Wairaka Stream Restoration Plan
Discussion Document

Prepared for

Unitec Institute of Technology
TE WHARE WĀNANGA O WAIRAKA

By

MORPHUM ENVIRONMENTAL LTD

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Contents

1.0 Introduction

Morphum Environmental was engaged by Unitec to write a discussion document, to help the planning of the restoration of the section of Wairaka Stream that runs through Unitec's Mt Albert Campus. The stream is important to Unitec and the wider community for a number of reasons, including the cultural significance of the stream being fed by a sacred spring on campus – *Te Wai Unuroa o Wairaka*, the potential to use the stream as a teaching resource, the unique ecological value of the watercourse as it stems from a clean water source in an urban setting, and the linkage of the stream to the wider Oakley Catchment, amongst other reasons.

In late 2009, Unitec began the development of a comprehensive Environmental Sustainability Strategy (ESS) (Fourie, 2011). The strategy aims to embed sustainability at the core of Unitec's four major areas of operation: Teaching, Research, Advocacy and Campus Operation (T.R.A.C), therefore the Wairaka Stream Restoration Plan Discussion Document, has been developed to enable collaboration with interested parties from within Unitec, such as:

- The ESS Committee;
- The Maori Senior Advisor to Unitec's Council and CEO;
- The Natural Sciences Faculty;
- Civil Engineering and Construction Departments;
- Facilities Management;
- The Biota of Wairaka Stream Seed Fund Project;
- The Sanctuary Steering Group; and
- USU Students' Association.

External stakeholders such as, Friends of Oakley Creek (a local community organisation), the Mason Clinic (neighbouring landowners), Auckland Council and Wai Care, are also considered key collaborators in planning the future restoration of Wairaka Stream.

In 2010, the Oakley Creek Watercourse Management Plan (WMP) (Coup et al, 2010) was developed by Morphum Environmental Ltd for Auckland Council (previously Auckland City Council). The scope of the WMP included Wairaka Stream, and provides a tool to describe specific management actions and management zones to improve the watercourse, though identification of Restoration Opportunities (ROs). No ROs fall within the Wairaka Stream, because ROs were only identified on publicly owned land. Wairaka Stream is included in Management Zone One (MZ1) of the WMP and is included in the high level objectives developed for this management zone. Enhancement opportunities for Wairaka Stream are also identified in the WMP. These

objectives and enhancement opportunities have been considered in the Wairaka Stream Restoration Plan development.

A key initiative identified in the ESS in 2010 is the opportunity to restore Wairaka Stream though riparian planting. The Civil Engineering department has commissioned this planning to expand on this riparian planting to include a soft engineering approach that could improve the stream function and ecology. This, and potential initiatives by the Natural Sciences Faculty, such as including stream restoration in the Restoration Ecology paper, provides an opportunity for the rehabilitation of Wairaka to be utilised as a teaching and advocacy tool.

1.1Scope

Wairaka Stream is a spring fed tributary entering Oakley Creek on the True Right Bank (TRB) in the lower reaches behind Unitec's Mt Albert Campus, on Carrington Road. The stream starts in the Unitec Campus, next to building 180, where clear spring water percolates up from a hole under the rocks. The adjoining surface water subcatchment flows through the Unitec Campus stormwater ponds and into Wairaka Stream, the stream then flows through the Unitec Campus and the Mason Clinic before entering Oakley Creek. A site map of Wairaka Stream is included as Appendix A.

The scope of the Wairaka Stream Restoration Plan Discussion Document includes the reaches of stream that flow through Unitec's property. The discussion document highlights improvements that could be made to the stream corridor in line with ROs described in the Oakley Creek WMP and other objectives that have been identified.

1.2 Objectives

Unitec's objectives for the restoration of Wairaka Stream aim to improve overall ecological and amenity values, stream function, align with cultural and community values, and aid in teaching and advocacy. These high level objectives are described in Table 1.

Table 1. Wairaka Restoration Objectives

Outcome		Objective
1	Increased biodiversity	Create natural green corridor linkages and improve the overall diversity of native species, both flora and fauna, though weed and animal pest control and planting the riparian margin.

