Statement of Qualifications and Experience

Zac Woods

I am an Environmental Consultant at Southern Skies Environmental Limited (SouthernSkies). SouthernSkies is an environmental consultancy specialising in erosion and sediment control, environmental management and planning. I have been employed at SouthernSkies since October 2015.

I hold the qualifications of Post Grad Diploma majoring in Environmental Science from the University of Auckland which I completed in 2017 and a Bachelor of Science majoring in Environmental Science and Earth and Ocean Science from the Waikato University which I completed in 2012.

SouthernSkies is a member of the Internation Erosion and Sediment Control Association.

I have nine years of professional experience in the environmental field as a consultant, specifically in erosion and sediment control and construction environmental management. I have managed a variety of multi-disciplinary environmental projects on behalf of clients in both the private and public sectors. I have provided technical, consenting and compliance auditing services to the Auckland Council and now also provide environmental leadership across a range of projects including roads, transmission lines and renewable energy.

I designed erosion and sediment control plans and provided technical advice on projects such as the Papakura to Pukekohe Electrification project for KiwiRail, Harapaki Windfarm for Meridian and OceanaGold's Waihi North Project which is also being lodged under the Fast Track Approvals Bill. I have prepared ESC Adaptive Management Plans for various sites and clients including Milldale for Fulton Hogan Developments, Drury Town Centre for Kiwi Property and Spedding Block for Oyster Capital.

I confirm that, in my capacity as the author of the Adaptive Management Plan, I have read and abide by the Environment Court of New Zealand's Code of Conduct for Expert Witnesses Practice Note 2023.

Statement of Qualifications and Experience

Campbell Stewart

I am an Environmental Consultant and Director at Southern Skies Environmental Limited (SouthernSkies). SouthernSkies is an environmental consultancy specialising in erosion and sediment control, environmental management and planning. I was a founding partner of SouthernSkies in 2003.

I hold the qualifications of Bachelor of Resource Studies (Land & Water Management / Forestry) from Lincoln University (1994) and is a Certified Professional in Erosion and Sediment Control (CPESC No. 7630).

SouthernSkies is a member of the Internation Erosion and Sediment Control Association.

I have 29 years of professional experience in the environmental field as a consultant, specifically in Erosion and Sediment Control and Construction Environmental Management. I have managed the environmental aspects of a variety of multi-disciplinary projects on behalf of clients in both the private and public sectors. My technical specialisation is erosion and sediment control and environmental management for infrastructure construction projects. I have provided technical, consenting and compliance auditing services to the Auckland Council (previously Auckland Regional Council) since 1998, I now also provide environmental leadership across a range of projects including roads, transmission lines and renewable energy.

I was the erosion and sediment control designer and technical advisor for multiple infrastructure and development projects, including Te Uku Wind farm, the Te Rapa Expressway, the Wairakei Transmission Upgrade, and the Huntly Bypass. These projects were all awarded the Waikato Regional Council earthworks 'site of the year' during their construction phases (Te Rapa and Huntly both winning twice each).

In 2016 I was the Technical Lead Author of Auckland Council Guideline Document 2016/005 Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region (GD05), which won the NZRMLA 2016 Technical Publication of the Year Award.

I was a Director of the International Erosion Control Association (IECA) Australasia (2009 -2015). As a Director of the IECA, I was tasked with revising the EnviroCert International Qualification Certified Professional in Erosion and Sediment Control (CPESC) to reflect New Zealand's erosion and sediment control guidelines. I was on the CPESC Australasia Ethics Committee 2018 and 2019.

I confirm that, in my capacity as the reviewer of the Adaptive Management Plan, I have read and abide by the Environment Court of New Zealand's Code of Conduct for Expert Witnesses Practice Note 2023.

SOUTHERNSKIES ENVIRONMENTAL

ADAPTIVE MANAGEMENT PLAN

EARTHWORKS STAGES 10 - 13

MILLDALE

FULTON HOGAN LAND DEVELOPMENT LTD

FEBRUARY 2025

Document Control

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Client	Fulton Hogan Land Development Ltd
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Reviewer	Campbell Stewart – (SouthernSkies Environmental) Jamie Whyte – Project Coordinator (Woods and Partners Ltd)
Approval	
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1. Introduction

This report has been prepared in support of the application by Fulton Hogan Land Development (FHLD) for a resource consent to the Environmental Protection Authority (EPA) under the Fast-Track Approvals Act 2024 (FTAA).

Resource consent is required for bulk earthworks, subdivision, streamworks, water permits and discharge consents for the development of 623 residential lots, 27 residential super lots, 1 neighbourhood centre lot, jointly owned access lots (JOALS) and roads to vest, reserves to vest, and all associated works, landscaping and infrastructure.

The development will require land modification works to facilitate Stages 10-13 of the Milldale Fast Track application. This includes bulk earthworks across the site to refine the site to the required finished levels. A full description of the project is provided in the application Assessment of Environmental Effects (AEE).

1.1. Adaptive Management

This Adaptive Management Plan (AMP) seeks to enable an adaptive environmental management approach that can evolve and adapt in response to measured data or best management practices.

Adaptive management requires a 'plan-do-check-act' approach to be undertaken whereby the ongoing monitoring and reporting that is proposed creates a continuous feedback loop from the effects being created.

