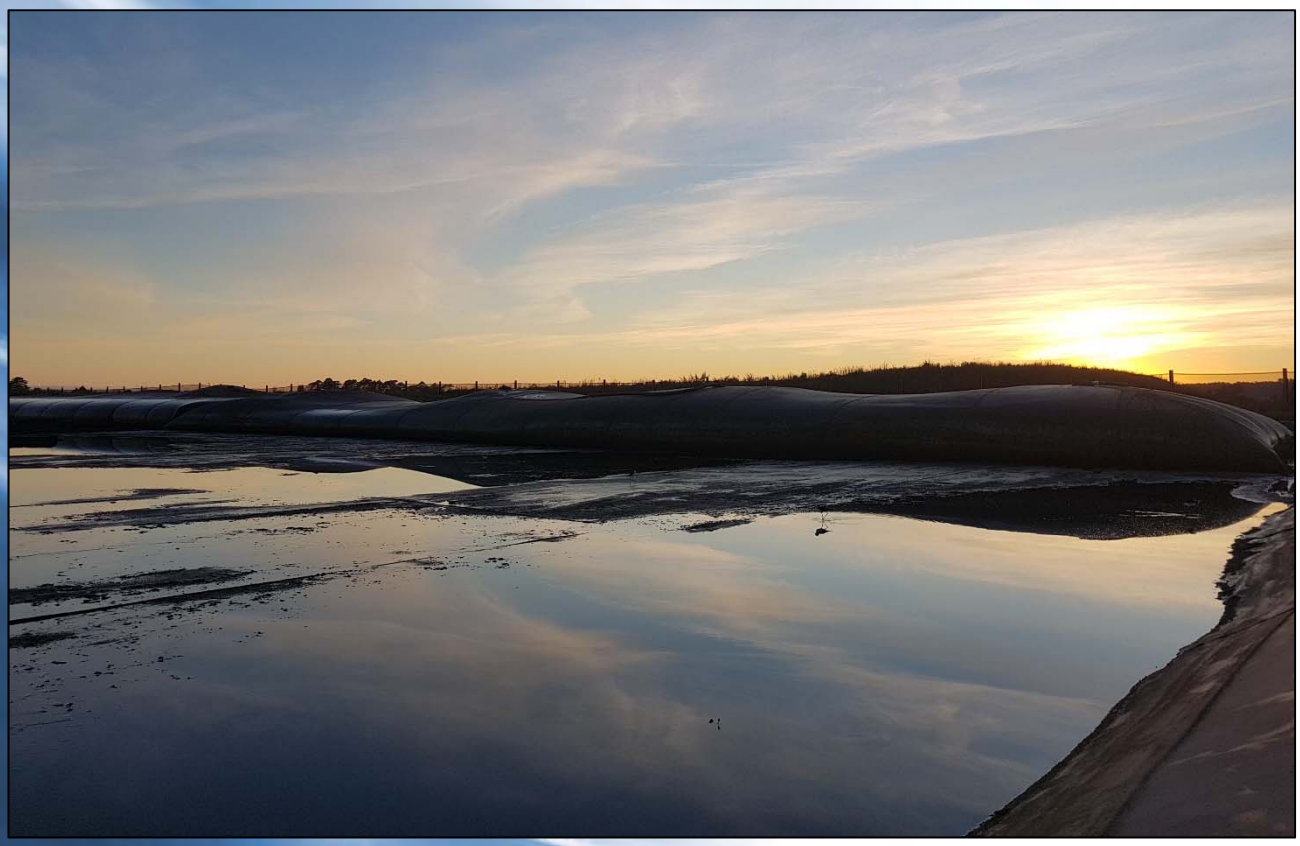


Bay of Plenty Regional Council

Kopeopeo Canal Remediation

CLG Monthly Update Report

December 2018

Executive summary

Dredging of contaminated sediment into containment site one (CS1) continued throughout December 2018.

Kopeopeo Canal from SH30/Kope Drain Road to the Orini/Kopeopeo confluence is isolated using the flood control structures (FCS) to ensure only monitored and controlled water discharges from, or flows into, the project area.

During December 2018, the following analytical sampling was undertaken and reported:

Canal Sediment Validation

Thirty-four validation samples were taken from behind the dredge within Section 5 (See Validation Plan in Appendix B). The Total PCDD/F (dioxin) I-TEQ Upperbound results were between 22 and 160 pg/g. Of the 34 samples analysed, three dioxin results were between 140 and 160 pg/g, triggering the need for redredging in these areas in accordance with the EMVP. Two samples had dioxin results of 61 and 68 pg/g, which could be accepted within the 95% UCL for the data set.

The 95% UCL was calculated as being 36.52 pg/g for the length of the canal chemically validated as at 22 December 2018.

CS1 Groundwater

Groundwater sampling was undertaken as part of the consent conditions by Golder Associates Limited (GAL) at CS1 on 12 December 2018. The dioxin results were between 4.39 and 5.41 pg/L. The results were all well below the adopted Tier 1 trigger level criterion for dioxin outlined in the EMVP of 13.4 pg/L and were consistent with previously recorded dioxin in groundwater results.

The following report is based upon the observations and commentary by the Independent Monitor Field Observer (Matt James) with support from the Independent Monitor (Andrew Kohlrusch). This report is subject to, and must be read in conjunction with, the limitations set out in Section 1.3 and the assumptions and qualifications contained throughout the Report.

Table of contents

Table index

Appendices

1. Introduction

1.1 Introduction

The Kopeopeo Canal is situated on the outskirts of Whakatane, in the Bay of Plenty, New Zealand. The Kopeopeo Canal Remediation Project is a joint venture between Bay of Plenty Regional Council (BOPRC) and central government (Ministry for the Environment (MfE)) in an effort to restore the canal's ability to transfer water and to remediate dioxin contamination caused by historic discharges from an adjacent sawmill. The project area is 5.1 km in length between the Kopeopeo and Orini canal confluence and the intersection of State Highway 30 (SH30) and Kope Drain Road (Appendix A).

The Independent Monitor (Andrew Kohlrusch) and Independent Monitor Field Observer (Matt James) provide independent feedback, assistance, and monitoring to the project management team, contractors working on site, and community through the Community Liaison Group (CLG). The objective of this relationship is to continue to build trust between the Whakatane community and the project team, provide independent feedback to the community, and allow the project team to access the extensive technical experience of the IM.

This report is part of the requirements outlined in the Bay of Plenty Regional Council Resource Consent 67173-AP Condition 6 – Independent Monitor.

1.2 Purpose

The purpose of this Community Liaison Group (CLG) Monthly Update Report (December 2018) is to provide an independent summary of the progress of the Kopeopeo Canal Remediation Project. The CLG Monthly Update Report (December 2018) is commissioned by Bay of Plenty Regional Council for distribution to the CLG and Whakatane community.

1.3 Limitations

This report has been prepared by GHD for Bay of Plenty Regional Council (BOPRC) and may only be used and relied on by Bay of Plenty Regional Council for the purpose agreed between GHD and Bay of Plenty Regional Council as set out in Section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Bay of Plenty Regional Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

GHD has prepared this report on the basis of information provided by Bay of Plenty Regional Council and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The IM and IM field observer are not providing commentary or observations on matters related to project team (or subcontractor) health and safety as part of the IM role for the Kopeopeo Canal Remediation Project.

2. Project Progress

2.1 CS1

The following summarises the project events at CS1 during December 2018 (Refer to photographs in Table 1: Photograph Progress Log):

- Dredging has almost been completed in Section 5.
- Bioremediation has started in one of the Geobags with a wood pellet layer being added on top of the bag (Photograph 1). This was then followed by the addition of the fungus-inoculated wood pulp (Photograph 2). The Geobag was then resealed after this process was complete (Photograph 3 & 4). This process was observed by the Principal Contractor, a representative for the Project Management Team, and Independent Monitor Field Observer and appropriate steps were taken to protect site workers and ensure that there was no accidental release of sediment from the Geobags.
- The containment cell is being cleaned in preparation for closure.
- During a heavy rainfall event on 25 and 26 December 2018, the CS1 office area flooded causing minor damage to office equipment.
- The containment cell was left in a semi-flooded state for the Christmas shutdown (Photograph 6).

2.2 CS3

The following summarises the events at CS3 during December 2018 (Refer to photographs in Table 1: Photograph Progress Log):

- The CS3 cell is being flooded with rainwater to minimise risk of wind damage to the HDPE liner.
- During a heavy rainfall event on 25 and 26 December 2018, rainwater overtopped the containment cell and flowed across the access track and into the Kopeopeo/Orini Pump Station Canal. This was due to the release valve in the sump of the containment cell not being opened.
- Planning is underway in preparation for moving the water treatment plant from CS1 to CS3.

2.3 Project Area

The following summarises the project events across the wider project area during December 2018 (Refer to photographs in Table 1: Photograph Progress Log):

- Two rounds of canal sediment validation were undertaken by Golder Associates Limited (GAL) in Section 5 (Photograph 5).
- The dredge finished removing sediment from Section 5.
- Weed has built up around FCS-East due to the low flow through canal because of low rainfall in December 2018 (Photograph 7 & 8).
- Both flood control structures (FCS) were used to manage optimal canal water levels for dredging and consent requirements. Where possible, both FCS were kept open to allow for water to flow through the project area in an effort to lower canal levels to the west of the project area.

- On-going discussion between project team, consent authority and IM to manage turbidity releases from the project area. Turbidity releases are being monitored through a combination of manual water sampling and live turbidity measurements.

Table 1: Photograph Progress Log

Photograph	Event
	Photograph 1: A hole is cut in the top of the sediment filled Geobag in CS1. The wood pulp layer that is put into the bag once the sediment is added is visible. This layer on the top of the bag provides the initial area for fungus to grow and begin the bioremediation process.
	Photograph 2: Fungus being added into the wood pellet layer on top of the filled Geobag.
	Photograph 3: The hole in the Geobag is stitched up once the fungus has been added.

Photograph	Event
	Photograph 4: Sealed up hole in the Geobag after the bioremediation team has completed the fungal addition. Bioremediation is now underway in this Geobag.
	Photograph 5: Validation sampling in Section 5.
	Photograph 6: CS1 left in a semi flooded state for the Christmas break.

Photograph	Event
	Photograph 7: Weed built up around FCS-East outfall.
	Photograph 8: Weed built up behind FCS-East.

