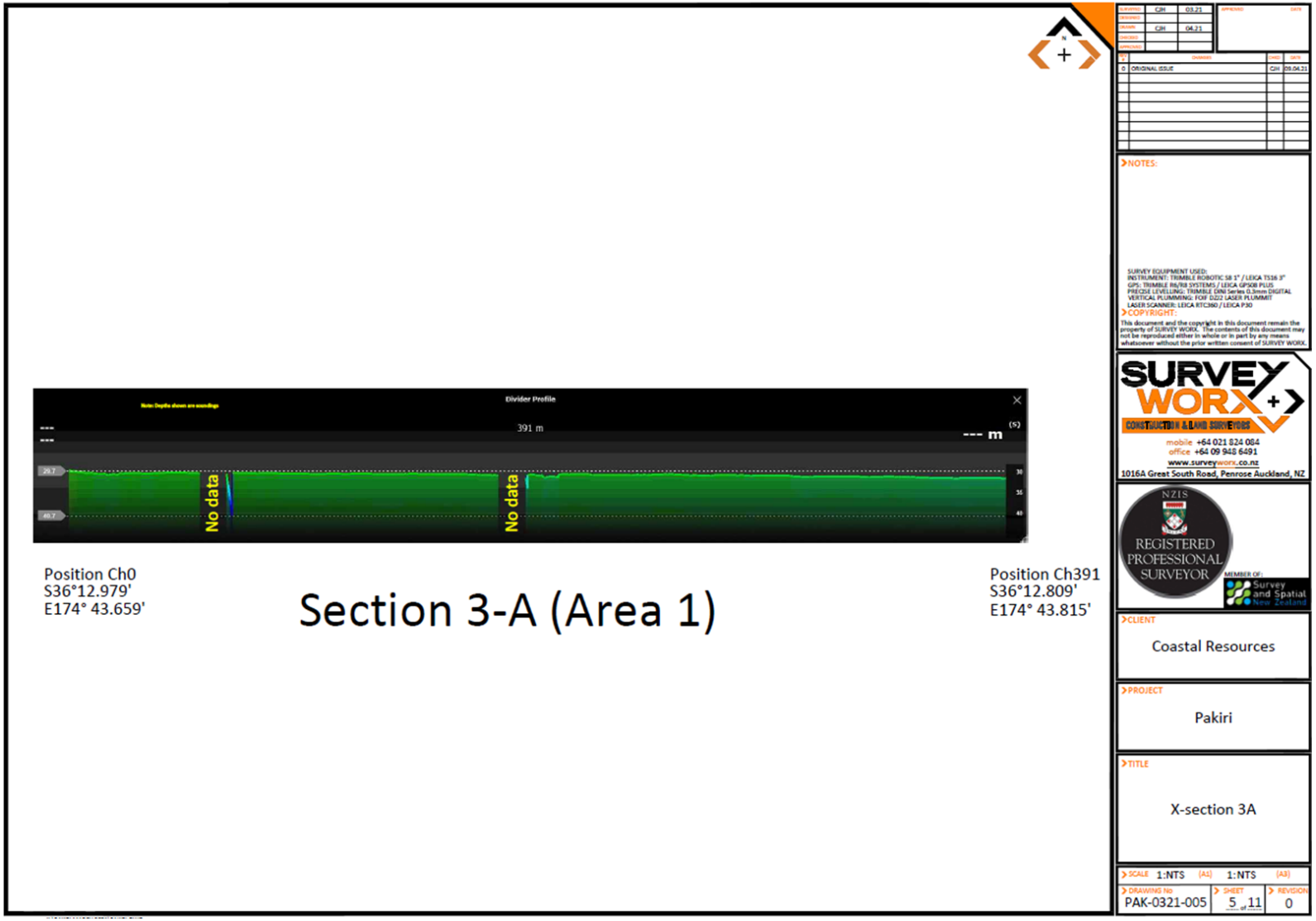


Figure 6-5 SurveyWorx Ltd image showing areas of no data along cross-section 3 surveyed on 02/03/2021. Note, this is only a snippet of the entire cross section.