This AMP provides support for the bulk earthworks Stages 10-13 to be undertaken as part of the Milldale development.

Stage 10 and 11 will involve approximately 248,900 m^3 of cut and 213,850 m^3 of fill over an area of approximately 23.1 hectares.

Stage 12 and 13 include approximately 525,225 m^3 of cut and 820,850 m^3 of fill over an area of 45 hectares.

This AMP identifies the practices and processes for the monitoring of event related sediment discharges to the receiving environment and the performance of the erosion and sediment control (ESC) measures adopted throughout the project's duration. The monitoring proposed as part of this AMP incorporates the currently consented earthworks areas. Civil works areas are not proposed to be monitored as part of the AMP.

Trigger levels can be used to trigger action if a specified limit is exceeded. Trigger levels are outlined in Section 3.2. Notification to Auckland Council will be required if trigger levels are exceeded, outlining the management response undertaken after an event.

Any changes to this document will be agreed upon by all parties involved, with appropriate authorisation by Auckland Council.

This AMP will cover:

<u>Pre-Construction Monitoring</u>

Freshwater

Prior to commencement of the initial earthworks Stages 2 and 3, the Consent Holder completed pre-construction freshwater monitoring.

The pre-construction environmental conditions were represented by:

- Water quality (limited to turbidity, total suspended solids (TSS) and pH);
- Macro Invertebrate sampling.
- Stream channel analysis

<u>Construction Monitoring</u>

Weather Monitoring

Prior to commencement of construction works an automated tipping bucket rainfall recorder will be installed on-site. The rainfall data will be recorded and utilised in accordance with Section 3.1.

Freshwater Monitoring

During construction works the Consent Holder will monitor:

- Upstream water quality.
- Downstream water quality.

Erosion and Sediment Control Monitoring

ESC monitoring will include scheduled site visits, pre and post rain event monitoring and water sampling.

All chemical treatment will be monitored in accordance with the Chemical Treatment Management Plan (CTMP).

During a rainfall trigger event (as defined in Section 3.1) water discharge monitoring will be undertaken on all sediment retention ponds (SRPs) that are discharging during the event.

Reporting

An Adaptive Management Response Report (AMRR) will be produced following each rainfall trigger event and provided to Auckland Council. The AMRR will detail the extent of the rainfall event, provide details of how the ESC devices operated and provide a summary of the turbidity recorded in the stream. If any trigger level exceedances (as defined in Section 3.2 and 3.3) are exceeded the report will include the causes and effects. Recommendations of changes that need to be implemented on-site and modifications to any ESC will also be included.

2. Baseline Monitoring

As of December 2017, water quality monitoring equipment has been set up in the Waterloo Stream to continuously monitor turbidity. These turbidity sensors allow water quality to be tested as freshwater flows into the site and as it departs. Originally turbidity was measured upstream of the site on the main Waterloo Stream channel and downstream of the site on the Waterloo Stream. These monitoring sites have been adjusted as the earthwork's boundaries have expanded to continue monitoring the water quality upstream and downstream of the earthworks.

A Freshwater Monitoring Plan was completed as part of the Stage 2&3 AMP and is provided as Appendix A of that plan. The baseline monitoring included pre-construction environmental conditions, represented by:

- Water quality (limited to turbidity, TSS and pH);
- Macro Invertebrate sampling.
- Pre-development slip sampling.

Four sets of baseline water quality sampling were undertaken in 2017 which showed variability in the water quality. TSS ranged from 6 – 122 g/m^3, turbidity ranged from 7 – 67 NTU and the pH ranged from 6.7 to 7.8.

Total aluminium was measured on one occasion on the 6th of October 2017. The results from the six monitoring sites ranged from 0.194 to 1.42 g/m^3.

Macro-invertebrate sampling was completed by Tonkin and Taylor on the 27th of September 2017. The results are provided in Appendix B of the Baseline Monitoring Plan. The results indicated that the stream was of 'poor' quality based on MCI scores of 79, 76 and 75.

A pre-development survey was undertaken on the 6th of October 2017 to identify existing slips within the Waterloo and Weiti Streams. A location map marking the slips was provided in the Baseline Monitoring Plan as Appendix C. The survey identified a total of 33 slips along these two streams.

Stream 21 Survey

A baseline stream survey was conducted in October 2023. A 135m section of Stream 21 (previously referred to as Stream P9) has been identified as being largely unaffected by previous works and will remain unaltered post development. This section of stream is located upstream of the discharge point of an existing Sediment Retention Pond (SRP-J), although it has received discharged treated sediment laden water from SRP-T (originally a topsoil stockpiling area) since its approximate construction date, 2 February 2021.

The baseline survey included:

- Cross-section measurements at three intervals along the identified 135m long reach of Stream 21. These locations will be plotted on the Site Monitoring Plan (incl. coordinates).
- Photographic log of the 135m section of Stream 21. Photos taken at each cross-section point. Photos also taken to identify any baseline stream characteristics that may influence downstream water quality (i.e., stream bank erosion).
- Cross-section re-evaluated on a yearly basis to monitor any potential changes.