3. Community Liaison Group Update

3.1 Community Concerns

A CLG meeting was not held during December 2018.

The project complaints register for December 2018 was reviewed by the IM. Further detail is provided in Section 4.10.

4. IM Inspection Summary

This section outlines the observations made during the site inspections undertaken by the IM field observer during December 2018.

4.1 Vegetation Clearing, Fauna, Topsoil Management and Rehabilitation & Visual Amenity

4.1.1 Project Area

Topsoil has been disturbed in the areas where the two boost pumps are located adjacent to Shaw Road and Paroa Road. Revegetation in these areas will be monitored and supplementary grass seeding may be required in January 2019 when the pumps are removed.

4.1.2 CS1

Odour from the sediments at the CS1 treatment plant has been noted in close proximity to the equipment, but not beyond the site boundary. Odour neutralisers are available if required and will be placed around the water treatment plant should odours be detected outside the CS1 boundary.

4.1.3 CS3

CS3 was used to store equipment during the Christmas closedown period in late December.

4.2 Drainage, Sediment & Water Management

4.2.1 Project Area

Flood control structures at the eastern and western ends of the KCRP area are used to maintain optimal water levels for dredging and consent requirements. Turbidity monitoring is intended to record that turbidity in water released from the KCRP area into the Orini/Kopeopeo confluence is no greater than 20% above background. During December, no discharges of water occurred with turbidity levels greater than 20% above background as measured at MP1, west of FCS-West. Compliance was determined using the turbidity monitoring network and no dioxin in water sampling was required. The methodology for dioxin in water sampling is outlined below and is used when the project team requires information additional to what the turbidity monitoring network can provide.

An agreement was reached between the project team, consent authority and IM that due to the limitations with the turbidity monitoring network in certain situations, predominantly during periods of high turbidity inflow from sources outside the project area, a dioxin in discharge water target should be adopted. The adopted target of 11 pg/L was based upon the Opus International Consultants Limited *Kopeopeo Canal Remediation – Memo regarding Filtrate Discharge* report dated 09 June 2016 that stated that the no observed effect concentration (NOEC) for dioxin was between 11 pg/L and 38 pg/L. The NOEC is the concentration of a contaminant at which no adverse effects were observed within the control animals. Consent Condition 12.3 also provides 11 pg/L as the long-term discharge limit for the filtrate leaving the containment sites after the control structures have been removed. The intended use of this limit is similar to the current discharge from the control structures, and as such, the criterion is likely to be suitable for this use.

The flood control structures are checked daily and the side culverts of the canal are checked weekly. These checks are reported as part of the Flood Management Situation Report prepared

by the deputy project manager on a daily basis as part of the requirements outlined in the Bay of Plenty Regional Council Resource Consent 67173-AP Condition 7 – Flood Management. The Flood Management Situation Report is emailed to the following parties:

- BOPRC flood managers and consent authority
- Whakatane District Council
- Kopeopeo Canal Remediation Project site managers and site engineers
- Kopeopeo Canal Remediation Project administrator and contractors
- IM field observer
- BOPRC compliance officer

Real time turbidity monitoring equipment is operational within the Kopeopeo and Orini canals and within the sump at CS1.

4.2.2 CS1

Rainfall is collected in CS1 and discharged to the canal as part of the sediment dewatering process. CS1 is kept in a semi-flooded state when the dredge is not operating to ensure that the area is covered in water and dust cannot be generated.

Sediment has been spilled in the containment cell multiple times over the last eight months and on each occasion; the IM and project team have both requested that this material be cleaned up. While it is not a dust risk due to the cell being kept flooded, there is a risk that sediment-laden water could be released from the cell into the Kopeopeo Canal. The cell is being cleaned using pressure jets and brooms with the material being recirculated into the Geobags and contained. The cleaning is focusing on the areas beneath each new Geobag that is rolled out. The cleaning of CS1 is expected to be finished in January 2019.

4.2.3 CS3

Rainfall is collected in CS3 and discharged when necessary into the Kopeopeo Canal. During the high rainfall event in late December 2018, the cell overflowed into the Kopeopeo/Orini Pump Station Canal. This did not cause any damage to the containment cell or erosion of the access road.

4.3 Dust Management

4.3.1 CS1

No nuisance-dust monitoring is being undertaken at CS1 as no dust generating activities are taking place. Three rounds of dioxin ambient air monitoring have been completed as per Bay of Plenty Regional Council Resource Consent 67173-AP Condition 39 – Dioxin & Air Quality Monitoring. The dioxin in air results ranged between 5.89 and 12.4 fg/m^3 (corrected to 0 ^oC, 101.3 kPa) I-TEQ Upperbound. All three samples were below the consented limit of 30 fg/ m^3 (corrected to 0 ^oC, 101.3 kPa) I-TEQ Upperbound.

4.3.2 CS3

No nuisance-dust monitoring is being undertaken at CS3 as no dust generating activities are taking place.

4.4 Waste Management and Hazardous Material

4.4.1 CS1

Rubbish is being collected within the site office and removed off site.

Oversized material coming off the water treatment plant as part of the sediment dredging process is being stored on site in one-tonne bulk bags. These bags are then crane lifted into the containment cell. Approximately 1125 bulk bags have been filled with oversized material to 22 December 2018.

4.4.2 CS3

Rubbish is collected and removed off site.

4.5 Heritage

During December there were no artefacts identified by the Cultural Monitor or archaeologist as Koiwi or Taonga. Small bones are being bagged and reported as they come across the screens on the water treatment plant or are found on the barge. The Cultural Monitor or her representative is notified of all dredging activity to allow monitoring of the oversized material.

The Cultural Monitor has also presented a draft version of a non-urgent discovery protocol designed to deal with small animal bones in the most practical manner. This protocol was prepared in consultation with Te Rūnanga o Ngāti Awa representatives and BOPRC and is intended to assist the Cultural Monitor in dealing with Koiwi or Taonga. This protocol is in addition to the requirements outlined in Bay of Plenty Regional Council Resource Consent 67173-AP Condition 32.1.

4.6 Fire Prevention and Response

No issues pertaining to fires were reported during December 2018.

4.7 Weed & Dieback Management

Weed removal was not needed during December 2018 as the dredging was being undertaken in previously cleared areas of Section 5.

4.8 Worker Wellbeing

There were no worker injuries recorded during December 2018.

Fatigue has been a concern raised by the IM and community members over the last eight months, largely due to the strenuous nature of the work and the long hours for the dredging contractors.

To mitigate fatigue risks within the team, the rotating week-off roster system continues to be implemented.

4.9 Community Interest

Equipment was stolen from a site office within CS3 during either November or December.

A shoulder closure is now in effect along the southern side of Shaw Road between the SH30 Bridge and the gate at the start of Kope Canal Road. Parking within this area is limited to a single vehicle. Supplementary parking is available in front of the stopbank gate.

A bunded area was created by WDC adjacent to Kope Canal Road and is being used for dewatering of liquid sludge. This is not associated with the KCRP.

4.10 Complaints Register

The project complaints register for December 2018 was reviewed by the IM and no complaints were received.

4.11 Compliance Auditing

No Bay of Plenty Regional Council compliance audits were undertaken in December 2018.

5. Monitoring and Validation

The validation and sampling strategy is outlined in the Environmental Monitoring and Validation Plan (EMVP) submitted as a requirement under Bay of Plenty Regional Council Resource Consent 67173-AP Condition 4.5.

5.1 Canal Sediment

The Bay of Plenty Regional Council Resource Consent 67173-AP Condition 25.4 states that "The remediation zone within the Kopeopeo Canal shall be deemed as being remediated when the 95% Upper Confidence Limit ('UCL') for dioxin concentration is determined to be at or below 60 pg I-TEQ-g using the validation methodology set out in the Environmental Monitoring and Validation Plan required by condition 4.5". The technical definition of a 95% UCL is "a number that one can be 95% confident that the true mean (average) concentration of the population is below that value".

During December 2018, 34 validation samples were taken from behind the dredge within Section 5 (See Validation Plan in Appendix B). The Total PCDD/F (dioxin) I-TEQ Upperbound results were between 22 and 160 pg/g. Of the 34 samples analysed, three dioxin results were between 140 and 160 pg/g, triggering the need for redredging in these areas in accordance with the EMVP. Two samples had dioxin concentrations of 61 and 68 pg/g, which could be accepted within the 95% UCL for the data set.

The 95% UCL was calculated as being 36.52 pg/g for the length of the canal chemically validated as at 22 December 2018.

5.2 CS1 Groundwater

Groundwater sampling was undertaken as part of the consent conditions by GAL at CS1 on 12 December 2018. Five samples were taken from the five monitoring wells installed around the containment cell (See Site Plan in Appendix A for well locations). The Total PCDD/F (dioxin) I-TEQ Upperbound results were between 4.39 and 5.41 pg/L.

The results were all welbelow the adopted Tier 1 trigger level criterion for Total PCDD/F (dioxin) I-TEQ Upperbound outlined in the EMVP of 13.4 pg/L. The dioxin results also showed no obvious change since the September 2018 CS1 groundwater sampling round which returned dioxin concentrations of between 4.2 and 5.62 pg/L.

6. Consent Monitoring Summary

The following consent monitoring summary is intended as a high level summary of consent compliance from the IM as per BOPRC Resource Consent 67173-AP Condition 6.3 (b). This summary is intended to provide the CLG with visibility and assurance that consent compliance is being achieved. The summary only lists conditions that are relevant at the time of writing this report. This summary is not intended to prove compliance with the BOPRC Resource Consent to a consent authority.

Table 2: Consent Monitoring Summary Table

Condition[1]	Description	Compliance	Details
6.1 – 6.3	Independent Monitor	Yes	Continued on site monitoring and reporting.
7.1 – 7.5	Flood Management	Yes	Flood management undertaken in accordance with FMP.
9.1 – 9.5	Erosion and Sediment Controls for Land Outside Canal	Yes	Compliant within KCRP.
10.1 – 10.2	Erosion and Sediment Controls – Canal Works and Discharges to Water	Yes	There does not appear to be any significant erosion of the canal banks occurring.
11.1 – 11.3	Site Access & Traffic Management	Yes	A shoulder closure has been put in place on Shaw Road due to the sediment transfer pipeline running along the road edge.
12.2	Discharges from the Containment Sites (Filtrate and Stormwater)	Yes	Stormwater and filtrate are being released back into the Kopeopeo Canal. Live turbidity monitoring is recording that these releases have minimal sediment loads and no discharges are released above 30 NTU. This is not a consent requirement while the FCS are in place.