Outcome		Objective
2	Enhanced ecological value	Create instream and terrestrial habitat for native freshwater macroinvertebrates and fish, and terrestrial species, through naturalisation of the watercourse and riparian planting.
3	Improved water quality	Reduce the potential for contaminants to enter Wairaka Stream from source to its confluence with Oakley Creek. Enhanced uptake of contaminants through interaction with Riparian Vegetation. Reduced temperatures and improved dissolved oxygen by increased shading and turbulence.
4	Improved stream function	Create a functioning floodplain and riparian environment that reduces bank erosion, and slows stormwater flow velocities through a soft engineering approach.
5	Enhanced cultural value	Consider the cultural significance of the groundwater spring and potential for other areas of cultural importance e.g. sustainable harakeke harvesting.
6	Reduced maintenance	Aim to reduce the cost and time spent on maintenance of the watercourse and surrounding environment, though careful selection of riparian plant species.
7	Enhanced amenity value	Provide more places for staff, students, visitors to Unitec and the local community to utilise the space provided by the stream. Include places to sit and relax/reflect/view art and sculpture (representative of Maori/European history and future, and read education signage in the vicinity.

Outcome		Objective
8	Incorporated into the curriculum	Use Wairaka Stream restoration as an ongoing teaching resource in courses taught at Unitec, such as those in the Natural Sciences Faculty and Engineering Departments.
9	Aligned with community values	Collaborate with and consider objectives of the local community and wider objectives for the local environment.

2.0 Enhancement Opportunities

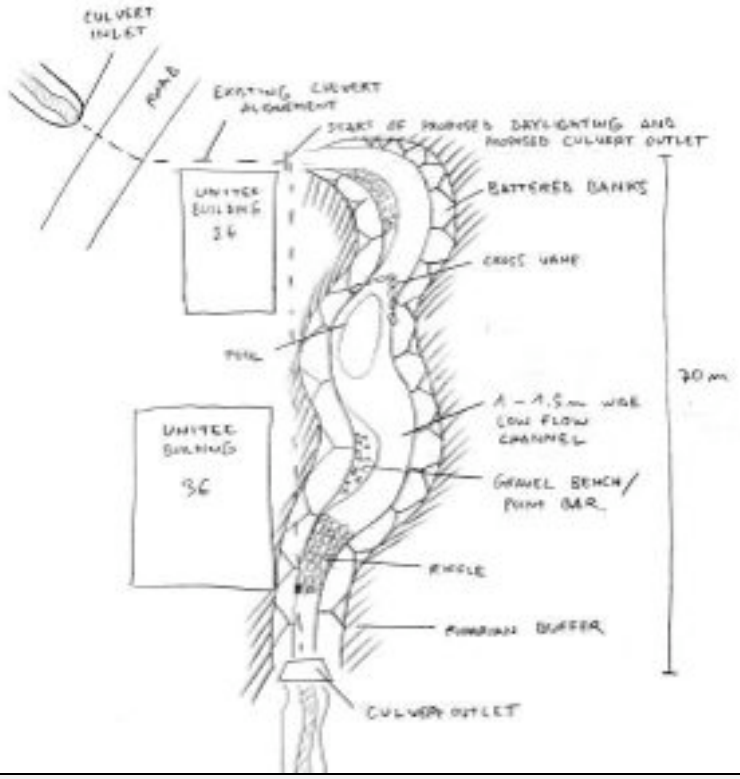
The objectives for Wairaka Stream restoration will be met by the implementation of key enhancement opportunities (EOs). The following opportunities have been scoped, and are recommended for consideration in the development of the Wairaka Restoration Plan. A map showing the location of EOs is included as Appendix A and more detail on each EO is included below.

2.1 Stream DayLighting

The lower section of Wairaka Stream (MU1), on Unitec property is piped by a one metre wide, 70 metre long concrete box culvert, from Carringtons Café to an outlet near the border of Unitec and Mason Clinic properties. The area is used as a preferential access way to a composting area near the true left bank (TLB). Table 2. describes enhancement opportunity one (EO1) Stream DayLighting.