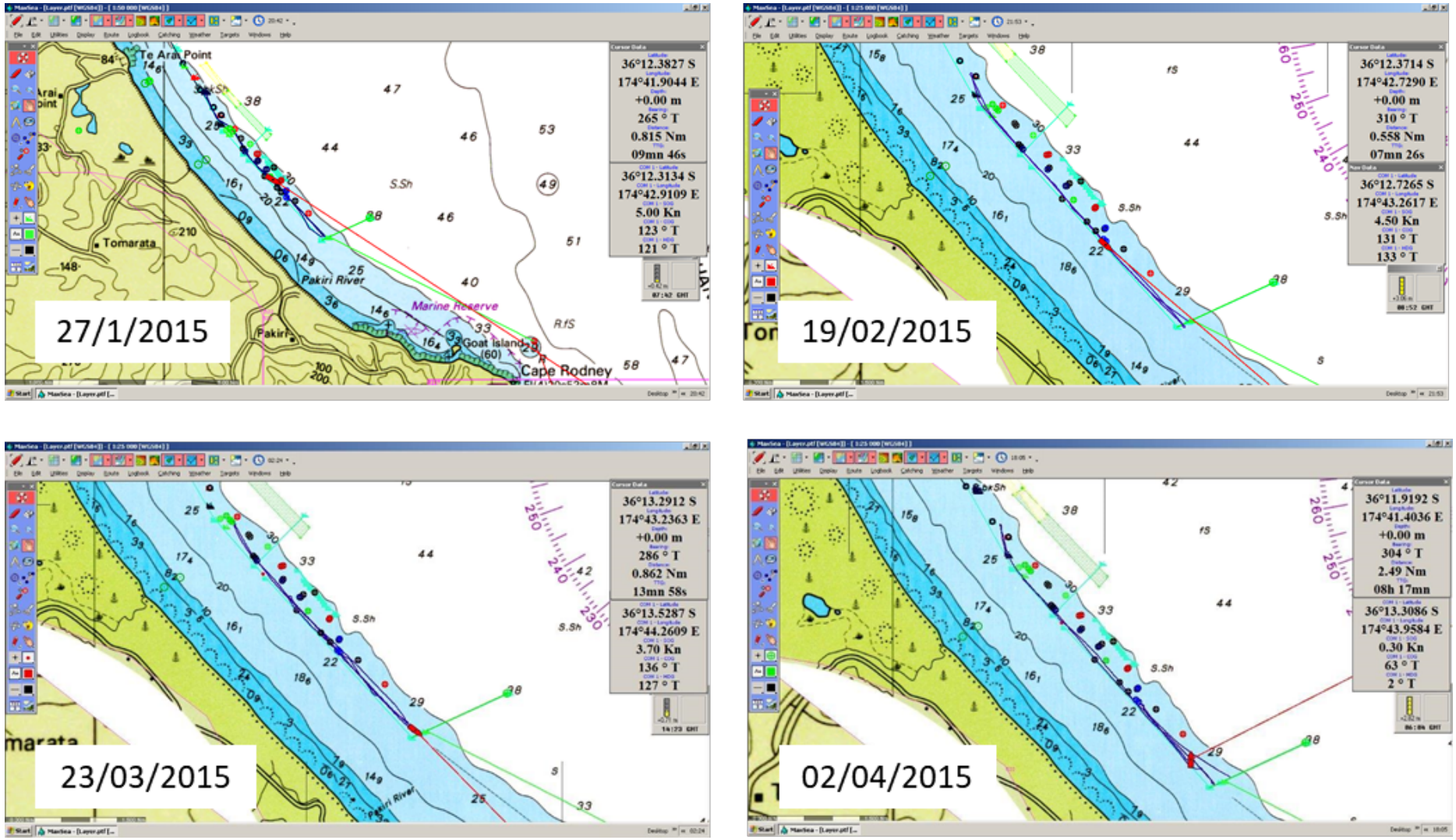


Figure 6-6 Images from Auckland Council (Official Information Requestion) of Kaipara Ltd Offshore Dredging Operations (AIS data – screenshot). These images show dredging occurring in the same location in consecutive months from January to April in 2015.