[1] Bay of Plenty Regional Council Resource Consent 67173-AP (12 May 2017).

Condition[1]	Description	Compliance	Details
13.1 – 13.3	Water Quality Monitoring in the Kopeopeo Canal Outside the Remediation Zone	Yes	Real time turbidity monitoring shows that turbidity in the water released from the KCRP area into the Orini/Kopeopeo confluence was no greater than 20% above background.
15.1	Kopeopeo Canal Vegetation Disturbance	Yes	Revegetation of the areas around the two boost pumps adjacent to Shaw Road and Paroa Road is being monitored.
17.1 & 17.5	Kopeopeo Canal Control Structures	Yes	FCS operating appropriately and mobile pumping stations are established in accordance with the FMP. FCS-West has been opened as much as possible to allow water to move through the project area.
19.1	Excavation of Sediment - Removal Methodology	Yes	The extraction of sediment from the Kopeopeo Canal is being undertaken in general accordance with the methods in the variation application and the Dredging Management Plan.
20.1	Containment Sites - Sediment Disposal	Yes	The sediment extracted from the Kopeopeo Canal is being transported and deposited at the containment sites in general accordance with the variation application and the Dredging Management Plan.
21.1	Containment Sites - Stormwater	Yes	Stormwater overflowed from CS3 into the Kopeopeo/Orini Pump Station Canal during a heavy rainfall event in late December 2018. No erosion damage occurred.
22.1 – 22.3	Cleaning of Machinery, Structures and Debris	Yes	Equipment is being appropriately cleaned.
25.1	Validation Sampling – Kopeopeo Canal	Yes	Validation sampling is undertaken as quickly as is practical.
25.2	Validation Sampling – Kopeopeo Canal	Yes	1 in 20 sediment samples are split and analysed at two different laboratories for the purpose of quality assurance.
25.5	Validation Sampling – Kopeopeo Canal	Yes	Control structures in place.

Condition[1]	Description	Compliance	Details
26.1 – 26.4	Communication – Community Liaison Group	Yes	CLG being adequately informed of project activities.
27.1 – 27.2	Complaints Register	Yes	Complaints register reviewed (Section 4.10).
28.1 – 28.5	Spill Prevention & Response	Yes	No spills have occurred outside the containment cell.
29.1	Hazardous Substances	Yes	No spills of hazardous substances.
30.1	Signage	Yes	Appropriate signage is in place along the length of the sediment transfer pipeline. Signs are in place identifying CS3 is closed to public access and directing the public towards alternative walking access along the eastern boundary of CS3. Signage on the walking access also informs the public that the path is not designed to be used by motorcycles.
31.1 – 31.2	Archaeological Sites	Yes	No Koiwi or Taonga have been discovered.
32.1 – 32.2	Cultural Monitor	Yes	The Cultural Monitor or an appropriately trained representative is on site to provide oversight during the dredging.
33.1	Hours of Work	Yes	Working hours are 7 am to 6 pm. The consent states 7.30 am; however, permission was gained from the consent authority to start at 7 am.
34.1	Access for Monitoring	Yes	Access has been provided to BOPRC at their request. No BOPRC Compliance Audits were undertaken during December 2018.
35.1 – 35.6	Water Metering & Reporting – Taking Water	NA	The consent authority stated, “this consent condition is void for the current methodology and BOPRC acknowledges that it is not needed to be complied with”.
36.2	Groundwater Monitoring & Responses	Yes	Groundwater monitoring undertaken as described in the GMP.

Condition[1]	Description	Compliance	Details
36.4	Groundwater Monitoring & Responses	Yes	Bi-monthly (every 2 months) groundwater level monitoring is being undertaken at CS1.
36.5	Groundwater Monitoring & Responses	Yes	Background groundwater monitoring is complete for both CS1 and CS3.
36.6 – 36.7	Groundwater Monitoring & Responses	Yes	Groundwater quality monitoring is to be undertaken quarterly for the first 12 months of sediment deposition. The latest round of groundwater quality monitoring for CS1 was undertaken in December 2018. As the 12 months of groundwater monitoring undertaken to date at CS1 has not shown any dioxin concentration greater than 30 pg/L (highest result is 9.53 pg/L), groundwater sampling can now continue at annual intervals for the remainder of the consent. Groundwater monitoring at CS3 on a quarterly basis will begin following the first deposition of sediment on the site.
38.1 – 38.2	Air Quality – General	Yes	Air quality undertaken in accordance with the EMVP.
39.1 – 39.6	Dioxin & Air Quality Monitoring	Yes	Ambient air monitoring complete at CS1 with results being below consent limits.
40.1 – 40.7	Dust Management	Yes	Dust is being appropriately managed.
41.1	Dust Monitoring	Yes	Dust is being appropriately monitored using visual means.
42.1 – 42.3	Remedial Action for Dust Emissions at the Containment Sites	Yes	No dust emissions have been identified.
43.1 – 43.4	Odour Management & Monitoring	Yes	Slight odour identified within CS1, but no odour identified outside the site boundary.

Condition[1]	Description	Compliance	Details
44.1 – 44.3	Soil Quality & Monitoring	Yes	Baseline soil sampling undertaken at CS3.
45.1 – 45.3	Aquatic Species	Yes	Suitable fish removal undertaken within the KCRP area.
46.1	Saltmarsh	Yes	Water levels within the canal are not being artificially held above 0.2 m RL (Moturiki Datum).

7. Conclusion

In December 2018, dredging of Section 5 of the Kopeopeo Canal finished, with subsequent sediment validation sampling. Thirty-four validation samples were taken from behind the dredge within Section 5 (See Validation Plan in Appendix B). The Total PCDD/F (dioxin) I-TEQ Upperbound results were between 22 and 160 pg/g. Of the 34 samples analysed, three dioxin results were between 140 and 160 pg/g, triggering the need for redredging in these areas in accordance with the EMVP. Two samples had dioxin concentrations of 61 and 68 pg/g, which were accepted within the 95% UCL for the data set. The 95% UCL was calculated as being 36.52 pg/g for the length of the canal chemically validated as at 22 December 2018.

Groundwater sampling was undertaken at CS1 (See Site Plan in Appendix A for well locations). The Total PCDD/F (dioxin) I-TEQ Upperbound results were between 4.39 and 5.41 pg/L. The results were all well below the adopted Tier 1 trigger level criterion for Total PCDD/F (dioxin) I-TEQ Upperbound outlined in the EMVP of 13.4 pg/L.

Cleaning of the containment cell at CS1 continued until the beginning of the Christmas shutdown period on 22 December 2018. In preparation for this shutdown, most of the equipment on the barge and within the containment sites was packed up and locked securely to minimise the risk of theft over the holiday period. No incidents were recorded on site and there were no complaints received from the community.

Flood management continued throughout December with one high rainfall event on 25 and 26 December 2018 requiring flood management. The project team appeared to be complying with all the key consent conditions checked by the IM field observer.

January will see the water treatment plant moved to CS3 in preparation for dredging Sections 6 and 7 of the canal.

Appendices

Appendix A – Site Plan

Paper Size A4

0 25 50 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: NZGD 2000
Grid: NZGD 2000 New Zealand Transverse Mercator

N

LEGEND

- Perimeter drain sample location
- Monitoring well location
- Turbidity monitoring point
- CS1
- FCS West
- Water treatment plant
- Topsoil stockpile
- Property boundary

Bay of Plenty Regional Council
Kopeopeo Canal Remediation Project

Job Number	51-33279
Revision	A
Date	22 Jan 2019

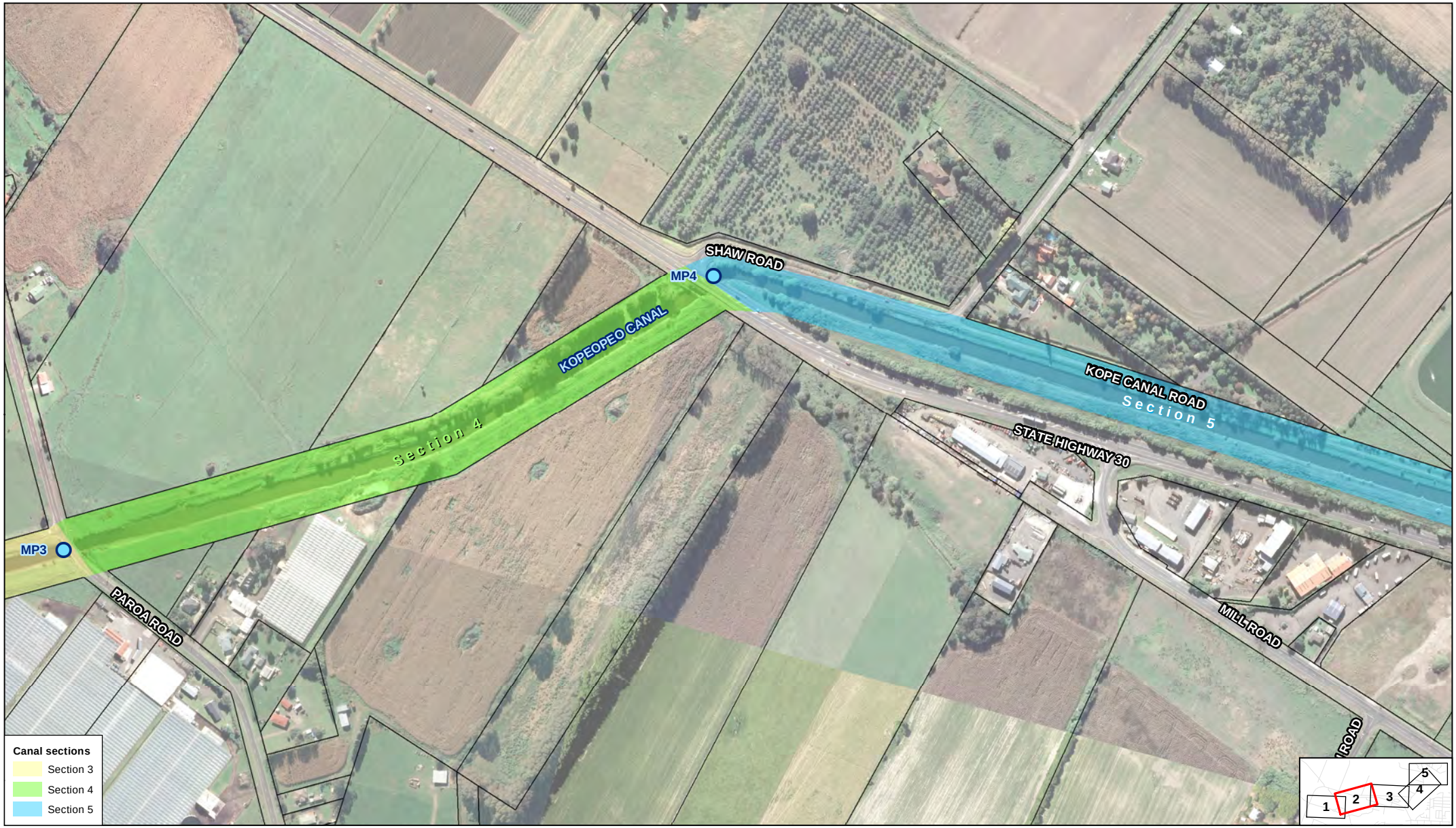
Site Plan

Figure 1

N:\NZ\Auckland\Projects\51\33279\GIS\Maps\Deliverables\51_33279_Z001_SitePlan.mxd