Table 2. Enhancement Opportunity One (EO1)

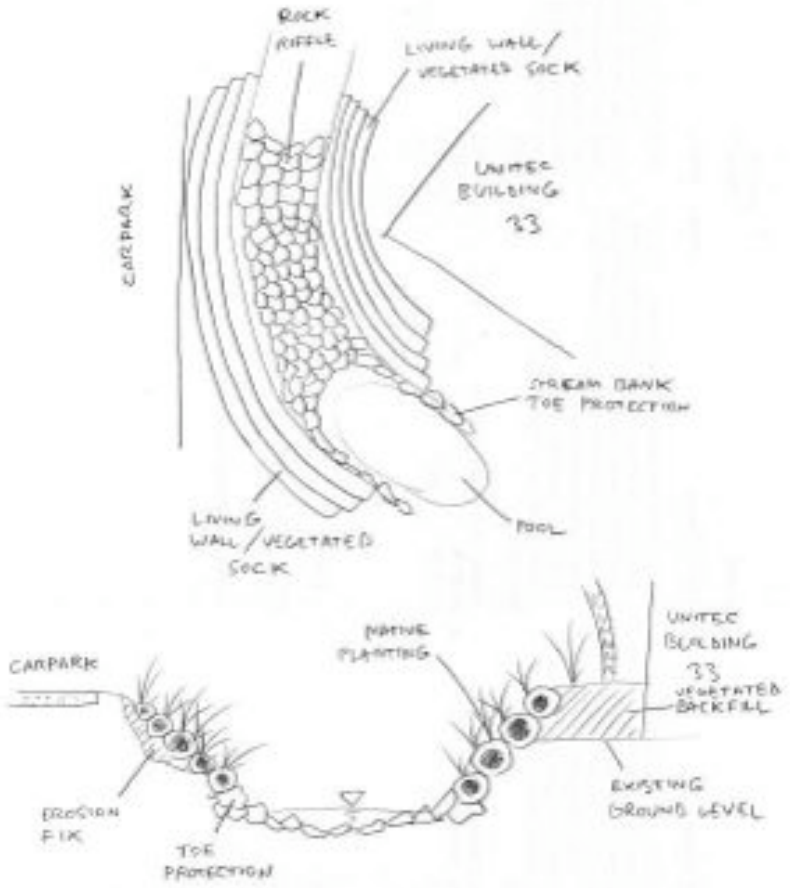
Enhancement Potential	
 **Figure 1. MU1 looking upstream at box culvert.**	Daylighting to rehabilitate the section of watercourse to a more natural stream. Daylighting the stream will enhance the instream and terrestrial habitat for native species.

Proposed Enhancement

Recommended Option
▪ Daylighting the stream from the corner of existing glasshouse (Unitec building 24). ▪ Meandering and bank recontouring. ▪ Stream bed habitat enhancement. ▪ Stream bank habitat enhancement (refer to EO5). ▪ Path and boardwalk development to maintain access requirements and improve access for amenity and education.

2.2 Erosion Protection

In MU2 the stream meanders around the back of Carringtons Café adjacent to the Auckland Blues training ground carpark. Space is limited between the building and carpark. Rocks have been placed on the inside bend of the stream on the TLB to prevent erosion too close to the neighbouring building, this is causing scouring of the outside bend on the TRB. Table 3. describes enhancement opportunity two (EO2) Erosion Protection.