3. Construction Monitoring

3.1. Weather Monitoring

Rain Forecast

Rain forecasts relevant to the site will be checked daily using MetService/ MetVuw online forecasting system. Close monitoring of the rain forecast will be necessary to ensure the appropriate site works can be implemented prior to rainfall trigger events.

If the monitoring suggests >20mm over 24 hours of rainfall, then this will trigger the pre-rain event inspections as outlined in Section 3.3.

Rain Gauges

An automatic onsite rainfall monitoring station which will give email/text notifications of rainfall triggers will be located onsite.

This station will measure the following parameters:

- Rainfall intensity
- Rainfall volume

The rainfall event trigger that will initiate additional monitoring is:

- >25mm rainfall over any 24-hour period.

Rainfall data will be provided within the AMRP for all rainfall trigger events.

Note, previous versions of the AMP have included a second rainfall trigger (>15mm rainfall within an hour), which has been removed from this version of the AMP. The first version of the AMP was provided for EW2 and 3 in 2018 and to date only one event has occurred where the 15mm in an hour trigger was exceeded when the 25mm in a 24hr period was not triggered. For simplicity, the >15mm in an hour trigger event has been removed.

3.2. Freshwater Monitoring

Continuous instream turbidity monitoring (upstream and downstream) will inform responses at the time a rainfall trigger is exceeded. The locations of the upstream and downstream turbidity monitoring stations are shown in Appendix A.

The monitoring locations include two upstream monitoring stations, one on the Waterloo Stream (main stream channel) and one on a northern tributary of the Waterloo Stream (referred to as the Milldale Stream), at Argent Lane, located upstream of the extent of the Earthworks 11 stage boundary. One downstream monitoring station is in place, downstream of the earthwork's areas.

It is noted that the EW12 and EW13 stage boundaries are located upstream of the Milldale Stream monitoring site. In this case, the current monitoring location is considered the most suitable location to provide beneficial information. The Milldale Stream catchment is largely within the proposed development which will extend towards Cemetery Road. Cemetery Road sits upon the ridge between the catchments.

The Argent Lane Milldale Stream turbidity sensor has been in place since 2021. Figure 1 demonstrates the turbidity trend recorded for rain events of varying intensity. This shows the variation in the turbidity with minimal earthworks activities being undertaken upstream of the sensor. Utilising this 'baseline' data it is proposed to retain the current Milldale Stream monitoring site and compare the baseline turbidity to future rain events of similar nature. If the recorded turbidity exceeds 75 NTU and the elevated or gross exceedances as detailed below, then the management practices detailed in Section 5 will be actioned.

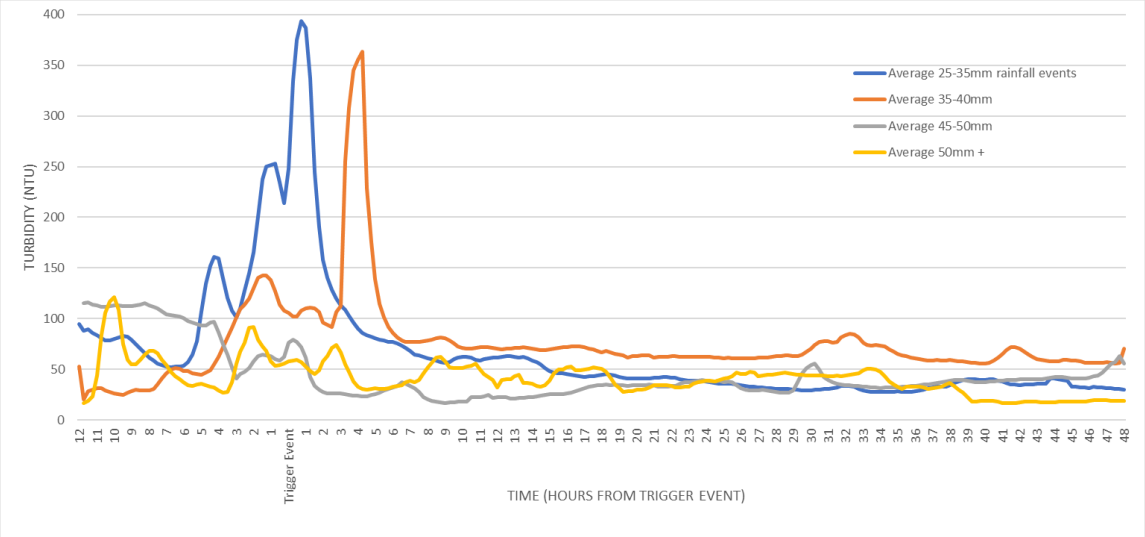


Figure 1: Milldale Stream 'baseline' pre-construction turbidity.

The data used in Figure 1 was sourced from single trigger events. The data was averaged using a moving average to smooth out spikes and irregularities.

An analysis of the Waterloo Stream turbidity was completed as part of the EW4 and 5 AMP. The analysis confirmed that during dry days and periods of minimal earthworks within the catchment the turbidity recorded at the downstream monitoring station fluctuates between 20 and 70 NTU. As a result, 75 NTU is taken as the upper end of the 'normal' range of turbidity in the stream. The following responses will apply when triggers are exceeded, and the downstream turbidity is greater than 75 NTU.