Level 1, 104 Spring Street, Tauranga 3110, New Zealand T 64 7 557 0110 E aklmail@ghd.com W www.ghd.com

Data source: Aerial imager - LINZ 2018 & ESRI 2018; General topo - LINZ 2018. Created by:jrprice



Paper Size A4

0 25 50 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: NZGD 2000
Grid: NZGD 2000 New Zealand Transverse Mercator

N

LEGEND

Turbidity monitoring point

Property boundary

Bay of Plenty Regional Council
Kopeopeo Canal Remediation Project

Job Number	51-33279
Revision	A
Date	22 Jan 2019

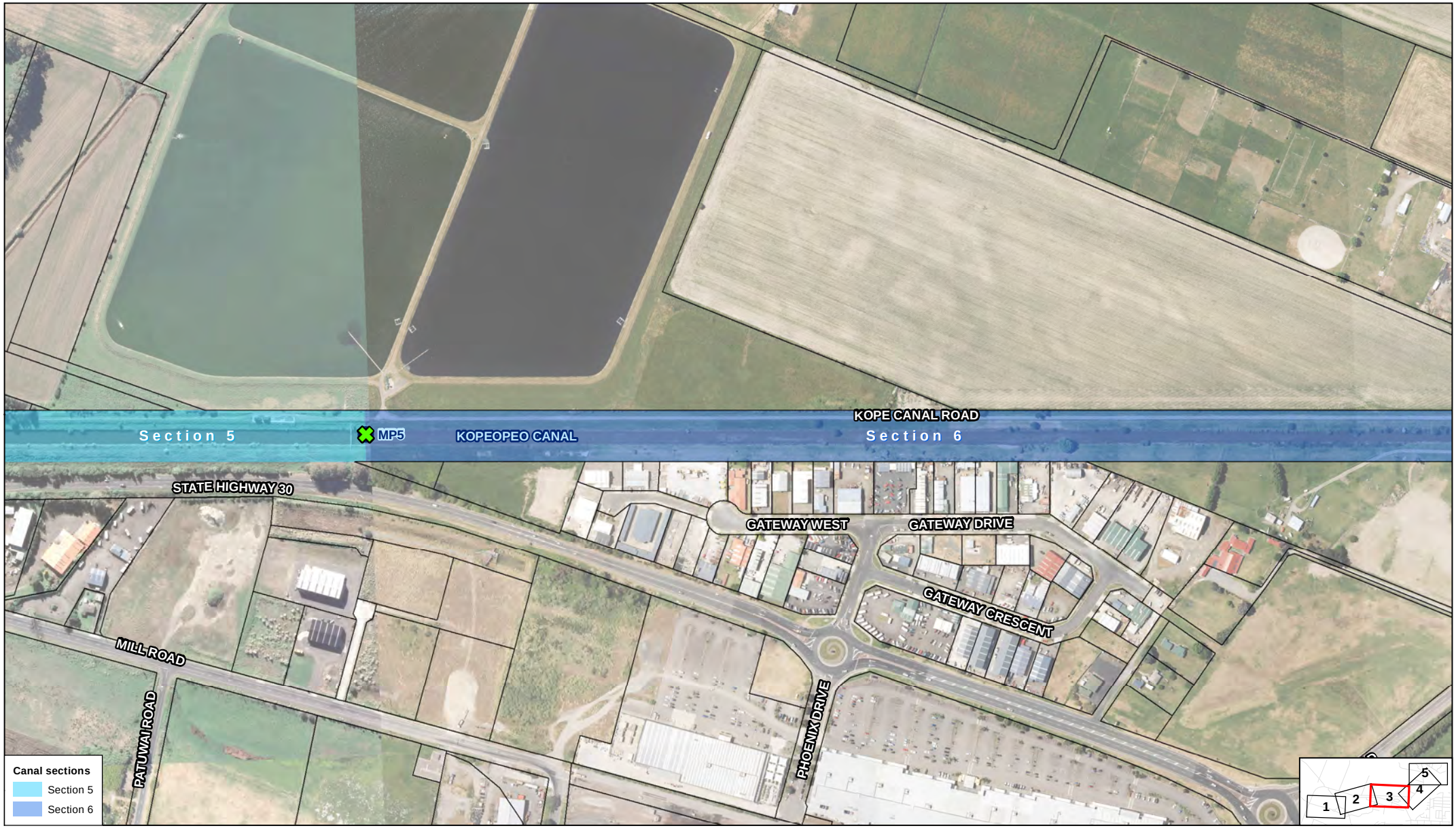
Site Plan

Figure 2

N:\NZ\Auckland\Projects\51\33279\GIS\Maps\Deliverables\51_33279_Z001_SitePlan.mxd

Level 1, 104 Spring Street, Tauranga 3110, New Zealand **T** 64 7 557 0110 **E** aklmail@ghd.com **W** www.ghd.com

Data source: Aerial imager - LINZ 2018 & ESRI 2018; General topo - LINZ 2018. Created by:jrprice



Paper Size A4

0 25 50 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: NZGD 2000
Grid: NZGD 2000 New Zealand Transverse Mercator

N

LEGEND

- Turbidity monitoring point
- Current dredge location
- Property boundary

Bay of Plenty Regional Council
Kopeopeo Canal Remediation Project

Job Number 51-33279
Revision A
Date 22 Jan 2019

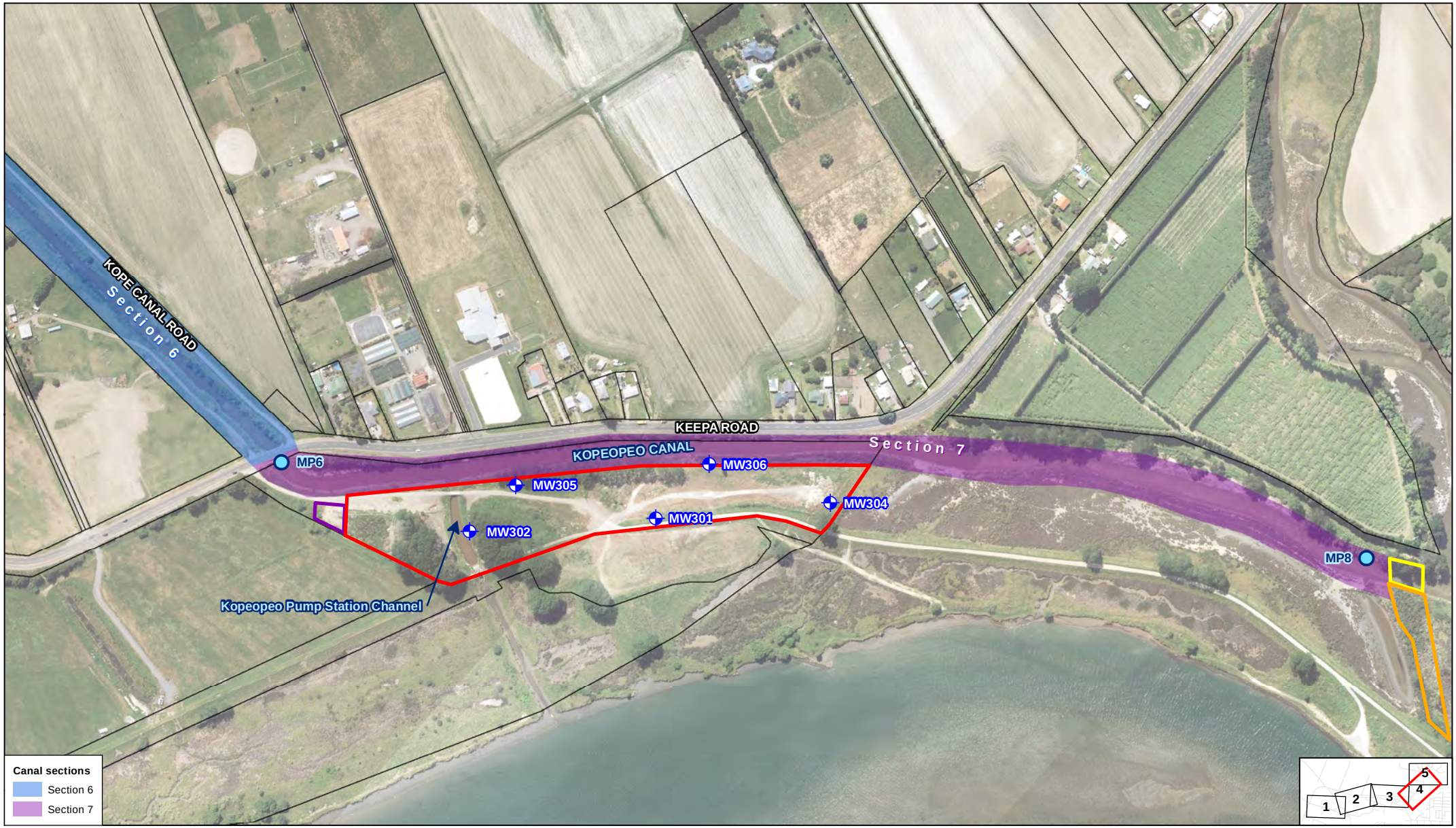
Site Plan

Figure 3

N:\NZ\Auckland\Projects\51\33279\GIS\Maps\Deliverables\51_33279_Z001_SitePlan.mxd