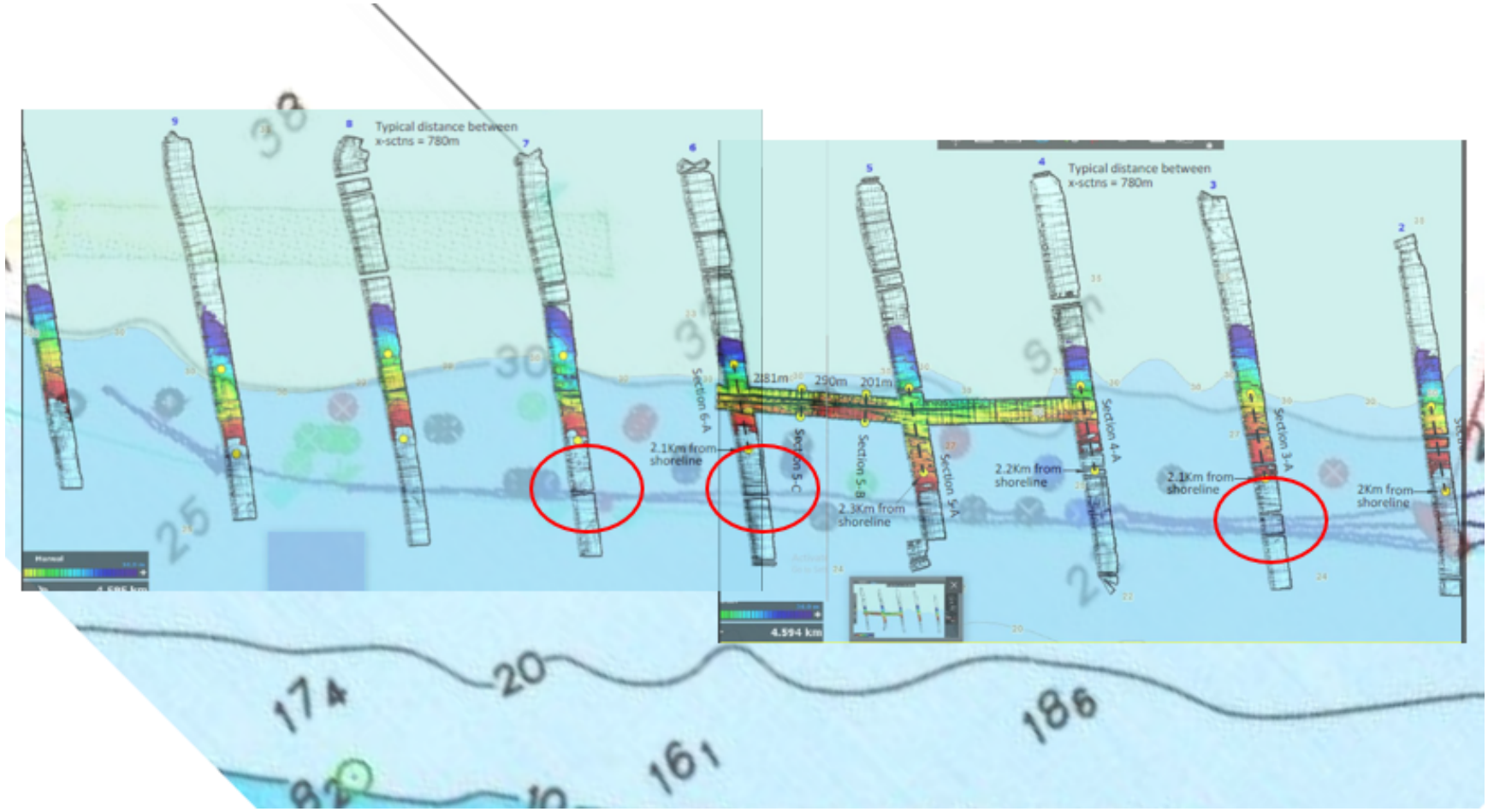


Figure 6-7 Shows Kaipara Ltd offshore dredging AIS data image (screenshot from AC) from 02/04/2015 underlying the SurveyWorx Ltd cross-sections of Area 1 carried out on the 02/03/2021. Red circles highlight the areas of the cross sections where data has been redacted and/or not analysed in the SWX (2021) report. The AIS vessel tracks in the 2015 image clearly align with the areas of the 2021 SWX image where data has been redacted and/or not analysed in the SWX (2021) report. This image highlights trenches that may have not been analysed.