Data will be checked 24 and 48 hours after a rainfall trigger exceedance and assessed against two turbidity triggers, being:

i. >20% elevated exceedance. If the downstream turbidity is >75 NTU and there is greater than 20% increase between upstream and downstream; and

ii. >50% gross exceedance. If the downstream turbidity is >75 NTU and there is greater than 50% increase between upstream and downstream.

If the >20% elevated trigger level is exceeded at the 24-hour and 48-hour periods, then the following will occur:

- Determine if the site is still discharging to the monitored waterway.
- Within one (1) working day of a 48-hour period exceedance, carry out and record in writing a full audit of the condition of all ESC within the earthworks area discharging to the monitored waterway by the ESC specialist.
- Remedy any causes on site that may have contributed to a threshold breach as soon as practicable, and record what remedial measures were undertaken; and

- Notify the Auckland Council – Team Leader Northern Monitoring by email within one (1) working day of the >20% elevated threshold breach, including providing details of the percentage change in turbidity and any remedial measures taken.

If the >50% gross exceedance trigger is exceeded at the 24-hour and 48-hour periods, then the following will occur:

- Within 24hrs of a >50% gross threshold breach that has occurred at the 24-hour and 48-hour periods, carry out and record in writing a full audit of the condition of all ESC within the earthworks area discharging to the monitored waterway by the ESC Specialist;
- Remedy any causes on site that may have contributed to a threshold breach as soon as practicable, and record what remedial measures were undertaken;
- Notify the Auckland Council – Team Leader Northern Monitoring by email within one (1) working day of the >50% gross threshold breach, including providing details of the percentage change in turbidity and any remedial measures taken;
- If the turbidity threshold remains generally elevated above the threshold for more than 48hrs, then undertake visual quantitative survey of baseline monitoring sites to determine if trigger breached.

Stream 21 Survey

Re-evaluation of the 135m section of Stream 21 will be undertaken annually in October. Annual stream monitoring will include:

- Repeat the three cross-sections along the Stream 21 transect.
- Identify any significant changes to the stream.

Results will be added to the Stream 21 Monitoring report on an annual basis.

3.3. Erosion and Sediment Control Device Monitoring

Site inspections

The site will be regularly inspected during the works. The aim of these inspections is to ensure that all ESC devices are installed correctly and then operate effectively throughout the duration of the works. This inspection programme will provide certainty to all parties that appropriate measures are being undertaken to ensure compliance with conditions of consent and Auckland Council Guideline Document 2016/005 *Erosion and Sediment Control Guideline for Land Disturbing Activities in the Auckland* Region (GD05). The inspection regime will keep ESC management at the forefront of works on site. Any potential problems will be identified immediately, and remedial works will be promptly carried out.

The inspection programme will consist of:

- **Weekly** site walkovers by the contractor and/or engineer to the contract to inspect and determine the effectiveness of all ESC devices installed on site;
- **Pre-rain event:** Prior to all forecast rainfall events irrespective of projected intensity, additional inspections will be made of ESC devices to ensure that they are fully functioning (i.e. not damaged) in preparation for the forecast event. Furthermore, checks will be carried out on all monitoring devices to ensure they are in good working order. These walkovers will be undertaken by the contractor and/or the engineer to the contract;
- **Pre-Forecasts > 20mm over 24 hours**: Prior to forecast heavy rainfall events the site will be inspected by the contractor and if required, an Erosion and Sediment Control Specialist. The aim of the inspection will be targeted at additional ESC that are required to be installed to ensure that the sites ESC devices perform effectively;

- **Rainfall Trigger Inspections** During rainfall trigger events the ESC devices will be inspected by an Erosion and Sediment Control Specialist in conjunction with the contractor, subject to health and safety restrictions, for example inspections will not be undertaken at night.

  The rainfall trigger event site audits will be undertaken as close to the trigger as possible and within 24hrs of the event, excluding Sundays and Public Holidays.

  Data will be collected by the automated turbidity monitoring stations at the up and downstream receiving watercourse points. Additional manual monitoring of all inlets and outlets of discharging SRPs will be conducted using the portable Pro DSS turbidity monitoring device; and

- **Post-rain event:** Following all rainfall events including rainfall trigger events, inspections will be made of ESC measures to ensure that all controls have performed as expected and to identify any maintenance requirements. This will be undertaken by the contractor and/or the engineer to the contract.

Any remedial works will be documented during these monitoring inspections and immediately attended to.

When the rainfall trigger (>25mm rainfall over any 24-hour period) is exceeded, the following will occur:

- Within 24hrs of a rainfall trigger, carry out and record in writing a full audit of the condition of all ESC within the earthworks;
- Remedy any causes on site that may have contributed to a threshold exceedance as soon as practicable, and record what remedial measures were undertaken;
- Notify the Auckland Council – Team Leader Northern Monitoring by email within one (1) working day if any threshold exceedance;
- Undertake stream monitoring as per Section 3.2 above;
- Record an assessment of the success of each remedial work in reducing ongoing sediment discharge; and
- Prepare an Adaptive Management Response Report, within 10 working days.