Level 1, 104 Spring Street, Tauranga 3110, New Zealand T 64 7 557 0110 E aklmail@ghd.com W www.ghd.com

Data source: Aerial imager - LINZ 2018 & ESRI 2018; General topo - LINZ 2018. Created by:jrprice



Paper Size A4

0 25 50 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: NZGD 2000
Grid: NZGD 2000 New Zealand Transverse Mercator

LEGEND

- Monitoring well location
- Turbidity monitoring point
- Access road built to enable control structure construction
- CS3
- FCS East
- Public car park
- Property boundary

Bay of Plenty Regional Council
Kopeopeo Canal Remediation Project

Job Number	51-33279
Revision	A
Date	22 Jan 2019

Site Plan

Figure 4

N:\NZ\Auckland\Projects\51\33279\GIS\Maps\Deliverables\51_33279_Z001_SitePlan.mxd

Level 1, 104 Spring Street, Tauranga 3110, New Zealand T 64 7 557 0110 E aklmail@ghd.com W www.ghd.com

Data source: Aerial imager - LINZ 2018 & ESRI 2018; General topo - LINZ 2018. Created by:jrprice

Paper Size A4

0 25 50 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: NZGD 2000
Grid: NZGD 2000 New Zealand Transverse Mercator

N

LEGEND

- Compliance Turbidity monitoring point
- Turbidity monitoring point
- Access road built to enable control structure construction
- FCS East
- Property boundary

Bay of Plenty Regional Council
Kopeopeo Canal Remediation Project

Job Number 51-33279
Revision A
Date 22 Jan 2019

Site Plan

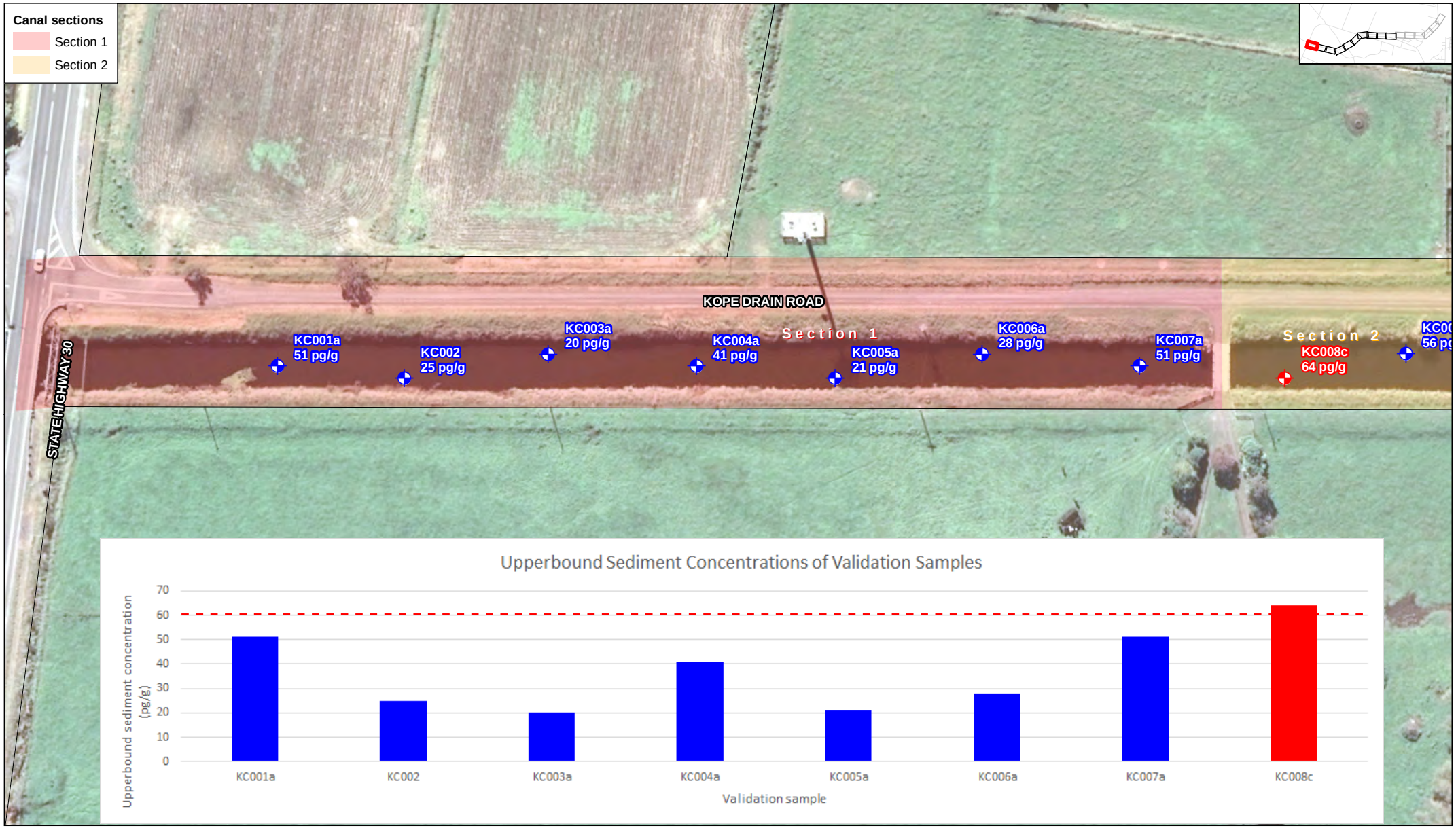
Figure 5

N:\NZ\Auckland\Projects\51\33279\GIS\Maps\Deliverables\51_33279_Z001_SitePlan.mxd

Level 1, 104 Spring Street, Tauranga 3110, New Zealand T 64 7 557 0110 E aklmail@ghd.com W www.ghd.com

Data source: Aerial imager - LINZ 2018 & ESRI 2018; General topo - LINZ 2018. Created by:jrprice

Appendix B – Canal Sediment Validation Locations



Paper Size A4

0 10 20 40

Metres

Map Projection: Transverse Mercator
Horizontal Datum: NZGD 2000
Grid: NZGD 2000 New Zealand Transverse Mercator

LEGEND

- Validation samples (upperbound sediment concentration < 60 pg/g)
- Validation samples (upperbound sediment concentration > 60 pg/g)
- Property boundary

Canal Sediment Validation 95% UCL of 36.52 pg/g
Remedial target = 60 pg/g

Bay of Plenty Regional Council
Kopeopeo Canal Remediation Project

Job Number	51-33279
Revision	A
Date	24 Jan 2019

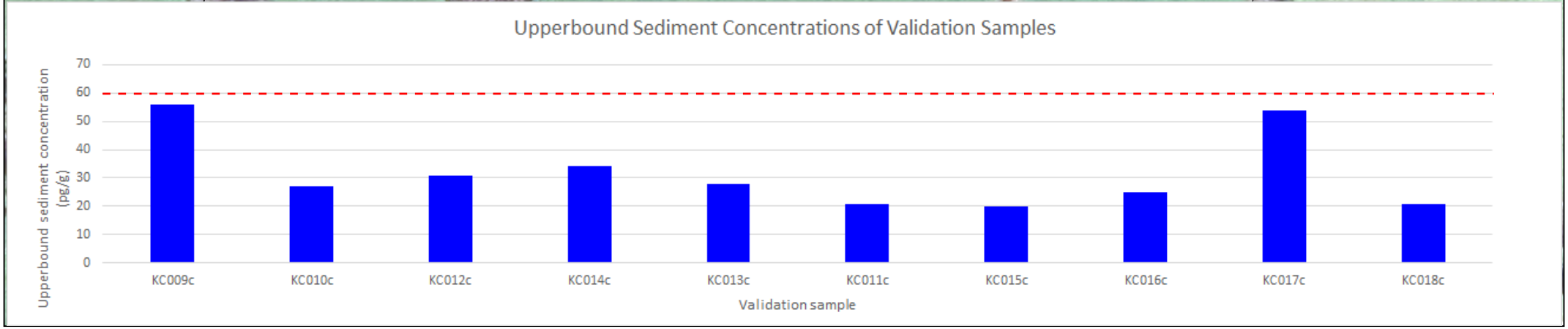
Validation Samples

Figure 1

N:\NZ\Auckland\Projects\51\33279\GIS\Maps\Deliverables\51_33279_Z002_ValidationSamples.mxd

Level 1, 104 Spring Street, Tauranga 3110, New Zealand T 64 7 557 0110 E aklmail@ghd.com W www.ghd.com

Data source: Aerial imager - LINZ 2018 & ESRI 2018; General topo - LINZ 2018; Validation samples - Golder. Created by:jrprice



Paper Size A4

0 10 20 40

Metres

Map Projection: Transverse Mercator
Horizontal Datum: NZGD 2000
Grid: NZGD 2000 New Zealand Transverse Mercator

LEGEND

Validation samples (upperbound sediment concentration < 60 pg/g)