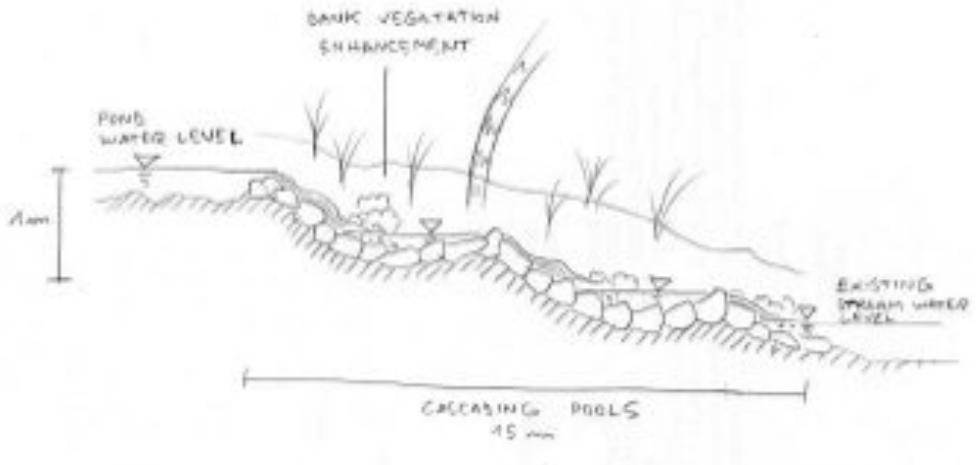
Table 3. Enhancement Opportunity Two (EO2)

Enhancement Potential	
 **Figure 2: MU2 looking upstream, showing rocks placed on TLB and scour on TRB.**	Erosion control measures to prevent scour of both banks and mitigate flood risk.
Proposed Enhancement	
	
Recommended Option	
▪ Raise true left bank to enhance flood protection. ▪ Enhance existing erosion protection.	

2.3 Cascading Pool

At the upstream extent of MU2, downstream of where the stream is culverted under Farm Road, a small on line sedimentation pond and one metre high wooden weir have been constructed, causing a barrier to fish passage. The sedimentation pond is almost full of sediment and aquatic weeds are present. Table 4 describes enhancement opportunity three (EO3) Cascading Pool.

Table 4. Enhancement Opportunity Three (EO3)

Enhancement Potential	
 **Figure 3: MU2 looking upstream to wooden weir and settlement pond.**	Replacement of the dam with a low gradient structure to allow fish passage. Dredging of the pond and planting, or adoption of a floating wetland to increase shadow and treatment capacity. Densification of riparian vegetation (refer to Section 2.5).
Proposed Enhancement	
	
Recommended Option	
▪ Adoption of a cascading pool structure improving: o Fish passage o Water oxygenation	

2.4 Cultural Planting

Wairaka Stream is of great significance to local Maori, as the spring that feeds the stream is said to be where '…Toroa's famous daughter Wairaka… drank from the waters she stamped from the ground.' (pg4, Truttman, 2007). The

spring was highly valued for drinking, rituals, healing, bathing, irrigation and a source of food. Today the Unitec marae – Te Noho Kotahitanga – is located next to the stream in Management Unit 4 (MU4). A section of the TLB of Wairaka Stream through MU4 has been planted as a Pā Harakeke (flax garden) for sustainable harvest of flax for weaving. Table 5. describes enhancement opportunity four (EO4) at the Pā Harakeke site.

Table 5. Enhancement Opportunity Four (EO4)

Enhancement Potential	
 **Figure 4: Pā Harakeke on TLB & Te Noho Kotahitanga**	There is potential to enhance the existing Pā Harakeke to cover a wider riparian area, and to meet objectives of Te Noho Kotahitanga. This could include other plants with cultural importance or additional harakeke cultivars available with the support of the Auckland botanic Gardens.

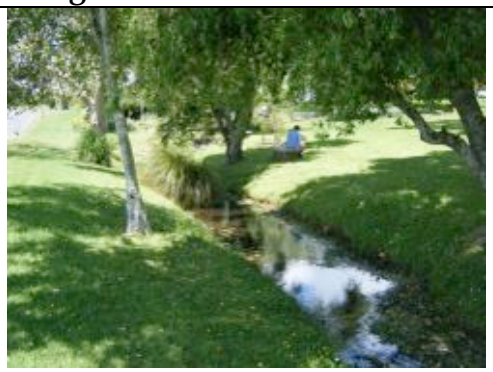
Traditionally, Wairaka Stream may have been used to grow and harvest native New Zealand watercress (puha). It has been suggested that this activity be reinstated at the stream. More research may need to be conducted into the health and safety issues surrounding harvest of puha from this urban site.