Sediment Discharge Monitoring

Manual Monitoring

Manual turbidity monitoring will be undertaken during rainfall trigger event site walkovers to provide a snapshot of the ESC performance. Manual turbidity monitoring will be undertaken using a handheld ProDSS water quality field instrument used to measure both inflow and outflow turbidity of discharging SRPs.

A treatment efficiency benchmark for the SRPs will be set at an average 90% efficiency (2-year 1hr duration = 26.1mm). If this threshold is exceeded as a result of monitoring during a rainfall trigger event, then the following will occur:

- Within 24hrs of a threshold exceedance, carry out and record in writing a full audit of the condition of all ESC within the earthworks;
- Remedy any causes on site that may have contributed to a threshold exceedance as soon as practicable, and record what remedial measures were undertaken;
- Notify the Auckland Council – Compliance Monitoring by email within one (1) working day of a threshold exceedance;
- Undertake stream monitoring as per Section 3.2 above;
- Record an assessment of the success of each remedial work in reducing ongoing sediment discharge; and
- Prepare an Adaptive Management Response Plan within 10 working days.

The treatment efficiency trigger will also be used to identify catchments that are deemed higher risk. If efficiency triggers are breached, then that SRP will be deemed to be 'high risk' for the next rainfall trigger event.

High risk SRPs will be subjected to additional scrutiny during pre-forecast inspections (forecasts of >20mm/24 hrs) to ensure that repeat breaches do not occur.

Data Interpretation

All data will be compiled for the analysis of sediment runoff in relation to rainfall, earthworks area and ESC performance. This analysis will provide evidence of efficiency of the ESC system within each SRP catchment. This will also inform potential for modification of site ESC practices to improve sediment retention within the site.

Data obtained from the analysis of grab samples taken during the Milldale Earthworks – Precinct 1 have been found to provide a trend between turbidity and TSS. If Auckland Council requires TSS values, then turbidity data may be used as a surrogate for TSS. At any stage, if required by Auckland Council, grab samples will be obtained from the site and tested at an accredited laboratory.

4. Reporting

Adaptive Management Response Report (AMRR)

Following every trigger event an AMRR will be generated to summarise the conditions during and after the event. If any triggers are exceeded, then an exceedance notification will be generated. This will outline what exceedance occurred, the extent of the exceedance, any actions taken to mitigate the effects of the event, and a proposed management response if required.

The Auckland Council – Team Leader Northern Monitoring will be notified by email within one working day of any threshold breach. A report will be provided within 10 days of the threshold breach.

Stream 21 Monitoring Report

To be updated on an annual basis and once earthworks are completed within the catchment area of this section of the Stream 21. Note, the original stream monitoring report refers to Stream P9, which has been renamed to Stream 21.

Annual monitoring will be undertaken in October each year during earthworks phase. The monitoring report will be updated, and results provided to Auckland Council by 1 December of each year.

5. Management Actions

Management responses/actions will be identified when a trigger event occurs. These responses are additional to general site management and maintenance.

In some instances, the adaptive responses will be discussed and agreed with the relevant stakeholders to ensure the most appropriate outcomes are achieved. General actions to be undertaken during trigger events are as follows:

- Investigate whether the triggers have been exceeded as a result of a natural process;
- Investigate whether there have been any significant events or failures that could have caused the discharge;
- Ensure all site controls are operating in accordance with approved plans and best practice;
- Determine if the discharge is an isolated case or is likely to be repeated; and
- Investigate and implement modifications, including:

- Investigate ESC measures to determine whether there has been a discharge from the devices;
- Make alterations to ESC measures and methodologies;
- Consider additional ESC;
- Refinement of chemical treatment systems;
- Progressive stabilisation in sub catchments;
- Increase maintenance of controls;
- Amendments to methodologies and sequencing of works and refinement of controls necessary; and
- Reduce the open area limits of earthworks.

If any rain event results in either:

- A high-risk SRP not meeting the efficiency benchmark; or
- An in-stream trigger (>50% or >20% over 48 hours) and an SRP efficiency benchmark is not met.

Then the default position will be to stabilise the contributing catchment unless the reporting and investigations could demonstrate that there were other / better solutions than a catchment shut down, and there was agreement with the Auckland Council – Team Leader Northern Monitoring.

6. Post Construction

A single post construction survey will be completed once the earthworks are completed within the catchment of this section of Stream 21.

Note, this does not include earthworks further downstream of this section of the stream.