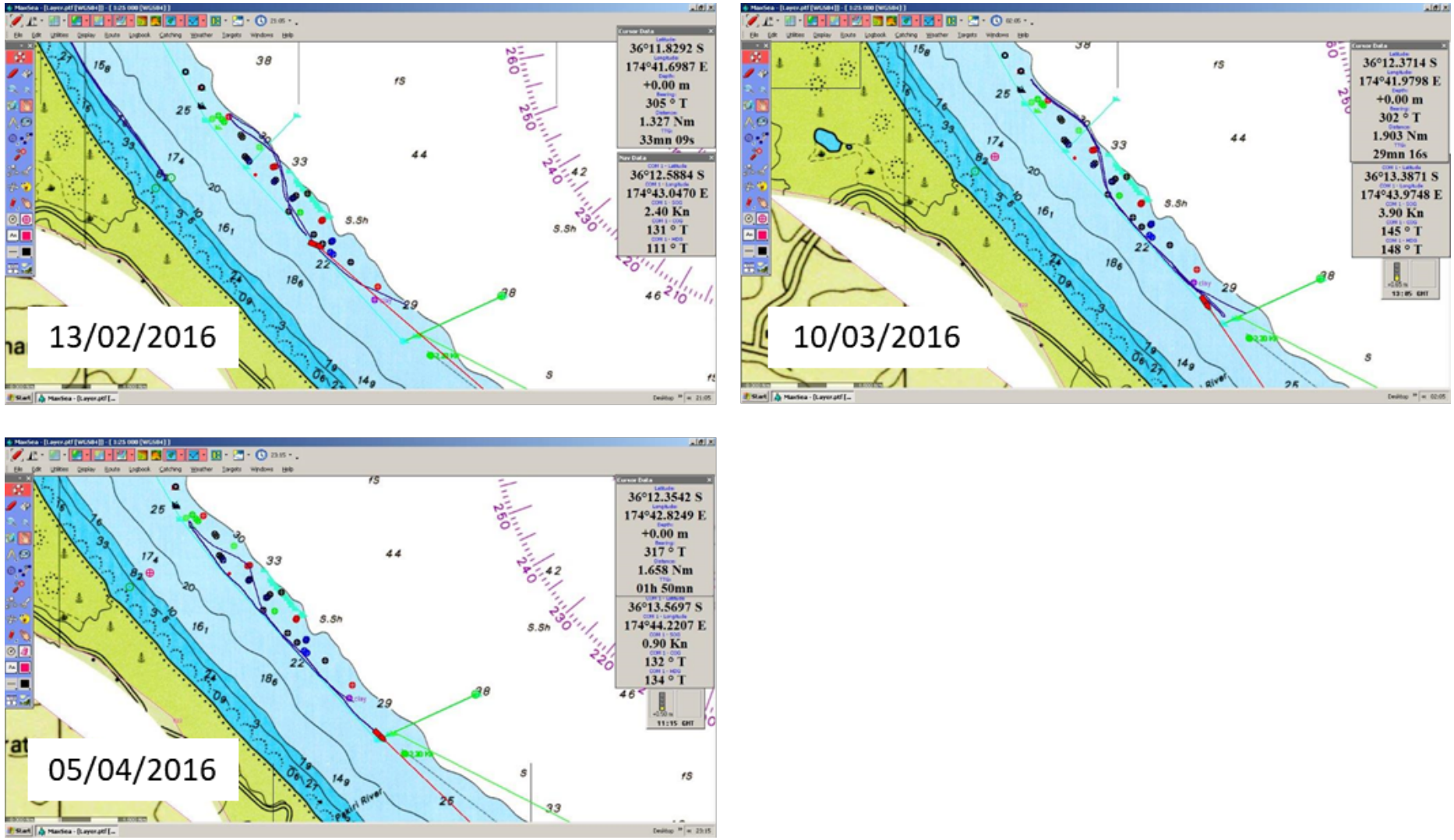


Figure 6-8 Images from Auckland Council (Official Information Requestion) of Kaipara Ltd Offshore Dredging Operations (AIS data – screenshot). These images show dredging occurring in the same location in consecutive months from February to April in 2016.