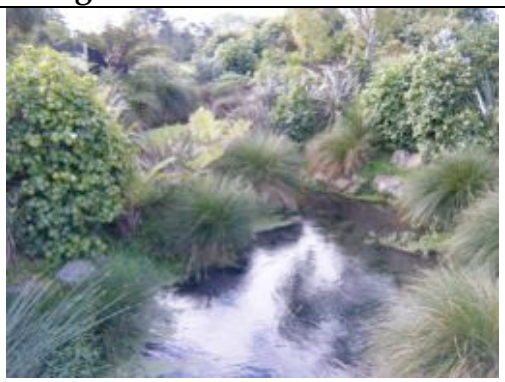
2.5 Riparian Planting

Riparian cover at Wairaka Stream is currently low, with much of the riparian margin consisting of mown banks right up to the stream edge. In the lower reaches, where some riparian cover does exist, tree species are generally exotic, consisting mainly of Willow (*Salix* sp.). The upper reach just below the spring, has been planted with predominantly native species and any riparian planting should be consistent with this, and other planting that has occurred lower in the stream at the confluence with Oakley Creek and the wider Oakley Catchment.

A planting plan should be developed in accordance with the Auckland Regional Council Technical Publication – Riparian Zone Management (TP148) (Becker, 2001). Appendix B includes a preliminary plant list for discussion, and approximate plant numbers and costs, for each Management Unit (MU) identified on the map in Appendix A. Table 6. describes the riparian planting enhancement opportunities in each MU.

Table 6. Riparian Planting Enhancement Opportunities (EOs)

Enhancement Potential	
Management Unit One	
 **Figure 5: MU1 looking upstream from culvert.**	MU1 starts at the Unitec property boundary between Unitec and the Mason Clinic (behind building 35), and finishes where the stream is daylighted next to Carrington's Café (building 33). The majority of the section of stream in MU1 is culverted (refer to Section 2.1). If the length of stream is daylighted there is potential to plant the riparian margin to provide shade to the stream, and reduce contaminants entering the watercourse through stormwater runoff.
Management Unit Two	
 **Figure 6: MU2 looking upstream under Willow cover.**	MU2 starts at Carrington's Café (building 33) and finishes at Farm Road. MU2 consists of mainly a mown riparian margin up to the stream edge, with some exotic tree species providing shade. There is potential to selectively remove exotic tree species as appropriate and replace with native species. Planting understory and groundcover natives will also reduce contaminated stormwater runoff entering the stream and provide shade. MU2 includes EO2 – Erosion Protection (refer to Section 2.2), which, if undertaken will include planting of appropriate native species on the living wall. EO3 – Cascading Pool (refer to Section 2.3) within MU2, includes planting of appropriate wetland species to improve the current instream stormwater settlement pond structure.

Management Unit Three	
 **Figure 7: MU3 looking downstream towards Unitec marae.**	MU3 starts at Farm Road and finishes near the carpark to the East of building 182. MU3 consists of predominantly low gradient slopes that are mown to the stream edge. Planting with appropriate native species will provide shade to the stream and reduce contaminated stormwater runoff entering the stream. MU3 includes EO4 – Cultural Planting (refer to Section 2.4). Riparian planting in this area could include expansion of the Pā Harakeke.
Management Unit Four	
 **Figure 8: MU4 looking downstream from footbridge.**	MU4 starts near carpark to the East of building 182, and finishes at the spring at the upper extent of the stream reach. MU4 consists of predominantly healthy native species planted to a riparian margin width of 2.5 – 10 metres. Some weeds exist within the unit which could be removed and replaced by infilling with native species.

3.0 Next Steps

It is recommended that a committee for Wairaka Stream Restoration is formed, consisting of key stakeholders, these parties may include:

- Civil Engineering and Construction Departments;
- Facilities Management;
- The ESS Committee;
- The Maori Senior Advisor to Unitec's Council and CEO;
- The Natural Sciences Faculty;
- The Biota of Wairaka Stream Seed Fund Project;
- The Sanctuary Steering Group;
- USU Students' Association;
- Friends of Oakley Creek;
- The Mason Clinic;
- Auckland Council Parks Team;
- Wai Care; and
- Morphum Environmental Ltd.