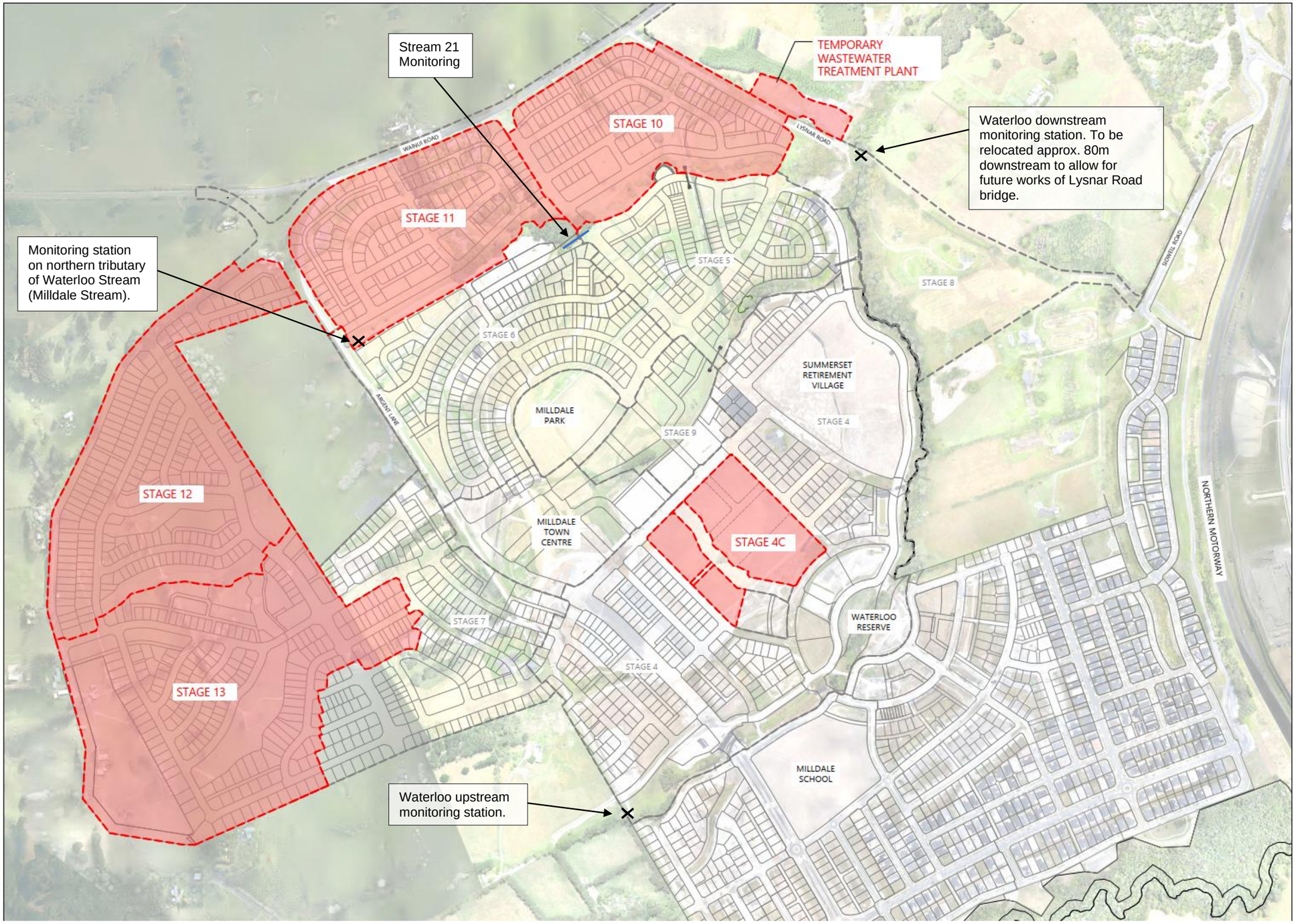
The post construction survey will include a summary of any changes that have occurred from the baseline survey to post construction and identification of any possible change to this section of the stream.

Appendix A

SITE MONITORING PLAN

Appendix B

STREAM 21 MONITORING REPORT



WOODS Est.1970

LEGEND

SUB-STAGE BOUNDARIES

BOUNDARIES

STAGES FOR FAST TRACK

P9 STREAM MONITORING

REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	JW	OCT 2024

SURVEYED	WOODS	SIDWELL ROAD WAINUI AUCKLAND
DESIGNED	WOODS	
DRAWN	FA	
CHECKED	JW	
APPROVED	JW	WOODS.CO.NZ

N

MILLDALE

MILLDALE FAST TRACK APPLICATION

WOODS Est. 1970

SOUTHERNSKIES ENVIRONMENTAL

REV	DATE	REVISION DETAILS	APPROVED
A	03.02.25	Draft for review.	

MILLDALE

Project	**MILLDALE**
Title	**Site Monitoring Plan Stages 10 - 13**

Drawn	Checked	Drawing No.	Sheet No.
ZW	CS	SMP-01	1

SOUTHERNSKIES ENVIRONMENTAL

P9 STREAM MONITORING

EARTHWORKS STAGE 7 – MILLDALE

FULTON HOGAN LAND DEVELOPMENT LTD

NOVEMBER 2023

Document Control

Project Number	P17-005
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1. Introduction

1.1. Adaptive Management

An Adaptive Management Plan (AMP) has been prepared to support the Earthworks 7 (EW7) Project, as part of the Milldale Precinct Earthworks. The EW7 AMP requires a section of approximately 135m of Stream P9 to be monitored before, during and after the proposed earthworks. This section of stream P9 is identified as a section of stream that will remain unaffected by the Milldale earthworks.

Baseline

Baseline monitoring was undertaken on 24 October 2023. The baseline monitoring included:

- Three cross-sections undertaken along the P9 transect.
- Photographic log of the stream and identification of any features along the reach that may influence downstream water quality.

During Construction

During construction this section of the P9 stream will be monitored and re-evaluated annually during October of each year that the earthworks are ongoing within the P9 stream catchment.