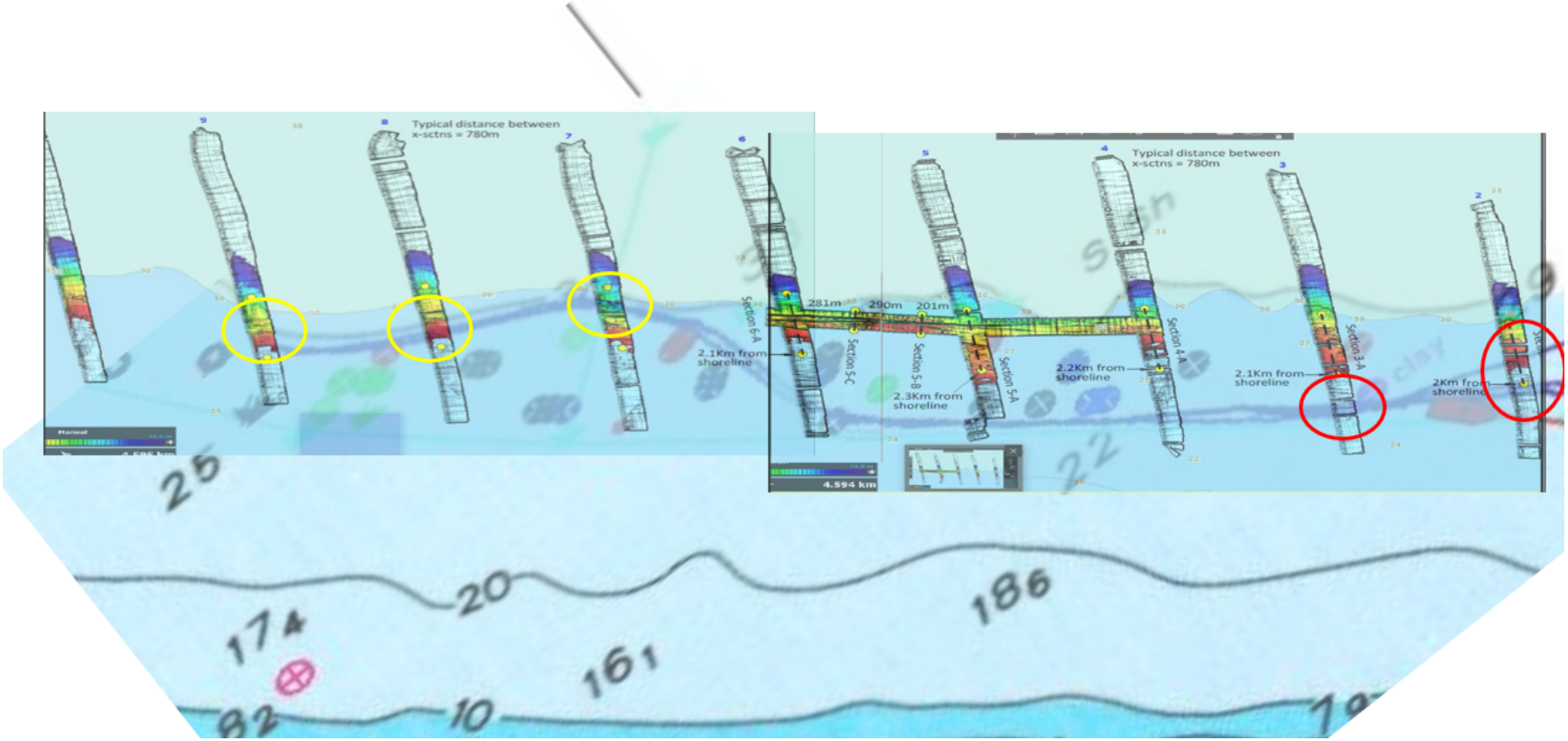


Figure 6-9 Shows Kaipara Ltd offshore dredging AIS data image (screenshot from AC) from 10/03/2016 underlying the SurveyWorx Ltd cross-sections of Area 1 carried out on the 02/03/2021. Red circles highlight the areas of the cross sections where data has been redacted and/or not analysed in the SWX (2021) report. The AIS vessel tracks in the 2016 image clearly align with the areas of the 2021 SWX image where data has been redacted and/or not analysed in the SWX (2021) report. This image clearly highlights trenches that have not been analysed. Trenches analysed in the SWX (2021) report are coloured Yellow.