The purpose of the committee is to:

- Confirm the objectives described in Section 1.2.
- Discuss the enhancement opportunities described in Section 2.0 (and others that may arise) and prioritise them based on their ability to satisfy the agreed objectives.
- Define specification for agreed enhancement opportunities.
- Identify costs and budget allocated for agreed enhancement opportunities.
- Plan and undertake agreed enhancement opportunities e.g. riparian planting.

The timeline in Table 7, proposes the next steps to ensure a collaborative approach to Wairaka Stream restoration is taken.

Table 7. Proposed Restoration Timeline

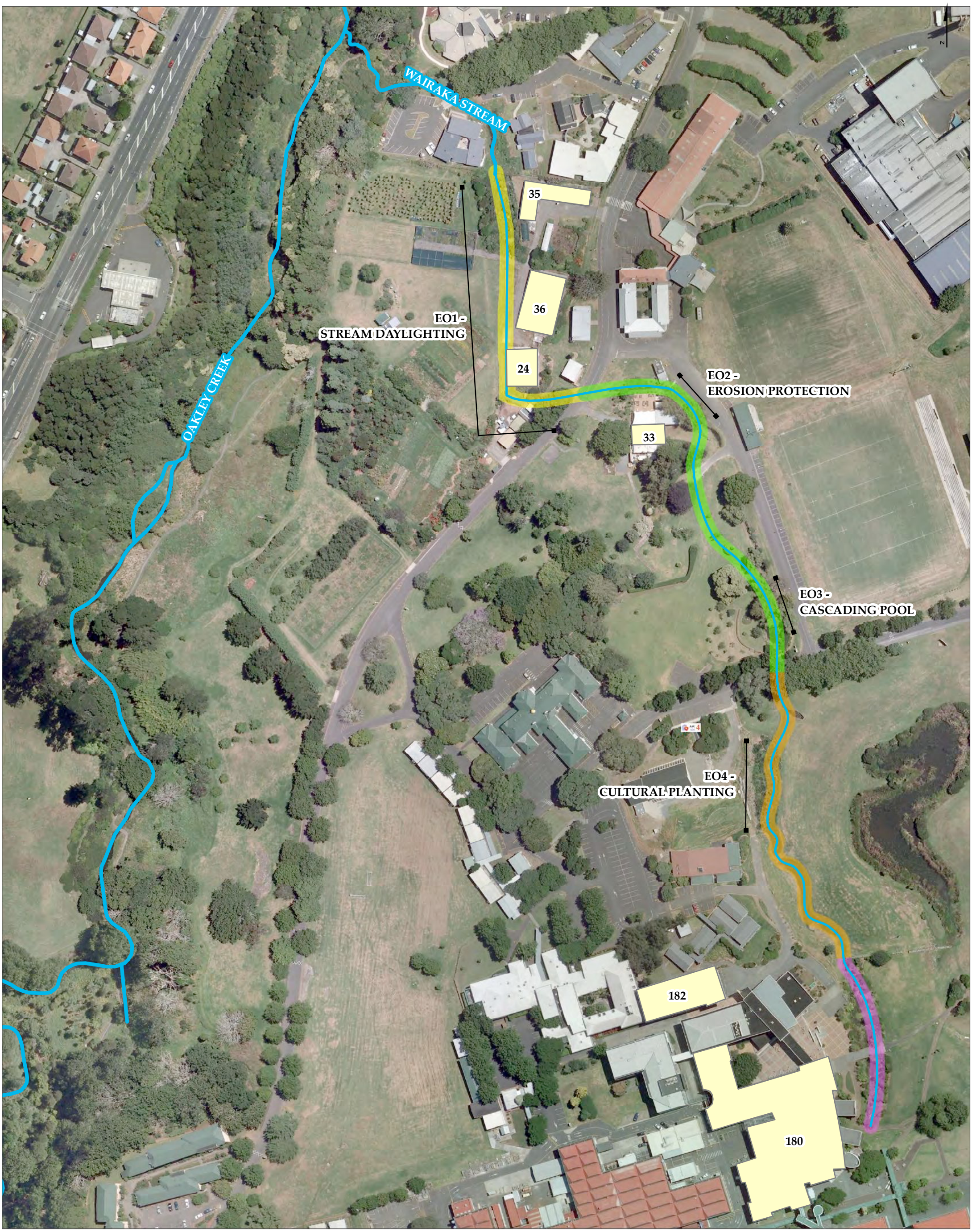
Task	Month 2012				
	Feb	Mar	Apr	May	Jun
Form Wairaka Stream Restoration Group					
Group to meet to discuss EOs and prioritise					
EOs defined and Engineering Design completed					
Costs identified and budget allocated					
Implementation of EO2 and EO3 subject to consenting requirements					
First riparian planting day					
Implementation of EO1 Stream Daylighting to be considered in conjunction with Auckland Council and implementation timeframe to be confirmed.					