Monitoring undertaken during the earthworks phase will include:

- Repeat the three cross-sections along the P9 transect.
- Identify any significant changes in the stream (e.g. stream flow path, bank erosion, sediment deposition etc). These changes will be documented with photos/evidence.

Post Construction

A single post construction survey will be completed once the earthworks are completed within the catchment of this section of Stream P9.

Note, this does not include earthworks further downstream of this section of the stream.

The post construction survey will include a summary of any changes that have occurred from the baseline survey to post construction and identification of any possible change to this section of the stream.

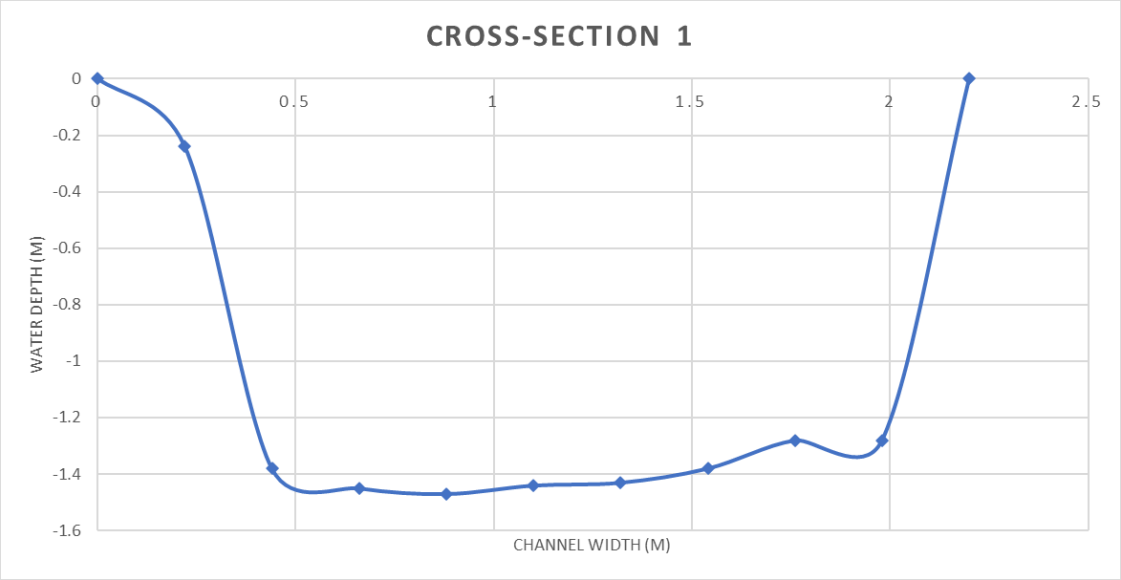
2. Baseline Survey

Baseline survey and cross-sections were completed on 24 October 2023.

Photographic log is provided in Appendix A.