Property boundary

Canal Sediment Validation 95% UCL of 36.52 pg/g
Remedial target = 60 pg/g

Bay of Plenty Regional Council
Kopeopeo Canal Remediation Project

Job Number	51-33279
Revision	A
Date	24 Jan 2019

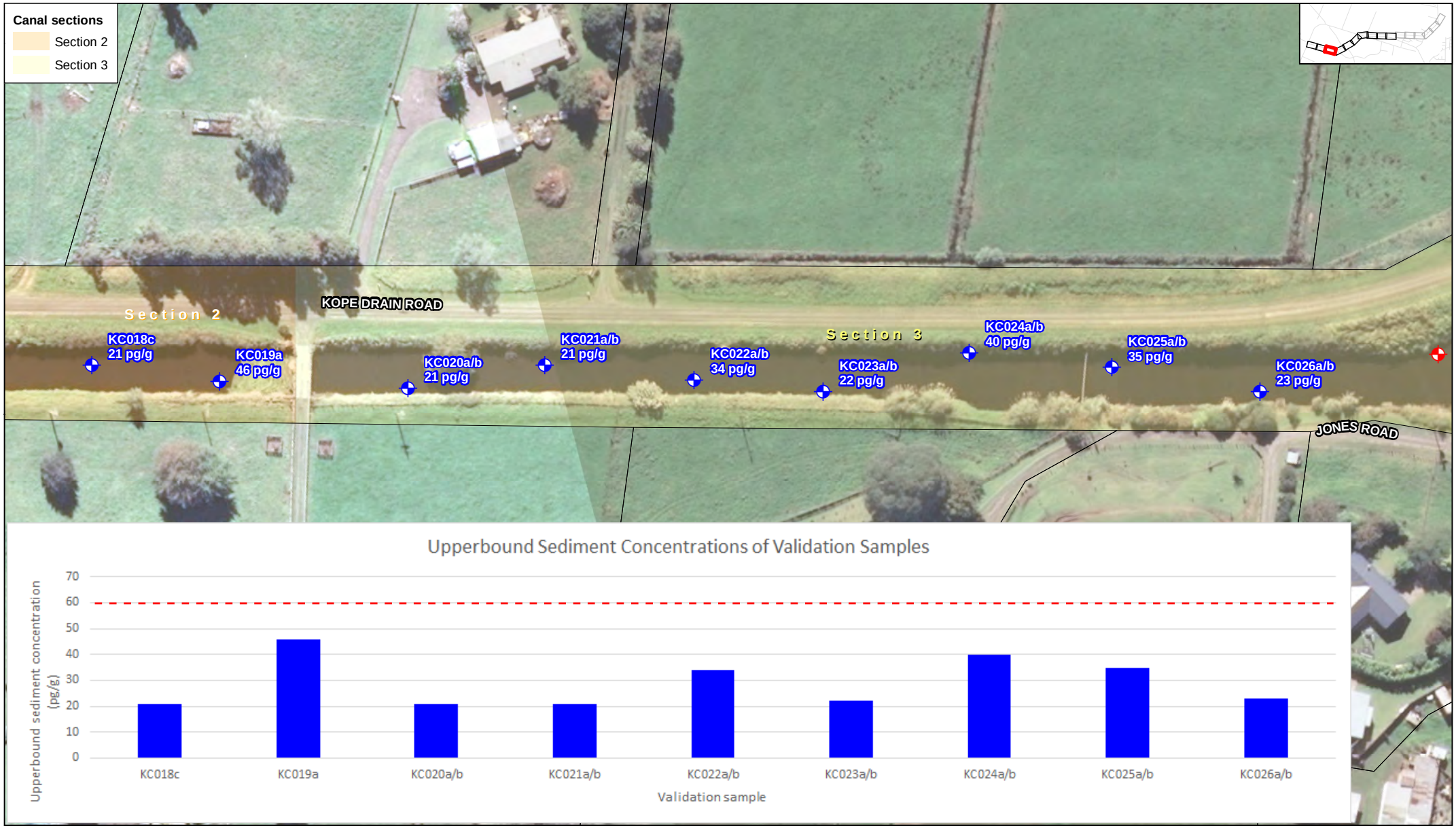
Validation Samples

Figure 2

N:\NZ\Auckland\Projects\51\33279\GIS\Maps\Deliverables\51_33279_Z002_ValidationSamples.mxd

Level 1, 104 Spring Street, Tauranga 3110, New Zealand T 64 7 557 0110 E aklmail@ghd.com W www.ghd.com

Data source: Aerial imager - LINZ 2018 & ESRI 2018; General topo - LINZ 2018; Validation samples - Golder. Created by:jrprice



Paper Size A4

0 10 20 40

Metres

Map Projection: Transverse Mercator
Horizontal Datum: NZGD 2000
Grid: NZGD 2000 New Zealand Transverse Mercator

LEGEND

- Validation samples (upperbound sediment concentration < 60 pg/g)
- Validation samples (upperbound sediment concentration > 60 pg/g)
- Property boundary

Canal Sediment Validation 95% UCL of 36.52 pg/g
Remedial target = 60 pg/g

Bay of Plenty Regional Council
Kopeopeo Canal Remediation Project

Job Number	51-33279
Revision	A
Date	24 Jan 2019

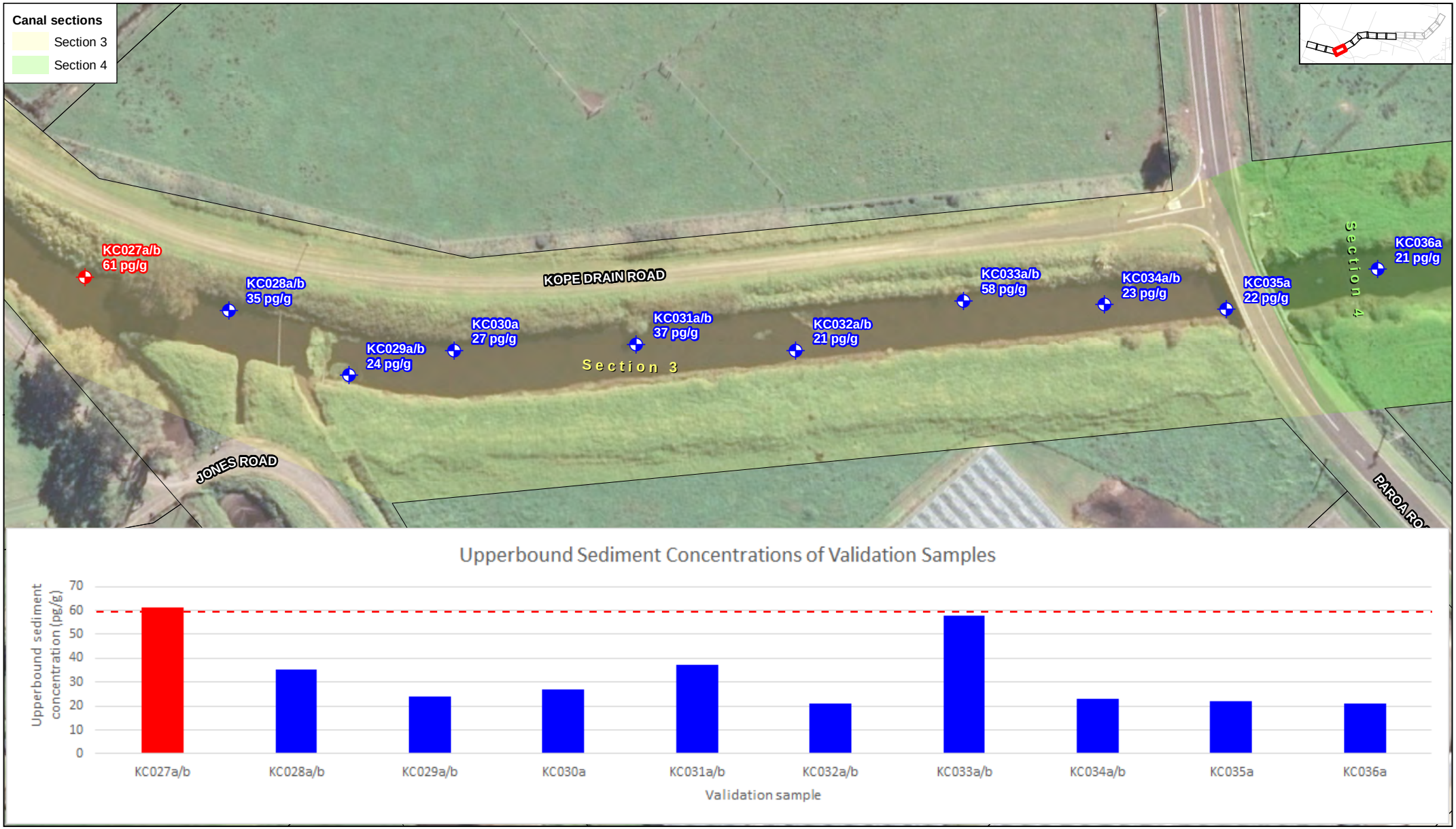
Validation Samples

Figure 3

N:\NZ\Auckland\Projects\51\33279\GIS\Maps\Deliverables\51_33279_Z002_ValidationSamples.mxd

Level 1, 104 Spring Street, Tauranga 3110, New Zealand T 64 7 557 0110 E aklmail@ghd.com W www.ghd.com

Data source: Aerial imager - LINZ 2018 & ESRI 2018; General topo - LINZ 2018; Validation samples - Golder. Created by:jrprice



Paper Size A4

0 10 20 40

Metres

Map Projection: Transverse Mercator
Horizontal Datum: NZGD 2000
Grid: NZGD 2000 New Zealand Transverse Mercator

LEGEND

- Validation samples (upperbound sediment concentration < 60 pg/g)
- Validation samples (upperbound sediment concentration > 60 pg/g)
- Property boundary

Canal Sediment Validation 95% UCL of 36.52 pg/g
Remedial target = 60 pg/g

Bay of Plenty Regional Council
Kopeopeo Canal Remediation Project

Job Number 51-33279
Revision A
Date 24 Jan 2019

Validation Samples

Figure 4

N:\NZ\Auckland\Projects\51\33279\GIS\Maps\Deliverables\51_33279_Z002_ValidationSamples.mxd

Level 1, 104 Spring Street, Tauranga 3110, New Zealand T 64 7 557 0110 E aklmail@ghd.com W www.ghd.com

Data source: Aerial imager - LINZ 2018 & ESRI 2018; General topo - LINZ 2018; Validation samples - Golder. Created by:jrprice

Paper Size A4

0 10 20 40

Metres

Map Projection: Transverse Mercator
Horizontal Datum: NZGD 2000
Grid: NZGD 2000 New Zealand Transverse Mercator

LEGEND

- Validation samples (upperbound sediment concentration < 60 pg/g)
- Superseded historic validation samples prior to redredge
- Property boundary