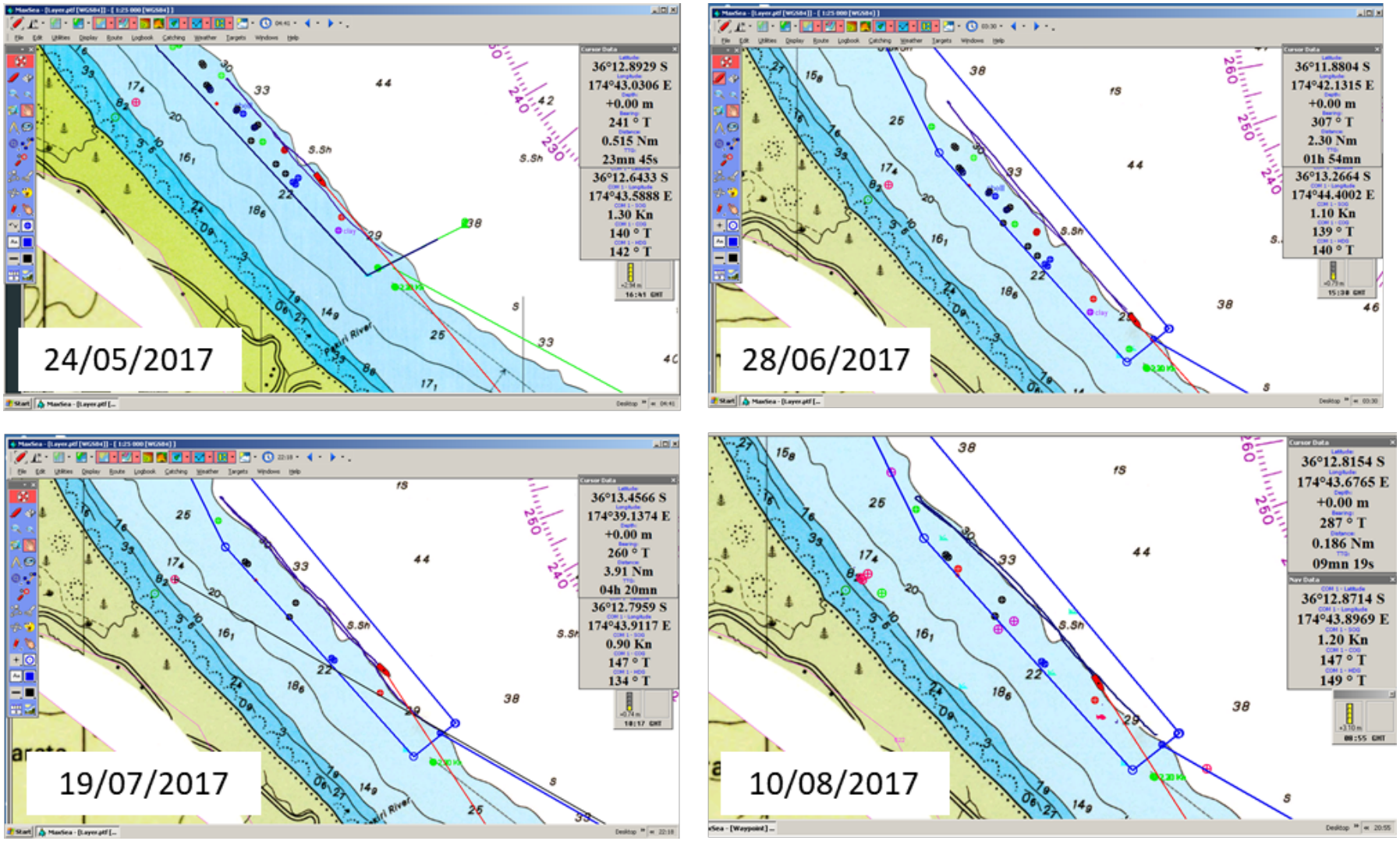


Figure 6-10 Images from Auckland Council (Official Information Requestion) of Kaipara Ltd Offshore Dredging Operations (AIS data – screenshot). These images show dredging occurring in the same location in consecutive months from May to August in 2017.

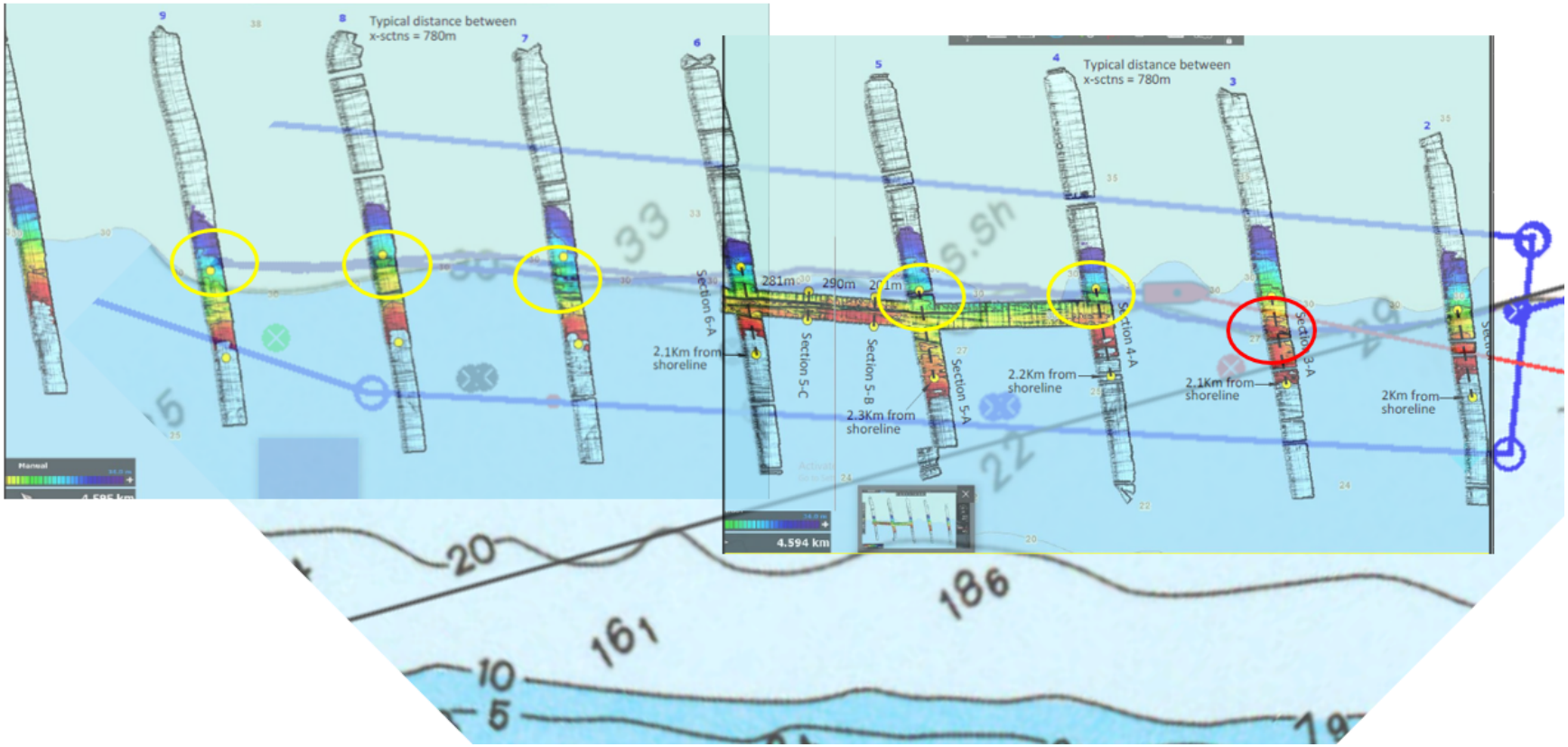


Figure 6-11 Shows Kaipara Ltd offshore dredging AIS data image (screenshot from AC) from 19/07/2017 underlying the SurveyWorx Ltd cross-sections of Area 1 carried out on the 02/03/2021. Red circles highlight the areas of the cross sections where data has been redacted and/or not analysed in the SWX (2021) report. The AIS vessel tracks in the 2017 image clearly align with the areas of the 2021 SWX image where data has been redacted and/or not analysed in the SWX (2021) report. This image clearly highlights trenches that have not been analysed. Trenches analysed in the SWX (2021) report are coloured Yellow.