Location details

	Latitude	Longitude
Start / Upstream extent (0m)	-36.607100	174.643628
Cross-section 1 (15m)	-36.607029	174.643738
Cross-section 2 (50m)	-36.606871	174.644044
Cross-section 3 (130m)	-36.606473	174.644750
End / Downstream extent (145m)	-36.606360	174.644870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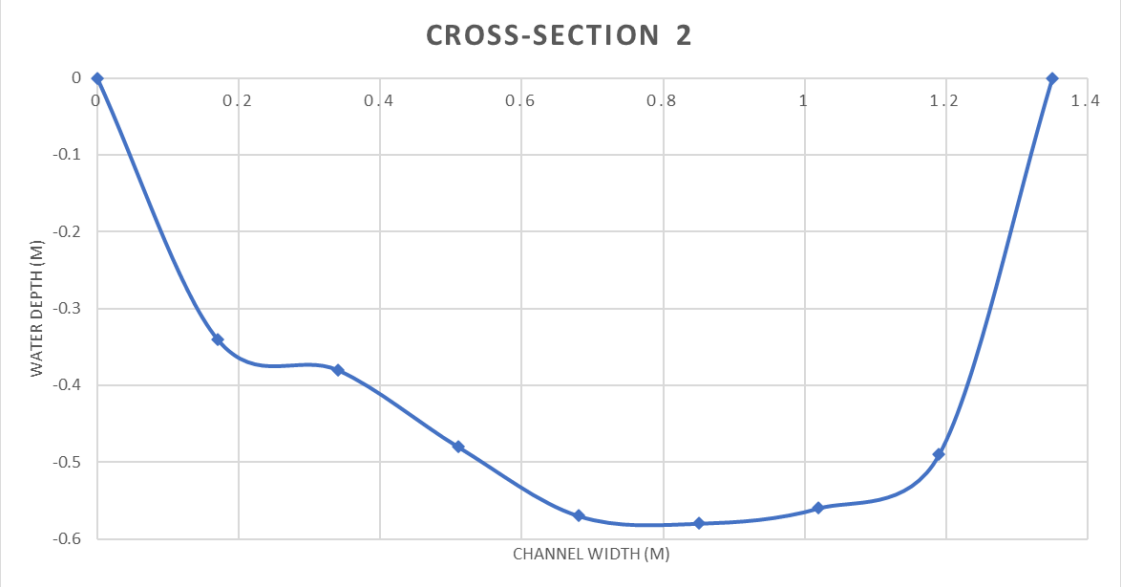
-0.2
-0.4
-0.6
-0.8
-1
-1.2
-1.4
-1.6
WATER DEPTH (M)
0
0.5
1
1.5
2
2.5
CHANNEL WIDTH (M)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-0.2
-0.3
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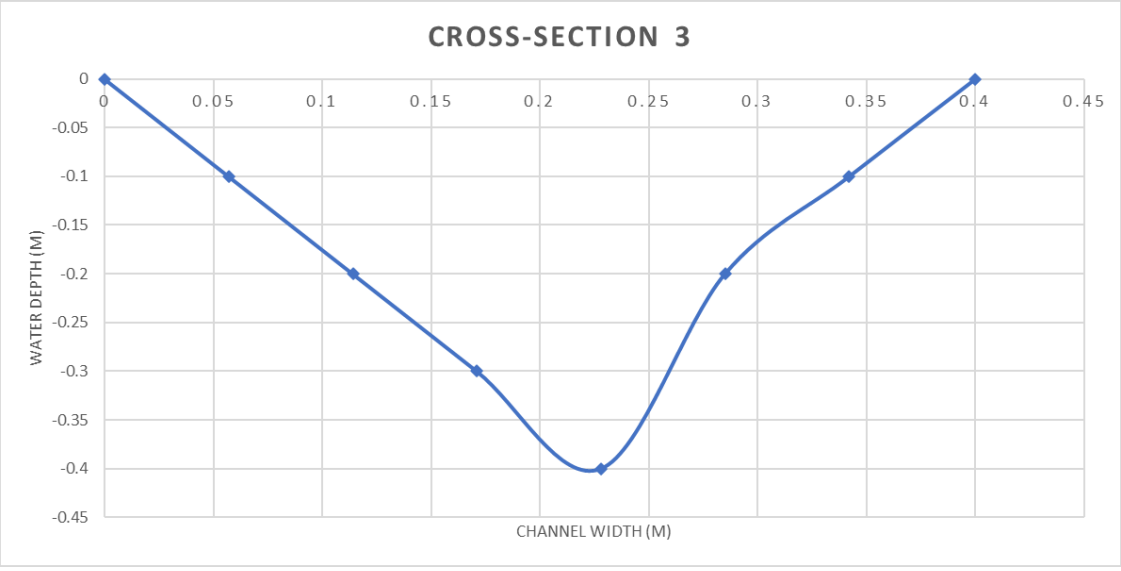
-0.5
-0.6
WATER DEPTH (M)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
CHANNEL WIDTH (M)


CROSS-SECTION 3
0
-0.05
-0.1
-0.15
-0.2
-0.25
-0.3
-0.35
-0.4
-0.45
WATER DEPTH (M)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
CHANNEL WIDTH (M)

Summary

From the upstream extent of the survey (0m) to approximately 80m downstream, the stream riparian zone is well vegetated and shaded with riparian vegetation. Some tree trimming has recently been completed of the larger trees to allow safe earthmoving to the south of the reach. This section is also characterised by several deep (1-1.5m) pools.

Existing vegetation and debris at the approximate 75m mark act as a dam which directly influences water depth upstream and downstream. From this point downstream the stream channel width and depth decreases. From the 100m mark to the end of the survey (145m) the riparian zone is dominated by low level vegetation and grass, providing little to no shading. This section of the stream is narrow and shallow.

3. Construction Monitoring

Annual stream surveys will be completed in October of each year while earthworks are ongoing within this section of the P9 stream catchment.

Annual stream survey results to be included as completed.

4. Post Construction

A final, post construction survey will be undertaken once the earthworks within the catchment of this section of the P9 stream.

Results to be included once completed.

Appendix A

Photographic log of P9 stream surveyed reach.

Photo No.	Location and description	Photo
1	0m Photo looking downstream at upstream extent and start point (fence line).	
2	0m Photo looking downstream at 0m just downstream of fence line.	
3	15m Photo of Cross-section 1 location, birds eye view.	

4	15m Photo of Cross-section 1 location looking downstream.	
5	Existing feature. Tree in stream. Tree trunk recently cut.	
6	50m Cross-section 2 looking downstream.	

7	Existing feature. Debris/vegetation in stream.	
8	Stream channel.	
9	Existing feature. Debris/vegetation in stream creating dam like feature.	

10	Existing feature.	
11	Stream channel.	
12	Stream channel.	

13	Stream channel.	
14	Stream channel.	
15	Stream channel.	

16	130m Cross-section 3 looking downstream.	
17	130m Cross-section 3 birds eye view.	
18	Stream channel.	

19	Stream channel.	
20	145m stream survey downstream extent and sediment retention pond outlet.	

Appendix B

SITE MONITORING PLAN - P9 Baseline Stream Survey

WOODS Est. 1970

SOUTHERNSKIES ENVIRONMENTAL

REV	DATE	REVISION DETAILS	APPROVED
A	24.10.23	P9 BASELINE STREAM SRUVEY	

MILLDALE

Project	**MILLDALE**		
Title	**Site Monitoring Plan** **P9 Baseline Stream Survey**		
Drawn **ZW**	**Checked** **CS**	**Drawing No.** **SMP-EW7-02**	**Sheet No.** **2**