Canal Sediment Validation 95% UCL of 36.52 pg/g
Remedial target = 60 pg/g

Bay of Plenty Regional Council
Kopeopeo Canal Remediation Project

Job Number 51-33279
Revision A
Date 24 Jan 2019

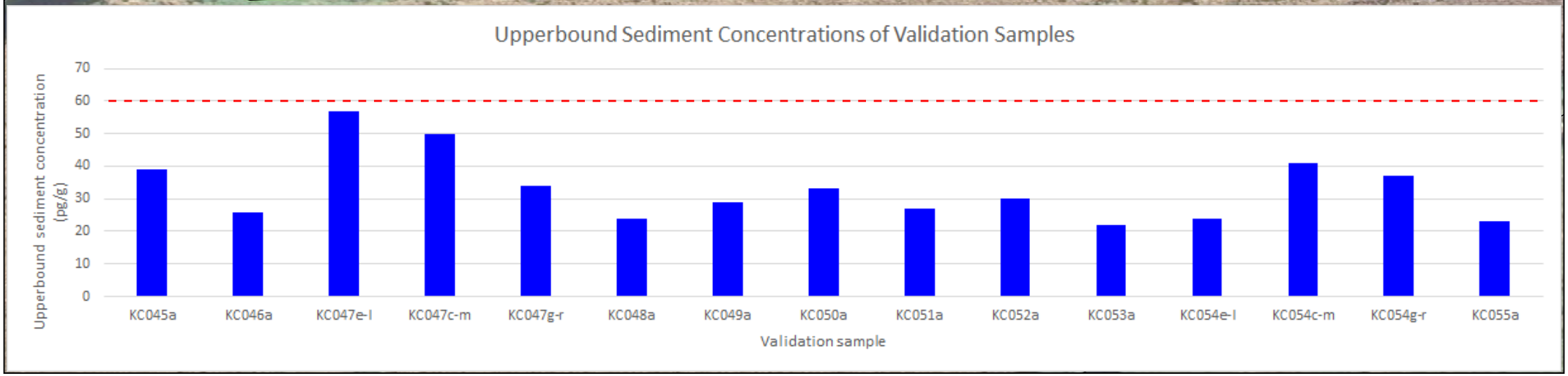
Validation Samples

Figure 5

N:\NZ\Auckland\Projects\51\33279\GIS\Maps\Deliverables\51_33279_Z002_ValidationSamples.mxd

Level 1, 104 Spring Street, Tauranga 3110, New Zealand T 64 7 557 0110 E aklmail@ghd.com W www.ghd.com

Data source: Aerial imager - LINZ 2018 & ESRI 2018; General topo - LINZ 2018; Validation samples - Golder. Created by:jrprice



Paper Size A4

0 10 20 40

Metres

Map Projection: Transverse Mercator
Horizontal Datum: NZGD 2000
Grid: NZGD 2000 New Zealand Transverse Mercator

LEGEND

- Validation samples (upperbound sediment concentration < 60 pg/g)
- Superseded historic validation samples prior to redredge
- Property boundary

Canal Sediment Validation 95% UCL of 36.52 pg/g
Remedial target = 60 pg/g

Bay of Plenty Regional Council
Kopeopeo Canal Remediation Project

Job Number	51-33279
Revision	A
Date	24 Jan 2019

Validation Samples

Figure 6

N:\NZ\Auckland\Projects\51\33279\GIS\Maps\Deliverables\51_33279_Z002_ValidationSamples.mxd

Level 1, 104 Spring Street, Tauranga 3110, New Zealand T 64 7 557 0110 E aklmail@ghd.com W www.ghd.com

Data source: Aerial imager - LINZ 2018 & ESRI 2018; General topo - LINZ 2018; Validation samples - Golder. Created by:jrprice

Paper Size A4

0 10 20 40

Metres

Map Projection: Transverse Mercator
Horizontal Datum: NZGD 2000
Grid: NZGD 2000 New Zealand Transverse Mercator

LEGEND

- Validation samples (upperbound sediment concentration < 60 pg/g)
- Validation samples (upperbound sediment concentration > 60 pg/g)
- Superseded historic validation samples prior to redredge
- Property boundary

Canal Sediment Validation 95% UCL of 36.52 pg/g
Remedial target = 60 pg/g

Bay of Plenty Regional Council
Kopeopeo Canal Remediation Project

Job Number 51-33279
Revision A
Date 24 Jan 2019

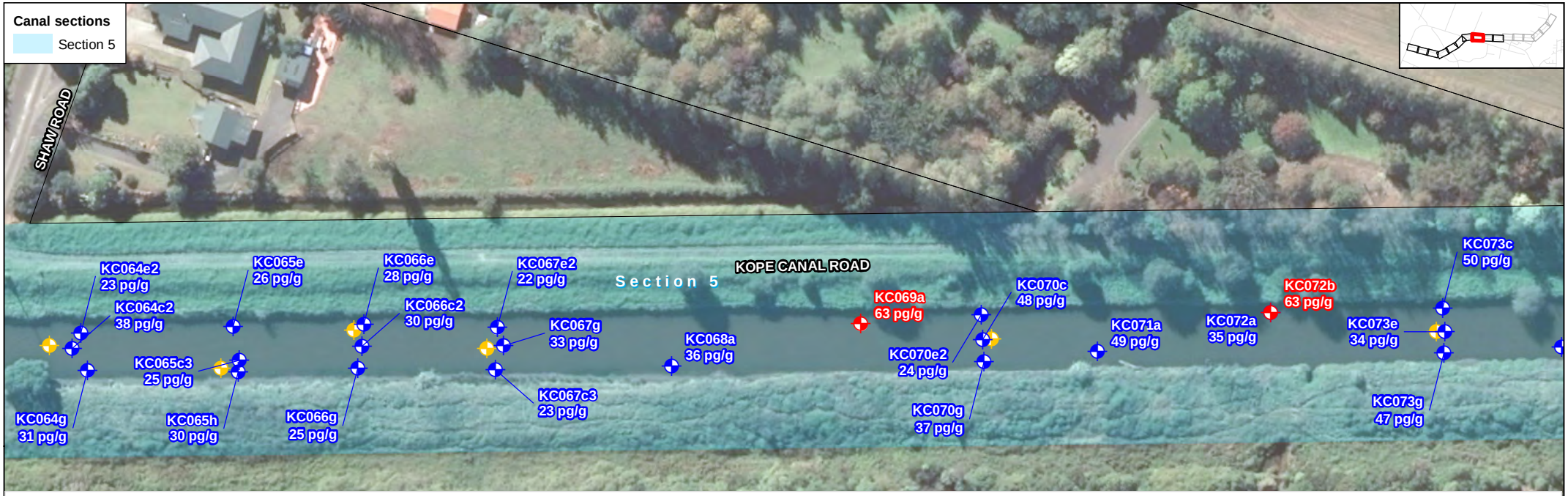
Validation Samples

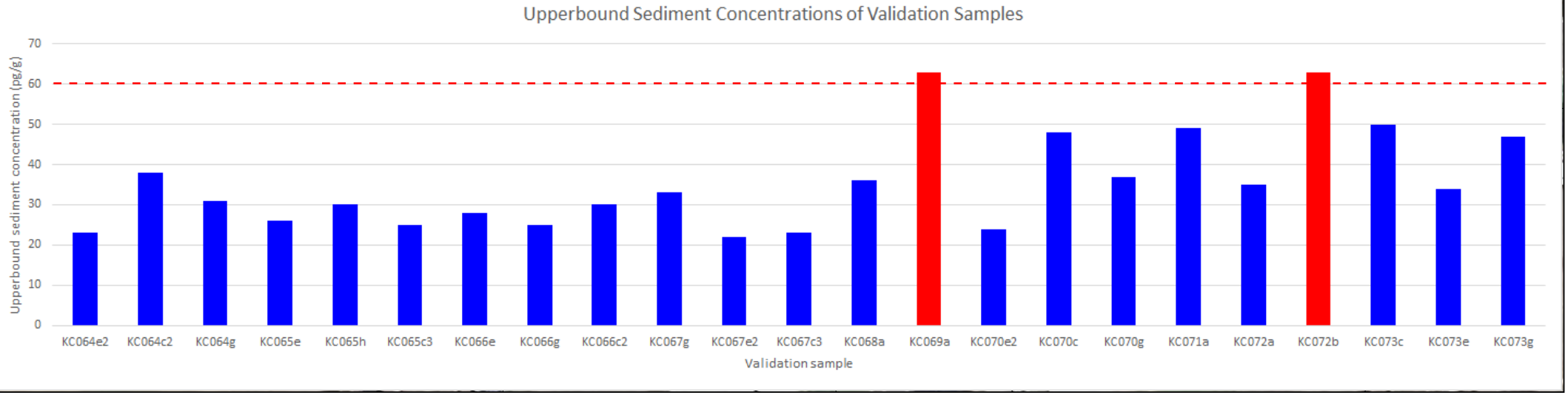
Figure 7

N:\NZ\Auckland\Projects\51\33279\GIS\Maps\Deliverables\51_33279_Z002_ValidationSamples.mxd

Level 1, 104 Spring Street, Tauranga 3110, New Zealand T 64 7 557 0110 E aklmail@ghd.com W www.ghd.com

Data source: Aerial imager - LINZ 2018 & ESRI 2018; General topo - LINZ 2018; Validation samples - Golder. Created by:jrprice





Paper Size A4

0 10 20 40

Metres

Map Projection: Transverse Mercator
Horizontal Datum: NZGD 2000
Grid: NZGD 2000 New Zealand Transverse Mercator

N

LEGEND

- Validation samples (upperbound sediment concentration < 60 pg/g)
- Validation samples (upperbound sediment concentration > 60 pg/g)
- Superseded historic validation samples prior to redredge
- Property boundary