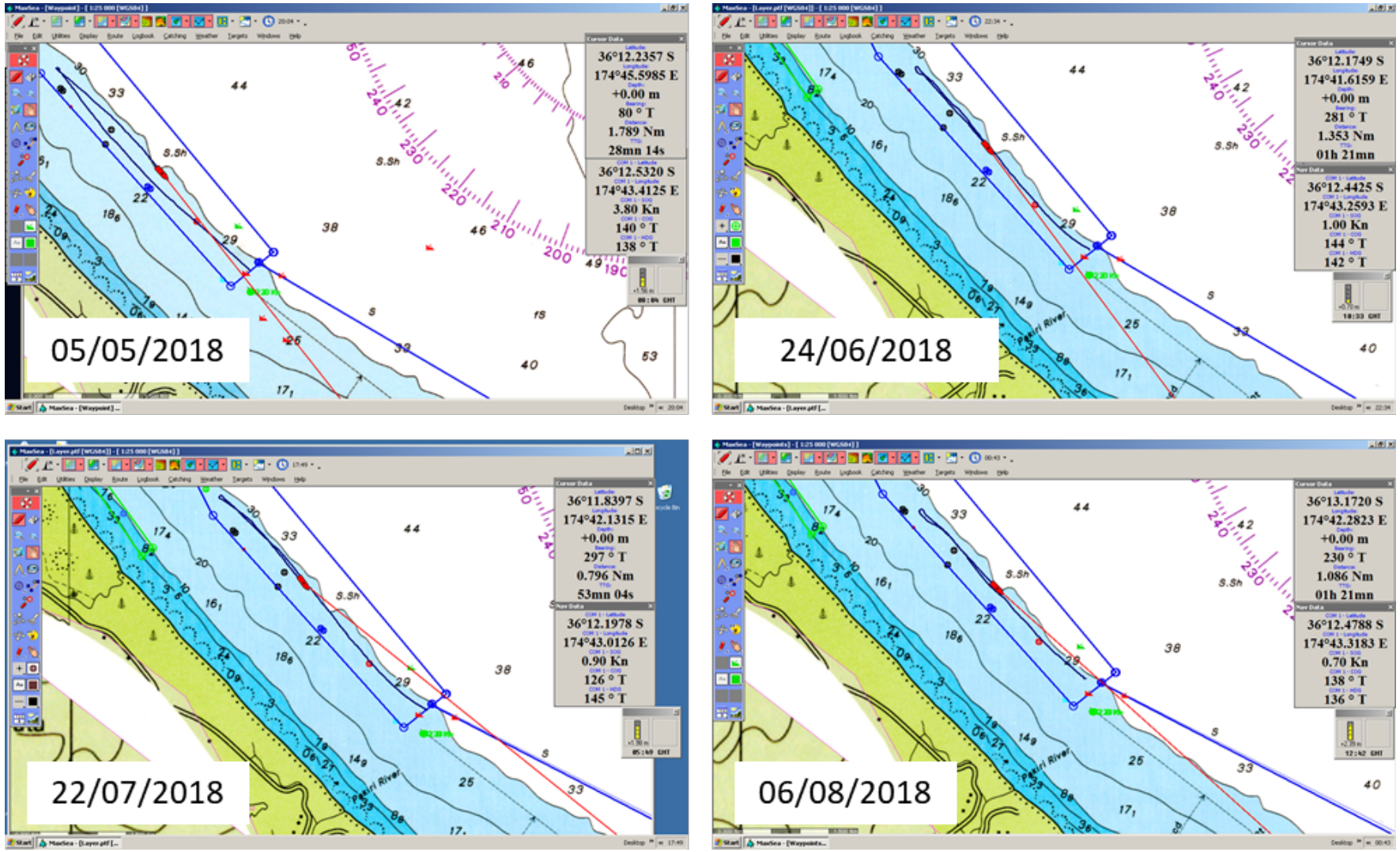
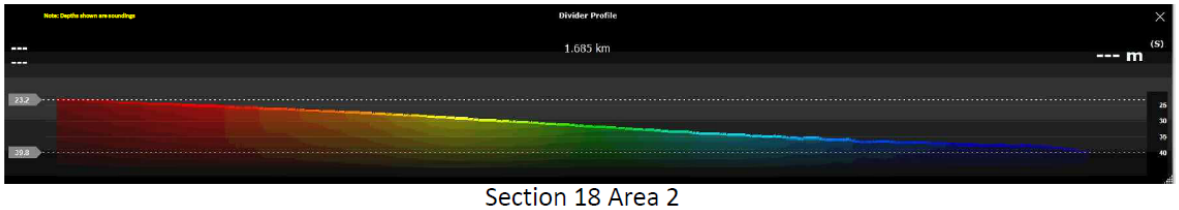
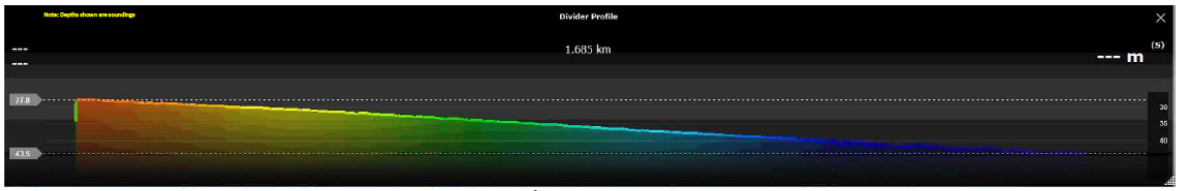