The Unitec Engineering Department is scheduled to run the Water and Soil conservation paper in Semester 1 2012, dependant on registrations. It is proposed that the internal assessment for this paper would be based on these enhancement opportunities. This process can feed into the design whilst giving students a hands on involvement with the project. It is recommended that the EO1 Stream Daylighting is also progressed with student input, potentially as a major design assessment in conjunction with Auckland Council.

Appendix A

Site Map

Wairaka Stream Restoration Site Map



- Management Unit (MU) 1
- Management Unit (MU) 2
- Management Unit (MU) 3
- Management Unit (MU) 4
- Enhancement Opportunity (EO)
- Watercourse
- Unitec Building

0 10 20 30 40 50
Metres

This plan may contain errors or omissions or may not have the spatial accuracy required for some purposes. There may be other information relating to the area shown on this map which is unknown to Morphum Environmental Ltd. This map may contain Crown copyright data. Please consult Morphum Environmental Ltd if you have any queries.

Auckland Council

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Scale : 1 to 1,500 @A3	
Sheet 1 of 1	Version : 1
Date : 18/01/12	Drawn by : AP
Map Number: 1	Approved by : CC

Appendix B

Preliminary Plant List and Approximate Plant Numbers

The plant species in Table 8. have been included based on their ability to satisfy the applicable objectives described in Section 1.2, and in accordance with TP148 – Riparian Zone Management. A planting plan including final plant species, and the number of each species would be developed after meeting with the Wairaka Stream Restoration Committee.

Table 8. Preliminary Plant List

Typical Revegetation Species		Type	Zone
Carex lessoniana	Rautahi	G	SB/F/SP
Carex secta	Purei	G	SB/F/SP
Carex virgata	Small swamp sedge	G	SB/F/SP
Cortaderia fulvida	Toetoe	U	F/S
Cordyline australis	Cabbage tree (ti)	T	F/SP/S
Blechnum novaezelandiae	Swamp kiokio	G	SP
Leptospermum scoparium	Manuka	T	SP/S
Coprosmas robusta	Karamu	T	S
Phormium tenax	Flax	U	S
Melicytus ramiflorus	Mahoe	T	F
Myrsine australis	Mapou	T	F

Key	
Spring	SP
Floodplain	F
Stream bank	SB
Slope	S
Tree	T
Understory	U
Ground cover	G

The estimated number of plants per Management Unit are included in Table 9. Plant numbers are based on the MU area and a general 0.5m spacing of plants. Table 9 also includes estimated costs for each MU, however these are subject to change depending on the type and size of plant species decided on.

Table 9. Estimated Plant Numbers and Cost Per Management Unit

MU	Area (m^2)	Plant Numbers	Cost
MU1	1,350	2,070	$9,950
MU2	1,751	2,700	$12,960
MU3	1,409	2,200	$10,560
MU4	807	404	$1,940

References

Becker, K. (2001). Technical Publication 148: Riparian Zone Management. Auckland Regional Council.

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