Canal Sediment Validation 95% UCL of 36.52 pg/g
Remedial target = 60 pg/g

Bay of Plenty Regional Council
Kopeopeo Canal Remediation Project

Job Number 51-33279
Revision A
Date 24 Jan 2019

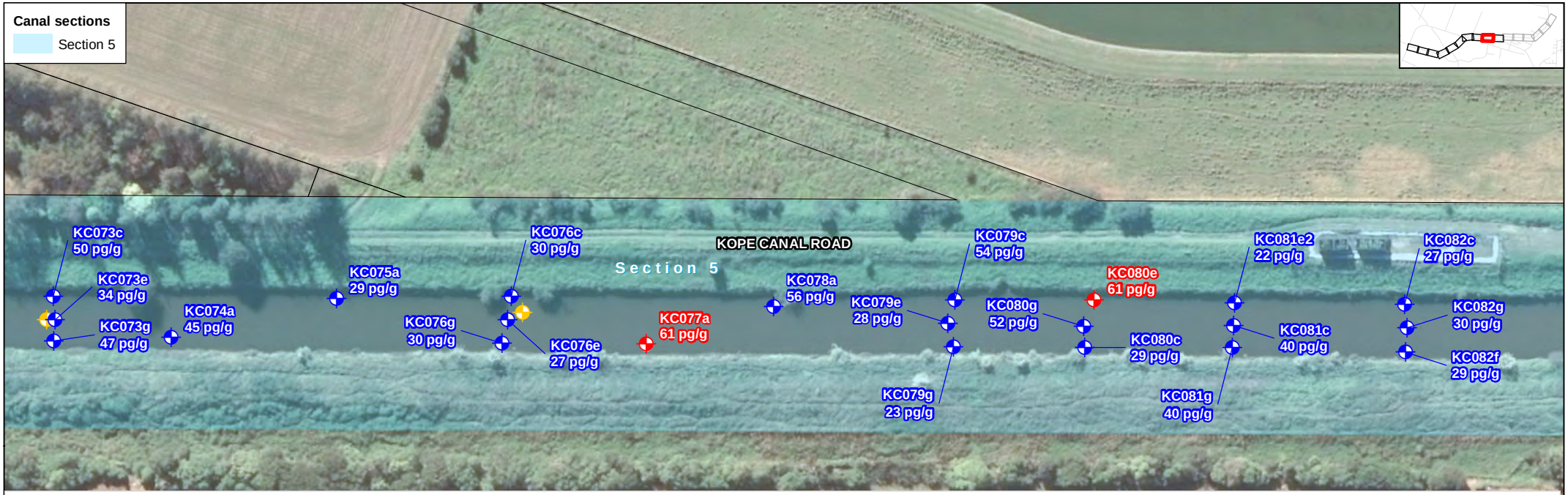
Validation Samples

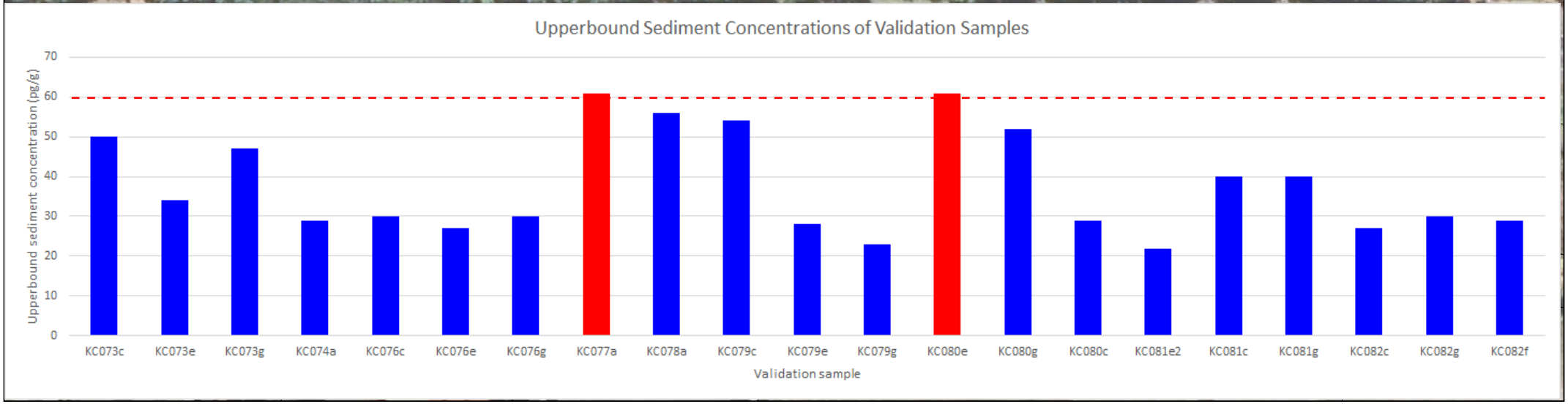
Figure 8

N:\NZ\Auckland\Projects\51\33279\GIS\Maps\Deliverables\51_33279_Z002_ValidationSamples.mxd

Level 1, 104 Spring Street, Tauranga 3110, New Zealand T 64 7 557 0110 E aklmail@ghd.com W www.ghd.com

Data source: Aerial imager - LINZ 2018 & ESRI 2018; General topo - LINZ 2018; Validation samples - Golder. Created by:jrprice





Paper Size A4

0 10 20 40

Metres

Map Projection: Transverse Mercator
Horizontal Datum: NZGD 2000
Grid: NZGD 2000 New Zealand Transverse Mercator

N

LEGEND

- Validation samples (upperbound sediment concentration < 60 pg/g)
- Validation samples (upperbound sediment concentration > 60 pg/g)
- Superseded historic validation samples prior to redredge
- Property boundary

Canal Sediment Validation 95% UCL of 36.52 pg/g
Remedial target = 60 pg/g

Bay of Plenty Regional Council
Kopeopeo Canal Remediation Project

Job Number 51-33279
Revision A
Date 24 Jan 2019

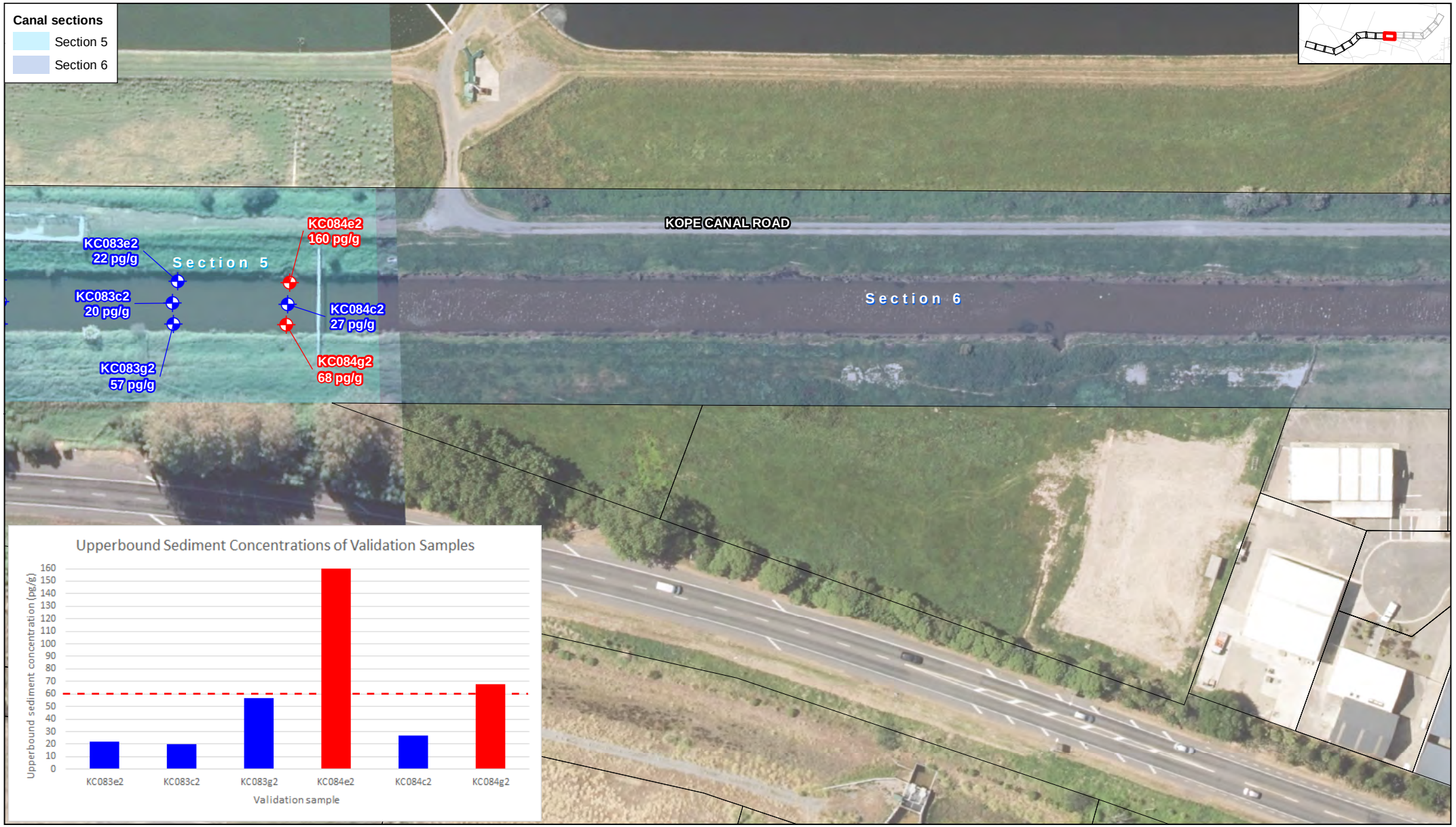
Validation Samples

Figure 9

N:\NZ\Auckland\Projects\51\33279\GIS\Maps\Deliverables\51_33279_Z002_ValidationSamples.mxd

Level 1, 104 Spring Street, Tauranga 3110, New Zealand T 64 7 557 0110 E aklmail@ghd.com W www.ghd.com

Data source: Aerial imager - LINZ 2018 & ESRI 2018; General topo - LINZ 2018; Validation samples - Golder. Created by:jrprice



Paper Size A4

0 10 20 40

Metres

Map Projection: Transverse Mercator
Horizontal Datum: NZGD 2000
Grid: NZGD 2000 New Zealand Transverse Mercator

N

LEGEND

- Validation samples (upperbound sediment concentration < 60 pg/g)
- Validation samples (upperbound sediment concentration > 60 pg/g)
- Property boundary

Canal Sediment Validation 95% UCL of 36.52 pg/g
Remedial target = 60 pg/g

Bay of Plenty Regional Council
Kopeopeo Canal Remediation Project

Job Number	51-33279
Revision	A
Date	24 Jan 2019

Validation Samples

Figure 10

N:\NZ\Auckland\Projects\51\33279\GIS\Maps\Deliverables\51_33279_Z002_ValidationSamples.mxd

Level 1, 104 Spring Street, Tauranga 3110, New Zealand T 64 7 557 0110 E aklmail@ghd.com W www.ghd.com

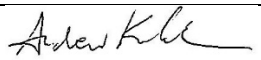
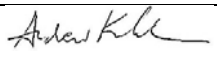
Data source: Aerial imager - LINZ 2018 & ESRI 2018; General topo - LINZ 2018; Validation samples - Golder. Created by:jrprice

GHD

Level 3, GHD Centre
27 Napier Street
T: 64 9 370 8000 F: 64 9 370 8001 E: aklmail@ghd.com

N:\NZ\Auckland\Projects\51\33279\Technical\Independent Monitoring Reports\CLG Progress Report\December 2018\CLG Update Report - December 2018 V1.0_Draft.docx

Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
1.0	M. James	A. Kohlrusch		A. Kohlrusch		05/02/2018

www.ghd.com