Figure 6-12 Images from Auckland Council (Official Information Requestion) of Kaipara Ltd Offshore Dredging Operations (AIS data – screenshot). These images show dredging occurring in the same location in consecutive months from May to August in 2018.

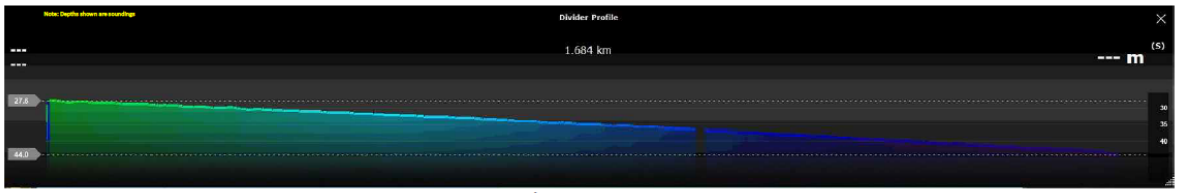
Figure 6-13 Shows Kaipara Ltd offshore dredging AIS data image (screenshot from AC) from 24/06/2018 underlying the SurveyWorx Ltd cross-sections of Area 1 carried out on the 02/03/2021. Red circles highlight the areas of the cross sections where data has been redacted and/or not analysed in the SWX (2021) report. The AIS vessel tracks in the 2018 image clearly align with the areas of the 2021 SWX image where data has been redacted and/or not analysed in the SWX (2021) report. This image clearly highlights trenches that have not been analysed. Trenches analysed in the SWX (2021) report are coloured Yellow.



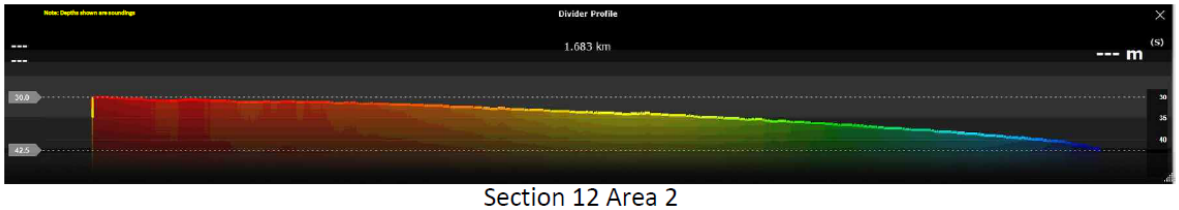
Section 18 Area 2



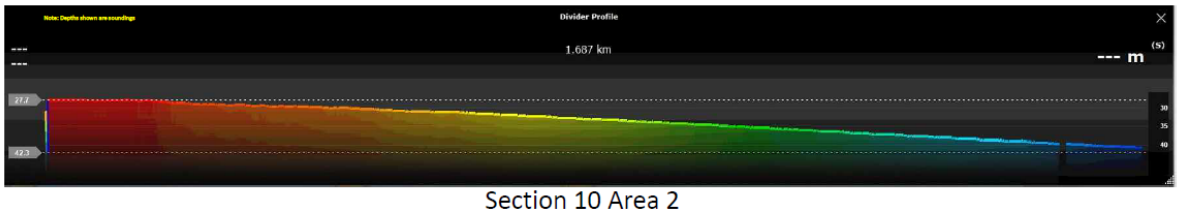
Section 16 Area 2



Section 14 Area 2



Section 12 Area 2



Section 10 Area 2

Figure 6-14 Low resolution profiles of Area 2.